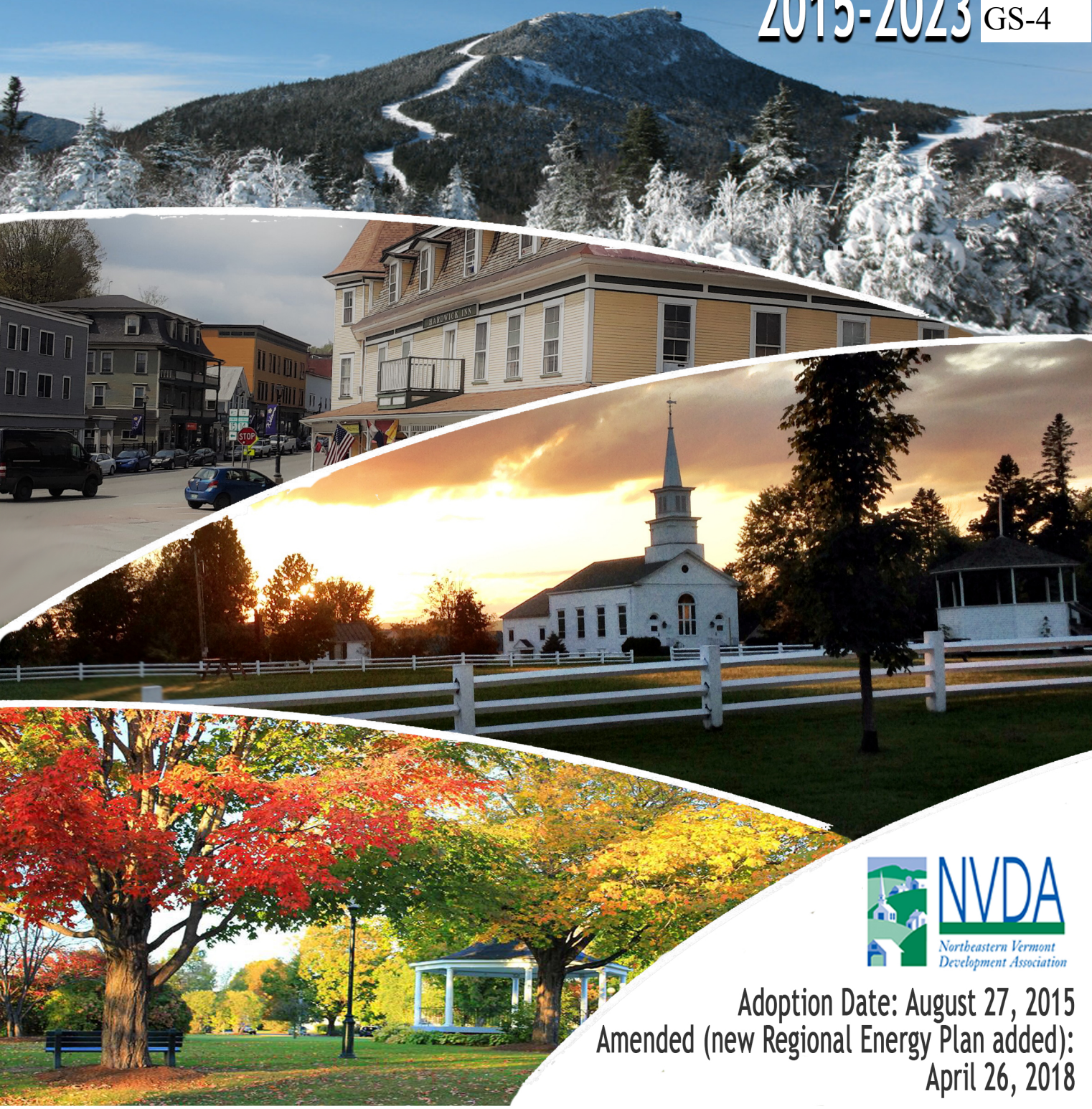
# Regional Plan for the Northeast Kingdom 2015-2023

Exhibit TL-GS-4




NVDA
Northeastern Vermont Development Association

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NORTHEASTERN VERMONT DEVELOPMENT ASSOCIATION

# TABLE OF CONTENTS

## VOLUME I REGIONAL GOALS & STRATEGIES



## VOLUME II REGIONAL ANALYSIS

## NVDA Region Transportation Maps

# Volume I

REGIONAL GOALS & STRATEGIES

# I. INTRODUCTION

The Northeastern Vermont Development Association (NVDA), the regional planning and development organization for the northeast region of Vermont, strives to assist and promote the interests of all municipalities in Caledonia, Essex, and Orleans Counties; and to support economic development initiatives that provide quality job opportunities in this region. The Association is enabled under the Vermont Municipal and Regional Planning and Development Act (24 V.S.A., 117, Section 4341). NVDA is the only combined Regional Planning Commission and Development Corporation in Vermont.

The mission of NVDA is to:

- Provide leadership and technical expertise to local communities, agencies, and organizations to facilitate cooperative planning within and among the Northeast Kingdom.
- Work to improve the quality of life for people in the Northeast Kingdom through planning and by promoting economic development while preserving the region's natural environment.

## Purpose

The previous version of the *Regional Plan for the Northeast Kingdom* was adopted in 1995, and readopted in 2000. A new plan was adopted in 2006 and amended in 2013.

The purpose of the *Regional Plan for the Northeast Kingdom* is to provide a guide for managing change and an informational framework within which municipalities, businesses, individuals, and other organizations can make decisions regarding growth and development. In no particular order, there are three principal uses for this Plan:

1. Guidance in regional and local planning and decision making
2. General information
3. As a basis for state review processes

## Organization

The Regional Plan is composed of three volumes. Foremost among the three is Volume I Regional Goals & Strategies, which presents the goals, policies, and objectives for the region. Volume I should be considered a quick reference to regional goals and policies. Volume II, the Regional Analysis, is a presentation of existing conditions and background information intended to give readers a picture of life in the Northeast Kingdom. Maps, tables, and photographs have been inserted throughout the second volume. The third volume is titled *Regional Transportation Plan for the Northeast Kingdom.*

This summary and the supporting narrative document are each divided into chapters addressing distinct elements such as housing, land use, energy, etc. The transportation plan focuses solely on transportation issues. All three volumes constitute the NVDA regional plan.

# II. REGIONAL VISION

Vermont's rural traditions have been better preserved in the Northeast Kingdom than in other areas of the state. Respect for individual rights and a genuine neighborliness toward others are values that continue as part of the social fabric here. The physical landscape has essentially remained unchanged with compact village centers surrounded by working farms and productive forests. When one examines local town plans throughout the region, one quickly gets the sense that most people in this region prefer gradual change over rapid growth. Nevertheless, most Northeast Kingdom residents stand firmly behind development that promotes job creation and sustained economic development.

The natural beauty and wholesome quality of life experienced in the Kingdom are things no longer enjoyed exclusively by the region's residents. With the Northeast Kingdom within a day's drive of more than 70 million people, the region has become a recreational playground for many out-of-area visitors. Others are seeking to permanently escape the rigors of urban life elsewhere and relocate to the region. Such outside interest in the region presents both opportunities and problems. While towns appreciate the additional revenue associated with seasonal residents and visitors, a large influx of new, year-round residents can strain local infrastructures and services. New residents sometimes seem to have unreasonable expectations, but they often bring fresh perspectives and new ideas. With longtime and new residents alike, the communities of this region are encouraged to plan for their future, so that growth is expected and welcome rather than haphazard and problematic. Over time, the cumulative effects of unplanned or uncoordinated growth can be dramatic, and may negatively affect local economies and the quality of life Northeast Kingdom residents have come to enjoy.

In both regional and local planning processes, we need to retain and strengthen existing businesses while creating new economic and employment opportunities for residents from all walks of life. We must provide quality educational opportunities and skills training for all job seekers to make the region's workforce more attractive to employers. With an economy that is to a great extent linked to our natural resource base, the region and its municipalities should also embrace strategies to protect the environmental quality in the Northeast Kingdom.

The availability of quality, affordable housing is a regional goal also shared by every local community, and upgrading existing, substandard housing is a particularly urgent priority. Northeast Kingdom residents are also encouraged to work with their local, regional, and state agencies and officials to revitalize downtowns, village centers, and cultural institutions to preserve our cherished way of life.

Local communities and state agencies must continue to upgrade public infrastructure in a coordinated manner, in order to protect the health, safety, and welfare of local residents. As a region, we must strive to provide a reliable and safe transportation system with improved access to destinations within and outside the region for a greater number of people. Achieving these broad goals will ensure that the residents of the Northeast Kingdom will prosper and live satisfying lives in communities of their own making.

## III. TOOLS FOR IMPLEMENTATION

A good plan provides a full range of options to its residents and citizens. Implementation – whether it is regulatory or otherwise – will ultimately depend on the political will of each member municipality of NVDA. NVDA can and should serve a vital role as facilitator for each endeavor by providing the knowledge, resources, expertise, and skills that will empower each municipality to make informed decisions and act decisively. Implementation options are organized in the following broader categories:

| **Implementation Option** | **NVDA's role** | **Examples** |
|---|---|---|
| A. Non-Regulatory Planning | NVDA will continue to update the regional plan, municipal plans, and supporting planning products in accordance with its statutory duties. | Regional Plan<br>Municipal Plan<br>Housing Studies<br>Capacity Studies<br>Hazard Mitigation Plans<br>Food System Plans<br>Solid Waste Management Plans<br>Wastewater Planning Studies |

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| B. Non-Regulatory - Programs and Incentives | NVDA will continue to advise communities on such programs and incentives to direct public and private investment in a manner that meets state planning goals. It will also participate in public comment and review of policies and plans that guide these incentive plans. (See E. Other Regulatory Jurisdictions.) | Downtown and Village Center Designation<br>Neighborhood Development Areas<br>Growth Centers<br>New Market Tax Credits<br>Low Income Housing Tax Credits<br>Vermont Employment Growth Incentive (VEGI)<br>Use Value Appraisal Program (Current Use)<br>Conservation Easements |
| C. Infrastructure Investments | NVDA will provide technical support, as appropriate to ensure municipalities invest in public infrastructure wisely. | Capital Budget and Planning<br>Bridge and Culvert Inventories<br>Bonds<br>Revolving Loan Funds<br>Tax Increment Finance Districts |
| D. Regulatory | NVDA will provide support, as appropriate to assist municipalities develop and enforce local regulations. | Zoning<br>Subdivision Regulations<br>Flood Hazard Regulations<br>Junkyard Ordinances<br>Freestanding ordinance (noise, outdoor wood boilers, etc.) |
| E. Other Regulatory Jurisdictions | While the Regional Plan does not have the same regulatory effect as municipal land use regulations, the policies and recommendations within this Plan guide decision making at the state, regional and local level. NVDA will review and provide testimony on proposed initiatives that impact our member municipalities. | Act 250 Review<br>Section 248 proceedings<br>Proposed legislation or policy |
| F. Grant Writing and Administration | NVDA provides ongoing grant writing and administration assistance to its member municipalities, which generally lack the in-house resources to obtain and administer grants. While grants serve other underlying purposes – such as planning, | Municipal Planning Grants<br>Vermont Community Development Program<br>Economic Development Administration<br>USDA Rural Development<br>Northern Border Regional Commission |

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| | feasibility, studies, infrastructure upgrades, and economic development initiatives – grant writing and administration requires RPC staff time and resources and therefore is a significant implementation activity in its own right. | |
| G.Outreach and Education | Education of not only those entities which coordinate daily with the Regional Commission but the general public as to the Plan policies and its implementation is essential. Plan implementation without public input is destined to fail. A deliberate effort to involve the public in all aspects of the Plan implementation process is essential. Education of the public on the overall values of multiple town planning for an area will continue to be an on-going function of the Regional Commission as it seeks to implement this Plan with others. | Training and workshops<br>Legislative Breakfasts<br>Industry Visits<br>Municipal Consultations |

## IV. TIMEFRAMES

### Ongoing, routine and immediate:

This includes annual statutory duties carried out by NVDA, such as outreach and education, as well as sustained effort, such as maintenance of existing plans (such as municipal plans, Local Emergency Operations Plans, Solid Waste Plans), and ongoing participation in designation or incentive-based programs (such as Downtown and Village Center Designation).

### Short-term implementation (1-5 years):

These include specific projects that can be carried out within five years, such as development of new supporting plans (agriculture/food systems, transportation plans, inventories and assessments, regional plan update, substantive updates to municipal plans and new municipal plans).

### Long-term implementation:

These include initiatives that can be started, but cannot be completed within five years, including initiatives that currently lack funding or resources for full implementation. Includes major infrastructure upgrades and studies and future needs.

## V. GOALS AND STRATEGIES

| Forest Land Use Goals | Strategies | Ongoing | Short-term | Longer-Term |
|---|---|---|---|---|
| Sustainable forestry will remain an economically viable tool to preserve woodlands, open space for recreation, and local character.<br><br>Mixed-use forests will allow for expanded economic benefits to forest owners while encouraging sound ecological practices and recreational access to the public.<br><br>Value-added processing opportunities for wood resources in the region will increase.<br><br>Residential and commercial development patterns will occur in such a way as to retain the productivity of the region's accessible forests.<br><br>State and federally-controlled land is an important resource for passive recreation and will continue to be accessible to the public.<br><br>Municipalities with land in municipal forests will have | Continue to provide planning assistance to communities seeking to conserve valuable forest land. Encourage landowners to enroll productive forestland in the "current use" program. In communities that have land use regulations, encourage the use of planned unit development coupled with low density zoning to preserve larger blocks of forestland while facilitating efficient residential and commercial development. | G | B | A, D, F |
| | Connect municipalities with appropriate agencies and resources providing management assistance with municipal forests. | G, E | | |
| | Provide management, financial, and technical assistance to local forest product industries, including wood product manufacturers, sawmills, paper mills, and wood-powered electrical generators (cogeneration). | G | A | F, B |
| | Support the development and marketing of distinctive wood products identifiable with Vermont and/or the Northeast Kingdom. | G | A | F |
| | Support owners of forestland who implement sustainable forestry practices to market their wood and wood products. | G | A | F |
| | Expand usage of existing rail infrastructure for shipping and interface with trucking. Explore the creation of forest-related industrial zones (i.e. rail sidings for sawmills) | | A | A, D, F |

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| the capacity to manage the land for its resource value and public recreational use.<br><br>Maintain enough forest land to support wood-related industries, retain the region's natural beauty, protect fragile areas, encourage wildlife, promote recreational usage, and maintain a healthy, sustainable forest based economy. | | | | |
| **Agriculture Land Use Goals** | **Strategies** | **Ongoing** | **Short-term** | **Longer-Term** |
| Farming and agriculture will remain an important and viable sector of the regional economy.<br><br>Contiguous tracts of agricultural soils will be preserved.<br><br>Development of residential and commercial uses will not significantly reduce the amount of open and productive farm land. | Continue to provide planning assistance to communities seeking to conserve productive agricultural land. Encourage the use of "planned unit development" coupled with low density zoning and other tools to preserve agricultural resources. | G | | A, D, F |
| | Provide technical assistance to towns seeking to encourage on-farm enterprises, through the use of land use regulations or incentives. | G | | A, D, F |
| | Provide support to farmers interested in diversification and/or product development. Assist with grants and low-interest loans for value-adding businesses and diversification. | G | A | F, B |
| | Identify funding sources for, and market existing and new food ventures in the region. | | F | F B |
| | Support education efforts that teach sustainable agricultural practices, and the tax benefits of enrollment in the "current use" program. | G | | |
| | Support succession planning and efforts to connect new and expanding farmers with affordable land. | A, B, G | | |
| **Recreation Land Use Goals** | **Strategies** | **Ongoing** | **Short-term** | **Longer-Term** |

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| Sufficient open space will be available for current and future outdoor recreational pursuits.<br><br>A variety of year-round and seasonal, indoor and outdoor recreation opportunities will be available for residents and visitors.<br><br>Public access to water bodies will be protected. | Assist towns to plan for future recreation needs, recognizing that privately-held land may not be available for passive recreational use in the future. | G | A, F | B |
| | Assist with financing to develop additional facilities such as sports fields, playgrounds, trail systems, ice rinks, skateboard parks, and recreation/bike paths, coordinating actions with the goals in the SCORP in order to access dedicated federal funds. | | F | |
| | Identify and protect public access to water bodies. | G | A, F | |
| | Identify the recreation facilities and activities most needed by youths and seniors and help towns identify and secure funds for their development. | | A | F |
| | Support local and regional recreation events (e.g. fairs, festivals, etc.). | G | | |
| **Future Land Use and Development Use Goals** | **Strategies** | **Ongoing** | **Short-term** | **Longer-Term** |
| Established centers will be an economically vital mix of commercial and residential uses, and will offer a variety of housing types available at different price points to support long-term sustainability.<br><br>Towns will be supported in identifying and implementing strategies that reverse the current trend of new residential development occurring primarily outside of centers.<br><br>Traditional development patterns will be maintained and linear "strip" | Direct public investment and create financial incentives for the development of a balanced mix of low-income, work-force, and upper-income housing in and adjacent to village centers and downtowns, with the goal of allowing all communities to develop into high-opportunity areas. | G , B , E | B, A | E |
| | Direct public investment for new elderly and affordable housing to town and village centers in locations with access to public transportation routes. Aside from promoting traditional settlement patterns, this will put seniors closer to such amenities as shopping, and community facilities, and enable income-stressed residents to have cost-saving access to services, employment centers, and public transportation options to places of employment. | A, G | A, B, F | |
| | Work with housing developers and communities to assure that all residents have the opportunity for access to high-performing schools and economically-sustainable employment. | A, G | B, F | E |
| | Assist communities applying for designation under the Vermont Downtown, Village Center, and/or Neighborhood Development Programs where appropriate to encourage mixed-use development (residential, commercial and appropriate light-industrial) in centers. | G | B | |

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| development will be avoided.<br><br>New development will be compatible with existing land uses, and consistent with local plans.<br><br>Historic structures, community facilities, and other buildings will be preserved and adapted for re-use.<br><br>Brownfield sites will be reclaimed.<br><br>Significant development proposals will consider the impact on adjacent regions. | Encourage adaptive reuse of historic structures through tax incentives, tax credits, grants, and loans, assistance in location of funding, etc. | G, B | B | |
| | Encourage desired town center development through investment, maintenance, and expansion of appropriate infrastructure (sidewalks, water and sewer, parking, public spaces, etc.). | G | B, A | F |
| | Support beautification efforts in town centers and downtowns. | B | F | |
| | Encourage towns to plan for community recreational and social needs. | G, B | A, C | F |
| | Avoid the development of agricultural lands with auto-dependent residential subdivisions by encouraging towns with land use regulations to lower the permitted residential density in agricultural zones, coupled with planned unit development or clustering provisions to ensure efficient and well-designed developments. | G | A | A, D, F |
| | Protect against the fragmentation of rural lands by the piecemeal development of residential lots by providing financial incentives for the development of attractive work-force and upper-income housing in and adjacent to village centers and downtowns. | G | B, A | G |
| | Support local conservation efforts. | G | A, F | B, F, D |
| | Encourage community open space plans and recreation infrastructure, recognizing that privately-held land will not be available unless protected through the purchase of conservation and access easements. | G | A, F | B, F, D |
| | Assist towns in identifying in their Town Plans appropriate areas for the development of industrial or manufacturing uses, based on the location of natural resources and existing transportation and utility infrastructure. | | A, F | |
| | Assist towns in marketing potential locations for industry to the business community. | G | B | |
| | Assist towns with the assessment and remediation of Brownfields in order to revitalize and re-use existing industrial infrastructure where appropriate for future industrial uses. | | A, F | F |
| **Energy Goals** | **Energy Strategies** | **Ongoing** | **Short-Term** | **Longer-Term** |
| | Promote a diversified energy portfolio for the region. | E | A, B | C |

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| An adequate, reliable, diverse, and secure energy supply will benefit the region. | Support the upgrade of regional transmission systems to continue to reduce constraints. | E | A, B | C |
| | Support the maintenance and upgrade of existing energy generation facilities and related infrastructure. | E | A | C |
| | Encourage local responders to plan for emergency energy resources (VEM Emergency Generators Grant Program generators.) | G | F | |
| Affordable energy alternatives will be available for the region's users. | Assist in the development of businesses that support alternatives energy use. | B, G | A, D | C, F |
| | Work with Tier 3 energy service providers to promote the installation of cold climate heat pumps and geothermal systems by facilitating outreach and education on their benefits. | G | | |
| | Partner with Efficiency Vermont and Tier 3 energy service providers to increase the use of efficient wood heat and biomass systems. | G | | |
| | Support the development of small-scale renewable resources, such as wind and solar and the use of supplemental sources (wood) to stabilize energy costs. | G, E | F | C |
| | Promote and support rail infrastructure as a cost-effective transportation resource for the energy industry. | E. | | C |
| | Encourage and support agricultural production of biofuels and oilseed crops, and explore ways to broaden access to processing infrastructure. | G | A, B, F | |
| | Identify potential users of district heating and wood heating systems and provide assistance to communities seeking to develop them. | | A | |
| | Encourage the legislature to increase incentives and rebates for efficient wood heat systems. | E | | |
| | Provide outreach and education among vendors, contractors, and the general public through venues such as tradeshows and workshops. | G | | |
| | Provide communities with an analysis of potential areas that are suitable for ground source heat pumps. | | A | |
| | Support upgrade and trade-out programs and incentives for older, higher emission wood-burning stoves and boilers. | G | | |

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| Decrease the region's reliance on single-occupancy vehicle trips and gas/diesel powered vehicles. | Continue to advocate for better telecommunications infrastructure so employees can work from home. | E | F | C |
| | Encourage local employers to reduce VMTs through programs such as ride sharing and Go Vermont. | G | | |
| | Support and expand access to liquid biofuels for use in commercial vehicles and heavy equipment. | E | F | C |
| | Support and expand the use of electric powered busses and vans among the public transportation providers serving the region. | E, G | F | C |
| | Work with cycling advocacy groups such as Local Motion by hosting safe on-road cycling workshops. | G | | |
| | Provide training to local zoning and development review boards to consider infrastructure for alternative transportation in their review of site plans. | D, G | F | C |
| | Provide technical and grant writing assistance to local planning commissions who plan for multi-modal circulation and better connectivity with alternative transportation modes. | F, G | | |
| | Promote the use of the region's cycling infrastructure, such as the Cross Vermont Trail and the Lamoille Valley Rail Trail and support the efforts of local groups who work to maintain them. | G | | C |
| | Supports municipalities and local businesses to install EV charging stations at convenient locations, such as in front of restaurants, stores, businesses, or entertainment or recreational facilities, where users would want to park for periods of two to four hours. Explore and pursue incentives to defray the cost of installation and administration so that users pay only for electricity. | B, G | | C |
| Net-metering capacity in the region will be maximized. | Encourage municipalities to become "clean energy districts" and participate in the PACE program (Property Assessed Clean Energy). This would provide consumers with options to more affordably implement grid-tied renewable energy systems. | G.) | B) | |
| | Support solar panel safety training programs for fire fighters and first responders. | G | | |
| Energy efficiency and weatherization will be an | Assist municipalities in reducing their energy costs through conservation, efficiency, and weatherization programs. | G | | |

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| integral part of the energy portfolio. | Support and promote the Energy Action Network (EAN) energy dashboard and education communities about its use and benefits. Support crowdsourcing on efficiency and weatherization efforts at the local level (e.g. Vermont Community Energy Dashboard.) | G | | |
| | Support Local Energy Committee/Coordinator efforts to reduce energy consumption, improve efficiency and weatherization, and develop new generation programs. | B, G | | |
| | Encourage municipalities to conduct energy audits and weatherization programs. | B, G | | |
| | Encourage businesses to make energy efficiency investments and develop energy efficient production methods. | B, G | | |
| | Promote energy efficient building design and construction methods (e.g. Green Building Design, LEED certification, and Passive Design). | B, G | | |
| | Promote Energy Efficiency Utility program resources by making web links available on municipal/regional web sites. | G | | |
| | Work with partner organizations and Energy Efficiency Utilities EEUs to offer workshops and educational opportunities to businesses on efficiency in new construction, retrofits, and conservation practices. | G | | |
| | Identify large energy usage customers (including large businesses, manufacturing facilities, and schools) as a target audience and encourage participation in commercial and industrial EEU programs. | G | | |
| | Facilitate strategic tree planting to maximize energy benefits by encouraging communities to participate in the ArborDay Energy Saving Trees Program. | G | | |
| | Support local zoning initiatives that incent the development of small and/or net-zero homes. | D | | |
| | Ensure that developments subject to Act 250 consider new energy requirements by encouraging the compliance with commercial energy stretch codes, particularly among proposed commercial uses that are high energy consumers. | D, E | | |

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| | Showcase the cutting-edge work of local architects and contractors who incorporate green building practices through NVDA's web site and newsletters. | G | | |
| | Promote the use of the Vermont Home Energy Profile among prospective buyers and sellers of homes. Work with local contractors to become BPI certified in energy-efficient retrofit work in order to assist with these profiles. | G | | |
| | Ensure that local zoning administrators have information on Residential Building Energy Standards and Commercial Building Energy Standards (RBES and CBES). Host and facilitate training sessions for local officials. Encourage communities with zoning to require Certificates of Occupancy. Encourage the local adoption of "stretch codes". | D, G | | |
| | Work with local affordable housing organizations to promote and improve the supply of the region's net-zero and near-net zero housing supply, such as Vermod homes. | G | | |
| | Review local zoning bylaws and offer technical assistance to development review boards when evaluating the energy efficiency implications of site plans for proposed developments. | D, G | | |
| Weatherize at least 25% of the region's housing stock by 2020. | Actively advocate for the continuation and expansion of funding programs that support thermal efficiency and renewable energy improvements, especially programs that are targeted to middle- and low-income households. | E | | |
| | Coordinate with and promote efficiency programs and weatherization assistance programs (such as Efficiency Vermont, NE TO, 3E Thermal, and Heat Squad) for low-income households and apartment buildings.<br><br>Cosponsor and organize weatherization workshops for home and businesses with EEUs.<br><br>Facilitate or sponsor a workshop for owners of rental housing (including farm labor housing) to encourage implementation of energy efficiency.<br><br>Encourage residents to hire Efficiency Excellence Network (EEN) contractors when completing energy efficiency projects by including links to the EEN on municipal/regional websites.<br><br>Make information available about lending programs that can improve the efficiency of older housing stock, such as Efficiency Vermont's "Heat Saver" | G | | |

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| | loan and USDA Direct and Guaranteed Loan Programs, for single homes and multi-family homes. | | | |
| Energy generation that provides the best cost-benefit to the region will be promoted. | Promote wood-based energy generation to support the region's forest industry.<br><br>Encourage the development of energy facilities and resources that help sustain local agriculture and forestry (i.e. grass/wood-pellets, small wind, solar, farm-methane, wood-chip, biodiesel. | B, G | A, E | G |
| Environmental and aesthetic impact of energy generation and usage will be considered.<br><br>There will be broad public participation in the decision-making process. | Encourage the Vermont Legislature to develop policies that support the development of solar, small-wind, hydro-electric, farm methane and biomass generation facilities, while respecting current local land use and the culture of the region.<br><br>Encourage the PUC to examine the long-term sustainability of proposed facilities | G, E | | |
| Assessment of local needs and values on new energy development will be encouraged. | Encourage towns to address energy development in town planning and zoning.<br><br>Provide assistance to businesses/municipalities to develop cogeneration and other alternative energy strategies. | G | A, G | |

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| Reduce the region's carbon footprint through the expansion of a closed loop soil-to-soil regional food system that sustains and feeds the people of the Northeast Kingdom. | Coordinate movement and storage of goods to achieve maximum efficiency.<br>Redirect food scraps and other organics from the waste stream in a manner that maximizes efficiency and minimizes hauling.<br>Support and further the goals and strategies of the NEK Food System Plan through its Leadership Group.<br>Explore the feasibility of establishing a leased storage facility.<br>Assess market demand for products and existing shippers and distributors already moving to external (New York and Boston) markets (including opportunities for backhauling).<br>Identify infrastructure needed to maximize inbound, outbound, and internal freight movement.<br>Explore the use of compost heat recovery; identify challenges, opportunities, and funding sources.<br>Explore the feasibility of a developing a "food miles" measurement that can be used in marketing local foods. | | A | |
| | Identify and publicize opportunities for shared truck space among existing growers and producers.<br>Generate better awareness of existing distribution resources, such as freight service.<br>Identify and publicize opportunities for shared storage space among existing growers and producers.<br>Promote the use of and increase the amount of on-farm power and community energy generation and the use of renewable energy for farming and food production (such as anaerobic digesters, solar, wind, biomass, and biodiesel, in accordance with local and regional planning priorities). | G | | |
| | Support local incentives for siting solar installations away from most productive agricultural soils. | | A, B, D | |

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| | Provide and increase opportunities for onsite and commercial composting training and education, sustainable farming methods focused on reduction and reuse of wastes (closed-loop nutrient systems), and shared facilities and infrastructure to transfer and store compost.<br><br>Establish a coordinated marketing campaign that dispels the perceptions around local food costing more and extols the long-range benefits of staying local (e.g. dollars re-circulated into the economy, food miles travelled). | | | G |
| **Utilities and Facilities: Educational Facilities Goals** | **Educational Facilities Strategies** | **Ongoing** | **Short-Term** | **Longer-Term** |
| School districts will seek to maximize educational opportunities for students, including extracurricular offerings, and increase economic efficiency by sharing services with neighboring school districts when feasible. | Investigate opportunities for shared facilities between municipalities and institutions. | A G | | |
| To provide the most favorable outcomes for students, school districts should be economically integrated. | Provide opportunities for the involvement of school officials in the local planning process.<br><br>Promote the development of economically integrated school districts through policies and programs that promote a range of housing options for all income levels within each school district. | G | **B** | |
| Adult literacy resources will continue to be available to residents of the Northeast Kingdom to increase the percentage of residents that have earned a high school diploma. | Support the efforts of local and regional libraries to provide quality facilities and materials for independent learning and education. | | F | |
| Post-secondary institutions in the region are vital to the economic development | Support the expansion of post-secondary institutions in the region, to continue to build a highly-educated workforce. | A | | |

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| potential of the region and will be supported. | | | | |
| Post-secondary schools will be closely integrated with the local communities they serve, including the business community, and should have a mutually beneficial relationship. | Support local and regional efforts for workforce development and adult education.<br>Promote cooperation between institutions of higher learning and local businesses to support quality training and employment opportunities for local residents. | G | A | |
| Affordable educational and training opportunities should exist for all persons within the region. | Support the efforts of local and regional libraries to provide quality facilities and materials for independent learning and education. | | F | |
| **Utilities and Facilities: Recreational Facilities Goals** | **Recreational Facilities Strategies** | **Ongoing** | **Short-Term** | **Longer-Term** |
| Towns in the region will provide recreational facilities according to the population's particular needs. | NVDA will assist municipalities in identifying recreational needs and securing appropriate funding sources to develop new facilities. | | F | **C** |
| State-managed lands in the region will continue to be accessible to the residents of the region, and improvements will be made as appropriate to serve the identified needs of the population, as articulated in municipal plans (e.g., blaze new trails, maintain parking areas and points of entry into state-controlled lands used for passive recreation, | NVDA will direct municipalities to appropriate resources (e.g., Northeast Kingdom Travel and Tourism Association) to develop strategies to increase visibility of existing recreational resources to residents and potential visitors.<br>NVDA will assist municipalities in identifying recreational needs and securing appropriate funding sources to develop new facilities. | G | **F** | **C** |

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| create improved access to waterbodies) | | | | |
| **Utilities and Facilities: Child Care Goals** | **Child Care Strategies** | **Ongoing** | **Short-Term** | **Longer-Term** |
| Child care entrepreneurs and child/family service centers should be supported. | Provide assistance to municipalities and non-profits seeking to develop child care facilities and/or programs. | | A | |
| | Assist municipalities in assessing the future local need for and supply of childcare services, and whether local barriers exist for the provision of needed services, and assist in developing an action plan. | | A | |
| Additional site-based or community child care centers that offer high quality, affordable care should be developed in employment centers and as a component of affordable housing developments. | Municipalities should encourage the inclusion of childcare facilities in the plans for any multi-family housing development that will accommodate families with children, and any large commercial development, to provide more options for employees. | | A, D | |
| The efficiency and effectiveness of existing child care, early education, and family service programs should be improved. | Employers, schools, and community organizations should collaborate to ensure that affordable, quality child-care services are available to meet the different needs of households. | G | | |
| Child care issues will be integrated into the planning process | Municipalities periodically should review land-use and development regulations to identify needed amendments to authorize quality child-care services in appropriate locations convenient to households, including as home occupations. | | A, D | |
| **Utilities and Facilities: Telecommunications Goals** | **Telecommunications Strategies** | **Ongoing** | **Short-Term** | **Longer-Term** |
| Northeast Kingdom residents, business, | Solicit input from towns in the region to determine where gaps in broadband and cell coverage may still exist. | A, E | | |

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| organizations and public entities will be served by an up-to-date telecommunications infrastructure. | Continue to work with state and regional agencies, as well as the private sector, to attain the coverage goals as set forth in the State Telecommunications Plan. | | C | |
| Affordable fixed and wireless communications systems, as well as high-speed Internet broadband, will be available throughout the region. | Encourage communities to set up wi-fi zones in public areas (libraries, municipal buildings, etc.) that are available free of charge to residents. | | C | |
| | Support development efforts that reduce the cost of high-speed telecommunications throughout Vermont and the Northeast Kingdom. | | C | |
| Telecommunications projects will be reviewed and permitted in accordance with the land conservation measures and policies for the protection of scenic resources identified in local and regional plans. | Assist municipalities in creating directive language in the municipal plan that clarifies the location and treatment of important natural and scenic resources. | | **A** | |
| **Utilities and Facilities: Security and Emergency Service Goals** | **Strategies** | **Ongoing** | **Short-Term** | **Longer-Term** |
| Emergency services should be provided to all residents | Support regional approaches to disaster planning and mitigation, including partnerships between neighboring communities and states and Canada. | G | | |

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| of the Northeast Kingdom through Enhanced 9-1-1, local departments, and mutual aid districts. | Ensure that adequate emergency services (personnel, facilities, and equipment) are available for new developments prior to placing additional demands on existing services. | G | C | |
| | Assist Local Emergency Planning Committees (LEPCs) and Towns to identify gaps in disaster planning, such as increased flood and drought protection, and work to eliminate gaps through an interagency, inter-jurisdictional approach. | | | |
| Towns should have up-to-date Local Emergency Operations Plans (LEOP). | Provide technical assistance to municipalities to help them maintain up-to-date LEOPs. | | G | |
| All buildings should meet current state fire code and safety standards. | Assist communities to apply for safety and emergency equipment grants by disseminating information on available funding programs. | | F | |
| | Assist interested municipalities with the adoption of building and fire codes for non-public buildings and rental properties. | | D | |
| | Encourage all communities to participate in the National Flood Insurance Program (NFIP) and to adopt the Vermont Transportation Highway Codes and Standards. | G | | |
| | Discourage development in identified or known flood prone areas to avoid costly potential damage to life and property. | | A, B | |

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| Emergency services training should be available to keep all emergency service providers current with regard to service provision and certification. | Support local efforts for disaster planning, response, recovery and mitigation. | G | | |
| **Utilities and Facilities: Water Supply Goals** | **Strategies** | **Ongoing** | **Short-Term** | **Longer-Term** |
| There will be sufficient quantities of water to meet existing and future residential, agricultural, commercial, industrial and recreational needs. | Support local proposals to upgrade existing water supply systems. | | C | |
| | Support water conservation measures to reduce the demand for water and protect water supplies. | G | | |
| Water supplies and water systems will not be contaminated, depleted, or degraded | Discourage development in Source Protection Areas, identified groundwater recharge areas, or other areas where water supplies are likely to be adversely impacted. | | A<br>D | |
| | Assist interested communities to identify, map, and plan for the protection of surface and groundwater resources. | | A | |
| Public investments will be made in utility facilities, services, and lands to support existing and future development within town centers, villages, or other designated and planned growth areas. Expansion of systems will not facilitate sprawl or strip development. | Assist towns and communities with the preparation of capital improvement plans and budgets to complement local plans and this plan. | | C | |
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| Effective, efficient, and accessible public services will be promoted. | Assist municipalities seeking to share services and infrastructure with neighboring municipalities in order to reduce costs and increase efficiency | A | | |
| **Utilities and Facilities: Wastewater, Sewage and Stormwater Management Goals** | **Wastewater, Sewage and Stormwater Management Strategies** | **Ongoing** | **Short-Term** | **Longer-Term** |
| The region's towns will have adequate wastewater treatment facilities with sufficient capacity to meet current needs and projected future development. | Support proposals to upgrade and improve existing wastewater treatment facilities. | | C F | |
| | Encourage the proper disposal of hazardous materials, particularly household hazardous materials that are difficult to treat in secondary systems. | G | | |
| | Assist communities with advanced planning activities for future upgrades and financing of local systems. | | A | |
| Public investments in new or expanded facilities and services shall be in agreement with local plans, shall be directed toward town centers, villages, or other designated and planned growth areas, and shall support the revitalization of established centers. | Provide advice and technical assistance to communities and groups interested in developing community wastewater systems. | G | | |
| | Assist communities to interpret and abide by changes to state and federal laws regarding municipal and on-site wastewater systems and stormwater regulations. | G | | |
| | Assist municipalities seeking to share services and infrastructure with neighboring municipalities in order to reduce costs and increase efficiency | G | | |

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| Municipalities will incorporate Green Stormwater Infrastructure in planning improvements to local road infrastructure and public facilities; and will incorporate them into land use regulations, as appropriate. | Conduct educational outreach to municipalities regarding the benefits of Green Stormwater Infrastructure. | G | | |
| **Utilities and Facilities: Solid Waste Management Goals** | **Solid Waste Management Strategies** | **Ongoing** | **Short-Term** | **Longer-Term** |
| Municipal and regional solid waste disposal systems shall be cost-effective, environmentally sound, and promote reduction, reuse, and recycling, and will support the State-wide goal of reducing the disposal rate of Municipal Solid Waste.<br><br>Increase solid waste diversion rates to 50% by the year 2020.<br><br>Hazardous wastes shall be disposed of facilities permitted by the Agency of Natural Resources to ensure proper handling. | Assist member towns and solid waste management districts in the implementation of solid waste management plans. | | A | C, F |
| | Encourage communities to meet the waste management and recycling goals established by the Northeast Kingdom Waste Management District and municipal waste management plans. | G | | |
| | Support public education to promote efforts to reduce and properly manage waste. | G | | |
| | Assist municipalities to adopt illegal dumping and burning ordinances. | | D | |
| | Encourage communities to create or expand local recycling facilities. | | A | C, F |
| | Assist communities in sustainable reclamation of brownfields in the region. | | A | F |
| Support efforts to reduce food waste by half by the year 2020. | Promote opportunities for schools and institutions to reduce food waste through best management 19 practices and performance-based contracts.<br><br>Provide technical assistance to entrepreneurs who are interested in food scrap hauling and 21 composting-related businesses. | G | | |

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| | Support efforts to aggregate and distribute gleaned agricultural products. | G | A, F | |
| | Support efforts to efficiently aggregate and distribute recovered food in a manner that minimizes spoilage and trucking miles. | | A | C, F |
| | Support the expansion and viability of commercial composting operations. | | | C, G |
| | Help communities plan for and create municipal composting facilities, where feasible.<br><br>Explore and facilitate the sustainable use of food residuals and other waste byproducts. | | A, F | |
| **Historic, Cultural & Scenic Goals** | **Historic, Cultural & Scenic Strategies** | **Ongoing** | **Short-Term** | **Longer-Term** |
| Future development should follow traditional development patterns, while providing for economic development opportunities and livable communities. | Promote local and regional tourism, since it an important part of our economic base. | B | A | |
| | Promote local traditions, skills, crafts, and the performing arts within the region. | B G | | |
| | Assist communities to designate downtowns and village centers under the Vermont Downtown Program. | G, B | A,); B, F | |
| | Support local cultural resource initiatives to revitalize communities and downtowns. | G, B | A, B | F |
| Significant historic, cultural, and scenic resources within the region should be identified and preserved. | Assist communities to preserve and maintain historic downtowns, village centers, buildings, and rural and scenic landscapes. | G | A, B, D, F | C, F |
| | Rehabilitate and re-use significant cultural, architectural, and historic sites, and community facilities, whenever feasible. | G | A, B, D | C, F |
| | Utilize federal, state, and local programs for developing or preserving local cultural and historic assets. | G. | B, F | |
| | Disseminate information about historic tax credits to businesses and property owners. | G. | | |
| | Assist municipalities with securing funding and technical assistance to conduct a comprehensive survey of local historic resources. | | F, B | |
| **Housing Goals** | **Housing Strategies** | **Ongoing** | **Short-Term** | **Longer-Term** |

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| An adequate supply of safe, attractive, and energy-efficient housing will be available to the region's residents in a proportionate balance of affordable, workforce, and market rate housing. | Encourage the use of innovative zoning incentives, including density bonuses or tax stabilization for mixed-income developments, universal access design, and small footprint housing. | | A, F | D |
| | Review and comment on proposed plans and policies that will impact future affordable housing development (e.g. downtown designation, Qualified Allocation Plan). | E G | A ( | |
| Housing will be available in a variety of types that meet the needs of all income groups and ages, and will be located near employment, services, commercial, civic, and recreational uses. | Assist towns to create housing policies that address the affordable housing needs of low-income residents. | G E | A<br>F | D |
| | Identify incentives for the development and rehabilitation of work-force and market-rate housing in established centers. | E | A F | D |
| | Facilitate fair housing trainings for municipal officials and other interested groups. | G, B, E | | |
| Existing housing stock – particularly that located in downtowns, village centers, and older neighborhoods in existing centers of development – will be preserved. | Provide outreach and education on housing programs that improve housing stock and promote home ownership. | G, B, E | | |
| Overall quality, safety, and energy efficiency of existing housing stock in the region will improve. | Provide outreach and education to property owners of old or substandard housing units in Designated Downtowns and Village Centers. | G, B | | |
| | Assist communities interested in adopting local building codes, or in adopting and enforcing "junkyard ordinances." | G | D | |
| Partnerships with regional housing and human service providers will be strengthened, allowing for more effective service provision. | Work with regional housing and human service providers, including Rural Edge, NEK Enterprise Collaborative, Lamoille Housing Partnership and NEK Community Action to identify housing needs and support economically integrated communities. | B, A,G | A, F | |

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| New housing development in downtowns and villages will conform to existing traditional patterns. | Assist communities applying for designation under the Vermont Downtown Program, Village Center Designation Program, and where appropriate, the New Neighborhood Designation Program. | G, A, B | B, A | |
| Municipalities will be supported in determining local housing needs. | Help communities evaluate needs through housing studies and build-out analyses. | G | A,F | |
| | Ensure that NVDA member communities remain eligible for Municipal Planning Grants | G | | |
| **Economic Development Goals** | **Economic Development Strategies** | **Ongoing** | **Short-Term** | **Longer-Term** |
| Reduce the region's unemployment rate.<br>Train new and existing workers to meet the needs of area businesses and increase workers' salaries.<br>Create higher wage jobs.<br>Coordinate economic development functions in the Northeast Kingdom.<br>Assist municipalities in their economic development efforts.<br>Increase and diversify the region's agricultural output, especially value-added production using local staple products and raw materials.<br>Downtowns and village centers in the Northeast | Provide technical assistance for new and expanding businesses, and recruit new businesses. | B, G. | F | |
| | Market the resources of NVDA. | G | | |
| | Assist existing manufacturing companies to grow by identifying new markets, products, and technology. | G | A | |
| | Assess opportunities for coordination of economic development organizations. | B. | | |
| | Provide greater access to revolving loan funds. | B, G | F | |
| | Participate in regional and statewide economic development strategy efforts that involve the Northeast Kingdom region (CEDS, USDA REAP Zone, etc.). | | D, G | |
| | Assist with the revitalization of distressed areas and and threatened employment sectors within the Northeast Kingdom. | B | | A |
| | When possible, provide grant and technical assistance and project management to towns, organizations, and businesses throughout the Northeast Kingdom. | G | F, G | |
| | Assist local planning commissions and development organizations in the Northeast Kingdom with economic development planning. | | A, G | |
| | Partner in economic development events with SBDC, PTAC, VMEC, VEOC, and others where regional businesses may benefit. | B | G | |

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| Kingdom should be maintained and revitalized.<br><br>Make quality, affordable child care available to workers with children in the Northeast Kingdom.<br><br>Expand tourism in the Northeast Kingdom, and make eco-based businesses a part of the region's landscape.<br><br>Increase research and start-up funds to aid value-added processing and to diversify the economy, especially for the region's farmers.<br><br>Strengthen manufacturing, particularly in the forest products and industrial machinery sectors.<br><br>Promote small business sectors, e.g. telecommuting, specialty foods, value-added businesses, arts and crafts and e-commerce. | Host business financing panels or workshops so that businesses are aware of capital resources available. | | | |
| Improve the economic infrastructure capacity (physical assets and workforce) in the Northeast | Develop and implement a comprehensive workforce development strategy for the region. | B | | A |
| | Assist municipalities with the planning, development, and maintenance of infrastructure projects that will improve economic opportunities, e.g. water, sewer, industrial sites, broadband, and transportation. | | A, F | C |

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| Kingdom to meet current and future needs.<br><br>Modernize and expand the region's telecommunications infrastructure to allow telecommuting and information-technology-focused companies to grow and thrive. | Support telecommunications infrastructure and knowledge capabilities by creating effective partnerships, and by advocating for increased infrastructure. | B | F | |
| Maintain and revitalize the downtowns and village centers in the Northeast Kingdom. | Promote and advocate for economic development projects in downtown areas. | G, B | | F |
| | Promote and maintain Downtown Designation and Village Center Designation where appropriate. | G, B | | |
| Mitigate the negative effects that some past businesses have had on the environment. | Identify, prioritize, and implement brownfield mitigation projects within the region. | | B, F | |
| **Natural Resource Goals** | **Natural Resource Strategies** | **Ongoing** | **Short-Term** | **Longer-Term** |
| The overarching goal for the region is to balance local economic needs with the protection of the natural resource that so many of the region's residents enjoy and depend upon.<br><br>The quality and quantity of the region's surface waters should be protected, maintained, and restored. | Provide public education on state and local water quality issues as they relate to local planning and development. | G | A, D | |
| | Discourage inappropriate development in flood hazard areas and floodplains. Support compatible land uses in flood areas, such as agriculture and passive recreation. | B, G | A, D, E | |
| | Support the efforts of watershed organizations working in the region. Coordinate the region's basin planning efforts with local plans and related activities. | B, G | A | G |
| | Encourage and assist communities to identify and protect community water supplies. Education on water conservation and resource protection should accompany these efforts. | B, G | A | G |
| | Prevent the degradation of significant wetlands through public education. | B, G | | |
| | Minimize the negative impacts of mineral and earth resource extraction and processing facilities. | A | A, D, E | |

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| The quality and quantity of existing and potential groundwater resources should be protected and improved.<br><br>Significant wetlands within the region should be protected.<br><br>The region's mineral and soil resources should be used in a manner that will support the sustainable growth and development of the region.<br><br>A consistently high level of air quality should be maintained for the health, safety, and enjoyment of the region's residents and visitors.<br><br>Adequate resource information for the region should be maintained to improve the region's ability to plan for protection of wildlife resources in the area.<br><br>Critical wildlife habitat should be protected.<br><br>The native biodiversity of the region should be | Support development of new markets and uses for local mineral resources. Encourage the use of locally obtained minerals for building construction and highway construction and maintenance. | G | | A |
| | Support efforts to reduce air pollutants generated in the region from the residential, commercial, industrial, and transportation sectors. | A | A, D, E | |
| | Support broader state and regional efforts to minimize pollutants entering the region from out of state. | B, E | | |
| | Support local and state efforts that inventory, delineate and map important habitats and wetlands. | | A, G | G |
| | Support local efforts to protect critical wildlife habitat and maintain habitat connectivity. | A | A, D, B | G |
| | Assist interested towns with planning and mapping for the protection of habitats and natural resources. | | A, G | |
| | Support state and local efforts to mitigate the impacts of the non-native species through ecologically sound methods (e.g. insect control, etc.). | G, B | | |
| | Support the protection of endangered and threatened native species. | | A, B | G |
| | Maintain and improve the resource stewardship in the area by supporting and advocating for recreation and environmental education opportunities. | G B | | |
| | Provide technical support for dark skies initiatives to prevent or minimize light pollution. | G | D | |

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| maintained, and restored when appropriate.<br><br>Private, public and community interests should be considered in matters affecting local recreation and open space. | | | | |
| **Flood Resilience Goals** | **Flood Resilience Strategies** | **Ongoing** | **Short-Term** | **Longer-Term** |
| Increase awareness of the most effective means of reducing future flood damage, as identified in Tactical Basin Plans and Stream Geomorphic Assessments (River Corridor Plans)<br><br>Protect areas identified and designated as flood plains, river corridors and land adjacent to streams<br><br>Mitigate risks to public safety, critical infrastructure, historic structures, and municipal investments. | Coordinate with the County Conservation Districts in hosting flood mitigation workshops for residential landowners and business owners, to educate them on measures to reduce flood risk and damage. | G, B | | |
| | Encourage Towns to include restriction of development within River Corridors, as mapped by the Vermont Agency of Natural Resources. | | A, D | |
| | Encourage Towns to amend zoning and subdivision regulations to include limits on clearing and impervious coverage, and that avoids impacts to wetlands and steep slopes (slopes greater than 20%). | | D | |
| | Encourage Towns to incorporate Planned Unit Development provisions in their bylaws as a means to minimize impervious coverage and clearing. | | D | |
| | Encourage towns to engage in a working partnership with adjacent communities to address control of stormwater runoff and actions that will allow rivers and streams to regain access to floodplains. | B | | |
| | Assist Towns in seeking funding to implement hazard mitigation projects identified in plans. | | F | |

# Volume II

REGIONAL ANALYSIS

# Chapter One: Land Use

This chapter of the Regional Plan identifies important land resources, and describes land use trends and how they relate to the economic health and quality of life in the region. This section also describes how the use of land relates to the statewide planning goals.

Of the 55 towns in the 3 counties of the Northeastern Kingdom, 34 towns have adopted zoning regulations, which provide a framework for future land use in these communities. This Regional Plan seeks to support the land use goals of the towns in the region, while recognizing potential impacts that land use in individual towns may have on regional resources, infrastructure, and economic development.

## I. LAND RESOURCES

### FORESTLAND

According to the National Land Cover statistics, the Northeast Kingdom has more than one million acres of forestland, accounting for more than 80% of the region's land cover.

Local forests provide residents of the Northeast Kingdom with a variety of benefits. The region's forested lands have existed as sources of income since the earliest European settlements and continue to offer significant potential for providing wood for value-added products such as furniture, lumber, wood pulp, and chips and pellets for biomass. Water and air quality, and wildlife habitats are all dependent upon the vast forests. Residents enjoy a variety of recreational activities in the forests as well, and much of the tourism industry relies on a healthy forest to remain viable. Hunting, fishing, snowmobiling, cross-country skiing, mountain biking, and bird and wildlife viewing are all dependent on a healthy forest. Many of these activities coexist well with responsible timber harvesting. Various game and non-game species rely on a landscape that includes forest, meadow, mixed-age trees, and forest edge environments. Snowmobiling, hiking, cross country skiing, horseback riding, and mountain biking often benefit from primitive roads maintained for logging.

Table 1.1 shows estimates for accessible and managed forested acreages for the region and counties. "Appropriate" forestland is defined by the Vermont Department of Forests, Parks and Recreation by subtracting from the National Land Cover dataset acreages with physical barriers to harvesting, or environmentally sensitivities that would render the forest cover inappropriate for harvesting. Estimates for "managed" forestland were developed using USDA Forest Service Forest Inventory and Analysis, as well as general assumptions about enrollment in Vermont's Use Value Appraisal Program (Current Use).

| Table 1.1: Forested Acreage | | | |
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| | **Starting Forestland** | **Acres of Appropriate Forestland)** | **Acres of Accessible, Appropriate, and Estimates as Managed Forestland** |
| Caledonia | 327,121 | 222,912 | 132,497 |
| Essex | 374,191 | 258,012 | 182,909 |
| Orleans | 317,602 | 253,647 | 156,740 |
| Northeast Kingdom | 1,018,914 | 734,571 | 472,146 |
| Source: VT Dept. of Forests, Parks and Recreation: *Vermont Wood Fuel Supply Study: 2010 Update* | | | |

(See the Economic Development chapter for a more comprehensive discussion of Silviculture and sustainable forestry practices.)

## Loss of Forest Cover

Today's forest cover is largely the result of more than 100 years of reforestation, which occurred when trees grew over land once cleared for pasture and crops, and timber harvesting declined. For the first time in a century, however, Vermont is losing its overall forest cover. While the loss is hard to quantify, Vermont has lost about 1% of its forest cover over the past decade and continues to lose about 1,500 acres of forest cover each year.[1] While a very small portion of forest cover has been cleared for agricultural or commercial uses, primary cause of forestland can be attributed to large lot rural residential development, which has primarily occurred away from traditional centers of development. (See Figure 1.4: Residential Development from 2005 to 2014) Nearly all of this development has been scattered and incremental and has not risen to the threshold of Act 250 review.

Scattered rural residential development contributes to *fragmentation* of our forested lands, which occurs when contiguous areas of forest cover (also called *forest blocks*) are divided by land development other than recreational trails or uses exempt from regulation.[2] Over time, the cleared swaths and non-forested pockets of land multiply and expand, resulting in disconnected forested islands surrounded by uses that threaten the health, function, and value of those lands as wildlife habitat and as a source of recreation. Subdivision also affects forested lands – even when the land is not converted for development. Long-range *parcelization* trends are likely to affect overall sustainability of our forests because subdivisions often result in tracts too small to support viable forestry operations. Economically and environmentally sound forest management is far more difficult to sustain on parcels smaller than 50 acres. Twenty-five years ago, 19,000 family forest landowners in Vermont owned parcels 10 acres or smaller. By 2012, there were 43,000 family forest landowners.[3]

Although Vermont leads the New England states in support for land conservation, decisive action and a full complement of integrated planning initiatives will be required to stop the loss of forest cover. Vermont statute now emphasizes the need for plans to identify important forest blocks and habitat connectors and recommend policies and strategies that minimize fragmentation to promote the health, viability, and ecological function of forests. Forest blocks are composed of *core* and *edge* areas. "Core forest" is described as

[1] Foster et al (2017). Wildlands and Woodlands Farmland and Community: Broadening the Vision for New England, Harvard Forest, Harvard University.
[2] 24 V.S.A. §4302(35)
[3] Vermont Agency of Natural Resources

forest that is more than 100 meters from the non-forest boundary. The "forest edge" is the ring around the core. The "edge" has different characteristics and serves as habitat for a different suite of species than the forest "core."

Given the complexity of the landscape and very different ecological conditions across the state, it is difficult to establish a minimum or maximum number of acres to define a functional forest block. However, forest blocks larger than 20 acres are mapped statewide and can be found in Biofinder (http://biofinder.vt.gov) and on the ANR Atlas (https://anrmaps.vermont.gov/websites/anra5/). High-value and statewide significant forest blocks are also mapped. (More information about the region's priority forest blocks and habitat connectors can be found in the Natural Resources chapter.)

## Forestland Preservation Tools

**Current Use:** The Vermont Department of Taxes' Use Value Appraisal Program (also known as "Current Use") is a tax program designed to support the state's agriculture and forest products economy. It relieves the burden of property taxes on foresters and farmers by assessing taxes based on the productive value of the land rather than on the land's potential for development for other uses. While enrollment in current use does place a lien on the property which remains in place until the Land Use Change Tax is paid, it does not place a permanent deed restriction on the property like a conservation easement would. The Land Use Change Tax is due when property is developed or withdrawn from the Current Use program, which provides a significant financial incentive to landowners to keep the land in productive forestry (or agricultural) use rather than develop it for other residential or commercial uses. The land can be developed with structures associated with the farming or forestry use of the property without penalty.

As of January 2016, a total of 3,104 parcels in the Northeast Kingdom region are enrolled in Current Use, comprising a total of 564,556 acres. The vast majority – more than 475,000 acres -- is enrolled as managed forestland.

**Conservation:** While most of the Northeast Kingdom's forestland is privately owned, state, federal, and local governments own nearly 130,000 acres combined in the Northeast Kingdom (private land with conservation easements is not counted in this figure). These 130,000 acres of publicly owned land are almost entirely forested. Nearly all public lands are open for recreation, with much of the state and privately-owned timber lands actively harvested. Approximately 48,000 acres of this land came into public ownership in 1999, when the Champion International Corporation conveyed its Essex County properties to the Vermont Agency of Natural Resources (nearly 23,000 acres) and the U.S. Fish & Wildlife Service (approximately 26,000 acres).

Vermont Land Trust (VLT) has conserved more than 570,000 acres statewide, and more than 200,000 acres of those lands are in the Northeast Kingdom. More than 90% of VLT conserved lands in the NEK are forested. Much of the land it has protected is privately owned and is conserved through the purchase or donation of a *conservation easement* that permanently restricts future development.

VLT has also played an active role in the creation of town forests. The Vermont Municipal Forest Law – authorized back in 1915 – allows municipalities to acquire lands for the purpose of growing timber or wood. The benefits of town forests also include natural habitat protection and forest block connectivity, water quality protection, and public access to recreation. Town forests can also serve as outdoor classrooms by establishing models for sustainable forestry management. The Northeast Kingdom contains 39 town forests, collectively containing more than 11,000 acres. The most recent addition to the region is the Canaan Community Forest, established in 2012, when the Town of Canaan received 424 acres of forestland donated by the Neil Tillotson Trust. The town has placed a conservation easement on 386 acres, which is designated for sustainable timber management, recreation, education, and natural resource protection. The remaining 56 acres is available to the town for future economic development.

Research to date indicates that municipal forests are largely overlooked in long-range planning endeavors. Roughly half do not have a forest management plan, and many are not even permanently protected from conversion of natural land cover.

**Conservation Overlays**: A few communities in the Northeast Kingdom have taken regulatory measures to protect forest blocks. The Town of Sutton, for example, has a special overlay that promotes low density development, while allowing for smaller lot sizes so that housing lots, driveways, and private roads can be sited in such a way to minimize fragmentation of forested areas. While a few other municipalities in the region are considering similar overlays, most communities with zoning attempt to protect their forested lands through a more traditional minimum lot size approach. This approach to forestland protection has some clear limitations, since it often allows for lot sizes as small as five or ten acres.

## AGRICULTURAL LAND

Farming has been an integral part of the region's economy from the time of the earliest settlements. According to the US Department of Agriculture, in 2012 there were 1,291 farms in the region, and land in farms accounted for 237,764 acres in the Northeast Kingdom, over 18% of the total land area. It is the second largest land use in the region, and has provided a livelihood for generations of residents. The future of farming in the region is evolving to respond to the challenges of low commodity prices and competition from within the U.S. and abroad. The state has lost over 10,000 farms in the past forty years. However, although there was a net loss of 1,222 acres of farmland in the Northeast Kingdom between 2007 and 2012, the region saw a gain of 31 farms during that same period (see Table 1.3). The region is seeing a shift toward smaller-sized farms. According to the 2012 Census of Agriculture, "very small" farms (fewer than 50 acres) now account for 35% of all farms in the region, up from 31% in 2007 and 28% in 2002.

Table 1.2 shows the breakdown of agricultural land for the three counties and the state of Vermont in 2012, and the regional comparison to 2007. In 2012 Orleans County had the most farmland, comprising 55% of all the agricultural land in the Northeast Kingdom region, while Caledonia accounted for about 34% and Essex County, about 11%.

**Table 1.2: Land in Farms 2007 and 2012**

| | Vermont 2012 | Caledonia 2012 | Essex 2012 | Orleans 2012 | Northeast Kingdom 2012 | Northeast Kingdom 2007 |
|---|---|---|---|---|---|---|
| | Acres | Acres | Acres | Acres | Acres | Acres |
| **Cropland, including pasture** | 488,327 | 29,050 | 8,020 | 52,531 | 577,928 | 97,544 |
| **Woodland, including pastured** | 536,075 | 38,269 | 12,003 | 50,935 | 637,282 | 100,504 |
| **Permanent pasture and rangeland** | 139,976 | 9,874 | 923 | 16,942 | 167,715 | 26,421 |
| **Other Land in farms** | 87,335 | 4,635 | 4,545 | 10,037 | 106,552 | 14,517 |
| **Total Land** | 1,251,713 | 81,828 | 25,491 | 130,445 | 237,764 | 238,986 |

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|---|---|---|---|---|---|---|
| **in Farms** | | | | | | |
| **Number of Farms** | 7,338 | 560 | 93 | 638 | 1,291 | 1,260 |

The U.S. Natural Resources Conservation Service has mapped most of the region's primary and secondary agricultural soils. These maps are available at the NVDA office in St. Johnsbury.

(See the Economic Development chapter for a discussion of agricultural production trends.)

## State and Regional Food System Planning

In 2009, in response to concerns that the food system in Vermont was too reliant on food grown and distributed from outside the New England region, the Farm to Plate Investment Program was initiated, and the Vermont Sustainable Jobs Fund (VSJF) developed a 10-year *Farm to Plate Strategic Plan*. The VSJF executive director is, by statute, a member of the Vermont Working Lands Enterprise Board, and the WLEB uses the *Farm to Plate Strategic Plan* to help evaluate areas of need to grow the food system and to make funding decisions. The *Farm to Plate Strategic Plan* is housed online on the "Vermont Food System Atlas" at http://www.vtfoodatlas.com/atlas. The "Atlas" serves as a clearinghouse of all Vermont farm and food sector resources.

A plan commissioned in 2010 by NVDA and prepared by the Center for an Agricultural Economy focused on developing a vibrant agricultural economy and food system in the entire Northeast Kingdom. *The Regional Food System Plan for Vermont's Northeast Kingdom* was originally released in 2011 and substantially updated in 2016. As the state's only comprehensive regional food system plan, the 2016 NEK Plan is based on a "soil to soil" model (see Figure 1.1) and is closely integrated with the Vermont Farm to Plate Strategic Plan. The NEK Plan contains 11 overarching goals ranging from production inputs, environmental stewardship, value-added production, distribution and demand, farmland accessibility, food access and justice, and workforce development. The goals identified in the 2016 NEK Plan, and the strategies and action items to achieve them, are incorporated by reference into this Regional Plan.

Figure 1.1: NEK Food System Model


## Farmland Access and Preservation Tools

Despite large amounts of undeveloped land in the region, maintaining contiguous tracts of farmland for future agricultural use continues to be an issue. Agricultural fields must generally be within close proximity to other fields used by a farmer. Preserving contiguous parcels that contain primary and secondary agricultural soils that can be used by a cluster of neighboring farms is more efficient than working scattered parcels of land.

The attributes that make land desirable for farming (well-drained and little slope) also make the land desirable for commercial development and large lot residential development. The region's farmlands can be highly attractive to non-farmers with the financial means to establish rural residential

properties, and even the most experienced farmer may not be able to vie for access to farmland pricewise.

The Vermont Land Trust conserves prime farmland through donation or purchase of conservation easements. Currently, VLT, at times in partnership with the Vermont Housing Conservation Board and the Vermont Agency of Agriculture, Food and Markets, has conserved about 32,000 acres of farmland on 150 farms in the region. The majority of conserved properties are dairy farms.

While a conservation easement keeps the land *available* for the next generation of farmers, it does not, however, ensure that it will be *affordable*. To meet this challenge, VLT has added an affordability option to its conservation easements known as Option to Purchase at Agricultural Value (OPAV). The OPAV gives the holder of the conservation easement the ability to purchase the farm at its agricultural value if the farm would otherwise be sold to a non-farmer. All new conservation easements carry an OPAV, and the option is being added to existing easements. VLT's Farmland Access Program has been connecting beginning farmers with affordable land since 2004. At least three new farmers in the region have successfully accessed land through this program in recent years.

One of the region's most significant farmland access challenges is succession planning for the next generation of farmers. A 2016 study by American Farmland Trust found that farmers aged 55 and older operate 60% of all farms in the NEK. With roughly a third likely to exit farming in the next two decades, the future of NEK farms is particularly unclear: Of the 345 farms in the region with a principle operator aged 65 or older, only 19 had identified a potential successor. Technical services, outreach, and public policy must be better aligned to facilitate succession planning to qualified successors.

Only about 16% of land enrolled in Current Use is agricultural use (just over 89,000 acres). Twenty towns in the region each have more than 2,000 acres of agricultural lands enrolled, with the top three being the Orleans County towns of Irasburg, with 6,390 acres; Newport Town, with 5,669 acres; and Holland, with 4,290 acres.

Current Use eligibility requirements have been a hurdle for some of our region's producers. For example, producers who have to demonstrate that farming is more than 50% of their income may not be eligible, particularly if they are in the "very small" farm category and are likely to work more than 180 days off the farm to support their operation. Farmers who rent land also may face eligibility obstacles. This plan supports a re-examination of taxation policies that can help our land-based entrepreneurs keep their operations financially viable.

Local land use regulations may be an effective way to protect agricultural resources, and have the flexibility to be modified over time through a public process as a town's goals and needs change. Through the use of regulatory tools such as agricultural overlay districts, low density zoning coupled with "planned unit development" or density-based zoning, towns can assure that agricultural resources are preserved while property owners can develop their property in an efficient manner for other uses, including residential or commercial developments. In 2017, the Town of Sutton became the first town in the region to adopt a density-based working lands overlay, which includes forested tracts as well as farmlands.

Approaches towns can use to encourage commercial uses that are agriculturally-based, but which may fall outside those recognized by the Agency of Agriculture Food and Markets, are discussed in a 2012 publication entitled *Facilitating Innovative Agricultural Enterprises*. A copy of this publication can be accessed online at the NVDA website: http://www.nvda.net/files/VT-Ag-Guide.pdf.

## RECREATION LANDS

Recreation opportunities enhance the quality of life for residents and tourists alike, provide the health benefits of exercise, and contribute significantly to the regional economy. Outdoor recreation activities, such as hunting, fishing, hiking, snowmobiling, horseback riding, cross country skiing, and mountain biking require relatively little maintenance of the open spaces where they take place. These activities often coexist easily with other land uses such as forestry and farming, and can take place on public and private lands. For example, a

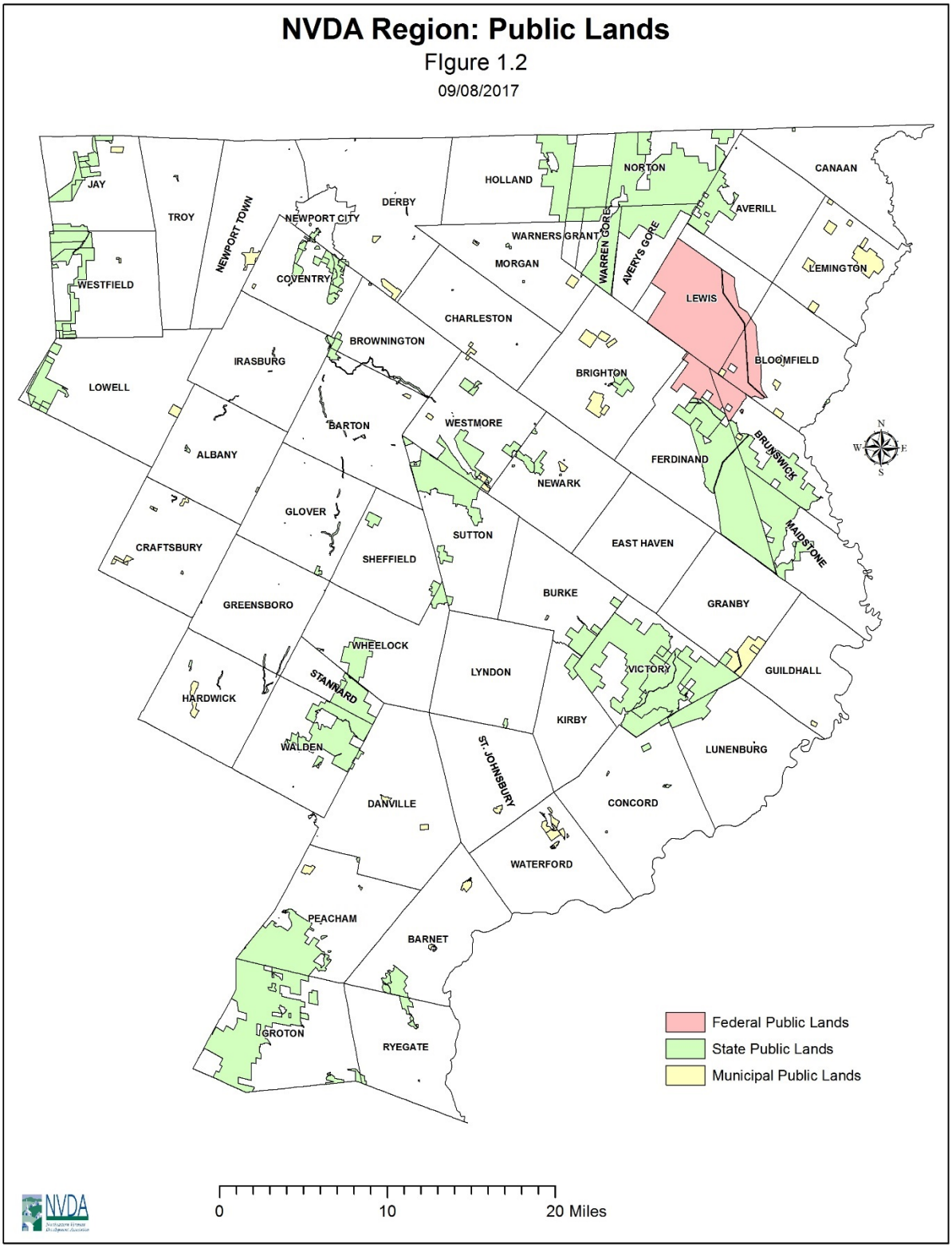
portion of Darling State Park has been leased to the Burke Mountain Ski area for alpine and Nordic ski trails. In northern Essex County there are vast tracts of forest land containing networks of four-season trails that are also used for forestry operations.

Private land owners have been generous in allowing recreational use of their land. Educating users about respectful and safe use is important in maintaining access to private lands in the future. However, residential development and the subdivision of land over time can reduce the amount of private lands available for recreation. This increases the pressure on public lands and those private lands that are still accessible. State-wide, the number of acres of posted property registered with town clerks was relatively constant from 2000 through 2010.

### Conserved Lands for Passive Recreation

Federal, state, and municipally-controlled land, whether conserved by fee ownership or by an easement on privately-held land, allow for varying levels of public access and are an important passive recreational resource. Some trails and logging roads are actively maintained by the state or non-profit land conservation organizations. The Vermont Association of Snow Travelers (VAST) is one such organization that maintains trails on both private, unencumbered land and publicly held land.

Figure 1.2 "NVDA: Public Lands" shows the location of lands held or controlled by local, state and federal agencies.


NVDA Region: Public Lands
FIgure 1.2
09/08/2017
JAY
TROY
NEWPORT TOWN
NEWPORT CITY
DERBY
HOLLAND
NORTON
CANAAN
AVERILL
WARNERS GRANT
WARREN GORE
AVERYS GORE
LEMINGTON
MORGAN
WESTFIELD
COVENTRY
LEWIS
CHARLESTON
BROWNINGTON
IRASBURG
BRIGHTON
BLOOMFIELD
LOWELL
BARTON
WESTMORE
ALBANY
FERDINAND
BRUNSWICK
NEWARK
GLOVER
SUTTON
EAST HAVEN
MAIDSTONE
CRAFTSBURY
SHEFFIELD
BURKE
GRANBY
GREENSBORO
WHEELOCK
LYNDON
VICTORY
GUILDHALL
STANNARD
HARDWICK
KIRBY
WALDEN
ST. JOHNSBURY
LUNENBURG
DANVILLE
CONCORD
WATERFORD
PEACHAM
BARNET
GROTON
RYEGATE
Federal Public Lands
State Public Lands
Municipal Public Lands
0
10
20 Miles

### Active Recreational Facilities

Sports fields, playgrounds, parks, improved trails, and lake and river-access require more maintenance and usually some form of public investment. A more detailed listing of these facilities is included in Utilities and Facilities Section of this Plan.

### Considerations

Municipalities should consider their residents' current and future needs for public spaces, water body access, and recreation facilities. This can be done through the municipal plan or in a separate recreation plan or open space plan. Municipalities should work in conjunction with their neighbors in the planning and development of recreation spaces so as to complement each other's investments.

As noted above, landowners in the region are often willing to allow their land to be used for passive recreational use, particularly in the winter; however, if land is not protected through easements or regulated through zoning, the recreational potential of these lands can disappear if the landowner decides to develop the property or sell to a new owner with different interests. This can happen piecemeal over many years, as house lots are carved out of large tracts of open space. Therefore, it is important that municipalities recognize that lands held privately may not be available for recreational use in the future, and plan accordingly.

The Statewide Comprehensive Outdoor Recreation Plan (SCORP) is a plan that identifies existing outdoor recreation opportunities and issues, and sets goals and objectives for the coming years. To qualify for federal Land and Water Conservation Funds, states must revise the State Comprehensive Outdoor Recreation Plan (SCORP) every five years. These funds can be passed through to municipalities. Vermont's latest Plan, for the period 2014-2018, contains an action plan that is incorporated in this regional plan by reference. The SCORP is available online at http://www.vtfpr.org/reclwcf/SCORP%202014-2018.pdf.

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## GOALS AND STRATEGIES FOR THE PROTECTION OF LAND RESOURCES

### FORESTLAND GOALS

- Sustainable forestry will remain an economically viable tool to preserve woodlands, open space for recreation, and local character.
- Mixed-use forests will allow for expanded economic benefits to forest owners while encouraging sound ecological practices and recreational access to the public.
- Value-added processing opportunities for wood resources in the region will increase.
- Residential and commercial development patterns will occur in such a way as to retain the productivity of the region's accessible forests.
- State and federally-controlled land is an important resource for passive recreation and will continue to be accessible to the public.
- Municipalities with land in municipal forests will have the capacity to manage the land for its resource value and public recreational use.
- Maintain enough forest land to support wood-related industries, retain the region's natural beauty, protect fragile areas, encourage wildlife, promote recreational usage, and maintain a healthy, sustainable forest based economy.

### FORESTLAND STRATEGIES

- Continue to provide planning assistance to communities seeking to conserve valuable forest land. Encourage landowners to enroll productive forestland in the "current use" program. In communities

that have land use regulations, encourage the use of planned unit development coupled with low density zoning to preserve larger blocks of forestland while facilitating efficient residential and commercial development.

- Connect municipalities with appropriate agencies and resources providing management assistance with municipal forests.
- Provide management, financial, and technical assistance to local forest product industries, including wood product manufacturers, sawmills, paper mills, and wood-powered electrical generators (cogeneration).
- Support the development and marketing of distinctive wood products identifiable with Vermont and/or the Northeast Kingdom.
- Support owners of forestland who implement sustainable forestry practices to market their wood and wood products.
- Expand usage of existing rail infrastructure for shipping and interface with trucking. Explore the creation of forest-related industrial zones (i.e. rail sidings for sawmills)

## AGRICULTURAL LAND USE GOALS

- Farming and agriculture will remain an important and viable sector of the regional economy.
- Contiguous tracts of agricultural soils will be preserved.
- Development of residential and commercial uses will not significantly reduce the amount of open and productive farm land.

## AGRICULTURAL LAND USE STRATEGIES

- Continue to provide planning assistance to communities seeking to conserve productive agricultural land. Encourage the use of "planned unit development" coupled with low density zoning and other tools to preserve agricultural resources.
- Provide technical assistance to towns seeking to encourage on-farm enterprises, through the use of land use regulations or incentives.
- Provide support to farmers interested in diversification and/or product development. Assist with grants and low-interest loans for value-adding businesses and diversification.
- Identify funding sources for, and market existing and new food ventures in the region.
- Support education efforts that teach sustainable agricultural practices, and the tax benefits of enrollment in the "current use" program.
- Support succession planning and efforts to connect new and expanding farmers with affordable farmland.

## RECREATION LAND USE GOALS

- Sufficient open space will be available for current and future outdoor recreational pursuits.
- A variety of year-round and seasonal, indoor and outdoor recreation opportunities will be available for residents and visitors.
- Public access to water bodies will be protected.

## RECREATION LAND USE STRATEGIES

- Assist towns to plan for future recreation needs, recognizing that privately-held land may not be available for passive recreational use in the future.
- Assist with financing to develop additional facilities such as sports fields, playgrounds, trail systems, ice rinks, skateboard parks, and recreation/bike paths, coordinating actions with the goals in the SCORP in order to access dedicated federal funds.
- Identify and protect public access to water bodies.
- Identify the recreation facilities and activities most needed by youths and seniors and help towns identify and secure funds for their development.
- Support local and regional recreation events (e.g. fairs, festivals, etc.).

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# II. EXISTING LAND USE & DEVELOPMENT TRENDS

Development patterns in northeastern Vermont have historically followed the valleys and waterways of the region. Early European settlers farmed the fertile soils of Orleans, Caledonia Counties and the Connecticut River valley in Essex County, using the rivers for moving logs and powering mills. Through the years, Caledonia and Orleans received the bulk of development, particularly around St. Johnsbury and Lyndon in the south, and Newport and Derby in the north. Smaller population and commercial centers also dotted the region. Development historically occurred in the form of compact village centers surrounded by a working landscape of farms and forestland. Though much of the old farmland has returned to forest, this traditional Vermont landscape has remained the dominant pattern of land use in the region. The map on the following page, "NVDA: Current Land Use," illustrates the region's current development patterns.

Most communities in the U.S. today have had to deal with some form of suburbanization, sprawl, loss of farmlands, and/or Brownfield issues influencing their development. To insure appropriate development for the Northeast Kingdom it is necessary to observe the development factors affecting other communities in order to direct future land uses appropriately.

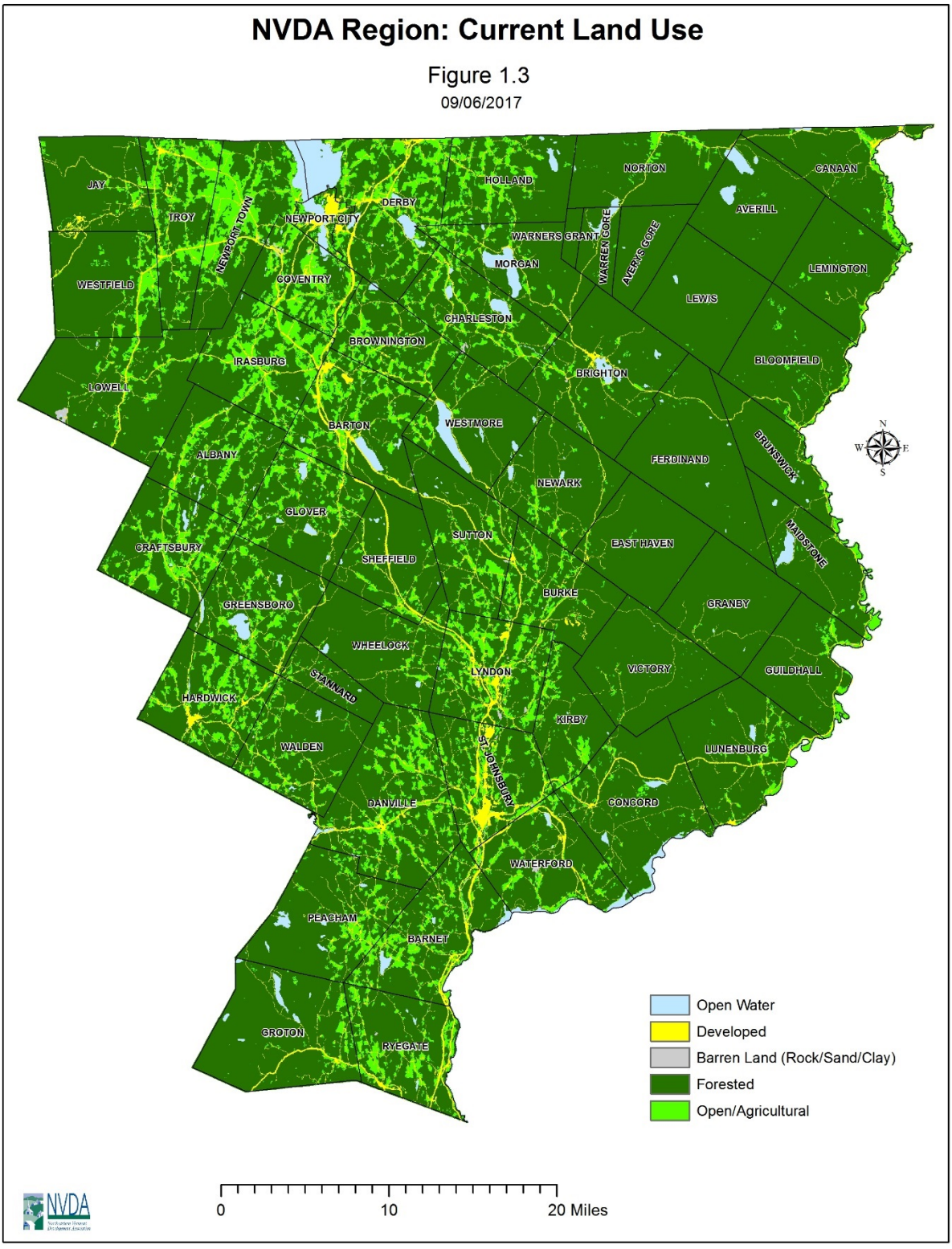
## Suburbanization and Sprawl

Population and transportation changes, expanded road systems, a loss of farms, and an increase in regional tourism have all contributed to alter the patterns of settlement in Vermont. Visitors, second-home owners, and increasingly mobile residents often desire homes and services in the region's scenic rural settings. Dispersed residential development can fragment wildlife habitats and productive forestland and agricultural land, and can result in sprawling local road networks that are difficult and expensive to maintain.

When residential development occurs in remote areas, driving becomes a requirement for most trips, increasing traffic congestion and causing greater demands on road infrastructure. The cost of associated improvement of roads, and increased demand for services including fire, ambulance and law enforcement, are often not covered by the tax revenues generated by these developments. This is particularly true when resulting disinvestment occurs in the existing town or village center, thus lowering property values and the grand list. The economic decline of established centers and the depletion of agricultural and forested land through residential subdivisions is a self-perpetuating problem that is hard to correct without intervention. Intervention can come in the form of financial incentives, local land use regulations, and transportation and housing policies that direct new development and public investment to Town centers. (See discussion of State designation programs in Section III. Future Land Use & Development).

Local land use regulations that establish low residential densities, (e.g., one residential unit per 25 acres) in agricultural areas, coupled with mandatory clustering or "planned unit development" is an effective way for Towns to protect valuable agricultural and forested land while promoting efficient, well-designed residential

development. Towns may also want to promote the high value of the land for a variety of agricultural enterprises by zoning specifically to accommodate these uses, with residences permitted only as accessory uses.


NVDA Region: Current Land Use
Figure 1.3
09/06/2017
JAY
TROY
NEWPORT TOWN
NEWPORT CITY
DERBY
HOLLAND
NORTON
CANAAN
AVERILL
WARNERS GRANT
WARREN GORE
AVERYS GORE
MORGAN
LEMINGTON
WESTFIELD
COVENTRY
LEWIS
CHARLESTON
BROWNINGTON
IRASBURG
BRIGHTON
BLOOMFIELD
LOWELL
BARTON
WESTMORE
BRUNSWICK
ALBANY
FERDINAND
NEWARK
GLOVER
SUTTON
EAST HAVEN
MAIDSTONE
CRAFTSBURY
SHEFFIELD
BURKE
GRANBY
GREENSBORO
WHEELOCK
LYNDON
VICTORY
GUILDHALL
STANNARD
HARDWICK
KIRBY
WALDEN
ST. JOHNSBURY
LUNENBURG
DANVILLE
CONCORD
WATERFORD
PEACHAM
BARNET
GROTON
RYEGATE
Open Water
Developed
Barren Land (Rock/Sand/Clay)
Forested
Open/Agricultural
0
10
20 Miles
NVDA

## Brownfields

Brownfields are defined by the Environmental Protection Agency (EPA) as "Abandoned, idled, or under-used industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contamination". Though Northeastern Vermont is not typically associated with issues such as these, there are many sites throughout the region where past uses led to the contamination of soils. Questionable or contaminated sites in the region are commonly located in or near urban areas with existing industrial infrastructure. Often, the responsible parties are no longer owners of the property; others are businesses that are now defunct; and though local governments are often aware of such problems, they have no money for clean-up.

The remediation of contaminated properties faces several obstacles. The potential for hidden, open-ended costs associated with cleanup is often enough to keep developers away. Current liability issues and low prices of prime developable land ("greenfields") make the reuse of some sites unlikely without incentives. Unfortunately, what is left is frequently a vacant or abandoned eyesore and potential health hazard. Abandoned sites do not contribute significantly to the property tax base and contaminated sites lower the property values of surrounding lots.

Reasons to reuse or redevelop brownfield sites include bringing unused properties back onto the tax rolls, maintaining local property values, and alleviating the need to build new sewer, energy, and transportation infrastructure. Reuse also reinforces efforts to maintain traditional development patterns by encouraging compact development and reducing pressures on undeveloped land. Federal and state grants, revolving loan funds, tax increment financing (TIF), and liability insurance (Brownfields Reuse and Environmental Liability Limitation Act – BRELLA) are some of the tools commonly used to finance brownfield redevelopment. These are all financing methods that communities need to consider. NVDA provides assistance to Towns in securing funds to assess and remediate Brownfields.

## Shoreline Development

The Northeast Kingdom possesses a majority of the state's lake and ponds, and also the majority of undeveloped shorelines. Recent increases in the development of second homes, camps, and primary residences have decreased the amount of undeveloped shoreline. Since the clearing and development of shorelines can negatively impact water quality, the State enacted the Vermont Shoreland Protection Act in 2014. The provisions of this Act require property owners to obtain a state permit for most development and clearing activities within 250 feet of the shores of lakes that are 10 acres or larger in size. In Caledonia County, all towns with the exception of Burke and St. Johnsbury have lakes that are large enough to be subject to the State Shoreland Act. In Essex County, all towns with the exception of Bloomfield, East Haven, Guildhall, Lemington, Victory and Warner's Grant have lakes subject to the State Shoreland Act; and in Orleans County all towns with the exception of Troy and Westfield have lakes subject to the provisions of the Act. Towns have the ability to seek delegation of review under the State Act, provided they have local regulations that are at least as stringent as the State's. Greensboro, in Orleans County, was the first and only town in the Northeast Kingdom region to seek delegation authority for review of permits under the State Shoreland Protection Act.

## Designated Downtowns and Village Centers

The Division of Community Planning and Revitalization within Vermont's Department of Housing and Community Development oversees a State designation program that encourages communities to reinvest in their downtowns and village centers. With designation comes numerous benefits, including tax credits, loans, and grants from various state agencies. Two of the designation categories that communities in the region have applied for and received are "Village Center" designation and "Downtown" designation. Details of these programs and application requirements can be found on the website of the Agency of Commerce and Community Development at http://accd.vermont.gov/strong_communities/opportunities/revitalization.

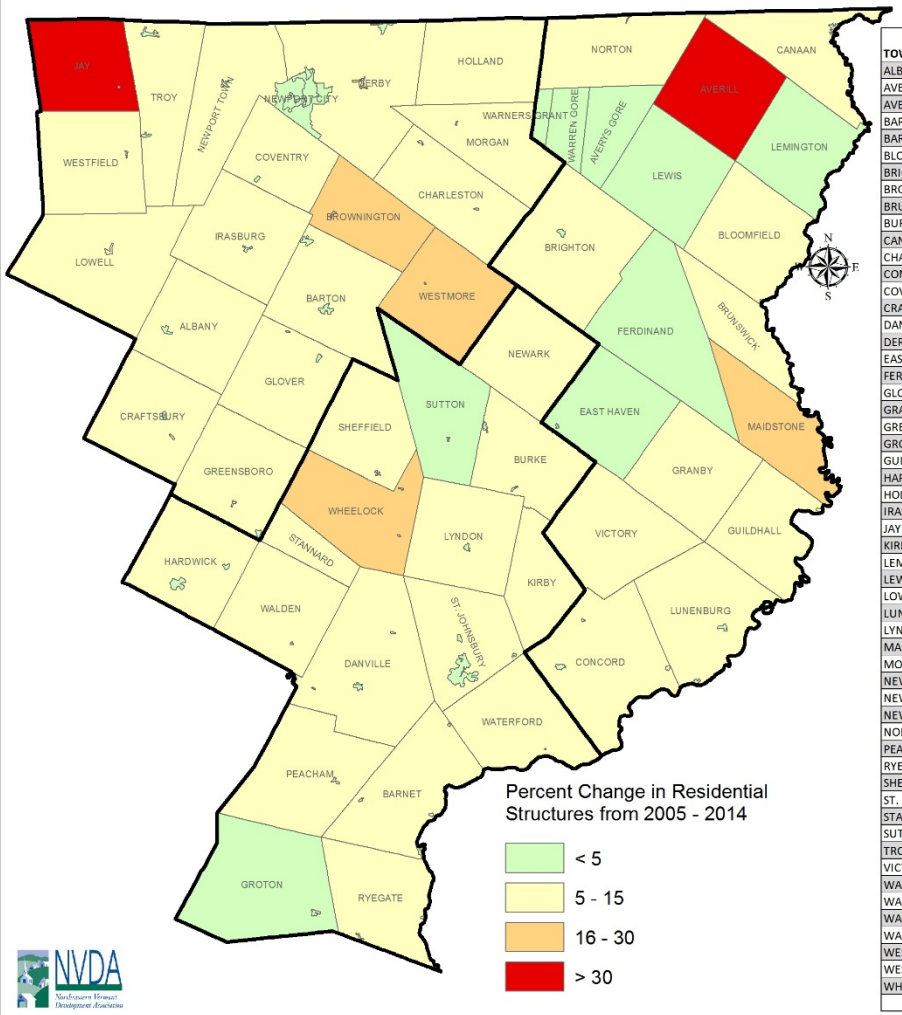
In 2013, the State developed a methodology for mapping "community center" areas. The goal was to assess progress towards the state's primary land use goal of maintaining settlement patterns of compact village and urban centers separated by rural countryside. The identification of community centers was to include all state-designated centers, including new town centers, growth centers and neighborhood development areas. Recreational facilities and parks adjacent to the centers were to be included, as well as neighboring residential areas that are pedestrian-oriented or have density that is significantly greater than surrounding areas. Areas that would be defined as "strip development" were to be excluded. A total of 63 centers were identified in the region. E-911 points were used to determine how much residential development had occurred in centers, as compared to outside of centers, from 2005 to 2014. Although this analysis doesn't account for multi-unit structures (each structure is counted as one, even if it has multiple residential units) this analysis shows that the vast majority of new residential construction since 2004 has occurred outside of centers. The results of this analysis are depicted on the map, "Residential Development from 2005-2014, NVDA Region."

Benefits of Village Center designation include tax credits available to the owners of income-producing properties for historic rehabilitations, façade improvements, and code improvements (including installation of elevators and sprinkler systems). Benefits also include priority consideration for Municipal Planning Grants, Dept. of Historic Preservation Grants, funding from Vermont's Community Development Program, and priority consideration by the State Building and General Services when leasing or constructing buildings. Significant benefits of Downtown designation include all the benefits of Village Center designation, in addition to a 50% technology tax credit for data and network improvements, and access to the Downtown Transportation Fund which includes grants of up to $100,000 for capital transportation and related capital improvements. The "Downtown" designation requires the establishment of an ongoing non-profit organization that works in partnership with public and private sectors to plan and implement a comprehensive downtown revitalization strategy.

The Northeast Kingdom currently has only two designated Downtowns – St. Johnsbury and Newport City. Towns with Village Center designation in the region currently include Brighton (Island Pond), Brownington, Burke (East Burke Village and West Burke Village), Canaan (Canaan Village and Beecher Falls), Craftsbury (Craftsbury Village and Craftsbury Common), Danville, Derby (Derby Line), Greensboro (Greensboro Village and Greensboro Bend), Hardwick, Lyndon, and Wheelock. These areas are depicted on the "NVDA: Future Land Use" map. The Town of Hardwick has considered pursuing the Downtown designation at times. Designation is time-limited, and some towns have lost their village center designation when their respective plans expired: Glover (Glover Village and West Glover), Barton (Barton Village), and Peacham. There is interest in renewing these designations when new plans are adopted. Other villages with interest in designation include East Craftsbury, East Hardwick, Groton Village, and Orleans Village in Barton. NVDA is committed to support these efforts to pursue and maintain designation.

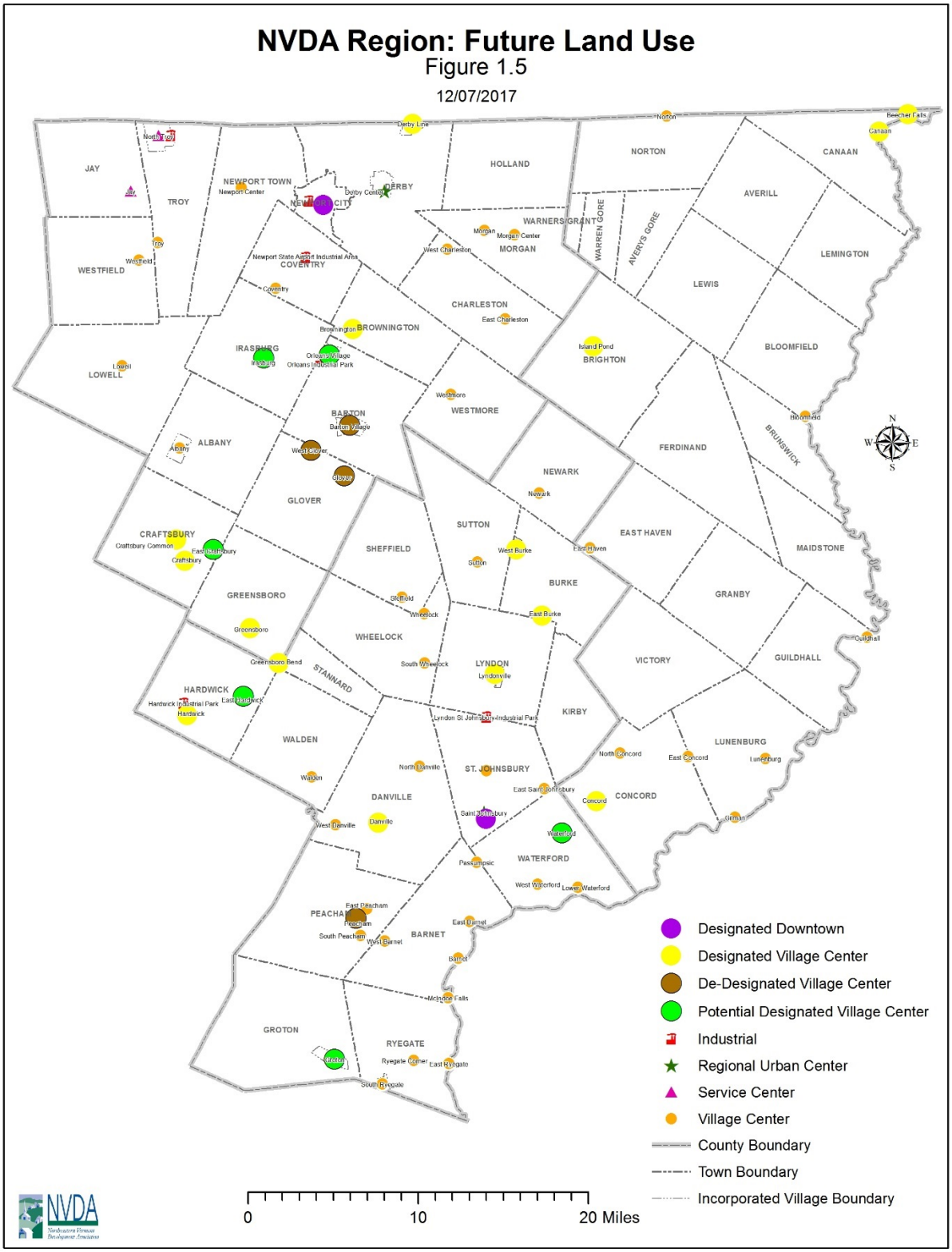
# Assessment of Residential Growth

**Residential Development from 2005 - 2014**
**NVDA Region**
Figure 1.4




**Total # of Residential Structures Added and Percent Change - 2005 to 2014**

| TOWN | # Structures Added In Centers | Percent Change In Centers | # Structures Added Outside Centers | Percent Change Outside Centers |
|---|---|---|---|---|
| ALBANY | -4 | -5.48% | 43 | 12.29% |
| AVERILL | 0 | 0.00% | 5 | 100.00% |
| AVERYS GORE | 0 | 0.00% | 0 | 0.00% |
| BARNET | 2 | 1.90% | 51 | 7.94% |
| BARTON | 3 | 0.82% | 41 | 6.69% |
| BLOOMFIELD | 0 | 0.00% | 12 | 10.34% |
| BRIGHTON | 0 | 0.00% | 58 | 11.62% |
| BROWNINGTON | 2 | 16.67% | 60 | 16.85% |
| BRUNSWICK | 0 | 0.00% | 6 | 13.95% |
| BURKE | 0 | 0.00% | 76 | 11.59% |
| CANAAN | 1 | 0.62% | 27 | 10.42% |
| CHARLESTON | 3 | 8.33% | 53 | 11.37% |
| CONCORD | 1 | 0.79% | 43 | 10.72% |
| COVENTRY | 1 | 2.86% | 49 | 14.54% |
| CRAFTSBURY | 0 | 0.00% | 52 | 10.77% |
| DANVILLE | -1 | -1.09% | 88 | 10.63% |
| DERBY | 24 | 0.00% | 119 | 8.19% |
| EAST HAVEN | 0 | 0.00% | 3 | 2.65% |
| FERDINAND | 0 | 0.00% | 0 | 0.00% |
| GLOVER | 5 | 8.33% | 46 | 12.67% |
| GRANBY | 0 | 0.00% | 5 | 12.20% |
| GREENSBORO | 0 | 0.00% | 28 | 8.21% |
| GROTON | 2 | 2.82% | 10 | 3.13% |
| GUILDHALL | 2 | 11.11% | 8 | 7.14% |
| HARDWICK | 7 | 1.75% | 62 | 9.14% |
| HOLLAND | 0 | 0.00% | 18 | 6.23% |
| IRASBURG | -1 | -2.33% | 57 | 13.16% |
| JAY | 0 | 0.00% | 144 | 63.72% |
| KIRBY | 0 | 0.00% | 19 | 9.95% |
| LEMINGTON | 0 | 0.00% | 1 | 1.89% |
| LEWIS | 0 | 0.00% | 0 | 0.00% |
| LOWELL | 2 | 5.26% | 44 | 14.72% |
| LUNENBURG | 2 | 1.27% | 43 | 10.36% |
| LYNDON | 1 | 1.64% | 90 | 5.43% |
| MAIDSTONE | 0 | 0.00% | 20 | 28.57% |
| MORGAN | 0 | 0.00% | 35 | 9.94% |
| NEWARK | 0 | 0.00% | 48 | 15.79% |
| NEWPORT CITY | 28 | 2.55% | 8 | 4.94% |
| NEWPORT TOWN | 2 | 2.50% | 57 | 9.81% |
| NORTON | 0 | 0.00% | 8 | 8.51% |
| PEACHAM | 3 | 9.09% | 29 | 8.61% |
| RYEGATE | 0 | 0.00% | 38 | 9.41% |
| SHEFFIELD | -2 | -5.88% | 31 | 12.02% |
| ST. JOHNSBURY | 3 | 0.24% | 81 | 9.67% |
| STANNARD | 0 | 0.00% | 10 | 10.75% |
| SUTTON | 0 | 0.00% | 8 | 2.21% |
| TROY | 4 | 1.16% | 66 | 15.49% |
| VICTORY | 0 | 0.00% | 4 | 5.56% |
| WALDEN | 1 | 25.00% | 50 | 14.25% |
| WARNERS GRANT | 0 | 0.00% | 0 | 0.00% |
| WARREN GORE | 0 | 0.00% | 0 | 0.00% |
| WATERFORD | 1 | 50.00% | 44 | 8.87% |
| WESTFIELD | 1 | 4.17% | 27 | 14.14% |
| WESTMORE | 0 | 0.00% | 44 | 23.40% |
| WHEELOCK | -1 | -4.17% | 49 | 16.50% |


NVDA Region: Future Land Use
Figure 1.5
12/07/2017
JAY
TROY
NEWPORT TOWN
Newport Center
NEWPORT CITY
DERBY
Derby Center
Derby Line
HOLLAND
NORTON
Norton
CANAAN
Canaan
Beecher Falls
AVERILL
WARNERS GRANT
WARREN GORE
AVERYS GORE
LEMINGTON
LEWIS
MORGAN
Morgan
Morgan Center
West Charleston
WESTFIELD
Troy
Westfield
COVENTRY
Newport State Airport Industrial Area
Coventry
CHARLESTON
East Charleston
BROWNINGTON
Brownington
IRASBURG
Irasburg
Orleans Village
Orleans Industrial Park
LOWELL
Lowell
BRIGHTON
Island Pond
BLOOMFIELD
Bloomfield
WESTMORE
Westmore
BARTON
Barton Village
ALBANY
Albany
West Glover
Glover
FERDINAND
BRUNSWICK
NEWARK
Newark
GLOVER
SUTTON
West Burke
Sutton
EAST HAVEN
East Haven
MAIDSTONE
CRAFTSBURY
Craftsbury Common
East Craftsbury
Craftsbury
SHEFFIELD
BURKE
East Burke
GRANBY
GREENSBORO
Greensboro
Greensboro Bend
Sheffield
Wheelock
WHEELOCK
South Wheelock
LYNDON
Lyndonville
VICTORY
GUILDHALL
Guildhall
STANNARD
HARDWICK
Hardwick Industrial Park
East Hardwick
Hardwick
KIRBY
Lyndon St Johnsbury Industrial Park
WALDEN
Walden
LUNENBURG
North Concord
East Concord
Lunenburg
North Danville
ST. JOHNSBURY
East Saint Johnsbury
DANVILLE
Danville
West Danville
Saint Johnsbury
CONCORD
Concord
Gilman
Waterford
WATERFORD
Passumpsic
West Waterford
Lower Waterford
PEACHAM
East Peacham
Peacham
South Peacham
BARNET
East Barnet
West Barnet
Barnet
McIndoe Falls
GROTON
Groton
RYEGATE
Ryegate Corner
East Ryegate
South Ryegate
Designated Downtown
Designated Village Center
De-Designated Village Center
Potential Designated Village Center
Industrial
Regional Urban Center
Service Center
Village Center
County Boundary
Town Boundary
Incorporated Village Boundary
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# III. FUTURE LAND USE & DEVELOPMENT

## Categories of Land Use

If we look at our current land use from a development standpoint, the region can basically be divided into five broad categories:

1. Regional Urban Centers
2. Service Centers
3. Village Centers
4. Rural Areas
5. Industrial/Business Areas

The Regional Urban Centers, Service Centers, Village Centers, and Industrial/Business areas are depicted on Figure 1.5, "NVDA: Future Land Use." Other areas are Rural, which includes open agricultural fields and forested areas. The areas are categorized for growth based on the following development pattern descriptions. These descriptions are general in nature and can be used to guide growth in an appropriate manner, keeping in the character of the area.

The Future Land Use Map and accompanying text is intended to complement local plans and provide guidance to communities developing local plans. The identification of future land use categories in the regional plan is general in nature; locally-adopted plans are informed by locally-determined goals, and local knowledge.

### Regional Urban Centers

**Description**

Regional Urban Centers are areas with concentrated development that provide the core support services for the less developed outlying areas. Higher capacity road infrastructure, municipal sewer and water, energy infrastructure, and emergency services are in place to support heavier development in these areas.

The Northeast Kingdom has two long-established regional urban centers, one centered on the Caledonia County seat and the other on the Orleans County seat. The regional urban center in the St. Johnsbury/Lyndon area serves the southern section of the region, and Newport City/Derby regional urban center serves the northern section. Transportation infrastructure plays an important role. St. Johnsbury/Lyndon is located at the intersections of Interstates 91 and 93, Route 5, and the main east-west connector Route 2. Newport City/Derby is also on Interstate 91 and Route 5, as well as Route 105. Rail yards operate in both St. Johnsbury and Newport City. Caledonia County Airport is located in Lyndon, and the Northeast Kingdom International Airport (previously the Newport State Airport), is in a growing, aviation-related industrial area just outside of the Newport City limits in Coventry.

The vast majority of covered employment in the Northeast Kingdom is located in the two urban centers. In 2012, the Northeast Kingdom had a combined 22,231 covered jobs; 9,718 of these were in the St. Johnsbury/Lyndon labor market area, and 10,566 were in the Newport City/Derby labor market area. Major sectors providing employment in the region include health care/social assistance, retail trade, manufacturing – precision metals and wood products, accommodation/food services, and construction. (VTLMI 2017). Both urban centers have industrial parks, regional hospitals, various state offices, and dense commercial development. Northern Vermont University, Springfield College, Lyndon Institute, and St. Johnsbury Academy are located in St. Johnsbury/Lyndon, and the North Country Career Center is located in Newport/Derby. Branches of the Community College of Vermont, and University of Vermont Extension offices are located in both centers.

These regional centers are also home to significant cultural and recreational resources and performing arts venues. In the St. Johnsbury/Lyndon regional hub, resources include the Fairbanks Museum and Planetarium, the Athenaeum, Catamount Arts, performance venues at St. Johnsbury Academy, Lyndon Institute and the Alexander Twilight Theater at Lyndon State College; and the Caledonia County Fairgrounds in Lyndon. Resources in the Derby/Newport City hub include the historic Haskell Opera House in Derby Line Village, the Goodrich Memorial Library in Newport, North Country Union High School, which hosts an annual music festival for all high schools in the region, and attractions along the Lake Memphremagog waterfront.

Housing density is greater in the regional urban centers than other towns in the region, with a mix of single family homes and multi-unit housing serving a range of income levels. In downtowns, structures often have commercial ground floors and residential upper floors. Combined, the two urban centers contain almost one-third of the housing units in the entire region. According to the American Community Survey's 2016 estimates, St. Johnsbury/Lyndon had a total of 5,876 housing units, about one sixth of the entire Northeast Kingdom's housing stock (which is 37,850). Newport City/Derby had a total of 4,615 housing units.

Other nearby major urban centers providing employment, services, and cultural opportunities to the region are Montpelier, Littleton, NH, West Lebanon, NH, and to a lesser extent, Magog and Sherbrooke, Quebec.

The Town of Hardwick, previously identified as a service center, is an emerging regional urban center. State highways 14 and 15 converge in the center of the downtown area, and the southern terminus of State Route 16 intersects with Route 15 in the eastern part of Town. Hardwick's Village Center designation by the State has been instrumental in encouraging investment in downtown. In addition, the industrial park adjacent to the downtown area has supported small industrial and commercial operations important to the local and regional economy, primarily in the value-added agricultural sector. Downtown Hardwick has a variety of historically significant civic buildings important to the vitality of the downtown, among which are the Jeudevine Library and the Hardwick Town House. The Town House serves as a venue for community functions and performances and provides gallery space. The building regularly hosts the Vermont Philharmonic, the Craftsbury Chamber Players, and Vermont Vaudeville, among other groups. Due to the growth of its commercial core and the importance of its cultural resources, Hardwick is a good candidate for Downtown designation, and is considering an application.

## Service Centers

Historically, a number of sub-regional service centers in the Northeast Kingdom met the everyday needs of residents, farmers and loggers in the surrounding rural areas. While the function of these service centers has changed somewhat over the years, these communities remain important centers for commerce, services, employment and community life. Barton (with its incorporated villages of Barton and Orleans) in Orleans County, and Hardwick in Caledonia County are two of the more significant service centers, providing 1,403

and 1,155 jobs in the region respectively. Other communities in this group include Orleans, Brighton-Island Pond, Canaan-Beecher Falls, North Troy, Jay, East Burke, and Danville.

The service centers are separated by distance from the two regional urban centers, and generally do not provide enough employment to be completely self-contained. As a result, many of the residents have to travel to the larger urban centers for employment. The growing availability of high speed internet in the Northeast Kingdom, residents now have more options to work from home, sometimes at great distances from their primary place of employment. In addition, many residents have found success in marketing products from their home-based business over the internet.

With some exceptions and individual variations, the service centers provide municipal water and sewer and employ municipal staffs. Other limited government functions may also be carried out in these communities. For example, Vermont Agency of Transportation has maintenance garages in Canaan, Barton and Brighton. All service centers are served by at least one state highway. Community health centers or medical clinics also exist in Barton and Island Pond and Danville.

Land use patterns in service centers have remained relatively stable over time. Change is very gradual. The cores of service centers continue to be characterized by relatively dense mixed land uses, containing civic, governmental, commercial, and mixed residential uses - not unlike times past. For the most part, the boundaries of the centers have remained unchanged over many decades.

Service centers typically have significant areas for industrial use and development. Large-scale resource-based industry in these communities was rooted in their early histories. This is exemplified by the Ethan Allen plants in Orleans and Beecher Falls. However, a reliance on a few large industries makes those communities very vulnerable to fluctuations in the national and regional economies. These service centers still have land set aside for future commercial and industrial development and would be happy to attract industry of any size. Orleans, North Troy and Hardwick all have industrial parks. Recent business development has occurred in both the Orleans and Hardwick industrial parks.

Jay and East Burke are special examples of service centers. These villages have maintained their role as service centers, primarily because they now serve the recreation needs of residents and visitors. Both have winter economies based on down-hill skiing, and to a lesser extent, cross-country skiing. Jay Peak, which recently went through a major expansion period, and along with Burke Mountain Resort with its new development projects, will both become four-season resorts. Expanded activities in recent years include mountain biking, vacation housing developments, hotel developments, and recreation facilities. Jay is the only town in the Northeast Kingdom that provides a higher number of jobs than their total population count. Based on 2015 data from the Vermont Department of Labor, there were 931 jobs in Jay, but the town's population was only 539.[4]

Island Pond, the "Snowmobile Capital of Vermont," is a traditional industrial service center that is becoming more reliant on its recreation resources. Brighton State Park and a sizeable private campground have for many years contributed to Island Pond's summer economy. Large blocks of conserved land that are managed, through fee-ownership or easements, by the State of Vermont and the US Fish and Wildlife Service, also helps to support the tourist industry. Miles of four-season trails are used by cross country skiers, snowmobilers, hikers, and equestrians. Opportunities for bird watching, in particular, present an important draw for tourism and are dependent on the boreal forest habitat.

### Village Centers

The Northeast Kingdom has retained many of its small, traditional New England villages located in rural settings. These continue to provide convenient access to basic goods and amenities for the local rural population in the form of general stores, dining, and fuel. Villages also usually have some small-lot residential housing, and such community buildings as libraries, schools, town halls, clubs, and churches. Many villages

[4] Data for 2016 covered employment in Jay is not available.

offer services for visitors from outside of the region, including inns, bed and breakfasts, dining, and access to recreational activities. Glover and Craftsbury are two examples of village centers.

Characteristics of Village Centers:

- Village/Town center with denser residential patterns than surrounding rural area.
- Appropriate businesses mainly serving the local population (small stores, dining, and some services) and visitors from outside of the region (inns, bed and breakfasts, and recreation).
- Emergency services
- Community buildings such as libraries, schools, town halls, churches, and clubs.

### Rural Areas

Most of the region's land lies outside of the town and village centers. It consists mainly of the farms and forestlands of the traditional Vermont landscape. These land uses are supported by the regional urban centers, service centers, and rural villages, where most of the people and commerce are located. These rural areas should receive very little commercial or industrial development unless it occurs in an established industrial park, or in an area specifically designated in the local zoning bylaw or identified in the Town Plan as being well suited to such uses.

### Industrial Parks

Some land uses, such as research and development facilities, certain manufacturing processes, warehouses, and trucking-related businesses may be more appropriately located outside of any of the above "center" areas because they 1) would be incompatible with nearby residential areas, 2) require immediate access to a major railroad or highway, or 3) need substantial amounts of land. Clustering these land uses in industrial parks can have the multiple benefits of efficient use of land and efficient provision of required infrastructure.

NVDA has helped develop four fully-serviced industrial parks along with incubator buildings in the towns of Hardwick, Lyndonville/St. Johnsbury, North Troy, and Orleans Village in the Town of Barton. In Newport City, near the border with Derby, there is an existing industrial park that was intended for use by AnC BIO but is now unoccupied. In Coventry, the site of the Newport State Airport, recently renamed the Northeast Kingdom International Airport, has been working on runway expansions since 2012 and has the capacity to function as an industrial park. .

## Desired Future Development Patterns

### Development Patterns in Centers (Village, Service and Regional Urban)

Municipalities that have been identified as Village Centers, Service Centers, and Regional Urban Centers on the Future Land Use Map can realize benefits, such as greater walkability, more efficient use of services, and stronger support for retail business uses, from denser residential development in the urban core. The appropriate residential density for a particular community will depend on existing development patterns, and accessibility to public water and sewer. Four units per acre is the typical density found in the highly walkable, pre-car-dependent residential neighborhoods adjacent to downtown business district in places like St. Johnsbury and Newport City. However, lower densities may be dictated by lack of public sewer and water infrastructure in other centers. Higher residential densities may be appropriate in areas supporting mixed uses (e.g., apartments over stores in the business district).

Ideally, development will occur within the core center area, and not expand into undeveloped areas outside the center via strip development. "Strip development" is defined by the State as "linear commercial development along a public highway that includes three or more of the following characteristics: broad road frontage, predominance of single-story buildings, limited reliance on shared highway access, lack of connection to any existing settlement except by highway, lack of connection to surrounding land uses except

by highway, lack of coordination with surrounding land uses, and limited accessibility for pedestrians." With the addition of Criterion 9L to the Act 250 permitting process, it will be more difficult for commercial and large residential developments to get state permits for developments perceived to be linear in nature.

However, it is not recommended that local zoning confine commercial or dense residential development to the boundary of any State-designated center in the municipality. The State downtown and village center designation process looks at existing commercial uses, not potential uses, because it is essentially a rehabilitation and revitalization program for areas with aging building stock. Therefore, land that is appropriate for denser development but is not yet developed as such is consequently excluded from the delineation of a State-designated "center."

The relatively newer "Neighborhood Development Area" is a complimentary state designation program for areas adjacent to existing designated centers. This designation is intended to encourage municipalities and developers to plan for new and infill housing in the area within walking distance of its designated downtown or village center. It is recognized that the improvement and development of housing in these areas will support the commercial establishments in the designated centers. Benefits of designation include the exemption of certain mixed – income projects from Act 250 regulations; a 50% discount on Act 250 fees for projects that are not exempt; a cap on the amount of State review fees for wastewater permits that will tie into an approved municipal system; and exemption from the land gains tax.

Promoting neighborhood development areas will be a useful approach to directing new housing development to existing centers, rather than undeveloped rural areas. In order for "neighborhood development areas" to effectively provide alternatives to car-dependent residential subdivisions and combat sprawl, it must be ensured that housing products for workforce (housing available to residents making up to 120% of the area median income) and upper-income households are included in the mix of new housing that is developed. As projected commercial development in the region is expected to bring middle and upper-wage earners to the area, it will be important to provide desirable housing options in or near existing centers to combat development pressure on rural lands. It will take considerable effort and long-range strategic planning to alter the trend of new residential development occurring primarily outside of centers.

### Development Patterns in Rural Areas

Just as the state designation programs mentioned above can help direct commercial and residential development to existing centers, these programs also help retain the important agricultural, forestry and recreation use of rural areas that lie outside of the commercial and residential cores.

When residential development occurs in rural areas, it should not result in the fragmentation of forestland or agricultural land such that it impedes the economic feasibility of agricultural or forest-based enterprises. Development in rural areas should also preserve, to the extent practicable, connections that facilitate the passive recreational use of land (e.g., trails).

Promoting commercial development that is tied to the agricultural use of the land, though zoning measures and/or educational outreach to residents, is one way to preserve the working landscape. Another way to achieve this desired pattern of development is to keep overall residential densities low in agricultural areas (e.g., one residential unit per 25 acres), coupled with clustering or "planned unit development" with an established maximum building envelope size.

For rural areas that are on the fringes of downtown and village centers, permitting higher residential densities and some commercial uses coupled with clear standards for pedestrian connections to the centers, is a way to accommodate growth while encouraging sustainable design.

Agricultural soils in rural areas outside centers or industrial parks should be conserved to the maximum extent practicable.

As previously stated, the region's rural areas should receive very little commercial or industrial development unless it occurs in an established industrial park or in an area specifically designated, either in a local zoning

bylaw or in a local municipal plan as being well suited to such a use. Nevertheless, rural lands containing one or more of the following conservation attributes, shall be considered exceptionally sensitive and shall therefore not be designated as appropriate for commercial or industrial development that is not directly related to the region's lands-based economy (i.e. forestry, agriculture, and recreation):

- State natural areas and fragile areas: The region has two such areas, which are both designated as National Natural Landmarks, the Willoughby Cliffs area and the Barton River Marsh.
- Lands managed by the Department of Forest Parks and Recreation
- Highest priority forest habitat blocks
- Forested coverage of Site Class 1, 2, and 3 soils of 25 acres or more
- Headwaters
- Upland areas of 2,000 or higher

Lands containing one or more of these attributes shall not be developed, as their best uses are a combination of forest and conservation purposes. Appropriate uses include sustainable forestry and logging practices, maple syrup production, wildlife habitat, and passive recreation. Maintaining forest and vegetation coverage on upland areas is particularly important in that it provides natural floodwater attenuation and minimizes contribution to flash flooding in downslope areas, as well as increased sediment loads to headwaters. Ridgelines in these sensitive areas are a particular concern as developments can be seen from multiple locations including neighboring communities. From our experience, distance is not an effective strategy to mitigate impacts to such viewsheds. NVDA will not support proposed development or re-designation of sensitive rural lands that include any of the following impacts:

- Loss of forest cover and introduction of impervious surface coverage
- Incursion of roads intended for uses other than resource-based activities (i.e. sustainable wood harvesting and recreation) that result in the fragmentation of habitat
- Uses that introduce smoke or other emissions
- Uses that introduce light trespass or sustained noise

Any existing impacts in sensitive rural lands shall be considered non-conformities with this Regional Plan and shall not be expanded.

### Development in Industrial/Business Parks

Industrial/business parks should be sited in locations served by major federal or state highways, airports, or railroads. Industrial/business parks are encouraged to be densely developed while allowing enough space for business expansion. Infrastructure (water, sewer, and electric power) connections designed to serve industrial parks should not contribute to strip development outside of the industrial parks.

Off-site mitigation of agricultural soils would be appropriate when new industrial/business parks are developed. However, land in the region's existing industrial/business parks should not be required to mitigate for agricultural soils when they are developed as they are all locally zoned for commercial and industrial use.

There are some projects in the works and on the horizon in the Northeast Kingdom that could spur increased development in towns throughout the region. An expansion to the Northeast Kingdom International Airport in Coventry is underway. Jay Peak has seen a number of expansion in recent years. The construction of a new, 116-unit hotel and conference center was recently completed for Burke Mountain, which will draw increased numbers of tourists. It is expected that this major expansion will spur increased commercial development catering to tourists and workers, and will place increased demands on services and facilities, including police/emergency services and child care facilities. However, although more school-aged

children would be expected with this growth, most schools in the region have been experiencing declining enrollment so the growth is expected to support rather than overwhelm existing schools. Schools operating close to capacity reach economic efficiencies not possible in schools with very low enrollment.

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## IV. DEVELOPMENTS OF SUBSTANTIAL REGIONAL IMPACT

For the purposes of this plan, Developments of Substantial Regional Impact are defined by the Northeastern Vermont Development Association as:

1. Projects that would have substantial and ongoing impact on two or more municipalities, including the host municipality.
2. Projects that would likely have substantial impact on a resource within the region that is widely used by people outside of the municipality in which it is located.
3. Projects that may affect development patterns to the extent that the character or identity of neighboring municipalities is significantly affected.

The projects described previously – major expansions at the Burke Mountain and Jay Peak resorts, the new biotechnology facility in Newport, and the expansion of Northeast Kingdom International Airport – would all qualify as Developments of Substantial Regional Impact. Also, qualifying as a Development of Substantial Regional Impact is the Casella Waste USA Landfill located in Coventry VT. This landfill currently accepts most of the solid waste generated in the State of Vermont. Trucks traveling to and from the facility from all parts of Vermont are a common sight.

Other developments having a substantial regional impact are the industrial-scale wind facilities located in Sheffield and Lowell. These facilities have impacted the view sheds in a number of adjoining communities.

## V. ADJACENT REGIONS

The Northeast Kingdom does not exist or function independently from those regions that surround it. Therefore, it is critically important that this plan take into account the planning for these neighboring areas to insure a smooth transition between the regions. This will also reduce the adverse impacts that development in one region might have on the adjoining region.

The Northeast Kingdom is surrounded by five different planning regions in Vermont and New Hampshire and one Canadian Province. Four of these regions are located to the south and west of the Northeast Kingdom in Vermont and include the Northwest Regional Planning Commission, the Lamoille County Planning Commission, the Central Vermont Regional Planning Commission and the Two-Rivers-Ottauquechee Regional Commission. New Hampshire's North Country Council abuts the Northeast Kingdom to the east and, finally, the Canadian Province of Quebec is to the north.

It is expected that the projected job growth in the Northeast Kingdom region will draw workers from adjacent communities, particularly those from the Northwest Regional Planning Commission and the Lamoille Country Planning Commission regions. The expected job growth in Jay and the Newport area also may spur new housing and/or commercial developments in communities from those regions – i.e. Montgomery or Morrisville. The success of value-added agricultural enterprises in Hardwick over recent years has had some effect on developments in Wolcott.

Other substantial developments in the Northeast Kingdom that have likely land use impacts on adjoining regions include: The Waste USA Landfill in Coventry (transportation and solid waste impacts); The Lamoille Valley Rail Trail (economic development and transportation impacts); And, the VAG Asbestos Mine (hazardous site in the communities of Lowell and Eden). Watershed boundaries also do not correspond to

regional and municipal geopolitical boundaries, so activities affecting a waterway in one community have the potential to impact the water resource in another region.

As identified by the Vermont Department of Labor in 2015, the following Labor Market Areas (LMA) exists in the Northeast Kingdom. Only the Derby and St. Johnsbury LMAs contain only NEK communities:

- Derby LMA
- St. Johnsbury LMA
- Morristown-Waterbury LMA (partial) – Craftsbury, Greensboro, Hardwick
- Colebrook NH-VT (partial LMA) – Norton, Averill, Canaan, Lemington, Bloomfield
- Littleton NH-VT (partial LMA) – Brunswick, Maidstone, Guildhall, Lunenburg
- Newbury LMA (partial LMA) – Groton, Ryegate

From working with local communities we know that NH towns (Colebrook, Lancaster, Littleton, etc.) along the CT River attract VT residents for employment, tax-free goods, and services. We also know that communities in the outer reaches of our region find it easier to travel to communities in adjacent regions for the same things in communities like Morrisville and White River Junction. The cities of Montpelier and Burlington also draw significant numbers of travelers from the NEK to access employment, state government and agencies, larger cultural events, and expanded goods and services. Growth in any of these adjacent or nearby areas has the potential to impact the NEK.

Lastly, an analysis of the impacts of the many large developments occurring or proposed in the Northeast Kingdom is nearing completion. This was funded by a planning grant from the Vermont Agency of Commerce, along with supplemental funds from USDA Rural Development. Drawing on data provided from several sources, including local, State and federal agencies, NVDA is examining existing conditions and assessing the potential impacts on emergency services, childcare, schools, infrastructure investments, recreational resources and housing. The conclusions and recommendations of this impact study are incorporated by reference into this Regional Plan.

## GOALS AND STRATEGIES FOR FUTURE LAND USE AND DEVELOPMENT

### FUTURE LAND USE & DEVELOPMENT GOALS

- Established centers will be an economically vital mix of commercial and residential uses, and will offer a variety of housing types available at different price points to support long-term sustainability.
- Towns will be supported in identifying and implementing strategies that reverses the current trend of new residential development occurring primarily outside of centers.
- Traditional development patterns will be maintained and linear "strip" development will be avoided.
- New development will be compatible with existing land uses, and consistent with local plans.
- Historic structures, community facilities, and other buildings will be preserved and adapted for re-use.
- Brownfield sites will be reclaimed.
- Significant development proposals will consider the impact on adjacent regions.

## STRATEGIES - CENTERS (Regional, Service and Village)

- Direct public investment and create financial incentives for the development of a balanced mix of low-income, work-force, and upper-income housing in and adjacent to village centers and downtowns, with the goal of allowing all communities to develop into high-opportunity areas.
- Direct public investment for new elderly and affordable housing to town and village centers in locations with access to public transportation routes. Aside from promoting traditional settlement patterns, this will put seniors closer to such amenities as shopping, and community facilities, and enable income-stressed residents to have cost-saving access to services, employment centers, and public transportation options to places of employment.
- Work with housing developers and communities to assure that all residents have the opportunity for access to high-performing schools and economically-sustainable employment.
- Assist communities applying for designation under the Vermont Downtown, Village Center, and/or Neighborhood Development Programs where appropriate to encourage mixed-use development (residential, commercial and appropriate light-industrial) in centers.
- Encourage adaptive reuse of historic structures through tax incentives, tax credits, grants, and loans, assistance in location of funding, etc.
- Encourage desired town center development through investment, maintenance, and expansion of appropriate infrastructure (sidewalks, water and sewer, parking, public spaces, etc.).
- Support beautification efforts in town centers and downtowns.
- Encourage towns to plan for community recreational and social needs.

## STRATEGIES RURAL AREAS

- Avoid the development of agricultural lands with auto-dependent residential subdivisions by encouraging towns with land use regulations to lower the permitted residential density in agricultural zones, coupled with planned unit development or clustering provisions to ensure efficient and well-designed developments.
- Protect against the fragmentation of rural lands by the piecemeal development of residential lots by providing financial incentives for the development of attractive work-force and upper-income housing in and adjacent to village centers and downtowns.
- Support local conservation efforts.
- Encourage community open space plans and recreation infrastructure, recognizing that privately-held land will not be available unless protected through the purchase of conservation and access easements.

## STRATEGIES INDUSTRIAL PARKS

- Assist Towns in identifying in their Town Plans appropriate areas for the development of industrial or manufacturing uses, based on the location of natural resources and existing transportation and utility infrastructure.
- Assist Towns in marketing potential locations for industry to the business community.
- Assist Towns with the assessment and remediation of Brownfields in order to revitalize and re-use existing industrial infrastructure where appropriate for future industrial uses.

# Chapter Two: Energy

## I. INTRODUCTION

Traditionally, Northeastern Vermont Development Association has approached energy planning from a strictly "supply-and-demand" perspective, and this has generally supported the traditional systems that have continued to meet our regional energy needs. The energy trends of the past decade, however, have presented NVDA with the challenge of addressing a much broader perspective, one that transcends current energy production and usage. During this time, several factors created a contentious climate for the future planning of our energy systems. The region has had to contemplate the effect of utility-scale wind development on our mountains; identify ways to ensure forest sustainability as wood-fuels grow in popularity; and seek means to secure long-term affordability of our energy resources for the general public and business communities. In response, NVDA expanded its approach to energy planning and its role in regional energy policy with the intent of seeking a stronger voice in formulating energy policy for NVDA and its member municipalities.

NVDA's statutory role in energy planning is outlined in V.S.A. Title 24, Chp.117 §4348a (3), which stipulates that a regional plan include:

> "… an analysis of energy resources, needs, scarcities, costs and problems within the region across all energy sectors, including electric, thermal, and transportation; a statement of policy on the conservation and efficient use of energy, and the development of renewable energy resources; a statement of policy on patterns and densities of land use likely to result in conservation of energy; and an identification of potential areas for the development and siting of renewable energy resources and areas that are unsuitable for siting those resources or particular categories or sizes of those resources."

The approval process for siting energy generation projects is largely under the jurisdiction of Section 248 of Title 30. The Vermont Supreme Court has expressly exempted projects subject to Section 248 from local permitting. At this time municipalities have only the power to regulate "off-grid" renewables – and must do so in accordance with Vermont Statute.

In accordance with Section 248, energy developers must obtain a Certificate of Public Good (CPG) from the Public Utility Commission (PUC) before beginning site preparation or construction of electric transmission facilities, electric generation facilities, and certain gas pipelines within Vermont[1]. Prior to issuance, the PUC takes into account the environmental, economic, and social impacts of a proposed facility. Municipalities and other groups are allowed to participate in the Section 248 review process, but many find doing so to be difficult and expensive. Moreover, the PUC is only obligated to give "due consideration" to the recommendations of the municipal and regional planning commission in determining if the project "will not unduly interfere with the orderly development of the region."[2] The process has also been complicated by the fact that Vermont statute does not define "due consideration", nor does it indicate whether the courts or the PUC should be the ultimate arbiter.

Previous versions of this plan have been prepared in anticipation of receiving "due consideration" in the Section 248 process. To support the PUC's consideration, NVDA has defined what constitutes a 'substantial regional impact' with regards to development (24 V.S.A. Chp.117 §4345a (17)). This

[1] Vermont Public Service Board. "Citizens' Guide to the Vermont Public Service Board's Section 248 Process.
[2] City of S. Burlington, 133 Vt. at 447, 344 A.2d at 25

definition is provided within Land Use section of the *Proposed Regional Plan for the Northeast Kingdom 2018* (Chp.1, pg. 24).

Act 174 of 2016 establishes a new set of municipal and regional energy planning standards. If these standards are met, regional and municipal plans may carry greater weight – "substantial deference" – in the Section 248 process. Unlike "due consideration," "substantial deference" is codified in statute to mean:

> "…that a land conservation measure or specific policy shall be applied in accordance with its terms unless there is a clear and convincing demonstration that other factors affecting the general good of the State outweigh the application of the measure of policy."

This regional plan has been revised to meet substantial deference under Act 174. It is important to note, however, that substantial deference does not carry the weight of zoning. Projects that fall under the jurisdiction of Section 248 are still exempt from local zoning and permitting. Nevertheless, this plan reflects our attempt to have a greater say in where energy projects should – and should not – be sited, and it is structured as a resource who municipalities who also wish to seek substantial deference for their local plans. Substantial deference is voluntary for municipalities. Duly adopted local plans that do not meet the enhanced energy planning standards of Act 174 but otherwise meet all the requirements of Chapter 117 will continue to receive due consideration from the PUC in the Section 248 review process. Whether or not a municipality choses to pursue substantial deference, it is hoped that this regional plan will help our municipalities to think comprehensively about energy use, resulting in strategies that conserve existing resources and reduce our reliance on fossil fuels.

## Strategy Outline

NVDA's Energy Plan aims to guide the region's energy development for the next eight years in support of Vermont's 2016 Comprehensive Energy Plan (CEP), which contains the following goals:

- Reduce total energy consumption per capita by 15% by 2025, and by more than one third by 2050.
- Meet 25% of the remaining energy need from renewable sources by 2025, 40% by 2035, and 90% by 2050.
- Achieve three renewable end-use sector goals for 2025: 10% transportation, 30% buildings, and 67% electric power.

The basic components of the Energy Strategy are organized into five main sections:

### State and Regional Overview

This section provides an estimate of local consumption across the transportation, thermal, and electrical energy sectors.

### Generation and Distribution

This section analyzes the existing framework by which our utilities generate and distribute power, as well as legislation and incentives that will impact future generation.

### Future Energy Use and 2050 Projections

This section analyzes the ambitious 2050 goals for Vermont's CEP and how it may impact future energy use in the Northeast Kingdom. Efficiency and conservation are also addressed in support of meeting statewide energy goals.

**Energy Resource Analysis and Recommendations**
In this section resources are analyzed for their current and future potential as part of the overall energy portfolio in support of 2050 goals. This section includes a region-wide GIS-based analysis, which identifies potential areas for the development and siting of renewable energy resources, areas that are unsuitable for siting those resources or particular categories or sizes of those resources, and potential generation from siting areas.

**Regional Goals & Strategies**
This section identifies the primary regional challenges for meeting 2050 goals and identifies pathways for meeting them.

## II. STATE AND REGIONAL OVERVIEW

### Statewide Energy Use

Vermont's total energy consumption is the lowest in the nation and has traditionally ranked among the lowest per capita. As of 2014, Vermont ranks 43rd in per capita consumption (about 223 MM BTUs). However, the state ranks 13th in total energy expenditures per capita (at $5,225). Throughout the U.S., energy prices are rising due to the stress on traditional resources and increasing consumption levels. To address rising energy costs, Vermonters are turning more and more towards supplemental fuels, renewables, co-generation facilities, and efficiency/conservation efforts.

**What is a BTU?**

BTU stands for **British Thermal Unit**, and it is defined by US Energy Information Administration as the measurement of the quantity of heat required to raise the temperature of one pound of liquid water by 1° F at the temperature that water has its greatest density (approximately 39 °F.

Fuels come in a variety of measurements – by cord, by gallon, by kilowatt – so this plan converts units of measurement into BTUs in order to compare their energy output consistently.

One BTU is a miniscule amount, so BTUs are often measured in the thousands, millions (MM BTUs), or even trillions.

Energy consumption has grown steadily since the 1960s. Historically, leaps in consumption are associated with major economic growth, low energy prices, population growth, and an overall increase in the number of vehicle miles driven. Vermont has limited generation capacity and has relied on Quebec to fulfill part of its energy needs since the early 1980s. With the permanent closure of the Vermont Yankee Nuclear Plant at the end of 2014, the state lost 55% of its generation capacity and now produces less than one-third of the energy it consumes. In addition to Canada, the state relies on the ISO-NE grid for power from neighboring states. Energy use is dominated by transportation and by heating in the frigid winters. About three-fifths of the energy consumed in Vermont are petroleum-based products, which are transported into the state by rail or truck from neighboring states and Canada. The state has limited access to natural gas. There is a natural gas pipeline in the Northeast Kingdom (which is shown on the regional energy maps), but we lack infrastructure to access it. Vermont is the second smallest natural gas consumer per capita, among the states. In 2015, nearly all of Vermont's in-state net electricity generation was produced by renewable energy, including hydroelectric, biomass, wind, and solar resources.[3]

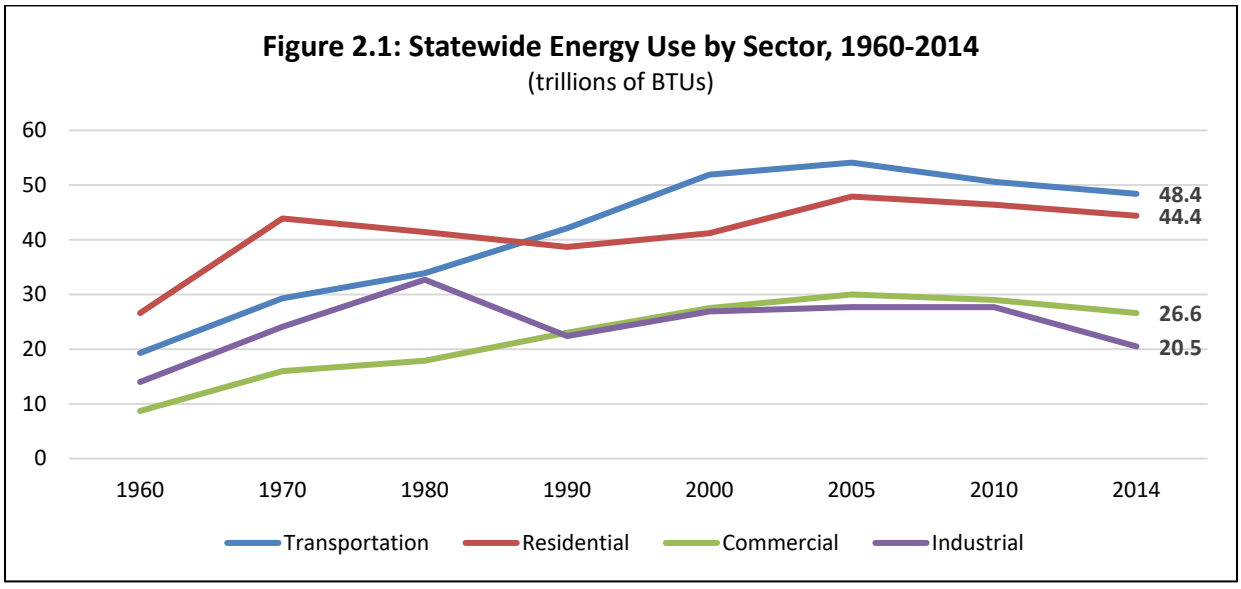
Table 2.1 represents the total primary energy consumption in the state from 2009 to 2014 Petroleum products are by far the leading source of fuel in the state, most of which is used in the transportation and residential heating sectors.

| Table 2.1: Primary Energy Consumption Estimates, 2009-2014 (Trillions of BTUs) | | | | | | |
|---|---|---|---|---|---|---|
| | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** |

[3] US Energy Information Administration: Vermont State Energy Profile and Estimates

| | | | | | | |
|---|---|---|---|---|---|---|
| Coal | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Natural Gas | 8.7 | 8.5 | 8.7 | 8.3 | 9.7 | 10.8 |
| Total Petroleum | 84.6 | 81.8 | 80.2 | 75.9 | 79.4 | 79.5 |
| Distillate Fuel Oil | 27.8 | 26.6 | 27.7 | 24.4 | 25.3 | 26.5 |
| Jet Fuel | 2.9 | 1.3 | 1.3 | 1.3 | 1.3 | 1.2 |
| LPG | 9.3 | 9.0 | 8.3 | 9.2 | 10.4 | 10.1 |
| Motor Gasoline, excluding fuel ethanol | 38.0 | 37.6 | 36.2 | 35.1 | 35.7 | 35.3 |
| Residual Fuel Oil | 1.2 | 1.0 | 0.9 | 0.6 | 0.8 | 0.5 |
| Other | 5.4 | 6.3 | 5.7 | 5.4 | 5.9 | 8.5 |
| Nuclear Electric Power | 56.1 | 50.0 | 51.4 | 52.3 | 50.6 | 52.9 |
| Hydroelectric Power | 14.5 | 13.1 | 13.8 | 10.6 | 12.3 | 11.2 |
| Biomass | 19.4 | 19.0 | 17.2 | 16.1 | 20.8 | 20.3 |
| Solar/PV | 0.1 | 0.2 | 0.3 | 0.5 | 0.7 | 0.9 |
| Wind | 0.1 | 0.1 | 0.3 | 1.0 | 2.3 | 3.0 |
| Net Interstate Flow of Electricity | -35.5 | -27.4 | -30.0 | -73.4 | -78.3 | -76.9 |
| Net Electricity Imports | 8.7 | 8.3 | 8.6 | 39.2 | 40.1 | 38.1 |
| Source: U.S. Energy Information Administration, State Energy Consumption Estimates, 1960-2014, released June 2016 | | | | | | |

Figure 2.1 outlines Vermont's energy use by sector between 1960 and 2014. While transportation energy use has grown at a faster pace than any other energy sector since 1960, it has dropped by more than 10% since 2000, most likely a result of an increase in fuel efficiency and conservation efforts. Residential sector consumption has grown by nearly 15% since 1990. Residential fluctuations are considered to be normal - resulting from general population growth, an increase in the average house size, and additional modern conveniences. While the drop from 2005 levels may be attributed in part to the great recession, it may also reflect more efficient building practices, such as more efficient heating equipment and better insulated building shells. According to the Energy Information Administration's 2013 Residential Energy Consumption Survey, U.S. homes built in 2000 and later consume only 2% more energy on average than homes built prior to 2000, despite being on average 30% larger.



Source: U.S. Energy Information Administration, State Energy Consumption Estimates, 1960-2014

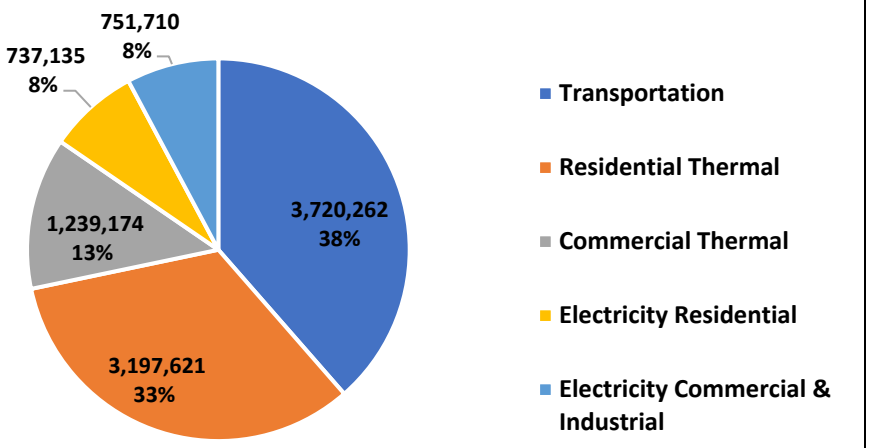
The industrial sector has seen the most significant decrease in consumption since 2010; however, it is unclear as to how much of this reduction is attributed to new energy efficiency measures employed by manufacturers, reduced production levels, or plant closings in Vermont.

## Regional Energy Use by Sector

*Note: The following regional estimates were developed using multiple sources, including the Department of Public Service, American Community Survey, Vermont Department of Labor. For more information about how these estimates were developed, please see Appendix A.*

According to NVDA estimates, residential and commercial thermal use (heating space and water) is the largest energy use at 46%. Transportation[4] is the second largest energy use in the Northeast Kingdom, accounting for 38% of total usage measured in MM BTUs,, followed by electricity at 16%. (Figure 2.2)

**Figure 2.2: Regional Energy Use by Sector (MM BTUs), NVDA Estimates**




### Residential Thermal

On average, a Vermont residence uses 110 MM BTUs annually for heating space and water. [5] Annual usage, however, can vary from as low as 70 MM BTUs to 150 MM BTUs, depending on a number of factors such as total square footage, seasonal use, and age of structure. The age of the Northeast Kingdom's housing stock is likely the most significant contributor to the overall usage. According to most recent American Community Survey Five-Year Estimates (ACS), nearly one-third of owner occupied housing units and nearly one-half of renter-occupied housing units were built prior to 1940. [6] Older homes are likely to be poorly insulated and leakier, driving up consumption and costs.

There are 26,133 occupied and heated households in the Northeast Kingdom, which collectively account for more than 3.2 billion BTUs and $40 million in various heating fuels. (Table 2.2)

**Table 2.2: Residential Heating Fuels Used in the Northeast Kingdom**

| Fuel Type: Space Heating | Number of Households | Avg. Use (Annual) | | Percent of Use: (All HHs) | Percent of Use: Owner | Percent of Use: Renter | Percent of Cost (All HHs) |
|---|---|---|---|---|---|---|---|
| Tank/LP/etc. Gas | 3,782 | 3,713,828 | Gallons | 14.4% | 12.4% | 21.1% | 23.5% |

[4] Transportation data only includes light-duty vehicles, and commercial transportation data is not available.
[5] Vermont Department of Public Service. "Guidance for Regional Enhanced Energy Planning Standards" March 2, 2017
[6] The American Community Survey (ACS) data differs from Census data in that it utilizes annual survey figures, from a smaller cross-section of the population, across a rolling 5-year timeframe to provide data estimates for a given year. The estimates used for this update were from 2011-2015.

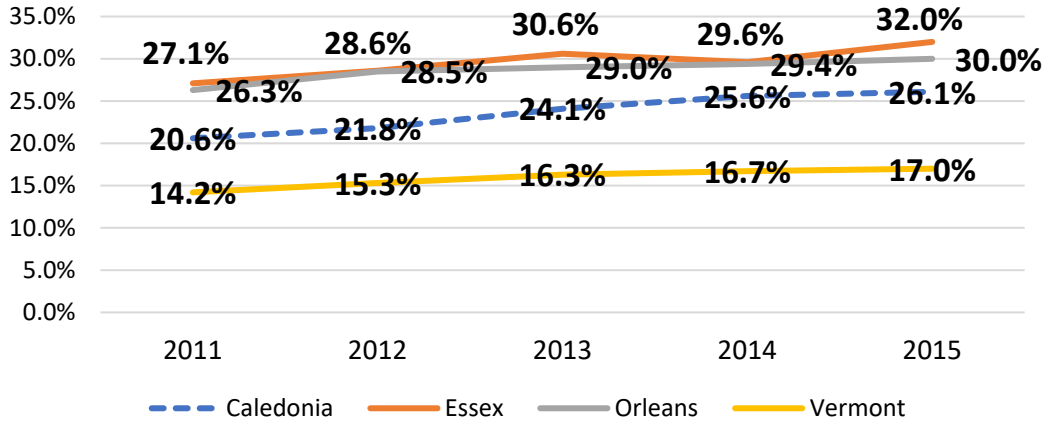
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Electricity | 454 | 11 | GWh | 1.7% | 0.8% | 4.7% | 4.0% |
| Fuel Oil | 13,997 | 9,252,413 | Gallons | 53.4% | 50.6% | 62.5% | 51.4% |
| Wood | 7,441 | 36,446 | Cords | 28.4% | 34.1% | 10.2% | 20.6% |
| Coal/Coke | 115 | 529 | tons | 0.4% | 0.4% | 0.6% | 0.5% |
| Other | 344 | - | | 1.3% | 1.6% | 0.4% | 0.0% |
| Source: NVDA (See Appendix A) | | | | | | | |

The region lacks natural gas distribution infrastructure, so oil is the most widely consumed residential heating fuel. Propane -- which is cleaner burning and less expensive than oil but tends to produce less heat per gallon – is the second most used heating fuel for rental stock.

Another contributor to residential thermal usage patterns in the Northeast Kingdom is the high concentration of seasonal homes. According to the 2010 Census, more than one of every five housing units in the NEK is a vacant housing unit intended for "seasonal, recreational, or occasional use". The Vermont Department of Public Service has estimated that "summer" seasonal housing stock – i.e. lake cottages -- may use as little as 5% of a year-round residential structure, while "winter" seasonal housing – like in Burke and Jay – could use as much as 10%. In reality, the seasonal usage lines are blurred, as many communities have seasonal populations that visit throughout the year. NVDA estimates that the region's approximately 8,800 seasonal units accounts for about 45,398 MM BTUs annually in thermal energy.

Wood is used by more than one-third of owner occupied homes, but only about one-tenth of renter-occupied homes. Two affordable housing developments in the region use wood pellets – Maple Street Senior Housing in Hardwick with 16 units, and Mathewson Block in Lyndonville with 6 units. The region's homeowners maintain a strong tradition of burning wood and do so at a much higher rate than the rest of the state. (Figure 2.3). In the late 2000s, instability of fuel prices compelled more homeowners to install wood-pellet stoves and furnaces, as well as outdoor wood boilers for heating water in recent years. Despite a recent drop in fuel oil prices in recent years, combined with a significant shortage of wood pellets during the 2014-2015 heating season, homeowners remain committed to wood. In many cases, fuel oil is actually used as a back-up source to wood.

**Figure 2.3: Wood Use in the NEK and Vermont, 2011-2015**




Source: American Community Survey

| Table 2.3: Cost of Fuels, 2011-2016 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | November 2011 | | | *November 2016* | | | | |
| **Types of Energy** | **BTU/Unit** | **Adj. Effic.** | **$/Unit** | **$/MM BTU** | **Typical Effic.** | **$/Unit** | **$/MM BTU** | ***High Effic.**** | ***High Efficiency$/MM BTU*** |
| Fuel Oil, gallon | 138,200 | 80% | $4.08 | $36.89 | 80% | $2.23 | $20.14 | *95%* | *$16.96* |
| Kerosene, gallon | 136,600 | 80% | $4.45 | $40.71 | 80% | $2.80 | $25.65 | | |
| Propane, gallon | 91,600 | 80% | $3.37 | $46.05 | 80% | $2.54 | $34.64 | *95%* | *$29.17* |
| Natural gas, Ccf | 100,000 | 80% | $1.78 | $22.22 | 80% | $1.41 | $17.67 | *95%* | *$14.88* |
| Electricity, kWh (resistive) | 3,412 | 100% | $0.16 | $46.37 | 100% | $0.15 | $43.46 | | |
| Electricity, kWh (heat pump)** | n/a | | | | | $0.15 | n/a* | *240%* | *$18.32* |
| Wood (cord-green) | 22,000,000 | 60% | $192.03 | $14.55 | 60% | $227.00 | $17.21 | | |
| Pellets (ton) | 16,400,000 | 80% | $263.51 | $20.09 | 80% | $275.00 | $20.96 | | |

Source: Department of Public Service, Vermont Fuel Price Report (2011 figures are adjusted for Inflation)
* n/a because heat pumps can only burn in one mode.

Table 2.3 demonstrates the change in heating fuel prices in the last few years. Only the least used fuel – resistance type electricity – has remained stable. Meanwhile the cost of fossil fuels has dropped, while the cost of wood has risen slightly. When oil prices were high, many NEK residents turned to alternative fuels, especially wood pellets, which are cleaner burning, more efficient than cord wood, and relatively easy to use. Stoves and furnaces can be controlled by a thermostat. Their prices have remained relatively stable, although there have been some shortages in recent heating seasons. Wood pellet stoves and furnaces may be a significant investment for most homeowners, so they have continued to use pellets even after the price of heating oil dropped.

In 2015 the Vermont Fuel Price report was amended to account for "High Efficiency" ratings of furnaces, which are manufactured to meet higher efficiency standards can result in savings on energy for the customer.

### Heat Pump Technologies:

The Fuel Price Report now includes information on electric-powered heat pump systems, which can deliver up to three times more heat energy than the energy required to operate them. This high return rate – called a coefficient of performance (COP) – offsets the increased electricity usage. All air – even frigid Vermont winter air – contains a significant amount of heat energy. The air source heat pump captures the heat energy from the outside, compresses it, and circulates it into the house at a high temperature. (In hot summer months, the technology operates in reverse, acting as an air conditioner.) Because a heat pump *transfers* heat rather than *generates* it, it requires significantly less energy to operate than a traditional electric, propane, or oil system.

Geothermal or "ground source heat pump systems" operate on the same principle: They extract natural low-temperature thermal energy from the ground during colder months for heating, and transfer thermal energy from the building to the ground in warm months for cooling. A geothermal system in Vermont can save roughly $1,000 to $2,000 annually in heating costs and have a "simple payback time" of between 10-20 years. This technology operates much like a refrigerator, utilizing a heat pump, heat exchanger, and refrigerant.

There are two main types of geothermal systems, open-loop and closed-loop. Open-loop systems utilize a deep rock well or pond to draw water to the heat exchanger where heat flows from the water into cold refrigerant. The refrigerant is then compressed, which greatly raises its temperature and converts it to vapor. Refrigerant vapors then transfer heat to water in a second heat exchanger that is then circulated to heat the building. The process operates in reverse for cooling. Closed-loop systems are slightly different in that they utilize piping in the ground or a pond that can be placed closer to the surface, but then require refrigerant or water with antifreeze to circulate in the piping.

Open-loop systems are more efficient than closed-loop systems and are often cheaper to install because they require less excavation. Open-loop systems are also a good fit for Vermont, since standing column wells can be constructed virtually everywhere. While existing well systems can have geothermal systems installed, installation of this technology is often cheapest during construction of a new building and development of a new well site. A geothermal well resource map is provided at the end of the chapter and identifies existing wells with a high potential for geothermal heating and cooling applications.

Traditionally, geothermal systems have been more efficient than air-sourced heat pumps (ones that just utilize outside air), because the ground/well source systems can take advantage of relatively constant temperatures below the frost line. In recent years, however manufacturers have developed air-sourced "cold climate" pumps that operate more consistently over Vermont's vast temperature ranges. Unlike geothermal units, they do not require excavation or duct work and can be much less expensive to install. Cold climate heat pumps have the capacity to heat about 50% to 70% of a building, depending on the size and layout of the structure. Older homes with multiple ells or wings may be difficult to heat with heat pumps alone, but the pumps may be effective for boosting colder underserved zones. They also may be useful in outdoor workspaces. Despite recent improvements in effectiveness on cold days, a backup heating source is usually required for sub-zero temperatures.

## Commercial/Industrial Thermal

Most of the region's commercial/industrial energy usage can be attributed to space heating and process heating. Table 2.4 identifies average heating load per establishments and total MM BTUs consumed annually[7] Heating loads vary significantly and may be highly specific to type of industrial processes. NVDA's estimates were developed using assumptions about business patterns. For example, types of businesses that tend to employ more workers per establishment can be expected to be the larger consumers of heat energy – schools, hospitals and clinics, hotels and restaurants. On the other hand, businesses that have few on-site employees – like real estate agencies – use significantly less.

To combat high heating costs, RadianTec, a radiant-floor heating manufacturing company in Lyndon, utilizes solar hot water panels and passive solar design to reduce their heat loads. Other commercial operations and institutions have turned to wood. Wood chips - either bole chips or whole tree chips - are well suited for combustion to supply heat, hot water, or steam in institutional, commercial, and industrial settings. The Vermont Fuels for School Program has been very successful

**Table 2.4: Commercial Thermal Energy Use**

| | # of Commercial Establishments | Average Heating Load (MMBTUs) | Total MMBTUs |
|---|---|---|---|
| Caledonia | 722 | 829 | 598,292 |
| Essex | 103 | 1,118 | 115,174 |
| Orleans | 631 | 833 | 525,708 |
| TOTAL | 1,456 | 851 | 1,239,174 |

Source: Department of Public Service, Vermont Department of Labor

[7] Vermont Department of Public Service. "Guidance for Regional Enhanced Energy Planning Standards" March 2, 2017

implementing wood heating in schools. Six schools in the Northeast Kingdom currently heat with wood: Burke Mountain Academy, Craftsbury Elementary, Danville School, Hazen Union School, and Lyndon Town School currently heat their facilities with wood. Ryegate and Groton students attend the Blue Mountain School in Wells River, which has been heated with wood chips since 1998.

Industrial and commercial enterprises in the state are also moving towards wood-based heating systems, and in some cases co-generation. In the Northeast Kingdom, the North Country Hospital, and Lyndon Furniture utilize wood-chip Combined Heat and Power (CHP) systems to meet partial heat and power needs.

### Thermal Efficiency and Weatherization

Regional thermal efficiency and weatherization efforts are spearheaded through four organizations: **Efficiency Vermont**, **Northeast Employment and Training Organization (NETO), 3E Thermal, and Heat Squad**.

Efficiency Vermont, the energy efficiency utility for the state, was established by the Vermont Public Service Board in 1999. The utility is funded by an energy efficiency charge on consumer electric bills, similar to a system benefits charge. Efficiency Vermont offers energy and money-saving programs to consumers that allow them to install and use energy-efficient construction designs, products and equipment. They also offer low-income energy assistance programs.

NETO was incorporated in 1978 as a 501(c)3 agency for the purpose of delivering weatherization programs to low income residents of the Northeast Kingdom. NETO receives most of its funding from the State of Vermont Weatherization Program and receives additional funding from the Department of Energy. Residents who do not qualify for low-income weatherization assistance can still contact NETO for energy audits.

3E Thermal (formerly known as Vermont Fuel Efficiency Partnership) is a statewide program that provides consulting, technical support, and incentives to owners of affordable apartment housing. Since 2010, 3E Thermal has collaborated on several multifamily energy-improvement projects around the NEK, representing a total of more than 250 apartments, each saving more than 6,000 MMBTUs annually. 3E is funded by a thermal efficiency fund created by the legislature that uses revenues from the regional Greenhouse Gas Initiative, a cape-and-trade system covering nine states in the Northeast, and the forward-capacity market, where Efficiency Vermont sells future electric savings through ISO-New England.

Heat Squad, an energy efficiency organization, founded by NeighborWorks of Western Vermont, is actually based in the Rutland area. However, in August of 2017, Heat Squad received $250,000 in grant funding from the Northern Border Regional Commission to expand their services to the Northeast Kingdom. The expansion is expected to result in 233 home energy retrofits over the next three years.

According to Efficiency Vermont, 6,061 efficiency projects have reduced thermal energy consumption in the Northeast Kingdom by more than 37,000 MM BTUS annually. (Table 2.5)

**Table 2.5: Thermal Savings in the NEK (MM BTUs), 2014-2016**

| | 2014 | 2015 | 2016 | Total |
|---|---|---|---|---|
| Residential | 2,986 | 1,774 | 2,722 | 7,481 |
| Commercial & Industrial | 3,015 | 19,982 | 6,590 | 29,587 |
| TOTAL | 6,001 | 21,756 | 9,312 | 37,069 |

Source: Vermont Energy Investment Corporation

The Vermont Department of Public Service seeks to optimize thermal performance on all new residential and commercial construction through the enforcement of energy codes. Although codes have been in place since the late 1990s, they have not always been enforced consistently. In 2013, the Vermont legislature passed Act 89, which ties documentation of compliance with energy codes to the

local zoning process. Zoning administrators are now required to provide all applicants with Residential Building Energy Codes (RBES) and Commercial Building Energy Codes (CBES). If a municipality issues a certificate of occupancy, the developer must produce certification of compliance with the codes. Act 89 also authorizes the Department of Public Service to adopt "stretch" codes that exceed baseline efficiency, and municipalities have the option to adopt these codes as they become available. The Department of Public Service adopted a stretch code for RBES, and a stretch code for CBES is in development. The Natural Resources Board presumes compliance with stretch codes to meet the energy efficiency criterion of the Act 250 review.

## Transportation

The EIA estimates that statewide, the transportation sector alone consumes about three-fifth of all petroleum products, mainly because rural residents drive long distances to work and errands. Regional estimates show transportation to be the second-largest overall energy use, and this estimate does not even include commercial and industrial vehicles. While Vermont ranks 50th in carbon dioxide emission, transportation accounts for more than half of all greenhouse gas emissions.

Energy use in transportation is most greatly influenced by the development patterns of the region. Given that the Northeast Kingdom consists of a rural landscape with small pockets of concentrated development, there are minimal avenues in which energy consumption as part of the transportation sector can be effectively reduced. Long commutes and incidental trips require NEK residents to drive an average of 14,000 miles per year, collectively accounting for more than 693 million vehicle miles travelled, which represents nearly $71 million in fuel costs. (Table 2.6) Nearly all of this energy is non-renewable. Ethanol currently accounts for the vast majority of renewable transportation energy use – about 6.5% of total BTUs – while electricity accounts for a mere .03%.

**Table 2.6: Transportation Energy Use in the Northeast Kingdom**

| | |
|---|---|
| Total Light Duty Vehicles | 49,676 |
| Total Internal Combustion Engine (ICE) Vehicles | 49,542 |
| Average Miles per gallon for ICE | 22 |
| Average annual Vehicle miles travelled ICE | 14,000 |
| Total annual VMTs ICE | 693,588,00 |
| Total Gallons ICE | 31,526,727 |
| Trillion BTUs, Fossil fuel | 3.5 |
| MM BTUs, Ethanol | 240,357 |
| Trillion BTUs Total ICE | 3.7 |
| Total Electric vehicles (EVs) (as of Jan. 2017) | 134 |
| Average annual VMT for EVs | 7,000 |
| Total annual VMTs for EVs | 938,000 |
| Average fuel economy for kWh | 3 |
| Total kWh for EVs | 312,667 |
| MMBTUs for EVs | 1,067 |

Sources: American Community Survey, Department of Public Service, and NVDA estimates.

Plug-in electric vehicles (EVs) have the greatest potential to reduce Vermont's statewide greenhouse gas emissions. "Refueling," which is as simple as plugging into an electric outlet, costs the equivalent of about $1.00 per gallon. According to Vermont Energy Investment Corporation, there are 1,595 EVs registered in Vermont as of April 2017, marking a 37% increase from the previous year.

There are two types of EVs:

- **All-Electric Vehicles (AEVs)**: An AEV can range as far as 80 miles on a single charge, but on very cold days, this range can be cut in half. AEVs are therefore best used as a second car.

- **Plug-in Hybrid EVs (PHEVs)**: A PHEV generally does not range as far as an AEV, but it can switch over to gasoline when the battery charge runs low, making it a more likely choice for those with longer drives and greater distance from public charging stations. About 75% of EVs registered in Vermont are PHEVs.

Not surprisingly, Chittenden County has the highest concentration of EVs on the road – about one-third of all EVs in the state. Nevertheless, Northeast Kingdom residents are beginning to use them as well. As of January 2017, there were 134 EVs registered in the region. The highest use is found in the region's population centers – St. Johnsbury, Lyndon, Hardwick, Derby, and Newport. There are three EV dealerships in the region – Lamoille Valley Ford in Hardwick, and Twin State Ford and Quality Mitsubishi, both in St. Johnsbury. A limited number of public charging stations have been established around the region (Table 2.7), and more will be needed to support expanded EV use, particularly if more drivers switch to AEVs. All but two of the existing public charging stations are level 2, which can be ideal when a driver can park for at least an hour for work, shopping, or dining. A level 2 is about six times faster than a level 1, which requires several hours of charge time. Only one location currently offers a DC fast charge, which can provide up to 80% battery charge in only 20 minutes. Unfortunately, many hybrids are not equipped to connect to the DC fast charge.

**Table 2.7: Public Charging Stations for EVs in the Northeast Kingdom**

| Town | Location | Charge Type |
|---|---|---|
| Barton | Barton Village Offices | Level 2 |
| Danville | Marty's First Stop | Level 2 and DC fast |
| Derby Line | Derby Line Unitarian Universalist Church | Level 2 |
| Hardwick | Lamoille Valley Ford | Level 2 |
| St. Johnsbury | Twin State Ford | Levels 1 and 2 |
| St. Johnsbury | Pearl Street Parking Lot | Level 2 |
| St. Johnsbury | Northeastern Vermont Regional Hospital | Level 2 |

Source: US Department of Energy's Alternative Fuel Locator

Ethanol, currently the primary source of renewable fuels for light-duty transportation vehicles, can be blended up to 10% with gasoline to form E10. It can be used in any engine that takes regular gasoline. Corn is the most common element used to produce ethanol, even though it can be produced from a variety of elements, including wood. Ethanol burns cleaner than gasoline and is very effective in lowering fuel emissions. Unfortunately, the fuel also has significant problems in cold-weather, which make it less useful for Vermont's climate. While E10 is required in many urban areas that do not meet federal air emission guidelines, this is not the case in Vermont. Many of the blends available in this area are 9% ethanol.

One area in which Vermont is seeing growth in fossil fuel usage is via compressed natural gas. With a reduction in natural gas prices, compressed natural gas is now economical for large industrial applications (utilizing over 150,000 gallons fuel oil annually) and as a transportation fuel. Both the Burlington Department of Public Works and Vermont Gas maintain vehicle fleets fueled with compressed natural gas. Liquified petroleum gas (LPG) can also be used a transportation fuel and produces fewer CO2 tailpipe emissions than conventional gasoline-powered vehicles. The region has one LPG fueling station at the Pick and Shovel in Newport.

Price volatility of gasoline in the first half of the past decade helped to spur an interest in the development of biofuels. Biodiesel is commonly made from soybeans, rapeseed (canola), and sunflowers; all of which can be grown in Vermont. Biofuel can be blended with diesel up to 5% (B5) to be safely used for on-road vehicles. Higher blends, including pure biodiesel (B100) can be used in off-road equipment and farm vehicles, although farm equipment manufacturers have approached the use of biodiesel with caution. Black Bear Biodiesel, located just outside of the region in Plainfield, is a B100 fueling station.

Research has found that oilseed crops, when grown in rotation with other crops, can help to support sustainable, diversified, and profitable agricultural enterprises. The Vermont Bioenergy Initiative, a program of the Vermont Sustainable Jobs Fund, provides early-stage grant funding, technical assistance, and loans to producers. Currently North Hardwick Dairy produces oilseed crops for use as fuel and food-grade. Although the recent drop in fuel prices has reduced some incentive for farmers to enter biofuel production, NVDA encourages further innovation and research into this area as a long-range economic opportunity.

Commercial shipping is one of the highest consumers of transportation fuels and another area in which the region can reduce consumption. As gas prices started to climb in the past decade area, businesses looked for alternative shipping methods and inquiries into the region's rail infrastructure grew. Railroad shipping is most desirable for non-perishable commodity goods. Upon further review it was found that regional rail infrastructure has the potential for growth, with room for increased traffic and a number of underutilized sidings. The Kingdom may also be able to attract additional rail usage if rail beds are upgraded to meet the 286,000 lb. weight limit standard and bridge heights are increased. Both improvements will allow rail cars to be filled to capacity and allow for the double stacking of rail cars, which is now standard across the country. NVDA also supports the re-establishment of the Twin State Line as a means to better connect the Kingdom with greater rail markets in New England.

## Development Patterns and Transportation Use

Understandably rural development patterns directly impact transportation energy usage, especially in regards to individual behaviors. With limited transit infrastructure, the region is dominated by single-occupancy light-duty vehicles. Residents typically commute to disparate labor market areas, reducing opportunities for carpooling. VTrans offers grant assistance to municipalities who wish to establish park and rides on municipal, state, or leased property on or near state highways. Mixed-use, higher density neighborhoods encourage more pedestrian use. The following land use principles encourage reduced transportation energy consumption[8]:

1. Encourage the location of new development in or near traditional village and city centers to reduce both sprawl and the number of vehicle miles driven.
2. Support transit-oriented development that fosters the expansion of public transportation and rail use.
3. Encourage the construction of Park and Ride facilities to support carpooling efforts.
4. Encourage the expansion of bicycle and pedestrian facilities such as sidewalks and bike lanes.

Additionally, improved telecommunications infrastructure in this region has the potential to reduce annual VMT's by allowing more workers to telecommute.

### Electricity Use

With respect to simply how much electricity is generated here relative to what is consumed, the Northeast Kingdom is a net exporter of energy. This is a major shift from more than a decade ago, when the region relied heavily on Canada, New Hampshire, and the rest of Vermont to meet its electricity demand. In 2016, the total electric usage for the region was 436,355 MWHs, representing a total of roughly 1.48 trillion BTUs. (Table 2.8). Despite the increase in customer counts in the C&I sector since 2014, total usage dropped by .4% over the same period. The number of residential customers increased slightly over the same period, but total residential usage decreased by a fraction

[8] See the Transportation, Land-Use, and Housing Sections of the *Regional Plan for the Northeast Kingdom* for additional energy-related recommendations.

of a percentage point, as did the average residential usage. Similar data on average commercial and industrial use is not available.

| Table 2.8: Annual Electricity Use in the NEK | | | |
|---|---|---|---|
| Usage by Sector (In MWHs) | 2014 | 2015 | 2016 |
| Commercial & Industrial | 221,395 | 229,877 | 220,313 |
| Residential | 216,757 | 218,962 | 216,042 |
| Total | 438,152 | 448,840 | 436,355 |
| Avg. Residential Use (in KWHs) | 6,323 | 6,372 | 6,295 |
| **Count of Customer Premises (Customers)** | | | |
| **Sector** | **2014** | **2015** | **2016** |
| Commercial & Industrial | 5,808 | 5,871 | 5,977 |
| Residential | 34,279 | 34,363 | 34,317 |
| Total | 40,087 | 40,234 | 40,294 |
| Source: Vermont Energy Investment Corporation | | | |

Although the commercial and industrial sector only accounts for about 15% of all electrical utility customers, they account for slightly more than half of all usage. Electric costs are a major factor in attracting and retaining major commercial/industrial operations in the region. New England retains the highest electric costs in the lower 48 states for both sectors. In April 2017, the state's average electric retail price was 14.14 cents/kWh in the commercial sector and 10.12 cents/kWh in the industrial sector. These rates are the second lowest in the New England, but still considerably higher than national rates of 10.38 cents/kWh and 6.63 cents/kWh respectively (U.S. Energy Information Administration, Electric Power Monthly). When most large manufacturers are speaking in terms of megawatt-hours (thousands of kilowatt-hours) for power consumption, those price differences are considerable. The former Dirigo Paper Mill utilized on-site hydro and waste steam for electrical generation. Ampersand Gilman Hydro continues to operate the site. Ethan Allen has studied the feasibility of a combined heat-and-power plant with Orleans and Barton Electric for their Orleans facility; and Lyndon Furniture in St. Johnsbury has employed a diesel-fueled electric generator to stabilize their electric costs for several years.

According to Efficiency Vermont, 6,061 efficiency projects have achieved savings electrical use in the Northeast Kingdom by 82,324 MM BTUs from 2014 to 2016. (Table 2.9).

| Table 2.9: Electricity Savings Achieved in the NEK, in MWh | | | | |
|---|---|---|---|---|
| **Sector** | **2014** | **2015** | **2016** | **Total** |
| Residential | 2,951 | 3,569 | 3,286 | 9,806 |
| Commercial & Industrial | 3,953 | 5,178 | 4,990 | 14,122 |
| Total | 6,904 | 8,748 | 8,276 | 23,928 |
| Source: Vermont Energy Investment Corporation | | | | |

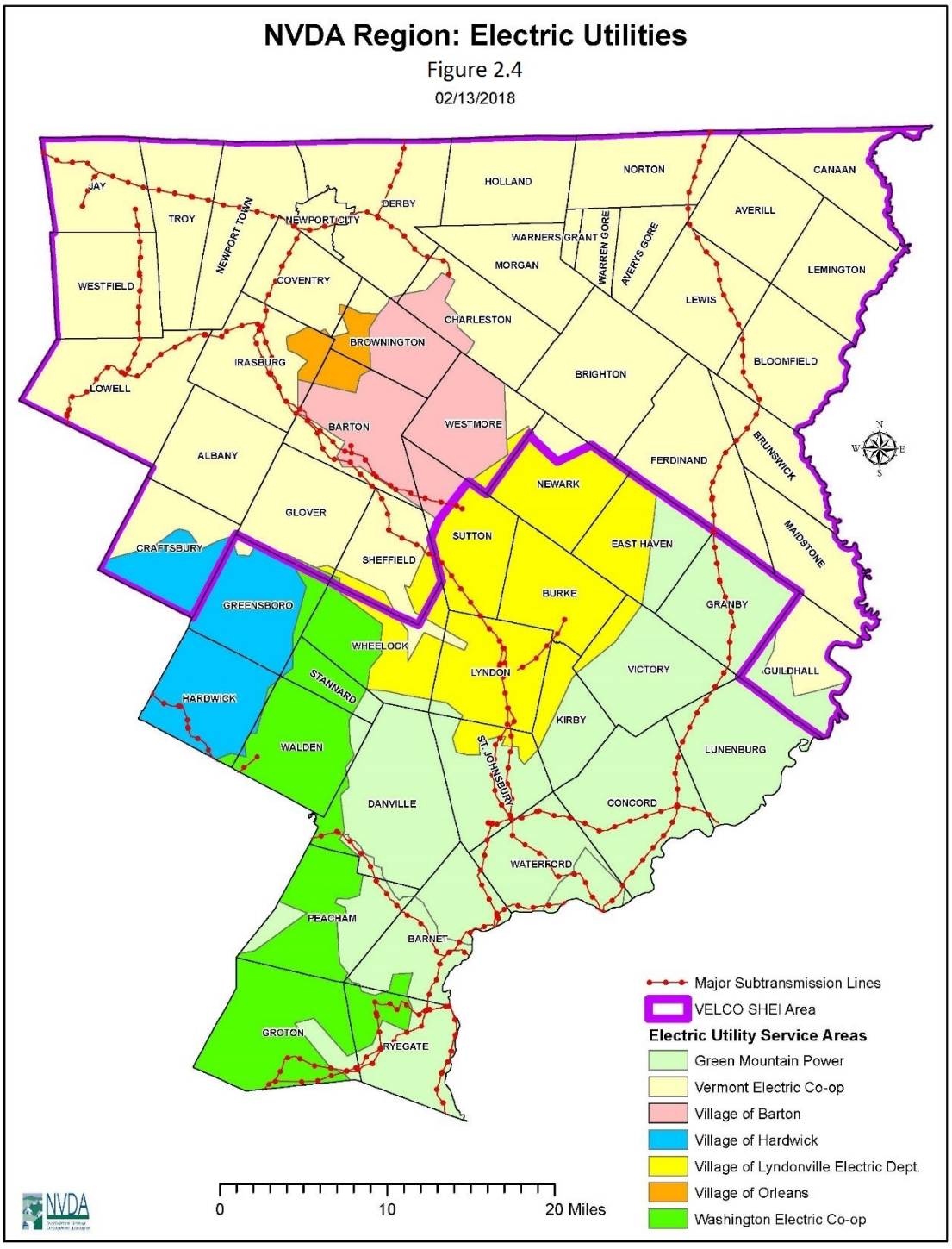
## III. GENERATION AND DISTRIBUTION

Electric systems are part of large regional networks that extend beyond state boundaries. Vermont belongs to a network that encompasses the six states of New England. These regional networks are responsible for the general organization and operation of the electric businesses and market territory. However, the vast diversity in state-to-state infrastructure can influence the energy climate in surrounding network states. For Vermont, this translates into major effects on the affordability, cost, and reliability of electrical systems.

### Regional Utilities

The Northeast Kingdom is served by seven electric utilities. Figure 2.4 depicts the coverage areas of the region's utilities and the subtransmission lines. Vermont Electric Co-Op serves the largest area, covering over 19 towns in Northern Essex and Orleans Counties. Green Mountain Power also covers a large area in Caledonia and Southern Essex Counties, with the remainder of the region served by Washington Electric Co-Op, and four municipal-owned electric companies. The NEK's

municipal electric utilities include Barton Electric, Orleans Electric, Lyndonville Electric, and Hardwick Electric. Together the municipal utilities provide service to 19 different towns and villages (Figure 2.4[9]).




[9] Latest version of mapped Utility Service Territories (VCGI ArcGIS) data available.

All the municipally owned utilities throughout the state are represented by the Vermont Public Power Supply Authority (VPPSA). VPPSA acts on behalf of the utilities in the regional buying and selling of power and provides rate studies, central computer services, load forecasting, tax-free financing of certain capital projects, and exploration of new generation options. VPPSA is a part owner in the McNeil Station in Burlington, a 50 MW generator that primarily uses wood, as well as the Highgate Interconnection facility, which is used to bring in power from Hydro Quebec. In 2010, VPPSA completed a 40MW peaking facility in Swanton, Vermont. The facility runs during peak price times to mitigate price spikes that typically occur in the summer and winter.

The region's utility power supply portfolios are made up of a mixture of generation resources, long-term contracts, and short-term contracts. Three of the municipal utilities generate some of their own power through hydro (Hardwick has a facility in Wolcott, just outside of the region.) Orleans Electric's portfolio also includes long-term and short-term contracts; however, it is without generation resources of its own. Figure 2.4 demonstrates the aggregated power supply by fuel type for all utilities serving the Northeast Kingdom. (This power supply mix will vary among each member utility of VPPSA.)

**Table 2.10: 2016 Fuel Mix (Before Sales of Renewable Energy Certificates)**

| VPPSA* | | Washington Electric Coop | | Vermont Electric Coop | | Green Mountain Power | |
|---|---|---|---|---|---|---|---|
| % | Source | % | Source | % | Source | % | Source |
| 40 | Market Purchases | 66 | Coventry Landfill | 59.6 | Hydro | 34.7 | Large Hydro |
| 33 | Hydro | 13 | NYPA (Large Hydro) | 19.4 | Wind/Solar/Farm Methane/Wood | 27.4 | Market Purchases |
| 15 | Biomass | 10 | Sheffield (Wind) | 17.9 | Nuclear | 13.8 | Nuclear |
| 7 | Landfill Gas | 5 | Small Hydro | 3.2 | Natural Gas/Oil | 5.6 | Existing VT Hydro |
| 2 | Solar | 3 | Ryegate (Wood) | | | 8.2 | Wind |
| 2 | Standard Offer | 3 | Market Purchase | | | 4.9 | Hydro |
| 1 | Fossil | <1 | GMP System | | | 2.6 | Wood |
| | | | | | | 2.1 | Solar |
| | | | | | | 0.3 | Methane |
| | | | | | | 0.4 | Oil & Natural Gas |

Source: Integrated Resource Plans, Utility reports, and web sites
*Fuel mix will vary among municipal utility members.

Until it shut down in 2014, Vermont Yankee supplied roughly one-third of Vermont's electric supply. Central Vermont Public Service and Green Mountain Power were the lead owners of the facility. (GMP and CVPS merged in 2012.) . While a large share of this replacement power has come from Hydro Quebec GMP, there is still some nuclear power in the mix from Seabrook, NH. While much of the utilities' power originates from Hydro Quebec, there are other sources from New York Power Authority, as well as smaller facilities throughout the state. Market purchase are power contracts purchased without any known environmental attributes and the fuel mix may change over time.

Green Mountain Power estimates that as of 2016, the market purchase mix is more than half natural gas, followed by nuclear, and oil.[10]

Although the NEK is a net exporter of energy, Vermont has traditionally been a net importer. Technically, the state produces enough generation; however, due to the performance characteristics of the in-state generation, Vermont has relied heavily on its transmission network to import power from neighboring states. When Vermont Yankee shut down, Vermont's net import rate rose significantly, making the state a net importer of power at virtually all hours from New York, New Hampshire, Massachusetts and Canada in order to meet the state's load requirements. Without significant new in-state generation, this situation will be a long-term operating condition.[11]

## Purchase & Distribution

The state of Vermont belongs to the ISO-New England Regional Transmission Organization (RTO). The ISO-New England RTO operates all of New England's bulk electric power system and works in coordination with the New England Power Pool (NEPOOL). NEPOOL is Vermont's regional representative of the electric power businesses, including utilities, independent power producers (IPP), suppliers, end-users, and transmission providers. In 1997, the RTO was developed as a means to create competitive wholesale electricity markets. Their responsibilities include developing, overseeing and operating the New England wholesale electric market, as well as managing and planning for regional electric needs.

The RTO wholesale electric market operates on a per-hour bid system that incorporates some short-term and long-term contracts. The bid system requires generation units to bid into the system based on what it costs them to produce for that hour. The hourly price is then set based on the most expensive facility needed to meet demand. As demand increases, the higher-priced facilities are pulled online to meet the increasing load. In Vermont, many of the "peaking" plants utilize diesel fuel. New England is also heavily dependent on natural gas generation facilities, which set the hourly price 85% of the time. Even though natural gas prices have dropped recently, New England households retain the highest electric costs in the country. As part of the RTO, Vermont is subject to these higher electric costs, even though there is only one natural gas generation facility in the state. According to the Public Service Department, the higher pricing is caused by existing long-term contracts and restrictive pipeline infrastructure. In other words, New England is still paying natural gas pricing that was set in a multi-year contract, plus its limited pipeline capacity means it cannot access additional volumes of natural gas outside of those contracts. Massachusetts is currently pursuing the expansion of a major pipeline to be able to utilize larger volumes of natural gas.

## Transmission

A majority of Vermont's electric transmission system is operated by the Vermont Electric Power Company (VELCO), which was established by Vermont's utilities in 1956. VELCO is responsible for bulk transmission lines with a voltage rating of 115kV and above. Lines with a rating of 34.5kV, 46kV, and 69kV are considered sub-transmission lines. The Northeast Kingdom has roughly 325 miles of transmission and sub-transmission lines (Figure 2.3) and serves as an important gateway for electricity coming from both Canada and New Hampshire.

VELCO is responsible for planning and constructing upgrades that ensure system reliability and maintain the grid. Several upgrades in recent years should significantly increase transmission capacity

[10] Green Mountain Power: Our 2016 Fuel Mix Information
http://www.greenmountainpower.com/2016/12/01/fuel-mix/

[11] VELCO: 2015 Long-Range Transmission Plan
https://www.velco.com/assets/documents/2015Plan_Final_toPSB.pdf

on existing lines: new lines between Irasburg and Newport; upgrades to the St. Johnsbury, Irasburg, and Newport substations; and the reconfiguration of the Hydro Quebec interconnection at Highgate. In 2010 VELCO upgraded the Hill Street substation in Lyndonville, which provided a secondary connection between Lyndonville Electric's grid and the larger VELCO transmission lines. In 2011, a new substation in Jay established redundancy in transmission paths and increased capacity to delivery power to the Jay area.

VELCO maintains a long-range transmission plan that must be updated every three years for the PUC. The plan and subsequent updates are vetted through a stakeholder group called the Vermont System Planning Committee (VSPC), which is made up of VELCO, electric distribution utilities, the Department of Public Services, representatives of demand and supply resources, and representatives of the general public. The most recent Long-Range Transmission Plan (June 2015) acknowledges that a profound transformation of the electric grid is already underway. The grid must become more agile and diverse by retiring traditional base load generation, increasing distributed renewable generation, and investing in demand-side resources, such as energy efficiency and demand response. Emerging technologies, such as heat pumps and electric vehicles, are reflected in the load forecast of the 2015 Plan, but their full impact cannot yet be quantified with confidence.

One ongoing VPSC initiative of particular concern to the Northeast Kingdom is grid congestion in the Sheffield Highgate Export Interface (SHEI), the northwestern area of our region where generation exceeds load. (Figure 2.4) In essence, the region generates far more power than it consumes, causing generation to exceed the capacity of the export line. The continued addition of new sources of generation, like solar, forces existing resources, like Kingdom Community Wind and Sheffield Wind to curtail their output due to the lack of capacity to export power. Adding more renewables to an already full grid at this point can simply mean replacing other renewables. While modest transmission upgrades may help to alleviate some congestion in the short-term, the situation will require robust, long-term solutions that are complex and possibly costly.[12] Utilities, clean energy advocates, regulators and other stakeholders are currently discussing ways that the SHEI limitations can be addressed to reduce or eliminate curtailments of generation located within the interface.

### Regional Generation Facilities

*(Note: For municipal-level generation estimates, see Appendix B.)*

The Northeast Kingdom has a very large share of generation resources compared to other regions of the state. (Table 2.11) The region is home to four major renewable generation facilities: the Ryegate Wood-Chip Plant, the Coventry Landfill methane-generator, the Sheffield Wind Farm, and Kingdom Community Wind in Lowell. Collectively, these facilities produced 80% of the region's total electricity generation that is not net-metered (i.e. grid-tied). 2005 saw the first major jump in regional generation growth with the development of the Coventry Landfill methane generator, which doubled its output in 2009. The region also produces a significant amount of hydro power. Collectively, hydro power (excluding Connecticut River production, which is technically in New Hampshire), the Northeast Kingdom's hydro resources account for 18% of regional generation.

[12] Frank Ettori, SHEI Overview, VSPC, July 12, 2017 v. 2

| Table 2.11: Generation Facilities in the Northeast Kingdom | | | | | |
|---|---|---|---|---|---|
| **Owner/Operator – Facility Name** | **Location** | **Utility** | **Facility Type** | **kW Capacity** | **Annual Output MWh** |
| Kingdom Community Wind | Lowell | GMP | Commercial Wind | 63,000 | *191,174* |
| Sheffield Wind | Sheffield | WEC | Commercial Wind | 40,000 | *121,380* |
| Passumpsic Hydro | Barnet | GMP | Hydro | 700 | 3,851 |
| East Barnet Hydro | Barnet | GMP | Hydro | 2,200 | 7,442 |
| Barnet Hydro | Barnet | GMP | Hydro | 490 | 1,814 |
| Great Bay Hydro Corp. (IPP) – West Charleston (Standard Offer) | Charleston | VEC | Hydro | 675 | 2,655 |
| Barton Village Hydro | Charleston | Barton Village Electric | Hydro | 1,400 | 4,210 |
| Fairbanks Mill | Danville | GMP | Hydro | 18 | 73 |
| West Danville #15 | Danville | GMP | Hydro | 1,000 | 3,700 |
| Ampersand Gilman Hydro | Lunenburg | GMP | Hydro | 4,850 | 28,000 |
| Great Falls | Lyndonville | LED | Hydro | 1,900 | 9,600 |
| Vail | Lyndonville | LED | Hydro | 350 | 1,850 |
| Newport 1, 2, 3 | Newport | VEC | Hydro | 4,000 | 15,735 |
| Dodge Falls | Ryegate | GMP | Hydro | 5,000 | 27,000 |
| Emerson Falls | St. Johnsbury | GMP | Hydro | 230 | 700 |
| Arnold Falls | St. Johnsbury | GMP | Hydro | 350 | 1,588 |
| Gage | St. Johnsbury | GMP | Hydro | 700 | 2,878 |
| Pierce Mills | St. Johnsbury | GMP | Hydro | 250 | 1,544 |
| North Troy | Troy | VEC | Hydro | 460 | 2,600 |
| Troy Mills Hydroelectric (Standard Offer) | Troy | VEC | Hydro | 816 | 3,210 |
| Maxwell's Neighborhood Energy, LLC (IPP) (Stanard Offer) | Coventry | VEC | Methane | 225 | 1,508 |
| WEC – Coventry Landfill | Coventry | WEC | Methane | 8,000 | 50,506 |
| Maplehurst Farm (Standard Offer) | Greensboro | HED | Methane | 150 | 1,005 |
| Chaput Family Farms (Standard Offer) | Troy | VEC | Methane | 300 | 2,010 |
| Sun CSA 73 (Community Solar) | Barnet | GMP | Solar | 150 | 184 |
| Sun CSA 59 (Community Solar) | Barnet | GMP | Solar | 150 | 184 |
| Barton Solar LLC (Standard Offer) | Barton | VEC | Solar | 1,890 | 2,401 |
| SolarSense VT (Community Solar) | Concord | GMP | Solar | 500 | 613 |
| Coventry Solar (Standard Offer) | Coventry | VEC | Solar | 2,200 | 2,794 |
| Sun CSA 27 (Community Solar) | Lowell | VEC | Solar | 150 | 184 |
| Solaflect Community Solar Park | Lunenburg | GMP | Solar | 150 | 235 |
| Sun CSA 53 (Community Solar) | Lunenburg | GMP | Solar | 150 | 184 |
| Ira Rentals (Standard Offer) | Newport | VEC | Solar | 37 | 47 |
| Bobbin Mill (Standard Offer) | Newport | VEC | Solar | 50 | 64 |
| Ryegate Power Station (IPP) | Ryegate | | Wood Chip | 167,627 | 154,785 |

| | | |
|---|---|---|
| **TOTAL** | 310,118 | 647,708 |
| Source: VEPP, Vermont Renewable Energy Atlas. Some outputs were calculated because actual output was not available, including KCW and Sheffield Wind, which are curtailed due to grid congestion. | | |

There are also three very large generation assets located on the border of the region that deserve to be mentioned. The Comerford Dam, McIndoe Falls Dam, and the Moore Dam are all located on the Connecticut River, which is owned by New Hampshire. Table 2.12presents their generation figures. According to the Department of Public Service, they are not considered Vermont generation assets, but their mere proximity to the region may pose a future benefit to our area.

**Table 2.12: State-Line Generation Facilities (Technically located in New Hampshire) in MWhs/year**

| | | | |
|---|---|---|---|
| TransCanada - Moore Dam | Hydro | 271,000.00 | Waterford, VT & Littleton, NH |
| TransCanada - Comerford Dam | Hydro | 315,000.00 | Barnet, VT & Monroe, NH |
| TransCanada - McIndoe Falls Dam | Hydro | 52,000.00 | Barnet, VT & Monroe, NH |
| **Total** | | **638,000.00** | |

### SPEED and Standard Offer

In June 2005, Vermont enacted the Sustainably Priced Energy Enterprise Development (SPEED) Program and Renewable Portfolio Goal to provide financial incentives for the development of new renewable generation facilities under 2.2 MW. The program encourages development by providing feed-in tariffs, which pay a set incentive rate/kWh above current market retail prices for power that meets program criteria and agrees to long-term contracts. Specific types of renewable generation were initially assigned different tariff amounts, and the program had a total cap of 50 MW. In the 2012, the legislature increased the cap to a total of 127.5MW that will be rolled out in set allotments over the course of 10 years to limit the impact on rate payers. Changes to the program also addressed how tariff rates are established, with the legislature promoting a reverse auction process to ensure competitive rates. Northeast Kingdom renewable energy development projects with standard offer contracts are noted in Table 2.13 and include all the farm methane generators, as well as hydro and solar, producing in excess of 15,000 MWh a year. In 2015, VPPSA was awarded two Standard Offer contracts for two solar projects (475 kW and 500 kW) to be located in Lyndonville. A contract has also been awarded to Dairy Air, a large wind project in Holland, although that project is still under review by the Public Service Board. Act 56, which established the renewable energy standard for electric utilities (see below), eliminated the SPEED Program, except for the standard offer component.

### Net-Metering

In 1998 the Vermont State legislature passed a bill allowing the practice of net-metering. Net-metering requires electric utilities to permit customers to interconnect on-site renewable electricity systems with the grid (e.g. a photovoltaic system with proper DC-AC conversion equipment) and to be billed only for the net amount of power they consume. This effectively creates an incentive equal to the customer's electric rate for the kWh of renewable electricity that they create. There have been several revisions to the net-metering rules over the past several years, including expanding production limits, simplifying permitting, and increasing peak load capacity, making it easier to establish individual and group run net-metered systems.

Although it is approved for a variety of systems -- solar, small wind, combined heat and power, farm methane, and bio-gasification facilities generating up to 500 kW – net metering has been most

popular with solar. This has been largely due to the "solar adder," which increased the average price per kWh of solar net-metered generation.

Act 99, which became effective in January of 2017, raised the cap on Vermont's utilities from 4% to 15%, meaning that the utilities have to take on net-metered systems on a first-come, first-served basis to all its customers until the cumulative generating capacity of all net-metered systems equal 15% of the utility's peak demand. New net-metering customers will be compensated at a reduced rate, although the rate is still well above retail electric rates. Instead of applying a solar adder, the new net-metering rule applies a series of adjustments for siting solar on statewide **preferred** sites that have already been disturbed: rooftops, parking lot canopies, brownfields, and gravel pits. There is no site adjustment for installations of 150 kW or more, so the new net metering has the potential – at least in theory – to site small developments away from open fields and other undeveloped areas. To date, utilities serving the Northeast Kingdom have reported a sharp uptick in the number of net metering applications, and in some instances, at double the rate of previous years. In testimony to the Senate Natural Resources and Energy Committee, VEC has noted that since January of 2017 66% of the 2017 net metering capacity is for projects greater than 150kW. This service area (the SHEI) already has significant system constraints, so new net-metered generation will displace existing generation which is less expensive.[13]

The region currently generates nearly 13,000 MWh through net metering. (Table 2.13). There has also been growth in group net metering and community solar programs, which allow individual customers within one utility service territory to invest in a solar project and receive distributed net metering credits. This off-site option can be cost-effective for residents, particularly renters and home owners where solar installations are not possible. Currently, such net metering projects in the area generate 11,792 MWh annually. Utility customers are also able to "sponsor" solar panels in community solar projects outside of the region.

**Table 2.13: Annual Output Net metering in the Northeast Kingdom (MWh)**

| | Caledonia | Essex | Orleans | NEK |
|---|---|---|---|---|
| Solar Net-Metering | 5,415 | 452 | 3015 | 8,882 |
| Group Net Metered | 836 | 275 | 209 | 1320 |
| Community Solar Array | 368 | 1032 | 184 | 1584 |
| Small Wind | 489 | 8 | 613 | 1,110 |
| Total | 7,108 | 1767 | 4021 | 12,896 |

Source: Vermont Renewable Energy Atlas

## Renewable Energy Standard

Until 2015, Vermont had a renewable energy portfolio goal for its utilities to meet growth in electricity demand by using energy efficiency and new renewable generation sources. When Act 56 was passed in 2015, this goal was replaced by a mandatory Renewable Energy Standard (RES) for the portfolios of Vermont's electric utilities. The RES has three tiers:

**Tier I**: 55% starting in 2017, existing total renewables will rise 4% every three years to reach 75% in 2032. A utility can meet this requirement by owning renewable energy or renewable energy certificates (RECs) from any plant, as long as the plant's energy can be delivered in New England.

**Tier II**: A subset of Tier I RECs, utilities now have a distributed generator requirement connected to Vermont's electric grid. Starting in 2017, 1% of the utility's portfolio must be *distributed renewable generation*, rising .6% each year to reach 10% in 2032. (Unlike energy produced in a large power plant, *distributed* energy is produced on-site or in a decentralized manner, such as district generation,

[13] Vermont Electric Cooperative: Testimony to the Senate Natural Resources and Energy Committee-March 23, 2017

through smaller grid-tied devices.) Utilities can meet this requirement by through the production of distributed renewable energy or through RECs that have come into service after June 30, 2015, are 5 MW or less, and are directly connected to Vermont's grid (i.e. in state generation.)

**Tier III**: This is an energy *transformation* requirement that starts from 2% in 2017 and rises to 12% in 2032. Utilities meet this requirement either through additional distributed renewable generation or "transformation projects" that replace or reduce fossil fuel consumption. Such projects include home weatherization, installation of heat pumps, the use of biofuels, or incentives to purchase EVs. The municipal utility members of VPPSA are exempted from this requirement until 2019, but VPPSA's program will likely include weatherization and heat pumps, biofuels, energy storage, and EVs and charging infrastructure.

### Renewable Energy Certificates (RECs)

Tiers 1 and 2 of the Renewable Energy Standard require utilities to hold Renewable Energy Certificates (RECs) to satisfy their requirements. RECs track how much renewable energy is produced from a project, and they have been a major supporting factor in the development of renewable energy. Because Vermont did not have mandatory renewable energy portfolio standards prior to the passage of Act 56, RECs were less likely to be "retired" (used) in state. Rather, they were often sold to Massachusetts, Connecticut, Rhode Island, Maine, and New York, which already had mandatory standards. Utilities and generators buy and sell RECs on an open regional market. Utilities cannot claim electricity is renewable if the REC from that electricity has been sold. Conversely, a utility can claim 100% renewability if it holds sufficient RECs to offset retail sales, even if it generates with fossil fuel. Act 99 affects the sale of RECs from small and mid-size generation. Under the new net metering rule, customers who keep their RECs (either to sell out of state or to keep for themselves) will be subject to a $0.03 penalty per kilowatt-hour (kWh). By contrast, customers who transfer their RECs to the utility will receive a $0.03 incentive per kWh for the first ten years of their operation. Even for a small residential-scale system, this penalty can amount to thousands of dollars. Although the law is intended to help Vermont utilities meet their renewable energy goals, critics of the legislation argue that it could stymie new solar development once utilities have met their 10% Tier II goals. Also, because energy consumers cannot claim to use renewable energy unless they retain the RECs, it does not support energy consumers who have made a conscious decision to avoid the use of fossil fuel and nuclear power.

## Incentives and Subsidies

There are considerable federal incentives that support the market for renewable energy development in Vermont. Without the tax credits and Renewable Energy Credits (RECs), some renewable technologies, such as utility-scale wind, would not be an economically viable resource. There are currently three major federal tax credits supporting the development of renewable energy facilities. Table 2.14 below lists the current federal subsidies and their eligible renewable technologies:

**Table 2.14 Federal Subsidies for Renewable Energy Development**

| Program Name | Applicable Technology |
|---|---|
| Business Investment Tax Credit (ITC) | Solar Water Heat, Solar Space Heat, Solar Thermal Electric, Solar Thermal Process Heat, Photovoltaics, Wind, Biomass, Geothermal Electric, Fuel Cells, Geothermal Heat Pumps, CHP/Cogeneration, Solar Hybrid Lighting, Fuel Cells using Renewable Fuels, Microturbines, Geothermal Direct-Use. This credit has been amended several times, most notably in 2015 in the Consolidated Appropriations Act, when the expiration date for these technologies was extended with a gradual step-down of the credits between 2019 and 2022. An investment tax credit is also available to home owners (such as for solar installations) through 2021. |

| | |
|---|---|
| Modified Accelerated Cost-Recovery System (MARCS) | Solar Water Heat, Solar Space Heat, Solar Thermal Electric, Solar Thermal Process Heat, Photovoltaics, Landfill Gas, Wind, Biomass, Geothermal Electric, Fuel Cells, Geothermal Heat Pumps, Municipal Solid Waste, CHP/Cogeneration, Solar Hybrid Lighting, Anaerobic Digestion, Fuel Cells using Renewable Fuels, Microturbines, Geothermal Direct-Use. Also amended in the Consolidated Appropriations Act, the "placed in service" deadline for bonus depreciation was extended to January 2018. |
| Renewable Energy Production Tax Credit (PTC) | Landfill Gas, Wind, Biomass, Hydroelectric, Geothermal Electric, Municipal Solid Waste, Hydrokinetic Power (i.e., Flowing Water), Anaerobic Digestion, Small Hydroelectric, Tidal Energy, Wave Energy, Ocean Thermal. This credit phases down for wind commencing construction after December 2016 and expires for other technologies. |

Vermont provides a tax credit that investors can claim in addition to the federal credit. Efficiency Vermont provides a link to rebates and incentives for small-scale renewables and efficiency improvements. https://www.efficiencyvermont.com/rebates). With regards to municipal tax, Vermont law allows municipalities to waive the property taxes for solar facilities and any land, not to exceed one-half acre, on which it is built.

Property-Assessed Clean Energy (PACE) Districts allow property owners to borrow money to pay for such things as energy efficient water heaters, lighting, furnaces, boilers, windows, programmable thermostats, and insulation, as well as solar heating, PV, wind and biomass systems. The amount borrowed is typically repaid via a special assessment on the property over a period of up to 20 years. In Vermont, local governments are authorized to create PACE Districts to provide financing. Participating property owners must agree to a special assessment and lien on the property and pay a one-time, non-refundable fee to support the reserve fund created to cover losses in the event of foreclosure of participating properties. The district may release a lien on a property once the property owner has met the terms of the loan. At this time only a few towns are implementing PACE Districts. Municipalities may have been slow to adopt PACE because of a perceived administrative burden. Since 2011, VEIC has received funding to provide most of the administrative support to town. More outreach and education about PACE may be necessary.

## Other Energy Facilities

The electricity system is the major energy network in the region. However, it is important to mention the Northeast Kingdom's other major energy infrastructure. The Portland Pipeline is a major crude oil pipeline that stretches from Portland, Maine into Canada. In our region, the pipeline runs from Guildhall northwest to Jay before crossing into Canada. While Vermont doesn't tap into the pipeline, its existence in our region as major transporter of oil is important for potential future use.

The Portland Natural Gas Transmission system also just touches the region. The transmission line also runs from Portland, Maine into Canada and is owned by TransCanada, a major Canadian energy supplier. The line just barely passes through the state in Canaan, Vermont before reaching Canada. A spur has recently been created from this line, but only serves the Ethan Allen Manufacturing Plant in Beecher Falls. Future potential to expand this transmission system into the region remains possible.

### Granite State Power Link (GSPL)

Plans have been announced for the development of a new electric transmission line in Vermont and New Hampshire that will deliver up to 1,200 MW of hydro power to southern New England. The infrastructure will consist of two converter stations (one in Vermont), 59 miles of high-voltage direct current line (used for transmitting large amounts of power over great distances), 109 miles of alternating-current line, and a switching station in New Hampshire. The line is proposed to be built adjacent to an existing VELCO transmission corridor and will require a 150 foot expansion. About 53 miles of GSPL will be high-voltage direct current line running through the towns of the Essex County. (Table 2.15) Because the NEK portion of the line is direct-current only, the line will not expand the region's transmission capacity to host new energy development (like wind or solar). The project is located alongside an existing transmission corridor, so visual impacts are expected to be minimal. Project developers are currently working with Vermont Association of Snow Travelers (VAST) to explore recreation opportunities, and the project will bring revenues and other financial benefits into the region and affected communities. The project has been found to be in conformance with NVDA's regional plan

**Table 2.15: Vermont Communities in the GSPL**

| Community | Approximate miles |
|---|---|
| Norton | 4.6 |
| Avery's Gore | 0.7 |
| Averill | 1 |
| Lewis | 6.7 |
| Bloomfield | 5.1 |
| Brunswick | 3 |
| Ferdinand | 5.7 |
| Granby | 8.5 |
| Victory | 2.4 |
| Lunenburg | 3.8 |
| Concord | 8.8 |
| Waterford | 2.1 |

## IV. FUTURE ENERGY USE AND 2050 PROJECTIONS

*(Note: for municipal targets in support of these goals, see Appendix A.)*

NVDA's Regional Energy Plan was developed in support of Vermont's 2016 Comprehensive Energy Plan (CEP), which contains the following goals:

- Reduce total energy consumption per capita by 15% by 2025, and by more than one third by 2050.
- Meet 25% of the remaining energy need from renewable sources by 2025, 40% by 2035, and 90% by 2050.
- Achieve three renewable end-use sector goals for 2025: 10% transportation, 30% buildings, and 67% electric power.

What follows below is one possible strategy, developed by Vermont Energy Investment Corporation, which uses a regionalized scenario of the statewide Long-Range Energy Alternatives Planning (LEAP) model. Historic information was primarily drawn from the Public Service Department's Utility Facts 2013 and U.S. Energy Information Administration data. Projections came from the Vermont Public Service Department's Total Energy Study (TES), and Integrated Resource Plans from the utility companies.

The "90x2050" approach has two major underlying concepts:

1. **Reducing energy use**: Aggressive weatherization, efficiency, and conservation measures are critical in reducing total energy demand to the point where it can be primarily met through renewable sources. Conservation involves reducing or eliminating unnecessary energy use and waste (e.g. lowering thermostats, limiting hours of operation, etc.). Efficiency also involves reducing the total amount of energy consumed, but the reduction comes from improving equipment or operating processes that use energy. Weatherization improvements are energy efficiency measures such things as insulating walls and ceilings, installing programmable thermostats, and replacing inefficient machinery. The net result is that less energy is used, while the overall costs needed for energy are reduced as well. Energy efficiency improvements typically have a cost, but the payback periods will vary depending upon the cost of the improvement and the amount of energy that is saved.

**2**. **Replacing traditional fuel sources**: The 90x205 model replaces traditional fossil-fuels with electricity, which can come from clean renewable sources like hydro and solar. Fuel switching primarily occurs by providing residential heating units with heat pumps, but efficient wood burning systems (like wood pellet furnaces) and bio fuels play an important role as well. Fuel switching also occurs by gradually replacing fossil-fuel burning automobiles with EVs. Electrification of heating and transportation has a large effect on the total demand because the electric end uses are three to four times more efficient than the combustion versions they replace. Even if the region's population grows and the economy expands, overall energy use declines because of efficiency and electrification.[14]

Regional end-use models (Figures 2.5 through 2.8) are derived from two scenarios:

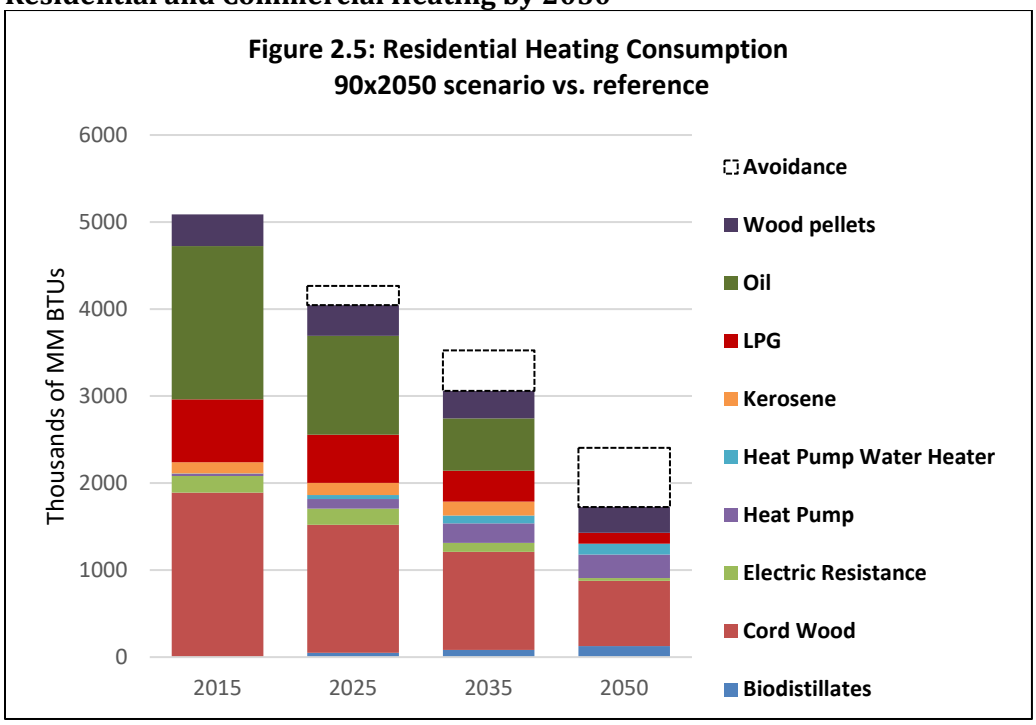
1. The "**reference" scenario** assumes a business-as-usual continuation of today's energy use patterns but does not reflect the Vermont's renewable portfolio standard or renewable energy or greenhouse gas emissions goals. The main changes over time in the reference scenario are more fuel-efficient cars because of CAFE standards.

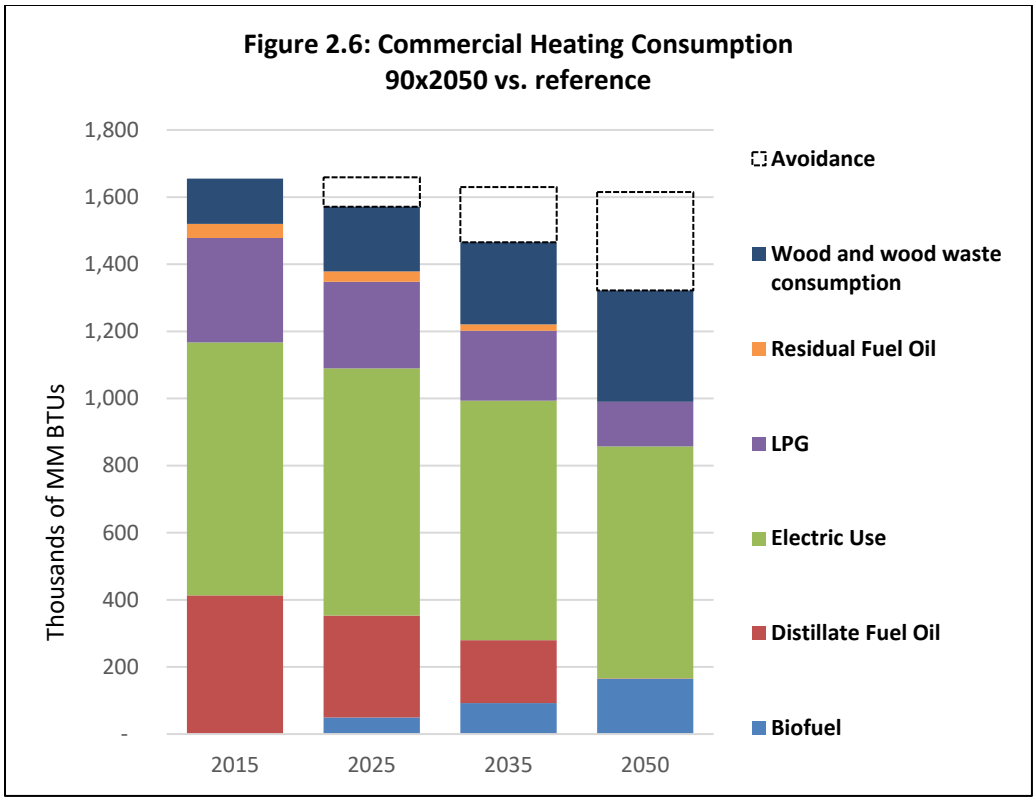
[14] Vermont Energy Investment Corporation: NVDA Modeling, Summary Results and Methodology

2. The "**90% x 2050 scenario"** is designed to achieve the goal of meeting 90% of Vermont's total energy demand with renewable sources.

What follows below shows 2015 usage according to the reference scenario, and then displays energy use from subsequent years based on the 90x2050 scenarios. "Avoidance" is the energy that is no longer needed because of aggressive weatherization, efficiency upgrades, and fuel switching.

## Residential and Commercial Heating by 2050






Residential demand was based on counts of housing units from American Community Survey and assumed a constant population growth rate of 0.21%, based on calculations from Vermont Population Projections 2010-2030. Residential demand also assumed that household size would decrease from 2.4 in 2010 to 2.17 in 2050. (More about the declining household size can be found in NVDA's Housing Plan.)

Projected change in the energy demand from the commercial sector was based on commercial sector data in the Total Energy Study, which showed commercial building square footage growing by almost 17% from 2010 to 2050.

In these scenarios, the use of electricity for residential heating nearly doubles. This increase offsets a slight decrease in electricity for the commercial sector, where wood and wood scraps and biofuels play a more significant role. Neither estimate accounts for the use of solar in water heating. According to the Vermont Renewable Energy Atlas, there are nearly 40 solar powered water heating systems in the Northeast Kingdom.

Table 2.16 establishes weatherization and fuel switching targets in support of the 90x2050 targets for residential and commercial heating in the Northeast Kingdom. These targets were developed with assistance from the Department of Public Service using the assumptions from the regionalized model from VEIC.

**Table 2.16: Weatherization and Fuel Switching Targets for the Northeast Kingdom**

| By Year | 2025 | 2035 | 2050 |
|---|---|---|---|
| Estimated number of households | 28,050 | 30,044 | 32,180 |
| % of households to be weatherized | 22% | 35% | 60% |
| # of households to be weatherized | 6,073 | 10,568 | 19,323 |
| Estimated number of commercial establishments | 1,571 | 1,692 | 1,822 |

| | | | |
|---|---|---|---|
| % of commercial establishments to be weatherized | 5% | 8% | 14% |
| # of commercial establishments to be weatherized | 75 | 130 | 248 |
| % of households with efficient wood heat systems (e.g. pellet furnaces, stoves) | 56% | 43% | 31% |
| # of households with efficient wood heat systems | 15,648 | 12,863 | 9,992 |
| % of households with heat pumps | 17% | 14% | 31% |
| # of households with heat pumps | 4,642 | 9,814 | 13,352 |
| % of commercial establishments with efficient wood heat systems | 15% | 17% | 22% |
| # of commercial establishments with efficient wood heat systems | 229 | 291 | 401 |
| % of commercial establishments with heat pumps | 6% | 10% | 13% |
| # of commercial establishments with heat pumps | 87 | 162 | 239 |

These projections assume a constant increase in the number of housing units and commercial establishments of about 0.6% and a weighted average heat load derived from existing municipal-level energy consumption estimates from by NVDA. (See Appendix B for a full explanation of municipal estimates.) Weatherization targets assume an average savings of 25% for residential heat load and 20% for commercial heat load.

Targets in Table 2.16 use methodology from the Department of Public service. Overall efficiencies achieved through the use of heat pumps (particularly in the residential sector) will reduce the use of supplemental heat. Nevertheless, we anticipate a continued need for efficient wood heating systems, particularly in older structures with multiple heating zones. The commercial sector is less likely to see a reliance on heat pumps, partly due to the relative lack of commercial development pressure in the region, not to mention the fact that a number of commercial establishments are already using efficient biomass systems.

Electricity use is expected to increase dramatically by 2050 so demand-side management and upgrades, such as hardwiring, lighting fixtures, and appliances is also an important part of this scenario, especially since electricity is replacing other fuel-burning thermal applications. Table 2.17 establishes targets for electrical equipment upgrades.

| **Table 2.17: Electrical Equipment Upgrade Targets for the Northeast Kingdom** | | | |
|---|---|---|---|
| **By Year** | 2025 | 2035 | 2050 |
| Estimated number of customers | 41,551 | 44,055 | 46,487 |
| # of customers to upgrade equipment | 10,769 | 16,923 | 24,808 |
| % of customers to upgrade equipment | 26% | 38% | 53% |

This estimate assumes an average savings of 400 kWh per project and assumes a projected number of customers by multiplying the number of housing units by 1.5 (to account for multi-units and non-residential customers.

Table 2.18 provides some historical data on weatherization, fuel-switching, and equipment upgrades accomplished to date. Measures that achieve thermal savings and electrical efficiency are often inextricably linked because they have *interactive* effects. For example, the installation of a cold climate heat pump may produce thermal savings, but it may also increase electrical use because it is replacing a fuel-oil system (thus making demand-side management critical). Also, in industrial settings a switch from incandescent bulbs (which emit a substantial amount of heat) to LED bulbs (which emit very little heat) can actually require additional energy to heat the space. A heat pump water heater in a finished basement collects heat from the space and delivers the heat to the water, meaning the basement requires additional heat.

Individuals and businesses can access a variety of resources, both public and private, for services ranging from energy audits to financing to contracting. Local energy committees have led successful campaigns to replace lighting with LED bulbs, encourage the purchase of Energy Star appliances, and educate consumers about incentives for more efficient options such as heat pumps. Additionally, improvements to battery storage may reduce peak demand. The development and use of real-time monitoring technology will also make customers more efficient users of electricity.

**Table 2.18: Efficiency Measures by Count in the Northeast Kingdom**

| | 2014 | | 2015 | | 2016 | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Res. | C & I | Res. | C&I | Res. | C&I | Res. | C&I |
| Air Conditioning Efficiency | 63 | 81 | 90 | 196 | 71 | 28 | **224** | **305** |
| Compressed Air | 0 | 57 | 0 | 10 | 0 | 12 | **0** | **79** |
| Cooking and Laundry | 323 | 1 | 265 | 76 | 244 | 0 | **832** | **77** |
| Design Assistance | 0 | 29 | 0 | 12 | 0 | 9 | **0** | **50** |
| Health and Safety | 9 | 0 | 12 | 0 | 8 | 0 | **29** | **0** |
| Hot Water Efficiency | 1,059 | 9 | 696 | 4 | 617 | 8 | **2,372** | **21** |
| Hot Water Fuel Switch | 1 | 0 | 0 | 0 | 0 | 0 | **1** | **0** |
| Hot Water Replacement | 2 | 0 | 2 | 2 | 2 | 0 | **6** | **2** |
| Industrial Process Efficiency | 0 | 40 | 0 | 8 | 0 | 15 | **0** | **63** |
| Light Bulb/Lamp | 70,113 | 14115 | 61,755 | 17,859 | 51,767 | 16,837 | **183,635** | **48,811** |
| Lighting Efficiency/Controls | 38 | 800 | 2 | 722 | 20 | 144 | **60** | **1,666** |
| Lighting Hardwired Fixture | 3,886 | 4185 | 5,030 | 6,764 | 4,484 | 7,139 | **13,400** | **18,088** |
| Motor Controls | 3 | 21 | 0 | 57 | 1 | 22 | **4** | **100** |
| Motors | 229 | 0 | 243 | 3 | 387 | 1 | **859** | **4** |
| Office Equipment, Electronics | 1,773 | 34 | 1,492 | 0 | 751 | 1 | **4,016** | **35** |
| Other Fuel Switch | 0 | 0 | 0 | 5 | 0 | 0 | **0** | **5** |
| Refrigeration | 461 | 129 | 320 | 317 | 238 | 83 | **1,019** | **529** |
| Space Heat Efficiency | 162 | 9 | 116 | 14 | 129 | 7 | **407** | **30** |
| Space Heat Fuel Switch | 27 | 1 | 27 | 6 | 19 | 5 | **73** | **12** |
| Space Heat Replacement | 4 | 10 | 43 | 38 | 113 | 9 | **160** | **57** |
| Thermal Shell | 225 | 1 | 152 | 11 | 156 | 7 | **533** | **19** |
| Ventilation | 194 | 93 | 66 | 88 | 32 | | **292** | **181** |
| Water conservation | 0 | 0 | 0 | 1 | 0 | 1 | **0** | **2** |

Source: Vermont Energy Investment Corporation

**Transportation Energy Use by 2050**

**Figure 2.7: Regional Light Duty Vehicle Consumption 90x2050 Scenario vs. Reference**

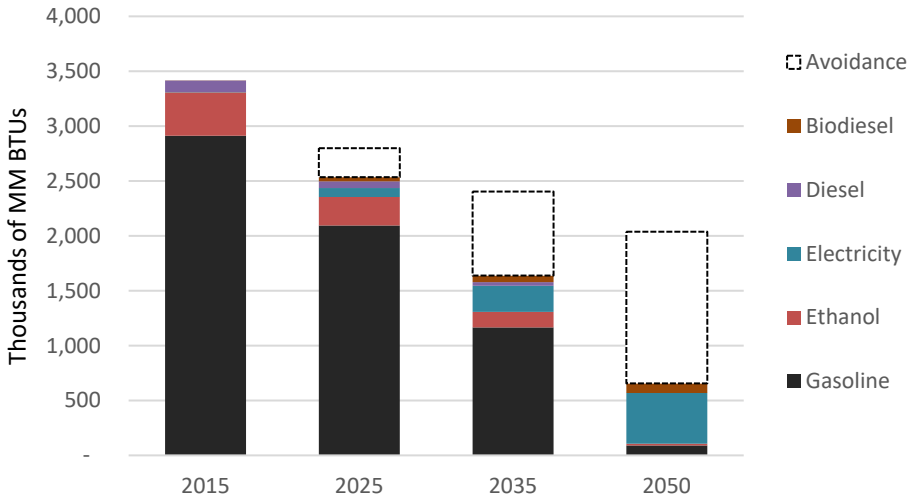
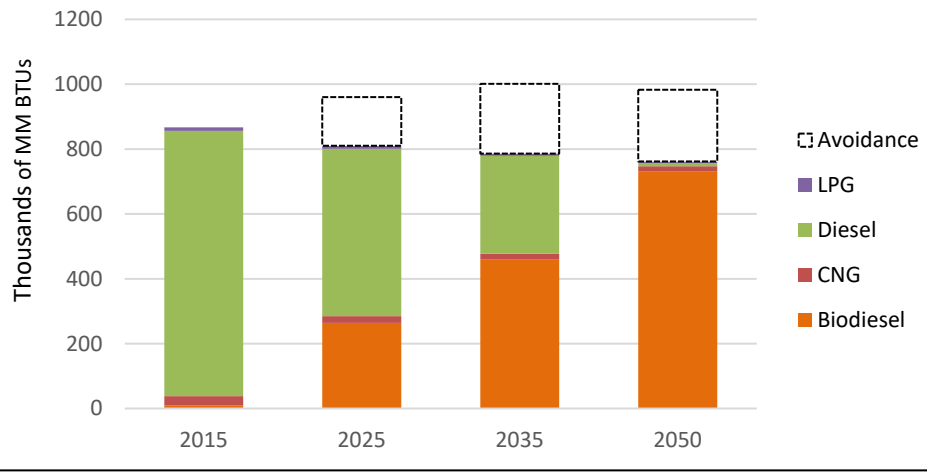



**Figure 2.8: Regional Heavy Duty Vehicle Consumption 90x2050 Scenario vs. Reference**




Biodiesel, which is currently being sources from oilseed grown in the Northeast Kingdom, is the most significant agent of change in use among heavy-duty vehicles and farm equipment. Among light-duty vehicles (LDVs), the gradual conversion from fossil fuel to EVs is expected to have a dramatic impact on electricity use in the Northeast Kingdom. These estimates assume gradual gains in fuel efficiencies from 3 miles per kWh to 4 miles per kWh, which helps to reduce total energy use by more than two-thirds from 2015 levels, even though the number of light duty vehicles on the road increase. In 2050, end-use electricity consumption in LDVs increases by more than 153 times, or more than 15,000%.

Clearly, the switch to EVs in the rugged Northeast Kingdom is a tall order, requiring significant investment in charging infrastructure, not to mention performance improvements on steep terrains

and in cold temperatures, battery storage, and affordability. Table 2.19 uses vehicle counts from American Community Survey to identify targets for achieving fuel switching goals for LDVs.

| Table 2.19: Fuel Switching Targets for Light-Duty Vehicles in the Northeast Kingdom | | | |
|---|---|---|---|
| **By Year** | 2025 | 2035 | 2050 |
| **Estimated number of light-duty vehicles** | 53,153 | 56,874 | 60,855 |
| **# of EVs** | 5,618 | 17,937 | 38,603 |
| **% of LDVs** | 11% | 32% | 63% |

## V. ENERGY RESOURCE ANALYSIS AND RECOMMENDATIONS

The 90x2050 projections – which will nearly eliminate the use of fossil fuels—will require transferring many of our uses to electricity. Therefore, even while electrical systems, appliances, and vehicles will likely continue to increase in efficiency, more electricity will need to be produced. Some of that will come from imported sources, such as hydroelectricity from Hydro Quebec and other providers, but much of it will also need to be generated by in-state renewable facilities as well.

90x2050 projections indicate that residential non-thermal electrical use alone could exceed 614,000 MWh by 2050. Additionally, conversion to light-duty EVs could require more than 135,000 MWh over that same period. Understandably, these projections counter earlier regional estimates, which showed only modest increases in regional electrical consumption to 462,353 MWh by 2020.[15] It is important to remember that the 90x2050 projections incorporate sweeping and long-range changes to the way we live and work.

Where – and how -- would energy generation occur? In support of the 90x2050 goals, each region has a set of generation targets. Because our region already generates a disproportionate share of energy relative to our low population, the Northeast Kingdom's new generation targets are the lowest in the state. (Table 2.19) While generation targets can be met through a variety of renewable technologies, the Northeast Kingdom does not have any generation targets specific to wind. Nevertheless, great care and consideration shall be given to the siting of new generation.

| Table 2.19: In-state Generation Targets | |
|---|---|
| Regional | New MWh |
| Addison | 172,978 |
| Bennington | 293,182 |
| Central Vermont | 418,530 |
| Chittenden | 845,236 |
| Lamoille | 185,927 |
| Northeastern | 18,680 |
| Northwest | 260,438 |
| Rutland | 439,276 |
| Southern Windsor | 194,612 |
| Two Rivers | 396,631 |
| Windham | 97,716 |

## Policy Statements

This region has a responsibility to plan for adequate supply of energy to meet local energy demand. Planning activities may include the production, storage, siting, and distribution of energy. Individuals, businesses, organizations, and communities are encouraged to explore emerging energy supply, efficiency, and net-metering opportunities that meet accepted environmental standards in order to satisfy their power demand.

New industrial/utility energy development shall meet the highest standards required by law. Permitting authorities shall first consider current and historical land use and the culture of the region, community opinion, economic benefit, as well as the land owner's rights. Any development shall to the extent possible be done so as to mitigate adverse impacts to the region. Any utility-scale energy generation project deemed acceptable by the Public Utility Commission shall

[15] NVDA Wind Study Report, March 26, 2015

include a plan for distributing benefits to the towns in the region proportional to the adverse effects experienced by that town. Long term maintenance, safety issues, decommissioning, and land reclamation procedures required at the end of the energy project's life must also be included in the project plan.

This plan aims to balance environmental quality and important natural resources with energy production. Significant local and regional support and clearly demonstrated benefits should exist in any energy proposal. This is especially relevant when siting commercial- or utility-scale wind facilities, which could have impacts on neighboring communities. "Commercial" and "utility" are defined in this plan as:

**Commercial-scale:** facilities with a capacity of more than 10 kW (which would be considered residential), but less than 100 kW. These structures typically have a height of just over 120 feet. (The wind tower at Burke Mountain is 123 feet high.) These structures are referred to as "business-scale" in the Vermont Renewable Energy Atlas.

**Utility-scale:** Wind turbines with a capacity of 1MW or more. These structures are referred to "commercial scale" in the Vermont Renewable Energy Atlas.

The region has recently experienced a sharp increase in the number of renewable energy applications which will worsen already congested transmission, particularly in the Sheffield-Highgate Export Interface (SHEI), where several existing generators are frequently curtailed by the ISO. While NVDA encourages appropriately scaled renewable energy development, NVDA has a commitment to ensure that such development is sustainable and feasible and does not merely substitute one renewable resource with another. NVDA supports energy development that will not exacerbate curtailment at issue within the SHEI. It is unlikely that any single solution will solve congestion within the SHEI and, as such, it is anticipated that incremental progress will be achieved as partial solutions are implemented. In the meantime, NVDA will support projects that are consistent with the land use and conservation measures in this plan and in duly adopted plans of impacted municipalities. Additionally, we will expect project developers to work with utilities and other stakeholders to explore innovative strategies that shift generation away from the hours when generation exceeds load within the SHEI area or otherwise avoids exacerbating congestion on the grid. An example of such a project would pair a battery with a solar facility to control when the project's power is exported to the grid. In determining support for such a measure, NVDA will seek guidance from the long-range Transmission Plan and Integrated Resource Plans in the region and will consult with utilities, VELCO, and other stakeholders.

## Siting Potential

This plan is accompanied by a series of maps (Appendix C) that can assist in the process of identifying potential areas for siting and quantifying generation output. Underlying assumptions were made about suitability factors, such as slope and direction of land, elevation and wind speeds, and access to three-phase power. Additional statewide layers identified *known* constraints and *possible* constraints, and a third layer has identified *regional* constraints:

Known constraints are areas not likely to be developed for renewable energy because they contain one or more of the following: vernal pools; river corridors; FEMA floodways; significant natural communities; rare, threatened and endangered species, national wilderness areas, wetlands (Class 1 and Class 2).

Possible constraints are areas that would likely require mitigation because they contain the one or more of the following: agricultural soils; special flood hazard areas (outside of the floodway); protected (conserved) lands; deer wintering areas; Act 250 mitigated agricultural soils; hydric soils, and highest priority forest blocks.

Regional constraint: NVDA's regional plan has long held that rural areas should receive very little commercial or industrial development unless it occurs in an established industrial park, or in an area specifically designated in the local bylaw or plan as being well suited to such uses. Lands with an elevation of 2,000 feet or more merit consideration as a special class of rural lands that should be protected from any large-scale commercial or industrial development characterized by a constructed height of 100' or more, and an acre or more of permanent site disturbance, such as clear-cutting. These lands, as indicated on attached siting potential maps, contain one or a combination of factors that make them unsuitable to such development – contiguous forest cover; sensitive wildlife and plant habitat; conservation lands and recreational assets; managed forestland; and headwaters and ephemeral surface waters, which are highly vulnerable to erosion and man-made disturbance. This high-elevation forest cover must be kept unfragmented for the attenuation of flood flows, the benefit of wildlife habitat and linkage, and public enjoyment through passive recreation.

The maps accompanying this plan do not carry the weight of zoning, and the siting of renewables on prime acreages (i.e. without known constraints) is not a foregone conclusion. Rather regional maps should be viewed as a starting point for our member municipalities to determine suitable and unsuitable locations for renewable energy development. This plan's siting considerations for each specific energy technology on the following pages should not be considered exclusive. They too should be seen as a starting point for creating effective local specification and constraints.

Our estimates for potential generation outputs are therefore deliberately conservative to account for the designation of local siting constraints. In most instances, only *prime* acreage (areas with no constraints at all) were used to calculate output potential. Even with a highly conservative estimate, potential generation vastly exceeds the regional generation target. This plan strongly encourages municipalities to conduct additional site investigations to identify local constraints (as well as preferred sites in addition to existing statewide preferred sites) in order to address the environmental, aesthetic, civic, economic, and cultural concerns unique to each community.

**Table 2.20: Estimated Potential Energy Generation in the Northeast Kingdom**

| | MW | MWh |
|---|---|---|
| Residential rooftop solar generation | 15.0 | 18,412.2 |
| Small commercial rooftop solar generation | 3.0 | 3,343.2 |
| Large commercial rooftop solar generation | 5.9 | 7,225.9 |
| Ground mounted solar | 652.6 | 800,340.3 |
| Wind (residential scale only) | 13.6 | 23,405.2 |
| Methane Digesters | 430.0 | 2,260,080.0 |
| Hydro | 2.9 | 10,238.6 |
| **Total Generation** | 1,123.0 | 3,123,045.4 |

## Solar

| | |
|---|---|
| **Total output potential:** | **829,321.6 MWh** |
| **Rooftop assumptions:** | NVDA assumed one out of every 10 residential structures (including seasonal, many of which are inhabited part-time year-round). The region has relatively few commercial structures, so NVDA determined small commercial suitable for solar (less than 40,000 sq. ft.) for solar to be 10% of all commercial structures, and large commercial |

| | |
|---|---|
| | structures suitable for solar (more than 40,000 sq. ft.) to be just 3% of all commercial structures.<br><br>The number of commercial structures was determined with NAICS classification counts used for determining commercial thermal energy use. (See Appendix B.) |
| **Ground mounted assumptions:** | Approximately eight acres of land are required to produce one MW of solar energy. In order to account for contingencies (property owners not interested in leasing their land, interconnection costs that may be too high, and unsuitability of specific sites) NVDA estimated only 1MW for every 60 prime solar acres. Acres with possible constraints were not included in the calculation. |

Overall solar resources in Vermont are quite good, and solar energy can be harnessed effectively for primary and secondary energy needs. The two main types of solar energy systems are photovoltaic (PV), which generates electricity, and solar thermal, which generates hot air or hot water for water and/or space heating. For some homeowners in our region, solar electricity systems have proven more cost effective than extending power lines to the home. A typical off-grid system consists of photovoltaic (PV) modules that convert solar energy to electricity, batteries that store the electricity (if off-grid), and an inverter that converts DC power to AC for use in conventional electric appliances. As a rough rule of thumb, a 1 kilowatt photovoltaic system can be expected to produce 3-3.5 kWh/day on average in Vermont.

Solar water heating systems typically utilize collectors to capture the sun's energy, a pump to circulate a solution through the collectors to extract heat energy, and a well-insulated storage tank to hold the heated water for use as needed (this can be integrated with an existing water-heating system). An appropriate size solar water-heating system can provide one-half to two-thirds of a household's annual hot water needs – typically 100% in summer, but as little as 25% in winter. In Vermont, these types of systems tend to pay themselves off in less than two decades.

Solar energy can also be harnessed through passive solar design (day-lighting and space heating) with Green Building Design. This includes orienting buildings close to true south, as well as using appropriate windows on the south wall, installing thermal mass (brick, concrete, or water) to store the sun's energy, and using appropriate levels of insulation. Through these designs, as much as 60% of a building's space heat can be derived from the sun. This type of heating is termed "passive solar" because no moving parts are needed, the collection and storage system is built into the structure. Green Building Design principles also attempt to maximize the amount of natural light a building receives, in order to reduce the energy costs associated with daytime lighting.

Active and passive solar systems are custom built based on the building site, building and purpose of the solar system. There are many factors that bear on siting solar systems. Many homes and businesses have good rooftop sites, or good sites nearby for ground mounted systems. Unfortunately, some do not, such as properties where there is limited southern exposure. One way to address this situation is through the development of "community-sized" PV projects or co-operative systems on the order of a few hundred kilowatts up to a few megawatts. There are a number of community solar sites in our region, which also allow renters and homeowners where rooftop solar will not work to take advantage of solar by "sponsoring" an off-site panel. Utility-scale PV developments are also becoming popular in other areas of the U.S. Often referred to as solar parks, farms, or ranches, these utility-scale PV installations are designed for the sale of merchant power (MWh) into the electric grid and can utilize several acres of land. Public concerns surrounding solar installations of this size usually focus on aesthetics and transmission line development.

### Siting policies for solar:

- NVDA has determined that the following types of locations in the region should be prioritized for future solar generation. Even though these locations are not shown on the

regional solar maps due to a lack of GIS data, these sites should be considered "preferred locations" for siting solar:

  - Rooftops of structures, residential and commercial. (Our conservative estimates show the region's total potential output from rooftop solar alone could amount to 23.9 MW, or 6.3% of the high end of the LEAP model projections for solar for 2050 of 377.2 MW).
  - Brownfield sites not located in a designated downtown or village center
  - Earth extraction sites (e.g. gravel pits, quarries), active or abandoned
  - Parking lot canopies and surface parking lots
  - Farms, where more than 50% of the power generated is used by the farm
  - Industrial parks, where more than 50% of the power generated is used by the tenants of the industrial park
  - Undersized lots and otherwise undevelopable land in existing industrial parks

- The Northeast Kingdom has a robust agricultural economy, and NVDA discourages siting ground-mounted solar in a manner that fragments productive agricultural soils, effectively removing farmland from production for decades. To this end, NVDA encourages municipalities to explore and identify local constraints that minimize farmland fragmentation. These measures may include agricultural overlays (regulatory), as well as conservation easements (non-regulatory). A number of land exploration tools, such as land evaluation and site analyses (LESAs) can help municipalities prioritize agricultural lands for protection. NVDA will assist local planning commissions to identify local constraints as appropriate.
- Notwithstanding the above concern, NVDA recognizes that successful integration of solar into active agricultural uses can help farms reduce expense, generate extra income, and remain viable. NVDA encourages on-farm solar that, to every extent feasible, uses existing farm structures, or is sited in a manner that supports grazing, the establishment of pollinator crops, or simply to create buffers between organic and non-organic production areas. NVDA will showcase best on-farm generation practices in the region and will cite "Guide to Farming Friendly Solar," produced by the Two Rivers Ottauquechee Regional Planning Commission, as a vital resource.

## Wind

| **Total output potential:** | **23,405.2 MWh** |
|---|---|
| **Assumptions:** | In accordance with Act 174 guidelines published in March of 2017, regional plans are allowed to submit plans to the Department of Public Service that do not establish targets for utility scale wind. This is especially important for the Northeast Kingdom, which has no targets for wind generation due to the existing level of production. When accounting for NVDA's regional constraint, the balance of prime wind acreages is just over 38,000. We estimate that new generation will be primarily farm- and residential-scaled.<br><br>Even though no significant acreage is required for a farm- or residential scaled turbine, NVDA's estimate |

| | |
|---|---|
| | assumed a contingency of 1 turbine for every 25 prime acres, with an average capacity of 9.5 kW. Some towns have no prime acres. For these towns, we assumed a broader contingency of 1 turbine every 75 acres.<br><br>The purpose of the contingency was similar to that of solar: to account for property owners not interested in leasing their land, prohibitive interconnection costs, and unsuitability of specific sites (including neighbor objections. |

Wind energy has recently been on the forefront of the renewable energy movement. The U.S. Department of

Energy has announced a goal of obtaining 5% of U.S. electricity from wind by 2020, a goal consistent with the current rate of growth of wind energy nationwide. Vermont is currently ranked 34th out of the lower 48 states for wind energy potential.

The Northeast Kingdom, the region that the NVDA serves, has considerable experience with utility-scale wind turbines. Caledonia County is home to First Wind's Sheffield turbines. Green Mountain Power's Kingdom Community Wind turbines are located in Lowell (Orleans County). Three additional projects were proposed, but not carried out: The East Haven Wind Farm (Essex County), Seneca Mountain Wind (Caledonia and Essex Counties), the Encore Redevelopment project in Derby (Orleans County). It follows that the NVDA's Board of Directors has become quite familiar with arguments both for and against industrial wind complexes.

The siting of wind turbines has raised concerns about aesthetic impacts, erosion, water quality impacts, noise, land scarring, and effects on wildlife, property values, public health, and local economic drivers, such as tourism. Because of our region's mountainous terrain, the ideal location for utility-scale wind turbines is on North-South oriented ridgelines with elevations between 2000 and 3500 feet above sea level. Each utility-scale tower can range in height from 135 feet to 500 feet tall, requiring specified FAA lighting for towers over 200 feet. For purposes of this plan, smaller non-utility scale wind systems are defined as turbines under 200 feet in height, including the length of the blades. Larger (utility-scale) ridgeline generation facilities may contain as few as 1 to as many as 40 or more turbines. Because of the variations in wind speed, the output of a wind facility is considered intermittent power, and the energy generated is generally 20-30% of what a conventional power generation facility of the same rated peak capacity would produce. Wind speeds need to be within an optimum range specific to the tower technology. If any wind speeds or gusts are registered over the optimum range the wind tower is usually shut down for safety purposes.

### Siting policies for wind:

- The NVDA has first-hand experience with the divisiveness that accompanies wind projects and the damage that the projects visit upon communities. In 2012, the NVDA Board of Directors voted 39 to 3 in favor of a resolution calling for a suspension of development of new industrial wind projects in the region. The Board called for the formation of a committee to study industrial wind energy in the region and develop findings and recommendations. The committee's findings and recommendations would be reviewed by the NVDA's Executive Committee and then by the full Board of Directors. As a result of this effort, the NVDA has developed the following position on industrial wind energy:

  *"The NVDA sees one clear benefit to industrial wind energy, one clear problem, and a host of troubling questions. The clear benefit is the tax relief that industrial-scale wind turbines bring to their host towns. The clear problem is the bitter divisions that wind brings to our communities. The troubling questions involve the unreliability of wind energy, the amount of energy produced versus the social and environmental disruption, the costliness of the electricity, and the dubiousness of the claims of environmental benefit. We are even more troubled by the potential impacts on human health, essential wildlife habitat, water quality, aesthetics, property values, and our tourism industry. We are also*

*troubled by the state's energy policies, the state's permitting process, and the ease with which the public good as expressed in our municipal and regional plans can be overridden by people who may never have even visited our region.*

**It is the position of the NVDA that no further development of industrial-scale (sic[16]) wind turbines should take place in the Northeast Kingdom.**

- Existing small turbines in the region are sited in very low-density areas and on farmland. NVDA strongly urges municipalities to consider density in their specifications, as even small wind turbines can produce noise that is incompatible with many residential areas. This can be established through the use of noise ordinances or through required distances from nearby residential uses, as specified in a locally adopted municipal plan with Substantial Deference.
- The Northeast Kingdom has no new generation targets for wind due to the large amount of energy generation currently coming out of the region. In keeping with the policies and recommendations in the Land Use Plan, the regional wind generation maps in Appendix C do not show many wind generation areas with high generation potential. This is due to the existence of known constraints, including upland areas of 2,000 ft or more, headwaters, forest coverage of site class 1, 2, or 3, priority forest habitat blocks, and state natural areas and fragile areas.

## Hydro

| | |
|---|---|
| **Total output potential:** | **10,238.7 MWh** |
| **Assumptions:** | NVDA's analysis takes into account only existing dams not being accessed for hydropower. Generation information comes from a 2008 Agency of Natural Resource study of small hydropower resources. |

Existing hydro-power facilities in the Northeast Kingdom collectively produce more than 118,000 MWh annually, accounting for more than 18% of our regional generation. (Table 2.13) The three Connecticut River Dams, though not considered part of our regional generation, are three of the largest hydro facilities in the Northeastern U.S. Together the Moore, Comerford, and McIndoe Falls Dams produce an additional 638,000 MWh of electricity annually (double what the region consumes).

Hydro facilities can be a good source of base-load power when regular rainfall is received. For river-run facilities, power generation is dependent upon continuous levels of rainfall and must run when the flow is at optimum levels. This can mean producing electricity when it might not be needed. Dams, on the other hand, have the advantage of storing their resource for later use. Unfortunately, drought can severely limit the production capacity of dams as well. Hydro power facilities can also alter the ecosystem of a waterway. Both reservoir and river-run systems can increase water temperature, decrease water speed, limit oxygen and increase nitrogen levels, and alter riparian areas. These changes to the ecosystem cause stress to fish populations and riparian-habitat wildlife[17]. Today, new hydro facility design and upgrades are engineered to mitigate or lessen negative impacts on the ecosystem.

Overall hydro-power is considered a long-term resource and is relatively secure and stable. Generation costs for hydropower vary considerably between facilities. Many of the facilities in the

[16] The language regarding "scale" of renewable energy development has since evolved. For all intents and purposes the preferred term is "utility-scale," although in context of the 2012 wind study, the terms "industrial" and "utility" may be used interchangeably.

[17] Foundation for Water Energy and Education

region were built in the early 1900's and have needed significant upgrades over the years. Upgrading existing hydro and permitting new hydro can prove to be very costly and consequently raises the production costs for the facility.

### Siting policies for hydro:

- While this energy source is renewable, the ability to create new hydro-power generation is limited. Some of the best hydro resources in the region are already generating, while permitting new facilities has been a long and difficult process. At this time, facilities in other regions of the state are facing some significant challenges in relicensing. Our focus for regional hydro-power should be focused on maintaining our existing generation infrastructure, upgrading aging infrastructure, and improving safety standards. The development of new facilities should be pursued where practical.

### Methane

| | |
|---|---|
| **Total output potential:** | **2,260,000 MWh** |
| **Assumptions:** | NVDA's estimate used the Farm to Plate Atlas for a count of dairy farms in the region. The waste from 4 to 6 cows can produce about 1 kW of energy. On-site systems were only considered, so farms known to have small herds were excluded from the estimate. Because digesters are a significant investment in equipment and maintenance, NVDA assumed a contingency of about 1 in every 8 farms. |

Methane, a common gas found in the environment, can be burned to produce electricity. Large amounts of methane are produced through the anaerobic digestion of manure, agricultural wastes, and other organic wastes. Both large farms and landfills offer the best potential to utilize this resource. The only large-scale landfill in the region is already being utilized for methane generation, but there are at least 20 dairy farms with enough capacity to sustain a manure-methane generation facility. In agricultural practices, manure is collected in various containment systems, where it can be heated up for methane gas production and collection. The remaining manure by-product can be spread on fields as fertilizer, the dry solids can be used for animal bedding, and the excess heat can be used for other purposes such as greenhouse heating.

In agricultural practices, the procedure also destroys harmful pathogens, reduces water quality impacts, reduces manure odors, and provides a new source of income to local farmers. The Blue Spruce Farm in Bridport, Vermont was the first farm in the state to develop a manure-methane generation system. In the Northeast Kingdom the Maplehurst Farm, Maxwell Farm, and Chaput Family Farms have installed anaerobic digester systems and collectively produce more than 4,500 MWh annually. All three are enrolled in the Standard Offer program, which offers long-term fixed prices for generation without having to go through the program's reverse auction process.

Food scraps and food residuals (byproducts from processing) can also be used to produce energy in a similar manner. The expansion of the region's agricultural processing sector, paired with Act 148's mandatory diversion of food scraps from the waste stream, creates additional opportunity to generate energy. Research with food waste is already underway at Vermont Technical College, but additional exploration is needed to make this feasible here in the NEK.

### Siting policies for methane:

- Manure methane generation should be expanded in the region's energy mix. As with farm-friendly solar generation, manure methane generation may protect the viability of working farms by reducing production expense and generating extra income for the farmer. NVDA

encourages municipalities to identify potential production sites in their plans and provide appropriate guidance for siting with regard to screening, noise, and odors.

- Existing on-site technologies are costly and only make economic sense for larger farms. (In Europe, central methane digestion systems do allow smaller farmers to process animal wastes, but trucking is involved.) Emerging technologies in Europe may prove to be more cost-effective for smaller farms. NVDA encourage the ongoing use state and federal grants, tax credits, incentives, and technical assistance to combat the high start-up costs of methane generation for the region's farmers.
- NVDA should work with the region's food system leadership group, as well as other proponents of the Regional Food System Plan, to ensure that the region's agricultural producers have access to technical services, grants, and other incentives to refine and maximize digester technologies.
- Food scraps and residuals may play a role in the region's energy generation portfolio as well. NVDA supports energy recovery that supports the highest and best use of waste materials, namely the food recovery hierarchy that prioritizes the reduction of waste. This policy is consistent with NVDA's Utility and Facilities Plan.

### Biomass

Biomass has significant potential to reduce the region's fossil fuel consumption. The majority of our fossil fuel consumption is for transportation and home heating uses, only a small portion of fossil fuels are used in electricity generation for the region. Wood chips, wood pellets, and biodiesel hold the greatest potential for Vermont to transition these uses towards renewable energy. The expansion of these resources will also offer strong support for our traditional economy (forestry and agriculture) and stabilize regional fuel costs. In the next few years, biomass usage should be promoted and expanded as a significant resource to diversify the region's energy portfolio and meet future energy needs.

The region already supports a large-scale wood-chip fueled electric generation facility. The Ryegate Power Station is the second largest electric generation facility in the region. Capable of generating 172,367 MWh annually; the plant operated at 100% capacity in 2009, but was idle in the spring of 2012. New power purchase agreements have been drafted and the plant resumed production in June 2012. Ryegate Power Station is a good example of the difficulties in making an electric-only wood generation plant profitable and competitive. Overall, the ease of handling, local availability, low emissions, and general low-costs of wood resources will allow the region an opportunity to expand this resource if fossil fuel prices climb.

One of the most efficient uses for wood-fuels is co-generation, the simultaneous production of both heat and power, such as the system in North Country Regional Hospital that generates a third of its electric needs and heats the entire hospital. Recent studies looking at co-generation opportunities in the region indicate that it works best when there is an equal need for heat and power[18]. Balanced heat and power loads are easier to provide for on the small scale, such as for an individual business but larger plants are more desirable, since they can secure more renewable energy incentives and the capital cost/kWh improves. Large co-gen applications (10+MW) may make sense if an equally large heat user can be found, such as a manufacturer that requires tremendous heat loads. Some engineers propose developing district heating systems along with co-gen plants in areas where a considerable industrial heat user is not available. District heating systems are utilized throughout Europe and one will soon come on-line in Montpelier. Unfortunately most of Vermont's communities do not have

[10] *Town of Sutton - Burke Lumber Site Redevelopment: Wood Supply Assessment & Wood Pellet Manufacturing Facility Feasibility Study/Business Plan* (June 2009, Innovative Natural Resource Solutions for NVDA), St. Johnsbury-Lyndon Industrial Park Energy Study (2007).

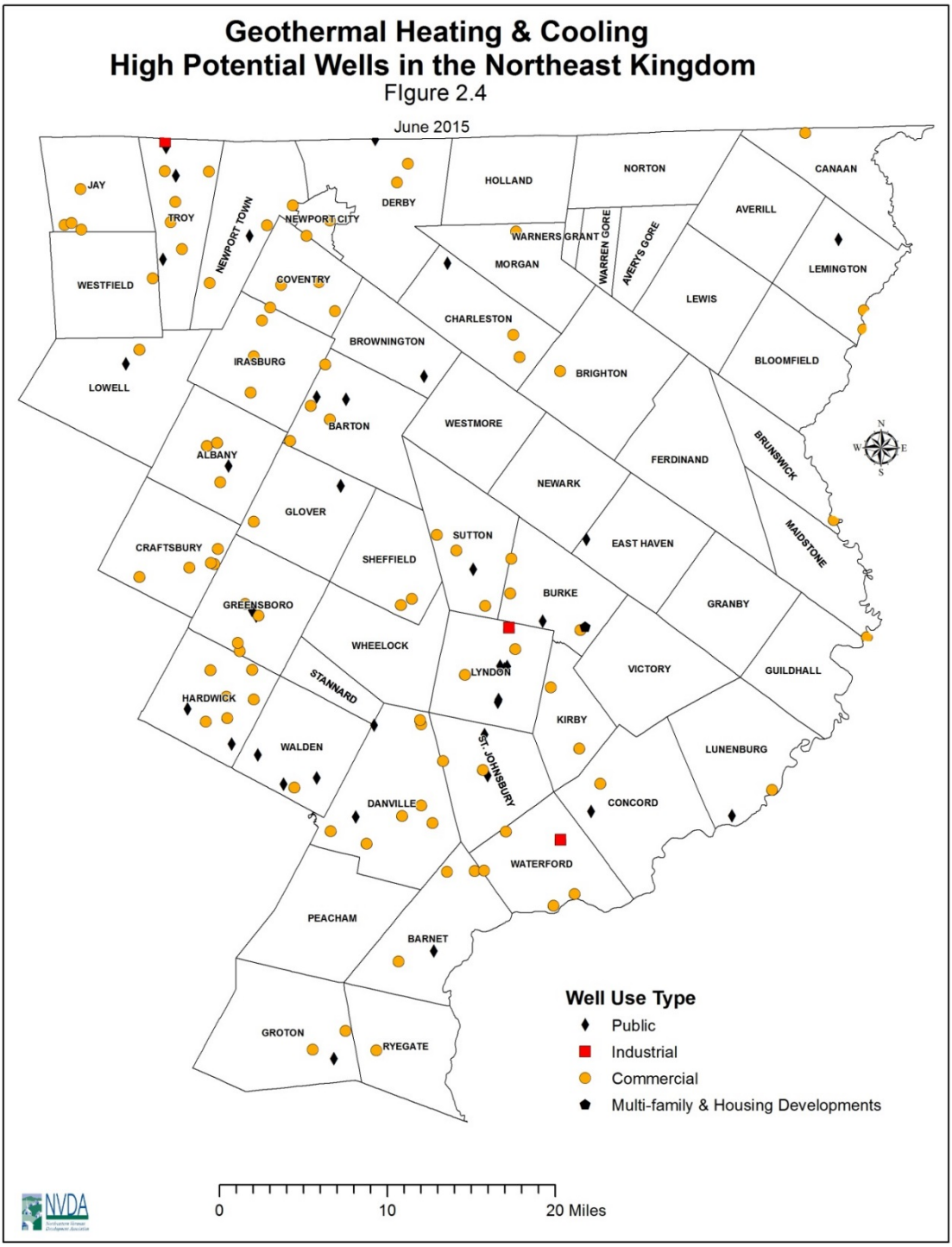
the density to support nor afford the $400/linear foot installation cost district heating requires for distribution. In addition, the average connection cost for district heating is around $5,000 per homeowner. In other words, district heating is not an easy sell to tax payers.

**Siting policies for biomass:**

- Siting wood-generation and co-generation facilities can be fraught with challenges. Noise, emissions, truck traffic, and unsightly smoke stacks are concerns when siting facilities near residential neighborhoods. Municipalities are strongly encouraged to develop performance standards for industrial uses.
- These facilities use a renewable fuel that grows at a specific rate, so overharvesting of the regional woodshed is a concern. The plan strongly urges a commitment to responsible stewardship of the region's forestry resources, accomplished through the use of forestry overlays that minimize fragmentation (regulatory), or enrollment in Vermont's Current Use Program and conservation easements (non-regulatory). A number of planning tools are available to municipalities, including forestry land evaluation and site analyses (FLESAs), that can help municipalities prioritize lands for protection. NVDA encourages local planning commissions to seek technical assistance.

## Geothermal

Geothermal has great potential for expansion in the Northeast Kingdom, with the most promising systems being open-loop well systems. This technology is also one of few renewable resources that can directly reduce fuel oil consumption used for space heating and should be encouraged in both existing and new construction in the region. There are numerous sites throughout the region where geothermal can be used. (Figure 2.4)


Geothermal Heating & Cooling
High Potential Wells in the Northeast Kingdom
FIgure 2.4
June 2015
JAY
TROY
NEWPORT TOWN
NEWPORT CITY
DERBY
HOLLAND
NORTON
CANAAN
AVERILL
LEMINGTON
WARNERS GRANT
WARREN GORE
AVERY'S GORE
MORGAN
LEWIS
WESTFIELD
COVENTRY
CHARLESTON
BROWNINGTON
IRASBURG
LOWELL
BRIGHTON
BLOOMFIELD
BARTON
WESTMORE
ALBANY
FERDINAND
BRUNSWICK
NEWARK
GLOVER
SUTTON
EAST HAVEN
MAIDSTONE
CRAFTSBURY
SHEFFIELD
BURKE
GRANBY
GREENSBORO
WHEELOCK
LYNDON
VICTORY
GUILDHALL
STANNARD
HARDWICK
KIRBY
WALDEN
ST. JOHNSBURY
LUNENBURG
DANVILLE
CONCORD
WATERFORD
PEACHAM
BARNET
GROTON
RYEGATE
N
W
E
S
Well Use Type
Public
Industrial
Commercial
Multi-family & Housing Developments
NVDA
0
10
20 Miles

## A Healthy and Sustainable Regional Food System

The food we eat has a profound impact on our region's energy use and carbon footprint. The complexity of processes and practices along every point in our food system -- from production, to processing, to distribution, to waste – has significant environmental and ecological implications, making food the number one cause of global warming.[19] Fortunately, the region's vibrant agriculture sector has helped to make Vermont a leader in access to local food. The Northeast Kingdom is the only region of Vermont to adopt a comprehensive Food System Plan, one that is built on a "soil to soil" model that seeks to localize the production, processing, distribution, consumption, and composting of our region's agricultural resources. The emerging Food System Leadership Group, is responsible for overseeing the implementation of the five-year plan. Their work can intersect with regional energy planning efforts in a number of ways, including:

**The reduction of food waste:** There has been a concerted effort to divert discarded food and food scraps from landfilling, as evidenced by the many schools, institutions, and municipalities that have established programs for collecting and composting food scraps. However, perfectly edible food often gets discarded as well. Food waste is a serious economic and environmental problem that persists, even in the face of rising food insecurity. Food waste is any food product that gets discarded, at any point along the supply chain: from produce left to rot in the fields, from expired foods discarded by the retailer, to leftovers scraped from dinner plates into the garbage bin. Anywhere from 25% to 40% of our nation's food ultimately goes to waste, nearly all of which ends up in landfills, where it produces methane that is 21 times more potent that CO2 as a greenhouse gas. Food waste contributes 4.4 gigatons of carbon dioxide equivalent into the atmosphere every year. If food waste were a country, it would be ranked just behind the U.S. and China as the third largest emitter of greenhouse gas emissions.[20] The NEK Food System Plan is focused on redirecting waste, both edible food to food secure populations, and food scraps and residuals to appropriate composting facilities and to digesters. The region has limited infrastructure for handling organic wastes, so a successful and efficient system will likely be a combination of trucking/hauling and on-site management.

**Shared distribution and warehousing**: In theory, a more localized food system reduces energy because it entails fewer "food miles" in getting the food from farm to table. Unfortunately, much of the region's agricultural product is currently distributed in and out of the region in a less-than-truckload capacity. Among the smallest of producers, the distribution system could be a Subaru. The NEK Food System Plan has identified a number of opportunities for shared distribution and storage, all of which can reduce transportation miles and greenhouse gas emissions. Coordination and oversight of these shared opportunities is needed to make this distribution system efficient.

**Conservation and Regenerative Agricultural Practices:** An array of practices that feed the soil can also increase the rate of carbon sequestration. While there is no single blueprint for success, a number of farmers in the region are implementing techniques such as diversified cover cropping and conservation tillage to mitigate the loss of topsoil and stem erosion. Grass farming and rotational grazing can reduce energy inputs, reduce erosion, and improve water quality as well. The NEK Food System Plan seeks to promote practices that improve environmental stewardship and overall soil health. It is imperative that farmers can access the technical assistance and resources that will help them achieve this.

[19] Paul Hawken. *Drawdown: The Most Comprehensive Plan Ever Proposed to Reduce Global Warming*, Penguin (2017)
[20] Ibid.

## REGIONAL ENERGY GOALS & STRATEGIES

### An adequate, reliable, diverse, and secure energy supply will benefit the region.

- Promote a diversified energy portfolio for the region.
- Support the upgrade of regional transmission systems to continue to reduce constraints.
- Support the maintenance and upgrade of existing energy generation facilities and related infrastructure.
- Encourage local responders to plan for emergency energy resources (VEM Emergency Generator Grant Program generators).

### Affordable energy alternatives will be available for the region's users that decrease the region's reliance on fossil fuel.

- Assist in the development of businesses that support alternative energy use.
- Work with Tier 3 energy service providers to promote the installation of cold climate heat pumps and geothermal systems by facilitating outreach and education on their benefits.
- Partner with Efficiency Vermont and Tier 3 energy service providers to increase the use of efficient wood heat and biomass systems.
- Support the development of small-scale renewable resources, such as wind and solar, and the use of supplemental sources (wood) to stabilize energy costs.
- Promote and support rail infrastructure as a cost-effective transportation resource for the energy industry.
- Encourage and support agricultural production of biofuels and oilseed crops and explore ways to broaden access to processing infrastructure.
- Identify potential users of district heating and wood heating systems and provide assistance to communities seeking to develop them.
- Encourage the legislature to increase incentives and rebates for efficient wood heat systems.
- Provide outreach and education among vendors, contractors, and the general public through venues such as tradeshows and workshops.
- Provide communities with an analysis of potential areas that are suitable for ground source heat pumps.
- Support upgrade and trade-out programs and incentives for older, higher emission wood burning stoves and boilers.

### Decrease the region's reliance on single occupancy vehicle trips and gas/diesel powered vehicles.

- Continue to advocate for better telecommunications infrastructure so employees can work from home.
- Encourage local employers to reduce VMTs through programs such as ride sharing and Go Vermont.

- Support and expand access to liquid biofuels for use in commercial vehicles and heavy equipment.
- Support and expand the use of electric powered busses and vans among the public transportation providers serving the region.
- Work with cycling advocacy groups such as Local Motion by hosting safe on-road cycling workshops.
- Provide training to local zoning and development review boards to consider infrastructure for alternative transportation in their review of site plans.
- Provide technical and grant writing assistance to local planning commissions who plan for multi-modal circulation and better connectivity with alternative transportation modes.
- Promote the use of the region's cycling infrastructure such as the Cross Vermont Trail and the Lamoille Valley Rail Trail and support the efforts of local groups who work to maintain them.
- Support municipalities and local businesses to install EV charging stations at convenient locations, such as in front of restaurants, stores, businesses, or entertainment or recreational facilities, where users would want to park for periods of two to four hours. Explore and pursue incentives to defray the cost of installation and administration so that users pay only for electricity.

### Net-metering capacity in the region will be maximized.

- Encourage municipalities to become "clean energy districts" and participate in the PACE program (Property Assessed Clean Energy). This would provide consumers with options to more affordably implement grid tied renewable energy systems.
- Support solar panel safety training programs for fire fighters and first responders.

### Energy efficiency and weatherization will be an integral part of the energy portfolio.

- Assist municipalities in reducing their energy costs through conservation, efficiency, and weatherization programs.
- Support and promote the Energy Action Network (EAN) energy dashboard and educate communities about its use and benefits. Support crowdsourcing on efficiency and weatherization efforts at the local level (e.g. Vermont Community Energy Dashboard).
- Support Local Energy Committee/Coordinator efforts to reduce energy consumption, improve efficiency and weatherization, and develop new generation resources.
- Encourage municipalities to conduct energy audits and weatherization programs.
- Encourage businesses to make energy efficiency investments and develop energy efficient production methods.
- Promote energy efficient building design and construction methods (e.g. Green Building Design, LEED certification, and Passive Design).
- Promote Energy Efficiency Utility program resources by making web links available on municipal/regional web sites.

- Work with partner organizations and Energy Efficiency Utilities EEUs to offer workshops and educational opportunities to businesses on efficiency in new construction, retrofits, and conservation practices.
- Identify large energy usage customers (including large businesses, manufacturing facilities, and schools) as a target audience and encourage participation in commercial and industrial EEU programs.
- Facilitate strategic tree planting to maximize energy benefits by encouraging communities to participate in the ArborDay Energy Saving Trees Program.
- Support local zoning initiatives that incent the development of small and/or net-zero homes.
- Ensure that developments subject to Act 250 consider new energy requirements by encouraging the compliance with commercial energy stretch codes, particularly among proposed commercial uses that are high energy consumers.
- Showcase the cutting-edge work of local architects and contractors who incorporate green building practices through NVDA's web site and newsletters.
- Promote the use of the Vermont Home Energy Profile among prospective buyers and sellers of homes. Work with local contractors to become BPI certified in energy-efficient retrofit work in order to assist with these profiles.
- Ensure that local zoning administrators have information on Residential Building Energy Standards and Commercial Building Energy Standards (RBES and CBES). Host and facilitate training sessions for local officials. Encourage communities with zoning to require Certificates of Occupancy. Encourage the local adoption of "stretch codes".
- Work with local affordable housing organizations to promote and improve the supply of the region's net-zero and near-net zero housing supply, such as Vermod homes.
- Review local zoning bylaws and offer technical assistance to development review boards when evaluating the energy efficiency implications of site plans for proposed developments.

### Weatherize at least 25% of the region's housing stock by 2020.

- Actively advocate for the continuation and expansion of funding programs that support thermal efficiency and renewable energy improvements, especially programs that are targeted to middle- and low-income households.
- Coordinate with and promote efficiency programs and weatherization assistance programs (such as Efficiency Vermont, NE TO, 3E Thermal, and Heat Squad) for low-income households and apartment buildings.
- Cosponsor and organize weatherization workshops for home and businesses with EEUs.
- Facilitate or sponsor a workshop for owners of rental housing (including farm labor housing) to encourage implementation of energy efficiency.
- Encourage residents to hire Efficiency Excellence Network (EEN) contractors when completing energy efficiency projects by including links to the EEN on municipal/regional websites.
- Make information available about lending programs that can improve the efficiency of older housing stock, such as Efficiency Vermont's "Heat Saver" loan and USDA Direct and Guaranteed Loan Programs, for single homes and multi-family homes.

### Energy generation that provides the best cost-benefit to the region will be promoted.

- Promote wood-based energy generation to support the region's forest industry.
- Encourage the development of energy facilities and resources that help sustain local agriculture and forestry (i.e. grass/wood-pellets, small-wind, solar, farm-methane, wood-chip, biodiesel).

### Environmental and aesthetic impacts of energy generation and usage will be considered.

### There will be broad public participation in the decision-making process.

- Encourage the Vermont Legislature to develop policies that support the development of solar, small-wind, hydro-electric, farm methane, biodiesel and biomass generation facilities, while respecting current local land use and the culture of the region.
- Encourage the PUC to examine the long-term sustainability of proposed facilities.

### **Assessment of local needs and values on new energy development will be encouraged.**

- Encourage towns to address energy development in town planning and zoning.
- Provide assistance to businesses/municipalities to develop cogeneration and other alternative energy strategies.

### Reduce the region's carbon footprint through the expansion of a closed loop soil-to-soil regional food system that sustains and feeds the people of the Northeast Kingdom.

- Coordinate movement and storage of goods to achieve maximum efficiency.
- Redirect food scraps and other organics from the waste stream in a manner that maximizes efficiency and minimizes hauling.
- Support and further the goals and strategies of the NEK Food System Plan through its Leadership Group.
- Identify and publicize opportunities for shared truck space among existing growers and producers.
- Generate better awareness of existing distribution resources, such as freight service.
- Identify and publicize opportunities for shared storage space among existing growers and producers.
- Explore the feasibility of establishing a leased storage facility.
- Assess market demand for products and existing shippers and distributors already moving to external (New York and Boston) markets (including opportunities for backhauling).
- Identify infrastructure needed to maximize inbound, outbound, and internal freight movement.
- Promote the use of and increase the amount of on-farm power and community energy generation and the use of renewable energy for farming and food production (such as

anaerobic digesters, solar, wind, biomass, and biodiesel, in accordance with local and regional planning priorities).

- Support local incentives for siting solar installations away from most productive agricultural soils.
- Explore the use of compost heat recovery; identify challenges, opportunities, and funding sources.
- Provide and increase opportunities for onsite and commercial composting training and education, sustainable farming methods focused on reduction and reuse of wastes (closed-loop nutrient systems), and shared facilities and infrastructure to transfer and store compost.
- Establish a coordinated marketing campaign that dispels the perceptions around local food costing more and extols the long-range benefits of staying local (e.g. dollars re-circulated into the economy, food miles travelled).
- Explore the feasibility of a developing a "food miles" measurement that can be used in marketing local foods.

# Chapter Three: Utilities & Facilities

## INTRODUCTION

This chapter of the regional plan identifies existing educational, recreational, and public facilities, and utilities including power generating plants, transmission lines, telecommunications facilities, public water supply, and sewage disposal systems.

The economic stability and orderly land use development of communities largely depends on the capacity of local and regional utilities and facilities. This chapter identifies areas where facilities need to be expanded in order to accommodate the growth that communities desire and/or that will result from pending significant development projects in the region. Goals, and strategies to achieve them, are contained at the end of each subsection in this chapter.

## I. EDUCATIONAL FACILITIES

### Overview

The Northeast Kingdom currently has 39 public schools, and 10 publicly-funded independent schools serving the 55 towns and gores in the region. Additionally, there are 6 independent schools that are approved or recognized by the Vermont Department of Education, but which are not eligible for publicly-funded tuition payments due to a religious affiliation. Of these 55 schools, 11 serve the secondary grades only (grades 7th or 9th through 12th), including two career/technical centers. Three public schools and two independent schools in the region provide education for primary and secondary grades in one school. (see Table 3.2)

Independent schools having boarding or home-stay programs add greatly to the cultural diversity of the community and act as a generator for the local economy. Three schools in the region have boarding programs: Burke Mountain Academy, Lyndon Institute, and St. Johnsbury Academy.

Sixteen towns in the region, including the six Essex County towns of the Unified Towns and Gores (UTG), do not operate schools and instead pay tuition for all students in grades K-12 to attend other schools. Another 16 towns operate an elementary school or belong to a union elementary district, but tuition all students in the secondary grades. Two towns tuition students in the 7th and 8th grades only, and two towns tuition just the elementary grades. (See Figure 3.1)

Both public and approved independent schools accept students from "school choice" towns (as schools that tuition some or all grades are known) and are eligible to receive payment via the tuition voucher system unless the school is religiously affiliated. Some of the independent schools offer specialized education to serve particular educational needs. In order to be approved by the State of Vermont, independent schools are required to provide a minimum level of curriculum and instruction.

School Choice towns generally allow families to send students to the school of their choice, usually provided the tuition cost does not exceed an amount pre-set by the sending school district. Transportation to school in these towns is generally left to the students' families.

Average Daily membership is a count of resident and state-placed students who receive an elementary or secondary education at public expense. "Elementary" students include those in Early Education, PreKindergarten, Kindergarten, and 1st through 6th grades. "Secondary" students include those in grades 7-12.

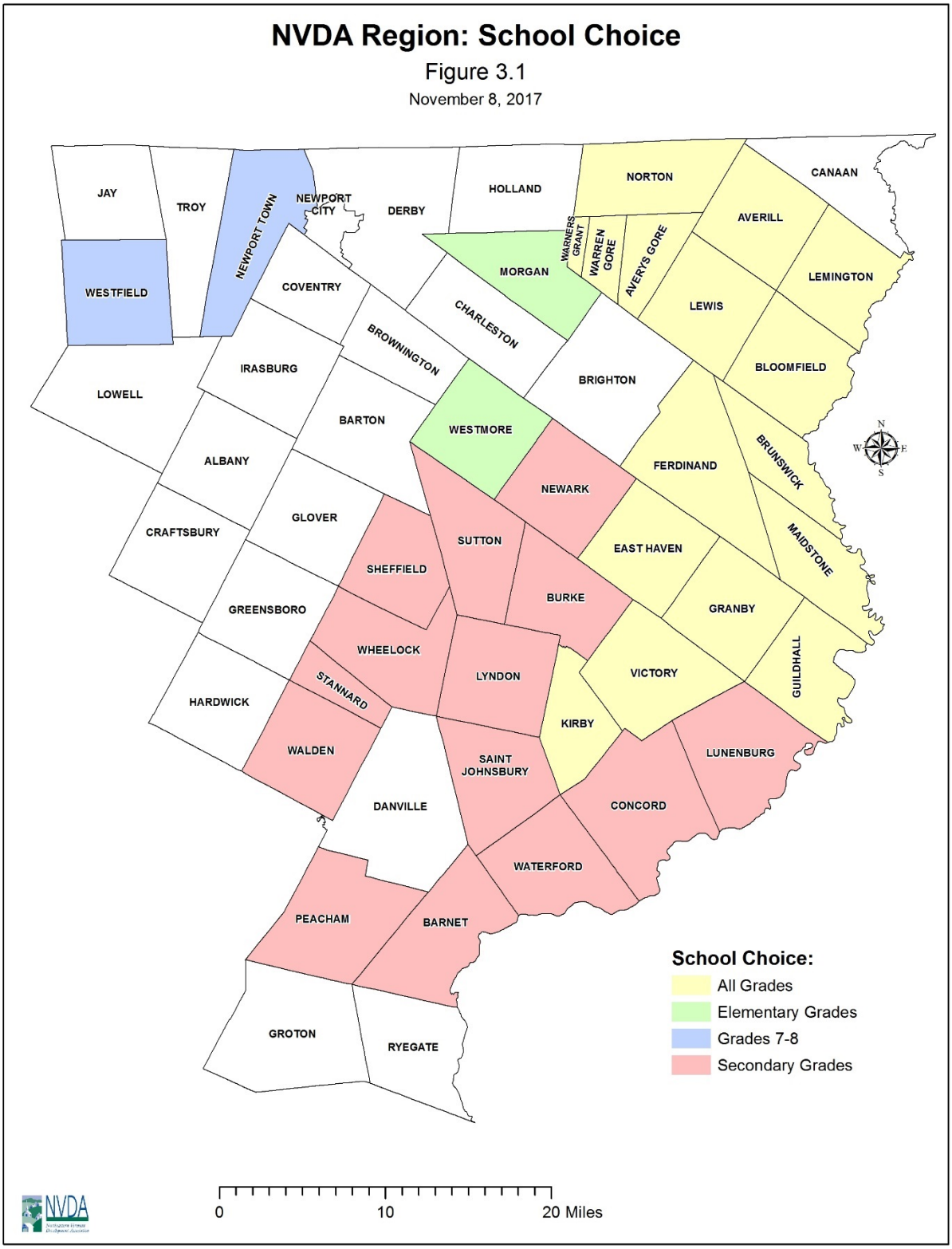
Table 3.1 gives an indication of the number of students sent from school choice towns to independent schools and public schools in other districts in the 2016 - 2017 school year.

Every year the State Department of Education publishes the "Average Announced Tuition" for public and approved independent schools in Vermont. In the 2017-2018, the Average Announced Tuition of Union Elementary Schools was $13,496, and Union 7th-12th Grade Schools was $15,130. The Department also publishes the Announced Tuition for each school as reported by the Supervisory Unions/Districts. It is noted that tuition rates do not necessarily correspond to per-pupil spending – rather, it is the amount that is paid by the sending district (usually one that does not operate a school) to the receiving school district. The tuition rates of private schools in the region are generally competitive with tuition rates at the region's public schools. Schools in New Hampshire are also a desirable option for students in Vermont school choice towns, particularly in the eastern Essex County towns along the Connecticut River.

**Table 3.1**
**Northeast Kingdom School Choice Towns**
**Average Daily Membership by District FY 2017**

| School District | County | Grades Tuitioned | ADM FY 2017 | |
|---|---|---|---|---|
| | | | Elem. | Second. |
| Barnet | Caledonia | 9-12 | NA | 127 |
| Burke | Caledonia | 9-12 | NA | 130 |
| Kirby | Caledonia | K-12 | 46 | 40 |
| Lyndon | Caledonia | 9-12 | NA | 293 |
| Newark | Caledonia | 9-12 | NA | 34 |
| Peacham | Caledonia | 7-12 | NA | 45 |
| Sheffield | Caledonia | 9-12 | NA | 46 |
| St. Johnsbury | Caledonia | 9-12 | NA | 534 |
| Stannard | Caledonia | 7-12 | NA | 19 |
| Sutton | Caledonia | 9-12 | NA | 66 |
| Walden | Caledonia | 9-12 | NA | 66 |
| Waterford | Caledonia | 9-12 | NA | 104 |
| Wheelock | Caledonia | 9-12 | NA | 44.2 |
| Bloomfield | Essex | K-12 | 8 | 13 |
| Brunswick | Essex | K-12 | 2 | 9 |
| East Haven | Essex | K-12 | 29 | 22 |
| Ferdinand | Essex | K-12 | NA | NA |
| Granby | Essex | K-12 | 2 | 1 |
| Guildhall | Essex | K-12 | 11 | 12 |
| Lemington | Essex | K-12 | 11 | 7 |
| Lunenburg | Essex | 9-12 | NA | 70 |
| Maidstone | Essex | K-12 | 7 | 5 |
| Norton | Essex | K-12 | 5 | 8 |
| Victory | Essex | K-12 | 7 | 6 |
| Coventry | Orleans | 9-12 | NA | 63 |
| Morgan | Orleans | K-6 | 37 | NA |
| Newport Town | Orleans | 7-8 | NA | 90 |
| Westfield | Orleans | 7-8 | NA | 27 |
| Westmore | Orleans | K-8 | 13 | NA |

Source: Vermont Department of Education, Average Daily Membership report for 2016-2017


NVDA Region: School Choice
Figure 3.1
November 8, 2017
JAY
TROY
NEWPORT TOWN
NEWPORT CITY
DERBY
HOLLAND
NORTON
CANAAN
AVERILL
WARNERS GRANT
WARREN GORE
AVERY'S GORE
LEMINGTON
WESTFIELD
COVENTRY
MORGAN
LEWIS
CHARLESTON
BROWNINGTON
BRIGHTON
BLOOMFIELD
IRASBURG
LOWELL
BARTON
WESTMORE
ALBANY
FERDINAND
BRUNSWICK
NEWARK
GLOVER
CRAFTSBURY
SUTTON
EAST HAVEN
MAIDSTONE
SHEFFIELD
BURKE
GRANBY
GREENSBORO
WHEELOCK
LYNDON
VICTORY
GUILDHALL
HARDWICK
STANNARD
KIRBY
WALDEN
SAINT JOHNSBURY
LUNENBURG
DANVILLE
CONCORD
WATERFORD
PEACHAM
BARNET
GROTON
RYEGATE
School Choice:
All Grades
Elementary Grades
Grades 7-8
Secondary Grades
0
10
20 Miles
NVDA

| Table 3.2<br>Schools in the Northeast Kingdom | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **School Name** | **Town** | **County** | **Type** | **Description** | **Grades served** | **Enrollment School year ending …** | | | | | **Fiscal Year 2018 Announced Tuition** | |
| | | | | | | **2013** | **2014** | **2015** | **2016** | **2017** | **Elem.** | **Second.** |
| CALEDONIA COUNTY | | | | | | | | | | | | |
| Barnet Elementary School | Barnet | Caledonia | Public | Day School | PK-8 | 219 | 217 | 213 | 213 | 206 | $15,800 | $15,700 |
| Burke Mountain Academy | East Burke | Caledonia | Approved Independent | Boarding School with skiing program | 8-12 | 54 | 59 | 63 | 66 | 56 | NA | NA |
| Burke Town School | Burke | Caledonia | Public | Day School | PK-8 | 201 | 204 | 217 | 210 | 206 | $ 14,747 | $14,747 |
| Arlington School (formerly Caledonia School) | St. Johnsbury | Caledonia | Approved Independent | Special Education Day School | 9-12 | 26 | 19 | 20 | 17 | 16 | NA | NA |
| Cornerstone School | St. Johnsbury | Caledonia | Approved Independent | Special Education day School | 4-12 | 21 | 24 | 27 | 29 | 20 | NA | NA |
| Danville School | Danville | Caledonia | Public | Day School | PK-12 | 374 | 356 | 346 | 366 | 366 | $12,300 | $15,100 |
| East Burke School | East Burke | Caledonia | Approved Independent | Day School | 8-12 | 8 | 11 | 13 | 8 | 9 | NA | NA |
| Green Mountain Technology and Career Center (Forestry & Land Management Program) | Hardwick | Caledonia | Public | Career/Technical Center and adult education | 7-12 | NA | NA | NA | NA | NA | NA | $15,415 |
| Hardwick Elementary | Hardwick | Caledonia | Public | Day School | PK-6 | 276 | 275 | 277 | 253 | 253 | $15,800 | NA |
| Hazen UHSD #26 | Hardwick | Caledonia | Public | Day School | 7-12 | 368 | 368 | 347 | 330 | 332 | NA | $17,700 |
| Lyndon Educational Alternative Resources Network, Inc.(LEARN) | Lyndonville | Caledonia | Approved Independent | General and Special Education Day School | 7-12 | 22 | 23 | 17 | 18 | 19 | NA | NA |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lyndon Institute | Lyndon Center | Caledonia | Approved Independent | Day and Boarding School, offers special education in all disability categories | 9-12 | 574 | 542 | 549 | 571 | 586 | NA | $ 16,995 |
| Lyndon Town School | Lyndon | Caledonia | Public | Day School | PK-8 | 484 | 518 | 492 | 472 | 506 | $14,747 | $14,747 |
| Millers Run School USD #37 | Sheffield | Caledonia | Public | Day School | PK-8 | 130 | 126 | 116 | 110 | 118 | $ 14,747 | $ 14,747 |
| Newark School | Newark | Caledonia | Public | Day School | PK-8 | 67 | 57 | 59 | 67 | 61 | $14,747 | $14,747 |
| Peacham Elementary School | Peacham | Caledonia | Public | Day School | PK-6 | 50 | 49 | 48 | 49 | 56 | $17,400 | NA |
| Riverside School | Lyndonville | Caledonia | Approved Independent | Day School | K-8 | 71 | 81 | 72 | 73 | 78 | NA | NA |
| St. Johnsbury Academy | St. Johnsbury | Caledonia | Approved Independent | Day and Boarding School, offers Special Education in all disability categories | 9-12 | 914 | 984 | 949 | 963 | 933 | NA | $16,885 |
| St. Johnsbury Schools | St. Johnsbury | Caledonia | Public | Day School | PK-8 | 658 | 690 | 685 | 742 | 710 | $10,025 | $ 10,025 |
| Sutton School | Sutton | Caledonia | Public | Day School | PK-8 | 108 | 107 | 110 | 99 | 104 | $14,747 | $14,747 |
| Thaddeus Stevens School | Lyndon Center | Caledonia | Approved Independent | Day School | 1-8 | 60 | 72 | 76 | 80 | 60 | NA | NA |
| Walden School | Walden | Caledonia | Public | Day School | PK-8 | 108 | 101 | 93 | 92 | 102 | $12,100 | $10,200 |
| Waterford Elementary School | Waterford | Caledonia | Public | Day School | PK-8 | 174 | 151 | 152 | 143 | 147 | $12,500 | $12,500 |
| | ESSEX COUNTY | | | | | | | | | | | |
| Brighton Elementary School | Brighton | Essex | Public | Day School | PK-8 | 88 | 91 | 93 | 93 | 104 | $14,425 | $ 14,425 |
| Canaan Schools | Canaan | Essex | Public | Day School | PK-12 | 202 | 184 | 193 | 195 | 189 | $16,000 | $ 17,500 |
| Concord School | Concord | Essex | Public | Day School | PK- 8 | 208 | 218 | 212 | 146 | 132 | $13,500 | $ 13,500 |
| Lunenburg Schools | Lunenburg | Essex | Public | Day School (separate elem. & middle schools) | PK-8 | 114 | 110 | 120 | 134 | 139 | $14,500 | $ 14,500 |

| ORLEANS COUNTY | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Albany Community School | Albany | Orleans | Public | Day School | PK-8 | 95 | 95 | 94 | 93 | 78 | $ 10,050 | $ 10,050 |
| Barton Graded School | Barton | Orleans | Public | Day School | PK-8 | 197 | 181 | 193 | 172 | 159 | $ 10,050 | $ 10,050 |
| Brownington Central School | Brownington | Orleans | Public | Day School | PK-8 | 110 | 116 | 106 | 112 | 124 | $ 10,050 | $ 10,050 |
| Charleston Elementary | Charleston | Orleans | Public | Day School | PK-8 | 113 | 130 | 122 | 114 | 112 | $ 12,019 | $ 12,019 |
| Coventry Village School | Coventry | Orleans | Public | Day School | PK-8 | 108 | 102 | 105 | 132 | 137 | $10,951 | $ 10,951 |
| Craftsbury Schools | Craftsbury | Orleans | Public | Day School | PK-12 | 160 | 168 | 179 | 190 | 196 | $13,800 | $ 17,900 |
| Derby Elementary School | Derby Line | Orleans | Public | Day School | PK-6 | 395 | 384 | 385 | 455 | 423 | $ 10,968 | NA |
| Glover Community School | Glover | Orleans | Public | Day School | PK-8 | 136 | 135 | 134 | 128 | 127 | $ 10,050 | $ 10,050 |
| Holland Elementary School | Holland | Orleans | Public | Day School | PK-6 | 68 | 67 | 52 | 36 | 41 | $13,500 | NA |
| Irasburg Village School | Irasburg | Orleans | Public | Day School | PK-8 | 136 | 148 | 140 | 144 | 134 | $ 10,050 | $ 10,050 |
| Jay/Westfield Joint Elementary | Jay | Orleans | Public | Day School | PK-6 | 97 | 86 | 86 | 93 | 79 | $13,266 | NA |
| Lake Region UHSD #24 | Barton | Orleans | Public | Day School | 9-12 | 361 | 346 | 352 | 359 | 394 | NA | $ 14,700 |
| Lakeview USD #43 | Greensboro | Orleans | Public | Day School | PK-6 | 78 | 83 | 90 | 89 | 91 | $14,100 | NA |
| Lowell Graded School | Lowell | Orleans | Public | Day School | PK-8 | 112 | 118 | 115 | 114 | 107 | $ 10,500 | $ 10,500 |
| Newport City Elementary | Newport City | Orleans | Public | Day School | PK-6 | 345 | 343 | 335 | 350 | 353 | $ 11,000 | NA |
| Newport Town School | Newport | Orleans | Public | Day School | PK-6 | 100 | 105 | 89 | 107 | 120 | $ 13,250 | NA |
| North Country Career Center | Newport City/ Derby | Orleans | Public | Career/Tech. Ctr. & adult education | 7-12 | NA | NA | 0 | NA | | NA | $ 14,662 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| North Country Junior UHSD# 22 | Derby Center | Orleans | Public | Day School | 7-8 | 272 | 257 | 270 | 281 | 259 | NA | $ 16,000 |
| North Country Senior UHSD #22 | Newport City | Orleans | Public | Day School | 9-12 | 850 | 836 | 796 | 724 | 711 | NA | $ 15,900 |
| Orleans Elementary School | Barton | Orleans | Public | Day School | PK-8 | 114 | 114 | 115 | 125 | 119 | $ 10,050 | $ 10,050 |
| Troy School | Troy | Orleans | Public | Day School | PK-8 | 158 | 199 | 184 | 173 | 189 | $ 12,400 | $ 12,400 |
| Turning Points School | Newport City | Orleans | Approved Independent | Special education school | 1-12 | NA | NA | 27 | 28 | 21 | NA | NA |
| *Residents in 2015 voted to close grades 9-12 at the Concord School. | | | | | | | | | | | | |

1

| Independent Schools in Northeast Kingdom Not Eligible for Publicly-Funded Tuition Payments | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **School Name** | **Town** | **County** | **Type** | **Description** | **Grades served** | **Enrollment Year ending…** | | | | |
| | | | | | | **2013** | **2014** | **2015** | **2016** | **2017** |
| Caledonia Christian School | St. Johnsbury | Caledonia | Approved Independent | Seventh Day Adventist Day School | 1-8 | 9 | 8 | 14 | 11 | 12 |
| Cornerstone Christian School (the Fold, Inc.) | Lyndonville | Caledonia | Recognized Independent | | 6-12 | 5 | 11 | 6 | 4 | 4 |
| Good Shepherd Catholic School | St. Johnsbury | Caledonia | Approved Independent | Roman Catholic Day School | PreK-8 | 156 | 138 | 104 | 88 | 75 |
| St. Paul's Elementary | Barton | Orleans | Approved Independent | Roman Catholic Day School | K-8 | 95 | 76 | 69 | 17 | 69 |
| United Christian Academy | Newport City | Orleans | Independent, Recognized | Christian Day School | K-12 | 82 | 87 | 103 | 64 | 77 |
| Twelve Tribes Community Church School | Island Pond (Brighton) | Essex | Recognized Independent | | Ages 6 -16 | NA | 1 | 6 | 3 | -- |

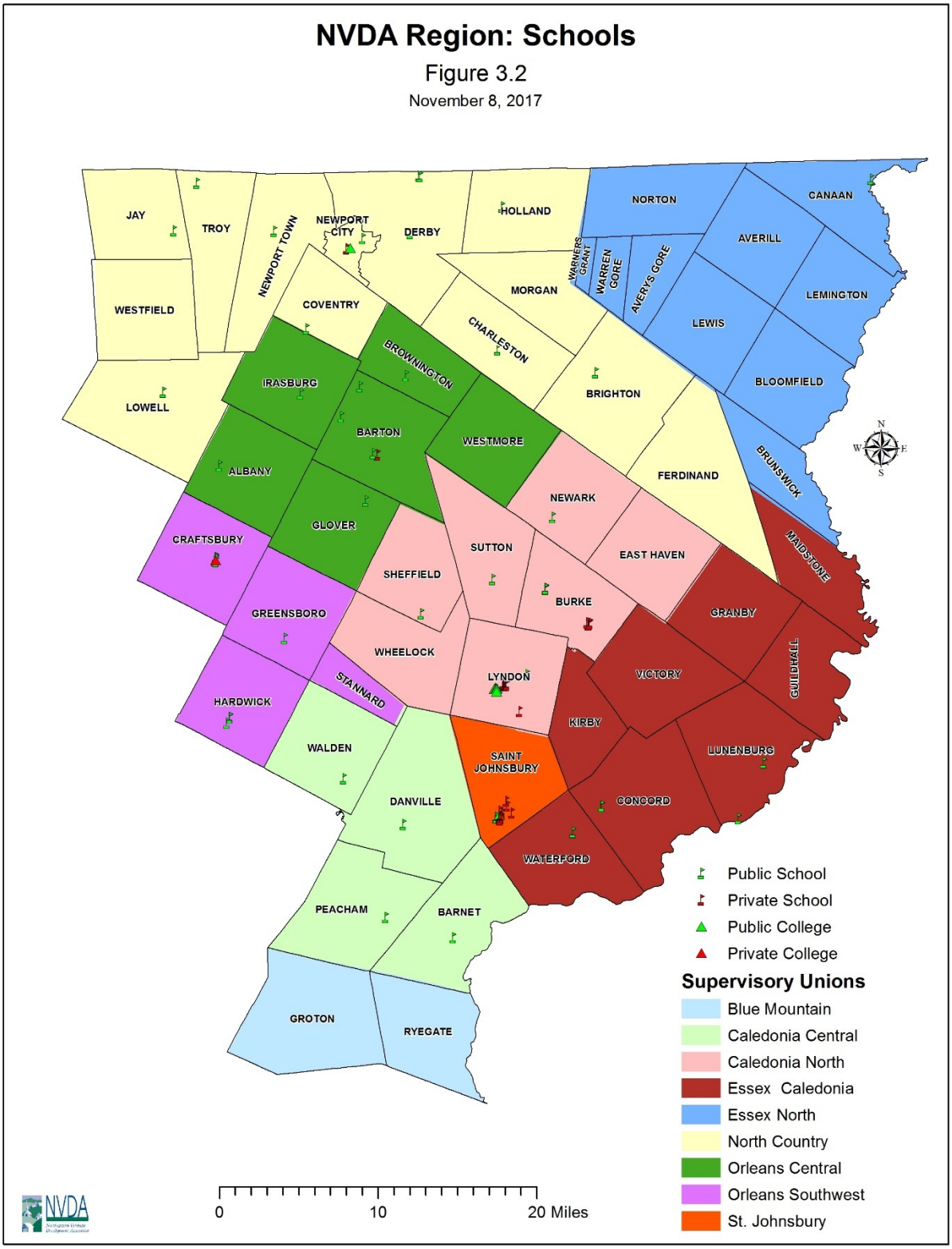
2

Schools that experienced increased enrollment > 10 % (and at least 10 students) from 2013-2017

4

5 Schools that experienced a decrease in enrollment > 10% (and at least 10 students) from 2013 to 2017

6


NVDA Region: Schools
Figure 3.2
November 8, 2017
JAY
TROY
NEWPORT TOWN
NEWPORT CITY
DERBY
HOLLAND
NORTON
CANAAN
AVERILL
WARNERS GRANT
WARREN GORE
AVERYS GORE
LEMINGTON
WESTFIELD
COVENTRY
MORGAN
LEWIS
CHARLESTON
BROWNINGTON
IRASBURG
BRIGHTON
BLOOMFIELD
LOWELL
BARTON
WESTMORE
BRUNSWICK
ALBANY
FERDINAND
NEWARK
GLOVER
CRAFTSBURY
SUTTON
EAST HAVEN
MAIDSTONE
SHEFFIELD
BURKE
GRANBY
GREENSBORO
WHEELOCK
LYNDON
VICTORY
GUILDHALL
STANNARD
HARDWICK
KIRBY
LUNENBURG
WALDEN
SAINT JOHNSBURY
DANVILLE
CONCORD
WATERFORD
PEACHAM
BARNET
GROTON
RYEGATE
N
W
E
S
0
10
20 Miles
Public School
Private School
Public College
Private College
Supervisory Unions
Blue Mountain
Caledonia Central
Caledonia North
Essex Caledonia
Essex North
North Country
Orleans Central
Orleans Southwest
St. Johnsbury

1
2

School size, distance from home, student diversity, physical facilities, academic programs offered including availability of Advanced Placement courses, and sports and extracurricular offerings are among the many factors considered by families in school choice towns when choosing a school.

Figure 3.1 depicts School Choice towns in the region, by grade levels tuitioned. Benefits of school choice include more flexibility for families and no school buildings to maintain. Some drawbacks are long travel times and high transportation expenses for families (or for towns that provide school bus transportation.) In addition, due to state formulas, a town tuitioning a handful of students may actually have a *higher* education tax rate than a town that maintains a school with hundreds of students.

## Home Study & Home School

Some families opt for "Home Study" programs to educate their children. The child is still taught a minimum course of study according to 16 V.S.A. Section 906, with an evaluation at the end of each school year by a qualified teacher, a standardized achievement test, or a portfolio. The number of home-schooled students in the Northeast Kingdom over the past 8 has ranged from a low of 327 in the 2009/10 school year to a high of 372 in the 2013/14 school year. (See Table 3.3). Data specifying the grade level was not available, and numbers tend to vary throughout the school year. Some students are home-schooled in some subjects, and attend school for other subjects or extracurricular activities.

In total, homeschoolers in the 2016/17 school year accounted for about 3.5 percent of the student population in the region.

**Table 3.3**
**Home-schooled students in the Northeast Kingdom**

| County | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 |
|---|---|---|---|---|---|---|---|---|
| Caledonia | 162 | 171 | 193 | 210 | 215 | 216 | 201 | 192 |
| Essex | 30 | 26 | 24 | 23 | 23 | 15 | 15 | 25 |
| Orleans | 135 | 144 | 139 | 139 | 134 | 126 | 134 | 130 |
| **Total NEK Region** | **327** | **341** | **356** | **372** | **372** | **357** | **350** | **347** |

Source: Vermont Agency of Education, response to data request, October 2017

## Supplemental Educational Programs

Another important educational resource in the region is educational/non-profit organizations which run programs for youth that lie outside traditional academic subjects. For example, the University of Vermont Cooperative Extension coordinates a variety of 4-H programs based in locations throughout the region, in subjects such as arts and crafts, cooking, agriculture and livestock, natural resources, energy, and teen leadership.

In 2012, Catamount Arts and the St. Johnsbury Athenaeum initiated an arts education program geared towards pre-k through 8th grade students. Daytime and afterschool programs have served elementary students in St. Johnsbury and neighboring towns in Caledonia County, and have included classes in music, dance, and studio art. Most recently, Catamount Arts has initiated an afterschool violin instruction program in the St. Johnsbury School which is free to all students, based on the international "El Sistema" model.

Other examples of non-profit organizations that provide arts-based education and enrichment programs include the Greensboro Arts Alliance and Residency (GAAR), based in Greensboro, Orleans County, that serves residents of all ages; and Vermont Children's Theater, based in Lyndon, Caledonia County, that provides a free summer theater program for students in the elementary and high school grades.

## Secondary Education

Table 3.4 shows the 2015-2016 data on dropout rates of the publicly-funded secondary schools in the three counties of the Northeast Kingdom. Since some secondary schools begin at grade 7 and some at grade 9, both drop-out rates are shown. When students fail to graduate from a secondary level institution (or levels beyond), their opportunities for gainful employment in the future are greatly diminished. It is important that schools and communities strive to help students complete their education.

**Table 3.4**
**Regional Education Comparison 2015-2016**

| County | School | Dropout rate Grades 7-12 | Dropout rate Grades 9-12 |
|---|---|---|---|
| Caledonia | LYNDON INSTITUTE | -- | 2.88% |
| Caledonia | ST JOHNSBURY ACADEMY | -- | 0.97% |
| Caledonia | DANVILLE | 1.27% | 1.83% |
| Caledonia | HAZEN UHS #26 | 1.49% | 2.17% |
| Essex | CANAAN SCHOOLS | 1.79% | 2.38% |
| Essex | CONCORD SCHOOL | 0% | -- |
| Orleans | CRAFTSBURY SCHOOLS | 0% | 0% |
| Orleans | LAKE REGION UHS #24 | 3.06% | 3.06% |
| Orleans | NORTH COUNTRY UHS #22A | -- | 3.89% |
| Vermont | STATEWIDE TOTAL | 1.95% | 2.8% |

Source: VT Agency of Education, 2013-2014 Dropout & High School Completion Report

Table 3.5 depicts educations levels of residents of the Northeast Kingdom as compared to the State. Region-wide, Caledonia County has the population with the highest education levels of the three counties, although it still lags behind the State. About 90 percent of the adult population in Caledonia County has a high school education, compared to about 92% of the State's population. 27% have a Bachelor's degree or higher in Caledonia, as compared to 36% of State's residents.

**Table 3.5**
**Educational Attainment in the Northeast Kingdom and State**

| 2015 | Caledonia | Essex | Orleans | Vermont |
|---|---|---|---|---|
| **Population 25 years and older** | 21,639 | 4,689 | 19,585 | 436,657 |
| Less than 9th Grade | 2.9% | 7.1% | 5.0% | 2.9% |
| 9th to 12th Grade, no diploma | 7.0% | 8.4% | 8.7% | 5.3% |
| High School Graduate (includes equivalency) | 36.1% | 43.3% | 38.7% | 30.1% |
| Some college, no degree | 18.6% | 15.7% | 18.2% | 17.4% |
| Associate's Degree | 8.3% | 9.5% | 7.2% | 8.4% |
| Bachelor's Degree | 16.0% | 10.7% | 14.4% | 21.7% |
| Graduate or Professional Degree | 11.0% | 5.3% | 7.7% | 14.3% |
| High School Graduate or Higher | 90.1% | 84.5% | 86.3% | 91.8% |
| Bachelor's Degree or Higher | 27.0% | 16% | 22.1% | 36.0% |
| **2000** | | | | |
| **Population 25 years and older** | 19,596 | 4,384 | 17,814 | 404,718 |
| High School Graduate or Higher | 82.6% | 75% | 78.2% | 86.4% |
| Bachelor's Degree or higher | 22.5% | 10.8% | 16.1% | 29.4% |

Source: U.S. Census Bureau, Census 2000, American Community Survey 2015

Residents of Essex County have the lowest level of educational attainment of the three counties, with about 85% having a High School diploma. However, when comparing the education levels of the region's 25 and older population to what it was in 2000, there has been a marked improvement.

Higher education enables residents to be more competitive in the higher-wage job market. An educated population is something that businesses will look for when making a decision to locate in an area, so a highly-educated population in the Northeast Kingdom is important to the future economic outlook of the region.

## Post-Secondary and Adult Education

At the post-secondary level, the region is home to four colleges: Sterling College in Craftsbury, two branches of the Community College of Vermont in Newport and St. Johnsbury, Springfield College in St. Johnsbury (School of Human Services), and Lyndon State College in Lyndon. Effective July 1, 2018, Lyndon State College and Johnson State College will merge to become Northern Vermont University, a two-campus institution of higher education.

Lyndon State College has signature programs that draw students from outside the State. The college has been recognized nationally for both its Atmospheric Sciences and Electronic Journalism programs.

Colleges and educational facilities are often viewed as "clean industries" and communities vie to have them. Expanding education institutions within the region is encouraged.

Vermont's adult education and literacy programs are offered through 10 full-service centers and several satellite centers across the state. Full-service centers provide a full range of services, from beginning to advanced literacy in math, reading, writing, interpersonal skills, workplace skills, General Educational Development (GED), Adult Diploma Program (ADP), English to Speakers of other Language (ESOL), High School Completion Program (HSCP) and basic computer instruction. Service centers in the Northeast Kingdom are located in Canaan, Newport, St. Johnsbury and Hardwick and are operated by Northeast Kingdom Learning Services (neklsvt.org).

## Technical and Alternative Education

Technical education has become an important and viable part of our educational system, allowing individuals to specialize in work areas typically not addressed by more traditional secondary school programs, and to earn industry-recognized credentials. These programs serve both high school-aged students and adult learners.

Technical education centers in the Northeast Kingdom include: The Canaan Career Center, Lyndon Institute Technical Center, St. Johnsbury Academy Applied Technologies Center, the North Country Career Center (NCCC), and the Green Mountain Technology and Career Center (GMTCC). The school districts of Ryegate and Groton in southern Caledonia County are served by the River Bend Career and Technical Center in Bradford.

The Canaan Career Center at Canaan School in Essex County offers technical education programs with courses of study in business administration and technology, building trades and restoration carpentry, diversified agriculture, fire and emergency services, and health services. The building trades program makes student labor available to nonprofit organizations seeking carpentry work, and students develop advanced skills in building conservation and historic preservation, gaining a sense of pride and ownership in the community.

The St. Johnsbury Academy program offers course in the career clusters of Agriculture, Food, & Natural Resources; Arts and Communication; Architecture and Construction; Business; Hospitality and Tourism; Human Services; Information Technology; Transportation; and Distribution and Logistics.

Lyndon Institute offers career sciences programs in Automotive Technology, leading to NATEF certification; Human Services with an emphasis on Early Childhood Education; Allied Health, leading to LNA

certification; Precision Machining; Welding, leading to AWS certification; Innovation/Engineering Career Academy; and Environmental Stewardship.

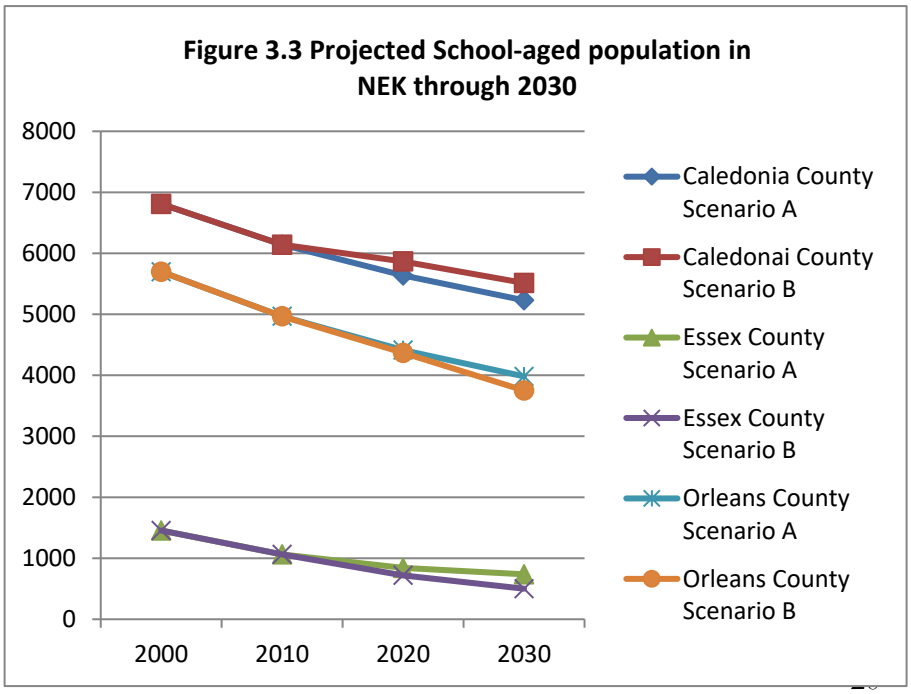
The NCCC is based in Newport and serves high school students and adults with programs in Agriculture and Natural Resources, Arts and Communications, Engineering and Technical Systems, Business Systems, and Health and Human Services. The Harold J. Haynes Memorial Land Lab of NCCC is located on 60 acres on Lower Quarry Road in Derby. Students in the Natural Resources, Building Trades, Heavy Equipment and Protective Services Programs participate in classroom activities as well as hands on land management, vehicle repair, construction and fire & emergency response safety training at this facility. In 2014 NCCC added a program in hospitality and tourism, and in 2015 a program in mechatronics and robotics was introduced. NCCC also provides a smaller selection of satellite programs and technical training at Lake Region High School in Barton.

GMTCC, based in Lamoille County, serves students at Hazen Union and Craftsbury schools. A satellite program in Hardwick located in a building behind the Hazen Union School campus offers a program in Forestry and Land Management Technology. This program provides students with introductory and basic training in areas of forest products, natural resource management, wood production, value added wood products, and the technologies associated with these applications. Student field experiences are conducted with forest land at Hazen, Lamoille Union, and at wood manufacturing facilities. Traditional sugaring operations are conducted in Hardwick with field experiences at advanced commercial operations.

## Issues and Concerns

The condition of the physical plant (buildings and grounds), the ability of school buildings to accommodate the student population, student to teacher ratios, and the academic strength of the school (measured largely by standardized test scores) are all items that provide an indication of the ability of a school to provide a good education to all students. Schools, in turn, are often a good indicator of the stability and economic health of the larger community.

The capacity of the physical plant of public schools in the Northeast Kingdom is expected to be sufficient for the foreseeable future. Based on population projections prepared by the State in 2013, the school-aged population is projected to decrease in all three counties of the Northeast Kingdom through 2030 (see Figure 3.3).




The State provided projections under two different scenarios: "A" based on the healthy growth experienced in the 1990s, and scenario "B", based on the slower growth rates of the 2000s.

On shown on table 3.2, . nine schools in the region experienced growth of greater than 10% from 2013 to 2017. Seven schools in the region experienced a decrease in enrollment of greater than 10% during this period.

A more pressing issue than capacity of the region's schools is the rising per-pupil cost of education. As populations shrink and pupil count goes down, per pupil cost can rise in towns that operate their own schools, resulting in a higher homestead education tax rate. It is important to note that because of the way in which education funding is structured, growth in a community that leads to more school-aged children does not necessarily result in an increase in the education tax rate in that town, even if the overall school budget increases. Vermont's state-funded education system links property tax rates to per-pupil spending rather than the overall school budget, so districts that have schools with high enrollment or that belong to a union school district typically tend to see lower education tax rates because of the economy of scale.

School choice Towns do not deal with physical plants of schools, and the budget of school districts in these towns are largely dependent on decisions made by neighboring school districts or the boards of independent schools. For school choice towns, education costs are dependent on tuition rates at the schools which students attend and vary widely (see table 3.2). In fiscal year 2017, both the highest and one of the lowest spending school districts in the region were in towns that tuitioned all grades: Lemington, with 14.98 equalized pupils, had the highest per-pupil spending in the State at $ 23,947.8. Brunswick, with 19.18 equalized pupils, spent just $ $7,444.53 per pupil. These figures represent spending "per equalized pupil" which assigns a weight to students based on grade level and other special education needs. (It is noted that the school districts of Lemington and Brunswick are among the ten towns that have voted to merge to form the NEK Choice school district, which will become effective in April 2018). In Caledonia County, one of the highest- and lowest-spending districts in 2017 were towns that had a designated elementary school but tuitioned its high school grades: Peacham had a total equalized pupil count of 87.59 in FY 2017, and its PK-6 elementary school had enrollment of 56., Peacham spent $18,112.83 per equalized pupil in FY2017, while St. Johnsbury, which maintains an elementary school with enrollment of 710 in 2017, and tuitions grades 9-12, had per-pupil spending of just $12,541.14. St. Johnsbury had a total of 1,119.29 equalized pupils in grades PK-12 in 2017.

There are many expenses and funding sources that contribute to the determination of per-pupil spending, but in general, low-per pupil spending is easier to accomplish in schools with high enrollment. It is noted that the St. Johnsbury Elementary School has the largest enrollment of any elementary school in the Northeast Kingdom. In addition, the location of the school in the center of a densely developed residential area allows many of the students to walk to school, alleviating some of the school transportation costs.

## School District Consolidation

In recent years State legislation has been introduced to address the issue of high education costs, including legislation designed to encourage, or even mandate, school consolidation.

In the Northeast Kingdom, several schools have closed in the last 10 years. Most recently, Guildhall closed its elementary school, and the Concord School eliminated the high school grades, and now tuitions those students to other schools.

The benefits of further school consolidation to increase efficiencies and reduce per pupil spending are limited in the region, in part due to the long distances between schools and the cost of student transportation. (See Figure 3.2)

Although many communities in the Northeast Kingdom are opposed to dissolution of local school boards and the forced closure of local schools, Supervisory Unions in the region are looking at ways to reduce costs by sharing items such as financial accounting systems and maintenance services.

Under State Act 46, study committees were formed to investigate the possibilities for merger of school districts.

In 2017, ten school districts in the Northeast Kingdom combined to form the NEK Choice School District, and eight school districts combined to form the Kingdom East School District.

The NEK Choice School District includes the school districts of Bloomfield, Brunswick, East Haven, Granby, Guildhall, Kirby, Lemington, Maidstone, Norton and Victory. This district will become part of the Essex North Supervisory Union (ENSU), and will become operational on July 1, 2018. Prior to creation of the NEK Choice School District, the ENSU included one school district that operated a PK-12 School (Canaan) and four nonoperating districts (Bloomfield, Brunswick, Lemington, and Norton). Assignment of the NEK Choice School District to the ENSU results in an Supervisory Union with two member districts (Canaan and NEK Choice) encompassing 11 towns. The NEK Choice School District's proposal anticipates potential cost reductions in the amount of $95,900.

The Kingdom East School District includes Burke, Concord, Lunenburg, Lyndon, Newark, Sheffield, Sutton and Wheelock, and will become operational on July 1, 2018.

The school districts of Barnet and Walden from the Caledonia Central Supervisory Union (CCSU) and the school district of Waterford from the Essex Caledonia Supervisory Union (all of which are PK-8 operating / 9-12 tuitioning) formed a study committee and developed a proposal to form the Caledonia Cooperative Unified Union School District. In addition, the Danville School District from the CCSU and the Cabot and Twinfield School Districts from the Washington Northeast SU have formed a study committee that is considering the advisability of creating a unified district that operates all grades (unified PK-12 operating district). These proposals have not yet been put to a vote by the electorate of the districts involved.

## Academic Achievement

Because of the nature of the state-funded education system in Vermont, the ability of a town to provide adequate educational facilities is not based on the wealth of local residents and grand list values. This has enabled higher-poverty school districts (defined here as schools with at least 50% of students eligible for free or reduced price lunch) to provide high-quality educational facilities without raising local tax rates to unsustainable levels. Vermont's school funding system has alleviated many of the funding problems associated with low-income school districts, ensures equal access to education for all the state's students, and is recognized as one of the most equitable school-funding systems in the nation. However, the system is not able to address other socioeconomic factors that are linked to student achievement. In general, statistics show that students in high-poverty school districts tend to perform more poorly than students in "middle class" districts (defined as districts where the proportion of students on free or reduced lunch is less than 50%).

According to an article by Richard D. Kahlenberg in *American Educator*, (Winter 2012-2013), boosting academic achievement in schools is dependent on economic integration. The article cites research that shows that the performance of low-income students improve when they attend schools serving students in the middle and upper-middle income brackets, and this improvement is independent of any benefits resulting from better-funded schools. The article identifies middle-class schools as those where less than 50 percent of students are eligible for free or reduced-priced lunch, and high poverty schools as those where at least 50 percent of students are eligible for free or reduced-price lunch. Link to the complete article: http://www.aft.org/pdfs/americaneducator/winter1213/Kahlenberg.pdf

Because of the significant effect that socioeconomic factors have on student performance, communities that support a balance of income levels through new housing development and job creation can better help assure that residents of all economic backgrounds have access to good schools, functional government and economic opportunity.

# GOALS AND STRATEGIES FOR EDUCATIONAL FACILITIES

## EDUCATIONAL FACILITY GOALS

- School districts will seek to maximize educational opportunities for students, including extracurricular offering, and increase economic efficiency by sharing services with neighboring school districts when feasible.
- To provide the most favorable outcomes for students, school districts should be economically integrated.
- Adult literacy resources will continue to be available to residents of the Northeast Kingdom to increase the percentage of residents that have earned a high school diploma.
- Post-secondary institutions in the region are vital to the economic development potential of the region and will be supported.
- Post-secondary schools will be closely integrated with the local communities they serve, including the business community, and should have a mutually beneficial relationship.
- Affordable educational and training opportunities should exist for all persons within the region.

## EDUCATIONAL FACILITY STRATEGIES

- Investigate opportunities for shared facilities between municipalities and institutions.
- Provide opportunities for the involvement of school officials in the local planning process.
- Promote the development of economically integrated school districts through policies and programs that promote a range of housing options for all income levels within each school district.
- Promote cooperation between institutions of higher learning and local businesses to support quality training and employment opportunities for local residents.
- Support the expansion of post-secondary institutions in the region, to continue to build a highly-educated workforce.
- Support local and regional efforts for workforce development and adult education.
- Support the efforts of local and regional libraries to provide quality facilities and materials for independent learning and education.

## II. RECREATION FACILITIES & PROGRAMS

The Northeast Kingdom is home to numerous State Parks, Wildlife Management Areas and Natural Areas that provide passive and active recreational opportunities. In addition, many towns in the region offer public recreation facilities in some form, including town parks or commons, town forests, tennis and basketball courts, ball fields, ice rinks, and public beaches. There are also school recreation facilities, and municipal buildings hosting local recreation programs.

The two major commercial recreational facilities in the region are Burke Mountain Resort, and Jay Peak Resort.

Burke Mountain has Nordic ski trails, Alpine ski trails served by four ski lifts and a J-bar, a full-service restaurant, and a hotel and conference center currently under construction. In the summer, the Burke ski trails are used for mountain biking.

Jay Peak, located in the town of Jay, also hosts a large hotel and conference center, with adjacent golf course. There are a number of alpine ski trails served by nine lifts that can reportedly service 12,820 people per hour. The Pump House Indoor Waterpark is attached to the hotel and is a major draw for tourists year-round. The Ice Haus Arena at Jay Peak offers ice skating lessons and public skating sessions for a reduced rate to Vermont residents.

Municipalities, especially the more rural ones, tend to rely to an extent on private property to meet residents' recreation needs. The Vermont Association of Snow Travelers (VAST) is an organization that relies in part on agreements with private property owners to allow winter access for recreational snow travel. However, unless there are permanent access easements on these properties, property owners can decide to exclude public access at any time.

Towns with higher populations, including St. Johnsbury, Lyndon, Newport City, and Derby, have an array of community recreational facilities and programs. In recent years St. Johnsbury closed its municipal recreation center located in the old armory building and partnered with St. Johnsbury Academy to provide the capacity and staff for its municipal recreation program, which continues to operate year-round and provide a variety of sports teams and activities. Catamount Arts, which is a non-profit arts organizations based in St. Johnsbury, also plays an important role in providing recreational and cultural programs for children year round. It also serves as a "regional box office" for events as diverse and geographically far-ranging as musical theater productions at the Haskell Opera House in Derby Line, to water skiing camps on Harvey's Lake in Barnet.

Parks or "greens" in the center of town are important for passive recreational opportunities. For example, Danville, St. Johnsbury, Newport and Lyndonville all host free outdoor summer concert series in centrally located public spaces.

Table 3.6 is a list of facilities available for use by the general public either free of charge or for a modest fee, organized by county and town. The facilities are generally operated by a municipality, state agency, or a non-profit. The list is not exhaustive, and does not include small pocket parks, school recreational facilities or other passive recreational facilities that may be highly valued by individual communities.

**Table 3.6**
**Major Recreational Facilities in the Northeast Kingdom**

| County | Town | Facility/Program | Owner/management organization |
|---|---|---|---|
| Caledonia | Barnet | Harvey's Lake/swimming beach, swim lessons, beach house, picnic areas, boating, water skiing | Town of Barnet, Harvey's Lake Beach Committee |
| Caledonia | Burke and Kirby | Darling State Park/primitive camping, hang gliding launch sites, observation/fire tower, | Vermont Department of Forests Parks and Recreation |

| | | | |
|---|---|---|---|
| | | rustic pavilion (portions leased to Burke Mountain ski area) | |
| Caledonia | Groton | Seyon Lodge State Park (in Groton State Forest)/lodge and conference center, fly fishing, boat rental, cross-country ski trails | Vermont Department of Forests Parks and Recreation |
| Caledonia | Groton | Ricker Pond State Park (in Groton State Forest)/campsites, lean-tos, cabins, swimming beach, boat launch, hiking trails | Vermont Department of Forests Parks and Recreation |
| Caledonia | Groton | Big Deer Sate Park (In Groton State Forest)/campsites, lean-tos, nature trails | Vermont Department of Forests Parks and Recreation |
| Caledonia | Groton | Stillwater State Park (In Groton State Forest)/ camp sites and lean-tos, swimming beach, boat launch | Vermont Department of Forests Parks and Recreation |
| Caledonia | Groton | Boulder Beach State Park (in Groton State Forest)/day use picnic areas, swimming beach, boat launch, boat rental, play area | Vermont Department of Forests Parks and Recreation |
| Caledonia | Lyndon/Burke | Cross Country ski/bike trails | Kingdom Trails |
| Caledonia | Lyndonville | Powers Park/outdoor swimming pool, tennis courts, swim lessons, arts and crafts program | Village Improvement Society/Powers Park Board |
| Caledonia | Lyndonville | Fenton Chester Arena (indoor ice rink/indoor field sports) | Lyndon Area Sports Association |
| Caledonia | Lyndonville | Community ski hill, rope tow, T bar | Lyndon Outing Club |
| Caledonia | Peacham | New Discovery State Park (in Groton State Forest)/ camp sites, lean-tos, seven horse camping sites, pond for fishing, trails | Vermont Department of Forests Parks and Recreation |
| Caledonia | Sheffield | Perry Holbrook State Park/ hiking trails, two ponds for fishing and picnicking. Dispersed recreation, including hunting and trapping. | Vermont Department of Forests Parks and Recreation |
| Caledonia | St. Johnsbury | Public outdoor swimming pool/free swim lessons | Kiwanis Club |
| Caledonia | St. Johnsbury | Playground, outdoor ice rinks(2), playing fields, tennis courts | Town of St. Johnsbury, Kiwanis Club, American Legion |
| Caledonia | St. Johnsbury | Town Forest hiking trails | Town of St. Johnsbury |
| Caledonia | St. Johnsbury | Fred Mold Park/picnic area and fishing pier at confluence of Moose and Passumpsic Rivers | Town of St. Johnsbury |
| Caledonia | St. Johnsbury | St. Johnsbury Country Club Golf Course/day rates available to the public | St. Johnsbury Country Club |
| Caledonia | St. Johnsbury (eastern terminus of LVRT) | Three Rivers Recreation Trail to Lamoille Valley Rail Trail/ four seasons transportation trail | Town of St. Johnsbury/VAST |
| Caledonia | St. Johnsbury | Dog Mountain: Dog Chapel, the Stephen Huneck Gallery and hiking trails on 150 acres | Friends of Dog Mountain |
| | | | |
| Caledonia and Essex | Averill, Avery's Gore, Bloomfield, Brighton, Brunswick, Burke, East | Kingdom Heritage Lands (West Mountain Wildlife Management Area, the Silvio Conte National Wildlife Refuge- Nulhegan Basin Division, and the Plum Creek private timberlands) / hiking trails, snowmobile trails, equestrian trails | Green Mountain Club/Vermont Agency of Natural Resources/VAST/ Vermont Horse Council |

| | | | |
|---|---|---|---|
| | Haven, Ferdinand, Granby, Lemington, Lewis, Maidstone, Morgan, Victory | | |
| Essex | Canaan | Canaan Recreation Park/ Adjacent to Library and Historic Society Museum, playground, golf range, softball fields, camp sites, picnic pavilion | Town of Canaan Recreation Committee/Canaan Historical Society |
| Essex | Concord, Granby, Lunenburg, and Victory | Victory State Forest/ primitive camping, hiking, hunting, trapping, wildlife viewing, snowmobiling, snowshoeing, and horseback riding | Vermont Department of Forests Parks and Recreation/Vermont Horse Council |
| Essex | Maidstone | Maidstone State Park/campsites, lean-tos, swimming beaches, playground, hiking trails, pavilion with picnic tables | Vermont Department of Forests Parks and Recreation |
| Essex | Norton | Black Turn Brook State Forest/ hiking, cross country skiing, snowshoeing, hunting, and fishing, primitive camping | Vermont Department of Forests Parks and Recreation |
| | | | |
| Orleans | Barton | Crystal Lake State Park/ Swimming beach, bathhouse, picnic area | Vermont Department of Forests Parks and Recreation |
| Orleans | Brighton (Island Pond) | Brighton State Park/Spectacle Pond public beach and bathhouse, campsites, lean-tos, cabins, boat rental, nature museum, amphitheater, hiking trails | Vermont Department of Forests Parks and Recreation |
| Orleans | Charleston | Northwoods Stewardship Center/ mapped trails, day camps, expeditions, science programs | Northwoods Stewardship Center |
| Orleans | Craftsbury | Hosmer Point, camp programs, sailing on Hosmer Pond | Hosmer Point |
| Orleans | Craftsbury/ Albany | Craftsbury Outdoor Center/Nordic ski trails, rowing center (sculling) | Craftsbury Outdoor Center (non-profit) |
| Orleans | Derby | Bike Path along Lake Memphremagog from Canadian Border to Newport City | Town of Derby |
| Orleans | Derby | Baxter Park/ Playground, Baseball Fields, Tennis Courts, Basketball Court | Town of Derby |
| Orleans | Derby | Lake Salem Beach House/ Beach House, Sand Beach, Volleyball Court, Horse Shoe Pits | Town of Derby |
| Orleans | Derby | Petsafe Kingdom Dog Park/off leash dog park | Town of Derby/Dog Park Committee |
| Orleans | Derby | Clyde River Park/picnic areas, passive recreation | Town of Derby |
| Orleans | Derby | Derby skating rink w/ warming shack at North Country Union Jr. High | Town of Derby |
| Orleans | Greensboro | Caspian Lake/ swimming beach, boat launch, picnic areas, natural areas | Greensboro/Hardwick Electric |
| Orleans | Newport | Prouty Beach and Campground | City of Newport |
| Orleans | Newport | Gardner Memorial Park: playground, basketball, picnic areas, Clyde River access, Lake | City of Newport |

| | | | |
|---|---|---|---|
| | | Memphremagog access, fishing dock, playing fields, skatepark, ice rinks | |
| Orleans | Newport | Newport Recreation Path/non-motorized recreational uses. Joins the Beebe Spur Rail Trail in Canada | City of Newport |
| Orleans | Newport | Newport City Dock/ marina, boardwalk, lake cruises | City of Newport |
| Orleans | Newport | Gateway Center/ event space on Lake Memphremagog | City of Newport |
| Orleans | Troy | Big Falls of the Missisquoi Natural Area/ swimming, fishing | Vermont Department of Forests Parks and Recreation |
| Orleans | Westfield | Hazen's Notch Natural Area, Hazen's Notch State Park/ hiking trails, rare plants and peregrine falcon viewing, intersects Long Trail | Vermont Department of Forests Parks and Recreation |
| Orleans | Westmore | Willoughby Cliffs Natural Area/Lake Willoughby (in Willoughby State Forest) fishing, hiking trails, swimming. Boat launch on north end of lake | Vermont Department of Forests Parks and Recreation |
| Orleans | Westmore | Sentinel Rock State Park/hiking, ADA- accessible interpretive center | Vermont Department of Forests Parks and Recreation |

## Planning Considerations

Communities should plan for adequate facilities to meet residents' needs, and financial sustainability is a key consideration. Towns should research funding options before undertaking a project, as certain loan programs offer loan forgiveness in communities that are financially stressed.

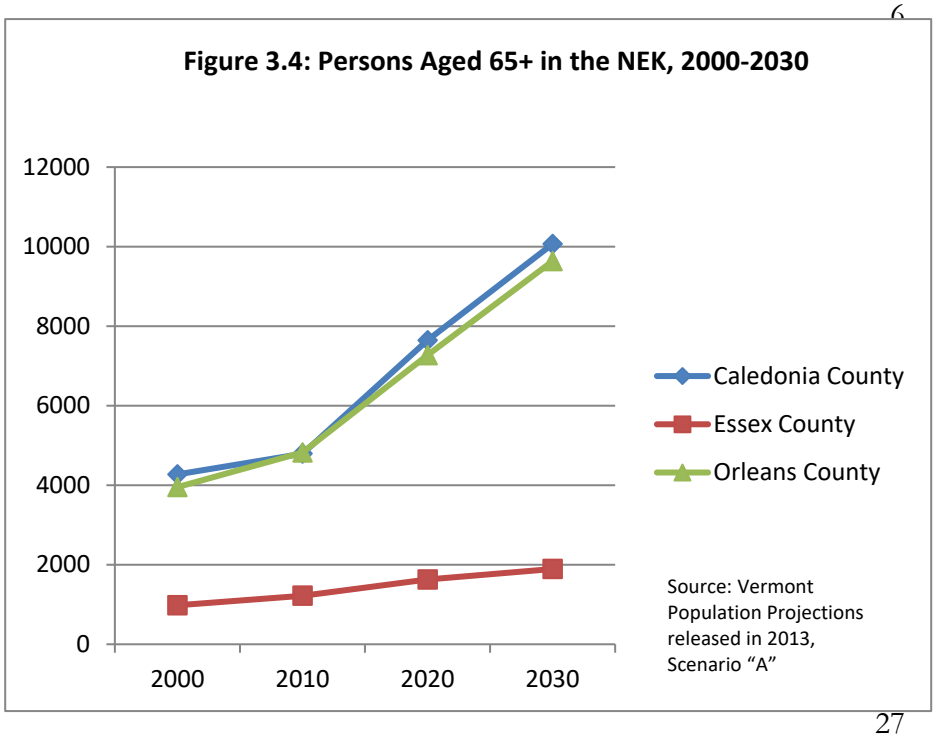



**Figure 3.4: Persons Aged 65+ in the NEK, 2000-2030**

Programs for seniors are an important part of the region's recreational programs, particularly since population projections predict that seniors over age 65 will continue to make up a greater percentage of the population in the Northeast Kingdom. By 2030, people aged 65 and older are expected to represent 32% of the region's population.

Some senior programs are organized by local non-profit community groups and receive support by the municipality through an annual appropriation. For example, "Wonder and Wisdom" receives an annual appropriation from the town of Greensboro to

provide programs for local seniors that are designed to enable them to maintain social contact, and make new friends through outings, cultural activities, and age-appropriate exercise classes.

The Northeast Kingdom Council on Aging, which is supported by the Vermont Agency of Human Services, offers fitness classes at locations throughout the NEK region especially designed for seniors, such as "Growing Stronger" and "Tai Chi for Arthritis."

Providing an adequate number of recreational programs and facilities adds to the residents' overall well-being and the community's quality of life, and thus are important for any town. Publicizing these recreational facilities to town residents and visitors is just as important as developing and maintaining them in the first place.

## GOALS AND STRATEGIES FOR RECREATIONAL FACILITIES

### RECREATIONAL FACILITIES GOALS

- Towns in the region will provide recreational facilities according to the population's particular needs.
- State-managed lands in the region will continue to be accessible to the residents of the region, and improvements will be made as appropriate to serve the identified needs of the population, as articulated in municipal plans (e.g., blaze new trails, maintain parking areas and points of entry into state-controlled lands used for passive recreation, create improved access to waterbodies)

### RECREATIONAL FACILITIES STRATEGIES

- NVDA will assist municipalities in identifying recreational needs and securing appropriate funding sources to develop new facilities.
- NVDA will direct municipalities to appropriate resources (e.g., Northeast Kingdom Travel and Tourism Association) to develop strategies to increase visibility of existing recreational resources to residents and potential visitors.

(Note: For discussion of goals related to recreational use of land, see Chapter One: Land Use Section V. Recreation Land Use Goals.)

## III. CHILD CARE

Safe, reliable and affordable childcare is a resource that is important to the economic and social well-being of Northeast Kingdom communities. It should be a consideration in any development that is designed to house families, particularly affordable housing developments as defined in state statute. It is also important to have childcare facilities near places of employment. The lack of sufficient childcare facilities poses a particular hardship to single parents struggling to find employment and care for a child.

The regional child care system is diverse, and includes independent day care homes, relative care, and center based group care.

The Vermont Department for Children and Families (DCF) operates the Bright Futures Child Care Information System, which is a database of child care providers searchable by town. The site also provides information on how to become a licensed childcare provider. A link to the database can be reached through the DCF website: http://www.brightfutures.dcf.state.vt.us

Regional agencies and organizations that offer child care programs or provide referrals to programs include Northeast Kingdom Community Action, Inc. (NEKCA), which oversees the Headstart and Early Headstart programs in the region; and Umbrella, Inc., which operates the Kingdom Childcare Connection program.

## GOALS AND STRATEGIES FOR CHILD CARE

### CHILD CARE GOALS

- Child care entrepreneurs and child/family service centers should be supported.
- Additional site-based or community child care centers that offer high quality, affordable care should be developed in employment centers and as a component of affordable housing developments.
- The efficiency and effectiveness of existing child care, early education, and family service programs should be improved.
- Child care issues will be integrated into the planning process.

### CHILD CARE STRATEGIES

- Provide assistance to municipalities and non-profits seeking to develop child care facilities and/or programs.
- Assist municipalities in assessing the future local need for and supply of childcare services, and whether local barriers exist for the provision of needed services, and assist in developing an action plan.
- Municipalities periodically should review land-use and development regulations to identify needed amendments to authorize quality child-care services in appropriate locations convenient to households, including as home occupations.
- Employers, schools, and community organizations should collaborate to ensure that affordable, quality child-care services are available to meet the different needs of households.
- Municipalities should encourage the inclusion of childcare facilities in the plans for any multi-family housing development that will accommodate families with children, and any large commercial development, to provide more options for employees.

## IV. TELECOMMUNICATIONS

The region can gain many economic, social, safety and cultural benefits with a strong telecommunication infrastructure.

The 2014 Vermont Telecommunications Plan issued by the State of Vermont Department of Public Service sets forth ambitious goals that, if realized, will help close the gaps in broadband and cell coverage experienced in many locations in the Northeast Kingdom.

Among the goals of the Plan:

1. Broadband Speed. Every E-911 residential and business locations 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, and every address should have access at speeds of at least 10 Mbps download. **By 2024, every address should have broadband speeds of 100 Mbps symmetrical.**
2. Broadband Deployment. Every address in Vermont should have access to wired and wireless broadband Internet access service.

3. Affordability. Broadband service should be affordable to all members of every customer class.
4. Local Public Generated Content. The state should promote locally generated content that is used and useful to the community.
5. Adoption and Usage. Vermont should support the universal adoption and use of broadband service at home and at work.
6. Mobile Service. Vermont should have universal availability of mobile service along roadways and near universal availability statewide.
7. Basic Service. Vermont should have 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.
8. Enhanced 911. Vermont should have available the best possible E-911 service. The State should endeavor to find greater efficiencies within the E-911 system without sacrificing public safety.
9. Competition. Vermont's telecommunications marketplace should be competitive and all Vermonters should reap the benefits of competition.
10. Regulatory Fairness. Like services should be regulated alike, regardless of the platform or technology used to provide the service.

For an in-depth description of Vermont's telecommunication goals refer to the Vermont Telecommunications Plan at:

http://publicservice.vermont.gov/sites/psd/files/Pubs_Plans_Reports/State_Plans/Telecom_Plan/VT%20Telecom%20Plan%202014.pdf

According to the Vermont Public Service Department, Essex County is one of the most underserved counties in the State, with DSL, cable and fixed wireless broadband services available to less than half of the population.

Table 3.7 below indicates broadband coverage in the Northeast Kingdom, as of January 2017.

**Table 3.7**
**Broadband Coverage by Town**
**January 2017**

| County | Town | # Buildings | Served 100/100 or Better | | Served 25/3 or Better | | Served 4/1 or Better | | Underserved* | |
|---|---|---|---|---|---|---|---|---|---|---|
| **CALEDONIA** | | | # | % | # | % | # | % | # | % |
| | Barnet | 1,026 | 0 | 0 | 224 | 21.8% | 748 | 72.9% | 278 | 27.1% |
| | Burke | 1,018 | 0 | 0 | 579 | 56.9% | 634 | 62.3% | 384 | 37.7% |
| | Danville | 1,421 | 0 | 0 | 751 | 52.9% | 862 | 60.7% | 559 | 39.3% |
| | Groton | 706 | 0 | 0 | 199 | 28.2% | 405 | 57.4% | 301 | 42.6% |
| | Hardwick | 1,413 | 16 | 1.1 | 964 | 68.2% | 1,245 | 88.1% | 168 | 11.9% |
| | Kirby | 274 | 0 | 0 | 29 | 10.6% | 92 | 33.6% | 182 | 66.4% |
| | Lyndon | 2,302 | 0 | 0 | 1930 | 83.8% | 1,988 | 86.4% | 314 | 13.6% |
| | Newark | 586 | 0 | 0 | 0 | 0 | 256 | 43.7% | 330 | 56.3% |
| | Peacham | 557 | 0 | 0 | 163 | 29.3% | 316 | 56.7% | 241 | 43.3% |
| | Ryegate | 682 | 0 | 0 | 277 | 40.6% | 446 | 65.4% | 236 | 34.6% |
| | Sheffield | 461 | 0 | 0 | 109 | 23.6% | 265 | 57.5% | 196 | 42.5% |
| | St. Johnsbury | 2,918 | 0 | 0 | 2542 | 87.1% | 2,649 | 90.8% | 269 | 9.2% |
| | Stannard | 139 | 0 | 0 | 0 | 0 | 84 | 60.4% | 55 | 39.6% |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Sutton | 476 | 0 | 0 | 119 | 25% | 162 | 34.0% | 314 | 66.0% |
| | Walden | 646 | 0 | 0 | 9 | 1.4% | 509 | 78.8% | 137 | 21.2% |
| | Waterford | 664 | 0 | 0 | 118 | 17.8% | 403 | 60.7% | 261 | 39.3% |
| | Wheelock | 505 | 0 | 0 | 63 | 12.5% | 264 | 52.3% | 241 | 47.7% |
| **ESSEX** | Averill | 246 | 0 | 0 | 0 | 0 | 18 | 7.3% | 228 | 92.7% |
| | Averys Gore | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 100.0% |
| | Bloomfield | 239 | 0 | 0 | 0 | 0 | 147 | 61.5% | 92 | 38.5% |
| | Brighton | 950 | 0 | 0 | 610 | 64.2% | 721 | 75.9% | 229 | 24.1% |
| | Brunswick | 76 | 0 | 0 | 0 | 0 | 18 | 23.7% | 58 | 76.3% |
| | Canaan | 611 | 0 | 0 | 0 | 0 | 398 | 65.1% | 213 | 34.9% |
| | Concord | 886 | 0 | 0 | 279 | 31.5% | 621 | 70.1% | 265 | 29.9% |
| | East Haven | 216 | 0 | 0 | 0 | 0 | 83 | 38.4% | 133 | 61.6% |
| | Ferdinand | 77 | 0 | 0 | 0 | 0 | 13 | 16.9% | 64 | 83.1% |
| | Granby | 105 | 0 | 0 | 0 | 0 | 63 | 60.0% | 42 | 40.0% |
| | Guildhall | 183 | 0 | 0 | 0 | 0 | 126 | 68.9% | 57 | 31.1% |
| | Lemington | 94 | 0 | 0 | 0 | 0 | 53 | 56.4% | 41 | 43.6% |
| | Lewis | 47 | 0 | 0 | 0 | 0 | 0 | 0 | 47 | 100.0% |
| | Lunenburg | 878 | 0 | 0 | 0 | 0 | 582 | 66.3% | 296 | 33.7% |
| | Maidstone | 332 | 0 | 0 | 0 | 0 | 130 | 39.2% | 202 | 60.8% |
| | Norton | 226 | 0 | 0 | 0 | 0 | 95 | 42.0% | 131 | 58.0% |
| | Victory | 100 | 0 | 0 | 0 | 0 | 63 | 63.0% | 37 | 37.0% |
| | Warners Grnt | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 100.0% |
| | Warren Gore | 59 | 0 | 0 | 0 | 0 | 4 | 6.8% | 55 | 93.2% |
| **ORLEANS** | Albany | 617 | 20 | 3.2% | 20 | 3.2% | 480 | 77.8% | 137 | 22.2% |
| | Barton | 1,474 | 0 | 0 | 926 | 62.8% | 1,214 | 82.4% | 260 | 17.6% |
| | Brownington | 542 | 0 | 0 | 318 | 58.7% | 493 | 91.0% | 49 | 9.0% |
| | Charleston | 757 | 0 | 0 | 460 | 60.8% | 601 | 79.4% | 156 | 20.6% |
| | Coventry | 475 | 0 | 0 | 227 | 47.8% | 319 | 67.2% | 156 | 32.8% |
| | Craftsbury | 693 | 59 | 8.5% | 59 | 8.5% | 606 | 87.4% | 87 | 12.6% |
| | Derby | 2,505 | 0 | 0 | 1932 | 77.1% | 2,197 | 87.7% | 308 | 12.3% |
| | Glover | 807 | 0 | 0 | 117 | 14.5% | 620 | 76.8% | 187 | 23.2% |
| | Greensboro | 830 | 7 | 0.8% | 84 | 10.1% | 724 | 87.2% | 106 | 12.8% |
| | Holland | 456 | 0 | 0 | 5 | 1.1% | 303 | 66.4% | 153 | 33.6% |
| | Irasburg | 616 | 0 | 0 | 175 | 28.4% | 340 | 55.2% | 276 | 44.8% |
| | Jay | 532 | 0 | 0 | 336 | 63.2% | 345 | 64.8% | 187 | 35.2% |
| | Lowell | 560 | 0 | 0 | 0 | 0 | 255 | 45.5% | 305 | 54.5% |
| | Morgan | 816 | 0 | 0 | 535 | 65.6% | 649 | 79.5% | 167 | 20.5% |
| | Newport City | 1,957 | 0 | 0 | 1936 | 98.9% | 1,947 | 99.5% | 10 | 0.5% |
| | Newport Town | 842 | 0 | 0 | 406 | 48.2% | 687 | 81.6% | 155 | 18.4% |
| | Troy | 885 | 0 | 0 | 688 | 77.7% | 771 | 87.1% | 114 | 12.9% |
| | Westfield | 374 | 0 | 0 | 121 | 32.4% | 174 | 46.5% | 200 | 53.5% |
| | Westmore | 585 | 0 | 0 | 0 | 0 | 402 | 68.7% | 183 | 31.3% |

**Source**: Vermont Public Service Department
*Underserved locations are potentially served at 4/1 by FairPoint

The Public Service Department provides up-to-date information on wireless and broadband coverage on its website: http://publicservice.vermont.gov

Geographic distance to markets traditionally posed a barrier for rural businesses. With the development of e-commerce and secure online transactions, rural businesses and residents can join in an expanded modern

economy. Tourism information and marketing of local products is available to customers anywhere at any time on the Internet. A strong telecommunications infrastructure serves to improve quality of life, supports businesses, and provides information to residents and tourists about the region.

As telecommuting becomes more popular, settlement patterns may change as more people work in "cyber-jobs" or further away from their employment locations. Video conferencing and teleconferencing allow people to work while away from their offices, reduce some time and expense of transportation to meetings and relieve the burden to drive in hazardous winter conditions. Although the availability of these systems has increased significantly in the last decade, there are still some gaps in coverage in the Northeast Kingdom region, as noted above.

In the Northeast Kingdom, an initiative of the Vermont Telecommunications Authority was the Northeast Kingdom Fiber Network. A fiber optic network benefits cell service and broadband internet expansion in the following way, as noted by the VTA:

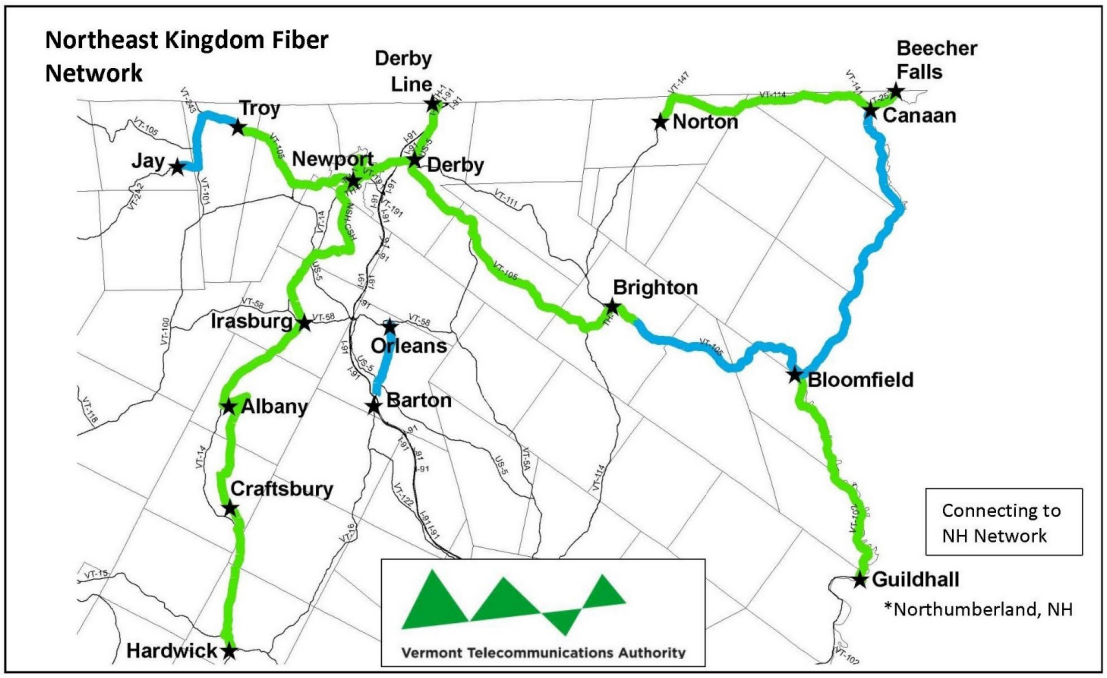
- Cellular towers and other cellular infrastructure need fiber optic routes for "backhaul," the means of transmitting signals from the wireless antennae to carriers' nationwide and global networks.
- For broadband Internet, getting fiber optic cable closer to end users makes faster Internet access possible even when the final leg of service to homes and businesses is a copper telephone line, coaxial cable TV lines or wireless signal.

The network includes the following connections:

- Derby Line to Derby, Route 5
- Derby to Brighton, Route 105
- Brighton to Bloomfield, Route 105
- Newport to Jay, Routes 105, 101 & 242
- Newport to Irasburg, Routes 5 and 14
- Irasburg to Albany, Route 14
- Albany to Craftsbury, Craftsbury Road
- Craftsbury to Hardwick, Route 14
- Orleans to Barton, Telfer and Baird Roads
- Guildhall to Beecher Falls, Route 102
- Beecher Falls to Norton, Route 114

The route connects from Guildhall across to Northumberland, NH to a 744-mile New Hampshire fiber optic network (see Figure 3.5)

**Figure 3.5**




In 2015, the activities of the Vermont Telecommunications Authority were absorbed by the Connectivity Division in the Vermont Department of Public Service.

## Regulations of Wireless Telecommunication Facilities

In 2007, the Vermont Legislature created 30 V.S.A. § 248a. Section 248a provided telecommunications carriers seeking to construct telecommunications facilities the option of obtaining a "Certificate of Public Good" from the Public Service Board (PSB) as an alternative to local zoning and Act 250 environmental review. Although municipalities may still adopt local ordinances pertaining to telecommunications towers, carriers typically choose to have projects reviewed by the PSB.

New legislation enacted in 2014 sought to clarify the role of the municipal and regional plan in Act 248a proceedings. Act 190 amendments to Section 248a directed the Public Service Board to describe how it interprets the terms "substantial deference" and "good cause" as used in the statute. These terms were intended to provide direction to the PSB as to how to weigh recommendations of municipalities with regard to their town plans and conservation measures.

The Public Service Board adopted the following definitions:

"Good cause" means a showing that deferring to the land conservation measures in the plans of the affected municipalities and the recommendations of the municipal legislative bodies and the municipal and regional planning commissions regarding the municipal and regional plans, respectively, would be detrimental to the public good or the State's interests articulated in 30 V.S.A. § 202c.

"Substantial deference" means to give significant and meaningful weight to the land conservation measures in the plans of the affected municipalities and the recommendations of the municipal legislative bodies and the municipal and regional planning commissions regarding the municipal and regional plans, respectively.

It is important that municipalities clearly describe their visions for telecommunication planning within their town plans, since the plans are consulted by both the Act 250 commission and the Public Service Board when reviewing projects.

NVDA encourages towns to prepare the most appropriate plans and regulation for their individual needs.

## GOALS AND STRATEGIES FOR TELECOMMUNICATIONS

### TELECOMMUNICATIONS GOALS

- Northeast Kingdom residents, business, organizations and public entities will be served by an up-to-date telecommunications infrastructure.
- Affordable fixed and wireless communications systems, as well as high-speed Internet broadband, will be available throughout the region.
- Land conservation measures and protection of scenic resources identified in local and regional plans will be give substantial deference when telecommunications projects are under review.

### TELECOMMUNICATIONS STRATEGIES

- Solicit input from towns in the region to determine where gaps in broadband and cell coverage may still exist.
- Encourage communities to set up wi-fi zones in public areas (libraries, municipal buildings, etc.) that are available free of charge to residents.
- Support development efforts that reduce the cost of high-speed telecommunications throughout Vermont and the Northeast Kingdom.
- Continue to work with state and regional agencies, as well as the private sector, to attain the coverage goals as set forth in the State Telecommunications Plan.

## V. SECURITY & EMERGENCY SERVICES

### Enhanced 9-1-1

Since 1998, enhanced 9-1-1 dispatch service has reduced the response time of emergency services for Northeast Kingdom towns. A person dialing 9-1-1 is automatically routed to the appropriate Public Safety Answering Point (PSAP), regardless of telephone exchange boundaries. The Derby State Police Barracks has been the regional PSAP, however due to state budget cuts the Vermont Department of Public Safety is consolidating from four PSAP's to two. Dispatching that is now done out of the Derby PSAP will be done out of Williston. This should not diminish the service provided or response times for first responders, however there has been some concern from citizens, first responder agencies, and local legislators. This change will take place as of September 30, 2015. The PSAP call taker has the caller's phone number, locatable address from a Geographic Information System (GIS), and contact information for the nearest emergency services (police, fire, ambulance, EMS). This enhanced service has shortened response time in the dispatch of appropriate local emergency services and finding the location of the caller without having the caller provide that information.

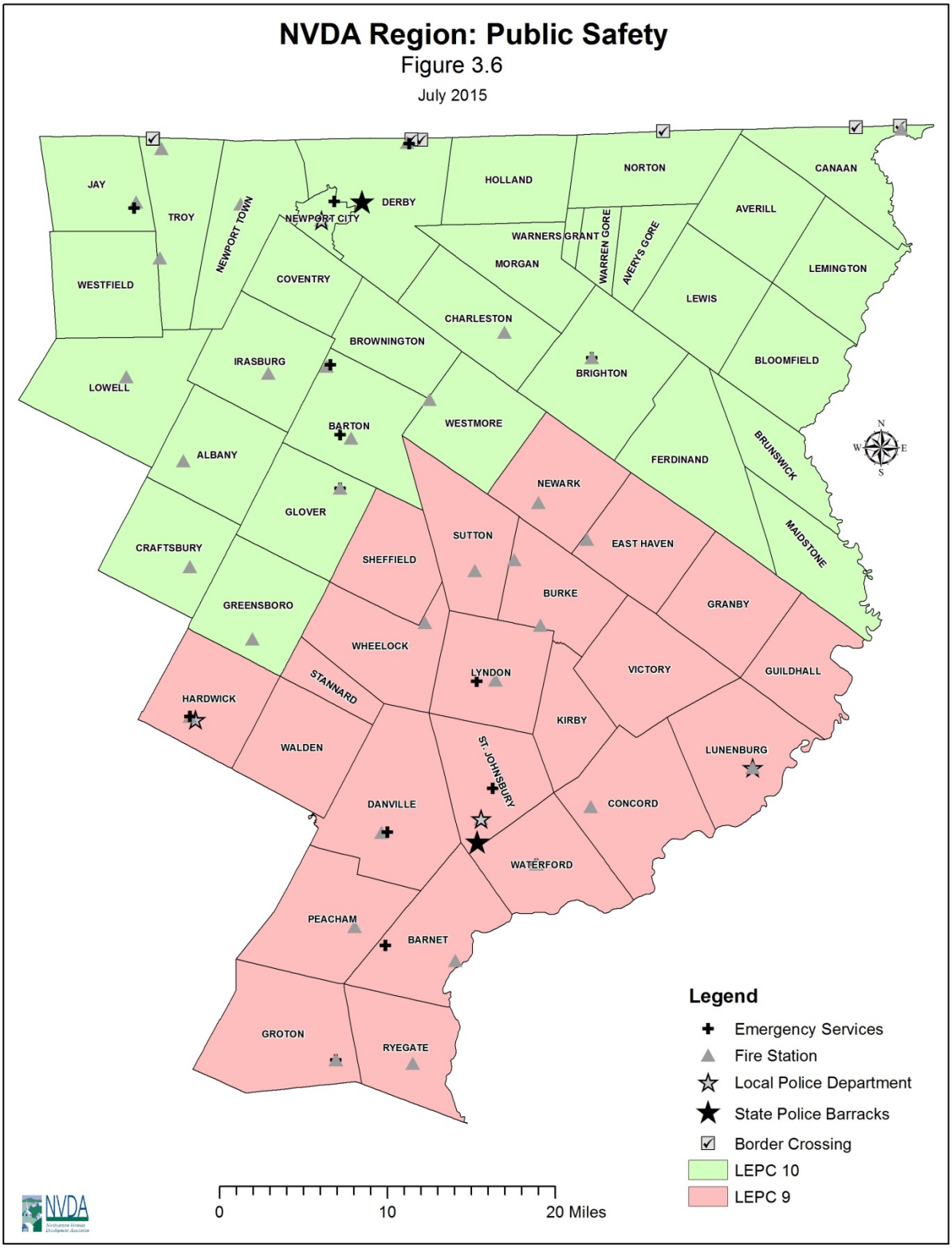
The Orleans County Sheriff's Department has researched the costs and logistics involved to keep dispatching local. There has been some interest from first responder agencies that now use the Derby PSAP to join this

dispatch system, if it occurs; however this new dispatch system managed by and located at the Orleans County Sheriff's Department would not occur until sometime in 2016.

## Fire Protection

The region is served by a variety of local fire departments. The majority of incorporated towns have their own fire protection. Other communities do not have a fire department and rely on neighboring towns to provide their protection. The types of departments vary from combination full/part-time to paid on-call, to all volunteer. The responsibilities of each department vary according to the population they serve. Major responsibilities of fire departments continue to be fire suppression, prevention and education. The majority of housing in the region (older, wood buildings) was constructed without modern building or fire code standards, making fire prevention a challenge in buildings with outdated wiring or heating. Fire departments also respond to calls for auto accidents, hazardous materials spills, Emergency Medical Services (EMS), and natural and man-made disasters. The capability of these departments to handle such incidents ranges from very good to very poor. If a technical response is needed that a department is not suited to handle, such as rope rescue or hazardous materials mitigation (Haz-Mat), the services will come from the nearest available department or the State Hazardous Materials Response Team. All towns have a fire warden.

Within the three counties there are mutual aid organizations which enable the departments to work collaboratively to mitigate problems in each other's communities. Some departments may travel as much as 40 to 50 miles if needed. One of the major hindrances for small towns is the lack of local firefighters to respond to incidents. Many communities are without immediate fire response because their staff/volunteers work outside the town and will not be able to respond quickly. In addition, departments face challenges to recruit new members due to the high level of training required and responsibilities within fire departments. It is necessary to maintain the proper level of skill and knowledge to respond to the wide range of complex emergencies in our communities. Our communities have had fire departments made up of a large number of dedicated individuals who were called upon frequently to perform in emergencies. The number of volunteers has decreased over the past ten years. Increased funding for equipment and training would assist our fire departments with keeping up with the demand for their services.


NVDA Region: Public Safety
Figure 3.6
July 2015
JAY
TROY
NEWPORT TOWN
DERBY
NEWPORT CITY
HOLLAND
NORTON
CANAAN
AVERILL
LEMINGTON
WARNERS GRANT
WARREN GORE
AVERYS GORE
MORGAN
LEWIS
WESTFIELD
COVENTRY
CHARLESTON
BROWNINGTON
IRASBURG
BRIGHTON
BLOOMFIELD
LOWELL
BARTON
WESTMORE
FERDINAND
BRUNSWICK
ALBANY
NEWARK
GLOVER
SUTTON
EAST HAVEN
MAIDSTONE
CRAFTSBURY
SHEFFIELD
BURKE
GRANBY
GREENSBORO
WHEELOCK
VICTORY
GUILDHALL
LYNDON
STANNARD
HARDWICK
KIRBY
WALDEN
ST. JOHNSBURY
LUNENBURG
DANVILLE
CONCORD
WATERFORD
PEACHAM
BARNET
GROTON
RYEGATE
Legend
Emergency Services
Fire Station
Local Police Department
State Police Barracks
Border Crossing
LEPC 10
LEPC 9
0
10
20 Miles
NVDA

1
2

## Ambulance Service

The towns of the Northeast Kingdom belong to one of three State Ambulance Districts. Within the districts there are several ambulance services. Parts of the region are served by ambulance services based in New Hampshire. Ambulance services provide medical first aid, CPR training, non-emergency medical transportation, and back up service to neighboring ambulance coverage areas. The chart below is a summary of the statistics and level of service provided by emergency medical teams operating in the region. Many of the trained first aid responders are volunteers. The "level of service" ranges from low to high service for technical certification and training. The towns listed in table 3.7 include the base locations for ambulance service. The level of service definitions are as follows:

FR-B First Responder EMT Basic Service

FR-I First Responder EMT Intermediate Service

FR-P First Responder EMT Paramedic Service

EMC-B Emergency Medical Certification Basic Ambulance Service

EMC-I Emergency Medical Certification Intermediate Ambulance Service

EMC-P Emergency Medical Certification Paramedic Ambulance Service

**Table 3.7 Ambulance base location**

| Base Town | District # | Level of Service | Base Town | District # | Level of Service |
|---|---|---|---|---|---|
| Barnet | 5 | FR-I | Newport | 2 | EMC-P |
| Barton | 2 | EMC-I | Orleans | 2 | EMC-I |
| Brighton | 2 | EMC-I | St. Johnsbury CALEX | 5 | EMC-P |
| Concord | 5 | FR-I | St. Johnsbury Fire Dept. | 5 | FR-B |
| Danville | 5 | EMC-I | Walden FAST Squad | 5 | FR-B |
| Derby Line | 2 | EMC-I | Waterford Fire Dept. | 5 | FR-B |
| Gilman-Lunenburg | 5 | FR-B | Colebrook, NH | 2 | EMC-B |
| Glover | 2 | EMC-I | Groveton, NH | 5 | EMC-B |
| Groton-Ryegate FAST Squad | 5 | FR-B | Lancaster, NH | 5 | EMC-I |
| Hardwick | 4 | EMC-I | Pittsburg, NH | 2 | EMC-B |
| Jay Peak FAST Squad/Ski Patrol | 2 | FR-I | Stratford, NH | 5 | EMC-B |
| Lyndon | 5 | EMC-I | Woodsville, NH | 5 | EMC-P |
| Missisquoi (Troy) | 2 | EMC-I | | | |

Source: NVDA 2003

## Medical Services

The region is fortunate to have two full-service health care centers available, the North Country Hospital (www.nchsi.org) in Newport, and the Northeastern Vermont Regional Hospital (www.nvrh.org) in St. Johnsbury. The Northeastern Vermont Regional Hospital is a member of the larger, regional Dartmouth-Hitchcock Alliance. Other hospitals near the region include the Copley Hospital in Morrisville, the Littleton (NH) Regional Health Care, the Cottage Hospital in Woodsville (NH), and the Weeks Medical Center in Lancaster (NH). Fletcher Allen Health Care, located in Burlington, is available for many specialized medical services.

Emergency mental health services, substance abuse counseling, and crisis support is provided by Northeast Kingdom Human Services on a twenty-four hour basis. The region's towns and villages also contain small medical clinics or physician offices, providing a greater level of access for local residents. Similarly, veterinarian services are available in a number of towns for pet and livestock care.

## Border Protection

The Border and Transportation Security Division, under the Department of Homeland Security, patrols the Northeast Kingdom portion of the Canadian border. The Division has six border crossings on the Canadian border in the region. The main border crossing facility is at Derby Line on I-91 and provides monitoring services of the movement of people and goods and processes immigration and emigration. The amount of security and level of surveillance at border crossings has been dramatically increased over the past few years.

## Police Protection

Municipal police departments are located in Hardwick, Lyndon, St. Johnsbury and Newport City. The towns of Brighton and Canaan use the same Officer for their Police coverage and when he is off-duty, that area is serviced by the Essex County Sheriff's Department or the Vermont State Police-Derby. County Sheriff's Departments are located in the towns of St. Johnsbury (Caledonia County), Newport (Orleans County), and Lunenburg (Essex County).

The Vermont State Police have barracks in St. Johnsbury (Caledonia County) and Derby (Orleans County). The St. Johnsbury State Police barracks covers 21 towns in Caledonia and southern Essex counties. The Derby barracks serves 32 towns in Orleans and Northern Essex. Trooper activities include patrolling rural roads, responding to auto accidents, and reducing the number of speeding and intoxicated vehicle operators. Troopers investigate domestic assaults, burglaries, child abuse, and arson.

The St. Johnsbury barracks provides dispatch service for Enhanced 9-1-1 service including four ambulance squads (Lyndon Rescue, Calex Rescue in St. Johnsbury, Danville Ambulance, Concord FAST Squad), Hardwick Police, Department of Fish and Game, Sheriff's Department (Caledonia, Essex, and Orange counties), and Bradford State Police. The Derby barracks provides dispatch service for State Police as well as Newport Police, Orleans County Sheriff's Office, Brighton Constable, as well as sixteen fire departments and seven ambulance squads. The Derby Marine Patrol covers Lake Memphremagog, an international waterway with Canada as well as many other lakes. Snowmobile patrolling is also a big part of police activity in the winter months, with the Orleans/Northern Essex County area having the most extensive trail system in the state (Source Vermont State Police, Derby, http://www.dps.state.vt.us). Crime statistics are also available at the Department of Public Safety website.

## Facilities, Prisons, and Courts

Correctional facilities are located in St. Johnsbury and Newport. St. Johnsbury hosts the Caledonia Community Work Camp, the Northeast Regional Correctional Facility, The St. Johnsbury Community Correction Center, and the St. Johnsbury Court and Reparative Services. Newport hosts the Northern State Correctional Facility, the Newport Court and Reparative Services, and the Vermont Correctional Industries. Courts in the region are located in each of the three counties (Caledonia, Orleans, and Essex) and serve as district, family, probate, small claims and superior courts.

## Disaster Planning and Services

The key to responding to disasters is to have sound emergency planning in place. Many services and grants at the federal, state and local levels support such planning efforts. The Directorate of Emergency Preparedness and Response, a division under the Department of Homeland Security, has designated mitigation as the cornerstone of emergency management. Mitigation begins with local communities assessing risks and repetitive problems and making a plan for creating solutions to these problems.

The Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 requires each state government to establish a State Emergency Response Commission (SERC). The SERC is charged with developing integrated plans for responding to chemical emergencies and making chemical information available to the public. The SERC appoints Local Emergency Planning Committees (LEPC) to prepare for

and respond to emergencies at the local level. Two LEPC's work in this region: one, serving Orleans County, and the other serving Caledonia and Essex counties.

NVDA, working as a liaison with the LEPC's, assists all towns in the region to keep the Local Emergency Operations Plans updated. These are efficient guides for use in the early stages of disaster response. The plans give contact information for the organizations and people responsible in an emergency including: emergency medical services (EMS), fire chief, hospital, select board chair, road foremen, law enforcement, town clerk, state contacts, and other resources. The plan describes the method for alerting and evacuating the population if necessary, the site of an alternate "emergency operations center", and locations of local emergency shelters. Other towns have Hazard Mitigation Plans which aim to prevent damage from natural hazards and outline improvements to structures and facilities in the event of damage.

Committees and partnerships aid in the ability to respond to disasters. For example, most of the states and territories have adopted a legal mechanism called the Emergency Management Assistance Compact, which allows states to assist one another during emergencies, but does not force a state to help if that state is unable. Vermont has recently become a partner in this mutually beneficial compact. Other local organizations like the Connecticut River Watershed Council have joined in cooperation with state and local emergency management and planning organizations to create plans for preventing disasters within the Connecticut River Watershed.

Disasters such as severe winter storms, droughts, floods, wildfires, high winds, earthquakes, and tornados have all been known to affect our region. The Vermont Emergency Management agency focuses on preparing and responding to these emergencies. In light of the past few years of drought throughout the state which has left groundwater and surface water reservoirs at very low levels, the Vermont Drought Task Force recommends that every town have an emergency plan to deal with drought preparedness.

The National Flood Insurance Program encourages each town to plan for flood hazards by designating flood prone areas in the town and restricting construction and development in these areas. Most of the towns in our region have adopted Flood Hazard Regulations to limit development in flood hazard areas.

Other aid agencies are designed to provide services in the event of disasters. The Northern Vermont Chapter of the American Red Cross offers service to the three counties of the region including training (First Aid, CPR, AED), HIV/AIDS education, disaster relief, armed forces emergency services, international tracing and communication services, language bank and youth services. In the event of a disaster, the American Red Cross provides shelter, food, health and mental health services to address basic human needs.

## GOALS AND STRATEGIES FOR SECURITY & EMERGENCY SERVICE

### SECURITY & EMERGENCY SERVICE GOALS

- Emergency services should be provided to all residents of the Northeast Kingdom through Enhanced 9-1-1, local departments, and mutual aid districts.
- Towns should have up-to-date Local Emergency Operations Plans.
- All buildings should meet current state fire code and safety standards.
- Emergency services training should be available to keep all emergency service providers current with regard to service provision and certification.

### SECURITY & EMERGENCY SERVICE STRATEGIES

- Support regional approaches to disaster planning and mitigation, including partnerships between neighboring communities and states and Canada.
- Support local efforts for disaster planning, response, recovery and mitigation.

- Assist communities to apply for safety and emergency equipment grants by disseminating information on available funding programs.
- Assist interested municipalities with the adoption of building and fire codes for non-public buildings and rental properties.
- Ensure that adequate emergency services (personnel, facilities, and equipment) are available for new developments prior to placing additional demands on existing services.
- Assist Local Emergency Planning Committees (LEPCs) and Towns to identify gaps in disaster planning, such as increased flood and drought protection, and work to eliminate gaps through an interagency, inter-jurisdictional approach.
- Encourage all communities to participate in the National Flood Insurance Program (NFIP) and to adopt the Vermont Transportation Highway Codes and Standards.
- Discourage development in identified or known flood prone areas to avoid costly potential damage to life and property.

## VI. WATER SUPPLY

The Northeast Kingdom region has a number of lakes, ponds, rivers, streams, and springs providing fresh water for our residents. The water supply in the region is used for a multitude of residential, agricultural, industrial, and commercial purposes. Thus, it is important that we work to ensure an adequate supply of usable water to meet the needs of all the region's residents and businesses. Generally, the water quality throughout the area is considered excellent. The majority of the region's water supply comes from groundwater, and the majority of water supply systems are privately-owned, on-site wells.

Results of regular testing by municipal water systems seems to indicate Vermont's water quality is generally good, but that contamination can and does occur. Common threats to our water supply systems come from agricultural runoff, salt storage areas, road salt, contaminated runoff from paved surfaces, and failing septic systems. Occasional contamination is a primary reason the state requires many public water systems to have source protection plans, well-head protection areas, test regularly for contaminants, and report those results to water customers.

### Public Water Supply

The *Vermont Water Supply Rule* is applicable to all Vermont water systems, including public and non-public water supply systems, privately owned water sources, and bottled drinking water facilities (only portions of the rule apply to each type of system). Its primary purpose is to regulate water systems in the state for the provision of clean and safe drinking water for Vermont's citizens, regardless of the type or size of system involved. The Vermont Water Supply Rule is administered by the Department of Environmental Conservation, Drinking Water and Groundwater Protection Division. The last Rule was adopted in 2010, a revision of the Water Supply Rule is currently underway.

All water systems are initially classified as Public or Non-public. Classification as a Public water system depends on the number of service connections (15 or more) or people served (25 or more) by the system.

Public water systems are further divided into Public Community water systems (serving residents on a year-round basis) and Public Non-Community water systems (serving non-residential groups of people such as schools, restaurants, etc.). These Public Non-Community water systems are subdivided into Non-Transient, Non-Community (NTNC) systems whose non-residential users don't change over time (i.e. schools and offices), and Transient Non-Community (TNC) systems whose non-residential users do change over time (i.e. restaurants and motels). Each type of public system requires a different level of chemical monitoring with Transient, Non-Community systems requiring the least.

The NVDA Region: Sewer & Water Map (Figure 3.6) shows the municipalities with public community water supply facilities.

## Source Protection

Public Community and Non Transient, Non-Community systems (such as systems serving schools) are required by the state to develop Source Protection areas (SPAs) and have Source Protection Plans. Included in most SPAs are three zones: 1, 2 and 3. The SPAs for groundwater sources are configured differently from surface water sources, but both establish Zone 1 as the immediate area of 200 feet around the water source or intake. This is the area where impacts from contamination are likely to be immediate and certain. The water system does not have authority to control land uses on any land within the SPA unless they own the land or have specific legal agreements with the landowner. However, Towns have the ability to enforce local ordinances with overlay districts that correspond with the SPAs for public water supply sources.

All public water systems are subject to regulation under the federal Safe Drinking Water Act. These federal regulations are administered by Vermont's Department of Environmental Conservation (DEC). Permits are administered by the Drinking Water and Groundwater Protection Division of the DEC. All public water systems are required to have a Permit to Operate. The Permit to Operate includes a description of the water system, findings from the most recent sanitary survey, conditions, requirements, violations and a compliance schedule to correct significant deficiencies. Operating permits do not expire and are non-transferable when ownership changes. The Drinking Water and Groundwater Protection Division conducts sanitary surveys at every three years for community water systems and in-state bottled/bulk water facilities, and every five years for non-community water systems.

In Vermont, public water supply systems may be owned and operated by municipalities or privately-owned (either individually or cooperatively). Municipally-owned water systems may be managed by the town or a fire district. Public drinking water systems are required to have an Operator certified by the Drinking Water and Groundwater Protection Division. The class of Operator Certification is based on the source water type, treatment, and population of a water system. Jurisdiction over protection of public water supply sources rests with the Drinking Water and Groundwater Protection Division and the District Environmental Commission (through the Act 250 review process). Local zoning decisions made my municipalities can also affect public water supplies.

Public water system violations are published in an annual report made available to the public by the Department of Environmental Conservation. "*Consumer Confidence Reports*" are made available by public water suppliers for public community residential systems on an annual basis.

In addition to providing adequate water supply systems to meet the demands for domestic, commercial and industrial uses, there must be a level of flow necessary for fire protection. This depends, in part, on the amount of water stored or available, the size of the water mains and the level of pressure needed.

The active public community water systems in the Northeast Kingdom, along with the number of people they serve, are shown in Table 3.8 below.

Figure 3.7 depicts Towns that have public community water systems, although most of these systems serve a very limited geographic area within the town. It does, however, indicate the potential for more compact development in these towns.

**Table 3.8:**
**Public Community Water Systems – Caledonia, Essex, & Orleans Counties**

| Caledonia County | | | | | |
|---|---|---|---|---|---|
| **Water System Name** | **System Type** | **Primary Source** | **Owner Type** | **Town** | **Pop** |
| BARNET Fire District 2 | C | GW | P | BARNET | 205 |
| PASSUMPSIC FIRE DISTRICT 1 | C | SWP | L | BARNET | 140 |
| MCINDOE FALLS FIRE DISTRICT 3 | C | SW | L | BARNET | 176 |
| KARME CHOLING | C | GW | P | BARNET | 140 |
| WEST BURKE HOUSING | C | GW | P | BURKE | 40 |
| BURKE FIRE DISTRICT 1 | C | GW | L | BURKE | 142 |
| BURKE MOUNTAIN WATER SYSTEM | C | GW | P | BURKE | 1058 |
| DANVILLE FIRE DISTRICT 1 | C | GW | L | DANVILLE | 450 |
| EAST HARDWICK FIRE DISTRICT 1 | C | GW | L | HARDWICK | 350 |
| HARDWICK TOWN WATER SYSTEM | C | GW | L | HARDWICK | 1900 |
| LYNDONVILLE WATER SYSTEM | C | GW | L | LYNDON | 4500 |
| LYN HAVEN FIRE DISTRICT 1 | C | GW | L | LYNDON | 100 |
| NORTHEAST KINGDOM MHP | C | GWP | P | LYNDON | 156 |
| PEACHAM FIRE DISTRICT 1 | C | GW | L | PEACHAM | 150 |
| RYEGATE FIRE DISTRICT 2 | C | GW | L | RYEGATE | 131 |
| SHEFFIELD FIRE DISTRICT 1 | C | GW | L | SHEFFIELD | 50 |
| ST JOHNSBURY WATER SYSTEM | C | SW | L | ST. JOHNSBURY | 5000 |
| ST JOHNSBURY CENTER F D 1 | C | SWP | L | ST. JOHNSBURY | 370 |
| GREEN LANTERN MHP | C | SWP | P | ST. JOHNSBURY | 144 |
| SUTTON WATER SYSTEM | C | GW | L | SUTTON | 190 |
| WHEELOCK FIRE DISTRICT 1 | C | GW | L | WHEELOCK | 50 |
| **Essex County** | | | | | |
| BLOOMFIELD | C | GW | L | BLOOMFIELD | 50 |
| BRIGHTON WATER SYSTEM | C | SW | L | BRIGHTON | 1782 |
| CANAAN FD #2 | C | GW | L | CANAAN | 350 |
| CANAAN FIRE DISTRICT 1 | C | GW | L | CANAAN | 970 |
| SORRELL MHP | C | GW | P | CONCORD | 112 |
| AQUA HAVEN | C | GW | L | EAST HAVEN | 150 |
| GUILDHALL WATER SYSTEM | C | GWP | L | GUILDHALL | 136 |
| LUNENBURG FIRE DISTRICT 2 | C | GW | L | LUNENBURG | 400 |
| LUNENBURG FIRE DISTRICT 1 | C | GW | L | LUNENBURG | 250 |
| **Orleans County** | | | | | |
| ALBANY WATER SYSTEM | C | GW | L | ALBANY | 200 |
| BARTON WATER SYSTEM | C | SW | L | BARTON | 950 |
| ORLEANS WATER SYSTEM | C | GW | L | BARTON | 846 |
| MAPLE LANE NURSING HOME | C | GW | P | BARTON | 181 |
| COVENTRY FIRE DISTRICT 1 | C | GW | L | COVENTRY | 251 |

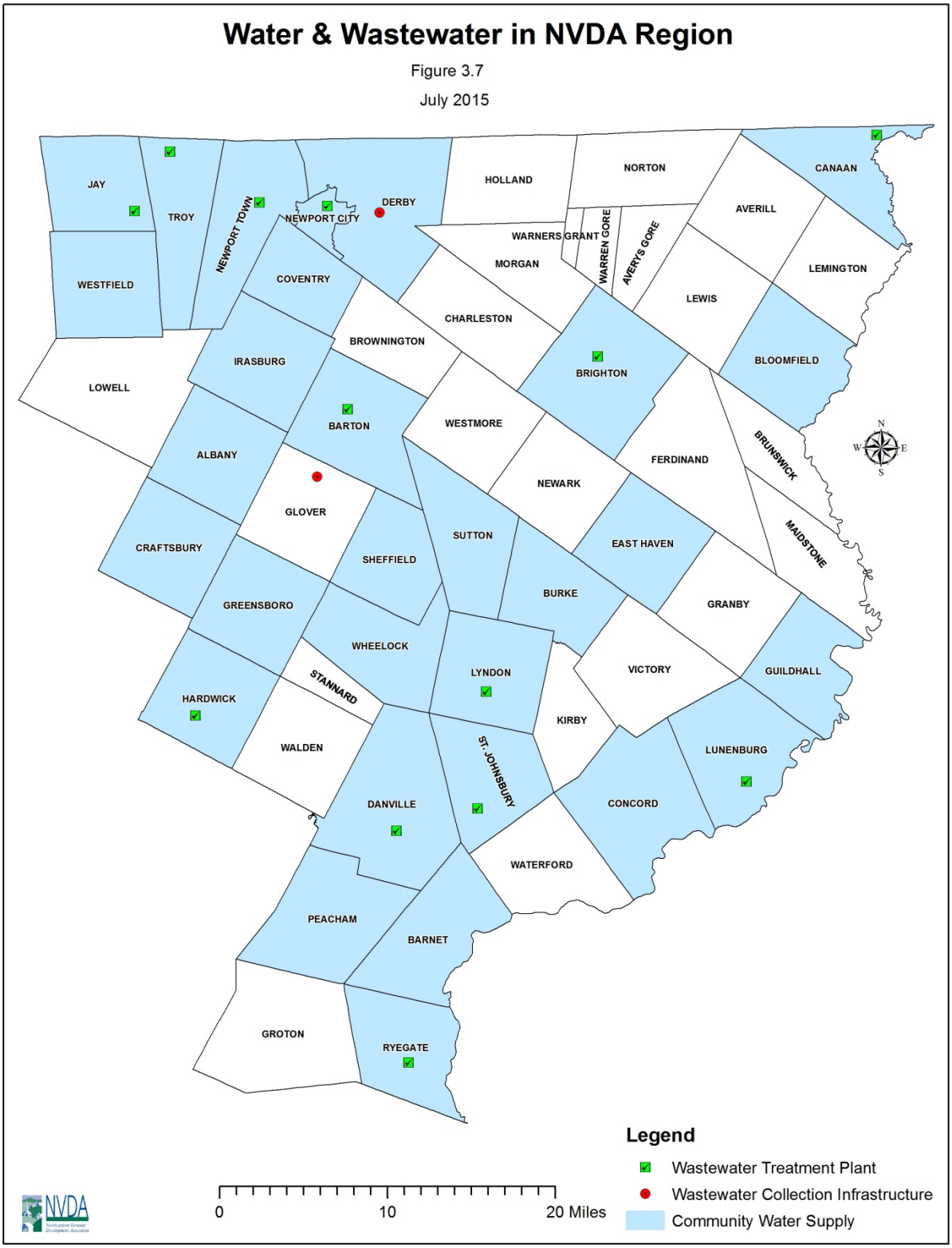
| | | | | | |
|---|---|---|---|---|---|
| CRAFTSBURY FIRE DISTRICT 2 | C | GW | L | CRAFTSBURY | 420 |
| BEEBE PLAIN WATER SYSTEM | C | GW | P | DERBY | 142 |
| DERBY LINE VILLAGE WATER DISTRICT | C | GW | L | DERBY | 1630 |
| DERBY CENTER WATER SYSTEM | C | SW | L | DERBY | 1100 |
| SHATTUCK HILL MHP | C | SWP | P | DERBY | 129 |
| DERBY MHP | C | SWP | S | DERBY | 265 |
| UNION HOUSE NURSING HOME | C | GW | P | GLOVER | 56 |
| GREENSBORO FIRE DISTRICT 1 | C | GW | L | GREENSBORO | 551 |
| GREENSBORO BEND FIRE DISTRICT #2 | C | GW | P | GREENSBORO | 71 |
| IRASBURG FD #1 | C | GW | L | IRASBURG | 200 |
| JAY PEAK SUBDIVISION II | C | GW | P | JAY | 66 |
| JAY PEAK WATER SYSTEM | C | GW | P | JAY | 6740 |
| TRILLIUM WOODS WATER SYSTEM | C | GW | P | JAY | 27 |
| NEWPORT CITY WATER SYSTEM | C | GW | L | NEWPORT CITY | 4766 |
| NEWPORT CENTER WATER SYSTEM | C | GW | L | NEWPORT TOWN | 330 |
| HOLBROOK BAY COMMONS | C | GW | P | NEWPORT TOWN | 95 |
| NORTH TROY WATER SYSTEM | C | GW | L | TROY | 860 |
| TROY WATER SYSTEM | C | GW | L | TROY | 315 |
| WESTFIELD FIRE DISTRICT 1 | C | GW | L | WESTFIELD | 120 |
| ALPINE HAVEN | C | GW | P | WESTFIELD | 250 |

C= Community, GW= Groundwater, SW= Surface Water, GWP= Groundwater purchased, SWP= Surface water purchased, L= Local Government, P= Private, S= State
Source: ANR Water Supply Division, 2014

## Public Water Issues

Many public water systems in the Northeast Kingdom do not have metering, and that is an issue that communities are beginning to address. The Towns of Hardwick's water system serves a population of 1,900 including residential and commercial customers. In 2014 the Town updated its water ordinance to address issues such as customer responsibility for preventing water loss through leakage of corroding pipes. By updating water ordinances and installing metering, issues of water loss through leakage or irresponsible usage can be curtailed, and water system managers have a better understanding of water use by different types of commercial operations.

Another issue that Towns can address through a water/sewer ordinance is allocations. For example, the Town of Derby has an ordinance that levies a fee for holding a water and or sewer allocation, discouraging property developers from holding on to allocations without using them for extended periods of time.


Water & Wastewater in NVDA Region
Figure 3.7
July 2015
JAY
TROY
NEWPORT TOWN
NEWPORT CITY
DERBY
HOLLAND
NORTON
CANAAN
AVERILL
WARNERS GRANT
WARREN GORE
AVERY'S GORE
LEMINGTON
WESTFIELD
COVENTRY
MORGAN
LEWIS
CHARLESTON
BROWNINGTON
IRASBURG
BRIGHTON
BLOOMFIELD
LOWELL
BARTON
WESTMORE
FERDINAND
BRUNSWICK
ALBANY
NEWARK
GLOVER
SUTTON
EAST HAVEN
MAIDSTONE
CRAFTSBURY
SHEFFIELD
BURKE
GRANBY
GREENSBORO
WHEELOCK
LYNDON
VICTORY
GUILDHALL
STANNARD
HARDWICK
KIRBY
WALDEN
ST. JOHNSBURY
LUNENBURG
DANVILLE
CONCORD
WATERFORD
PEACHAM
BARNET
GROTON
RYEGATE
N
W
E
S
Legend
Wastewater Treatment Plant
Wastewater Collection Infrastructure
Community Water Supply
0
10
20 Miles
NVDA

1
2

## Capacity

The permitted maximum daily demand of a public water system is noted on the operating permit issued by the State Drinking Water and Groundwater Protection Division. The aspects of a system that determine the permitted maximum daily demand include well yield, treatment capacity, and storage capacity.

While the maximum permitted demand as a measure of gallons per day is established by the state-issued operating permit, the determination of reserve capacity of a system is not as easily established, particularly for older water systems. While actual gallon-per-day water usage can be compared to maximum permitted demand, this does not necessarily determine reserve capacity of a system, since actual usage from all connections may be below potential usage based on allocation. The Vermont Water Supply Rule is in the process of being revised to provide a more accurate means of determining the reserve capacity of a water system.

The current water supply rule specifies that public community water systems be designed to meet a projected future demand, and requires that when a water system, expecting future growth, reaches 90% of capacity of a treatment or pumping system it begin planning for additional capacity.

**Management**

The Capacity Development Program in the Drinking Water and Groundwater Protection Division of the State DEC deals with long range plans for water systems, asset management plans, water audits and reviews of budgets and user rates. The "Capacity" of a water system is measured not only by well yield, storage capacity and treatment capacity (which would be the technical capabilities of a water system) but also managerial and financial capabilities. The State's strategy to ensure water quality and supply is to provide resources and education to water system owners/operators so that their systems will be able to comply with all state and federal rules.

The Vermont Rural Water Association (VRWA) is a non-profit that provides technical and managerial assistance to water and wastewater systems in Vermont. Since 1982, VRWA has helped many system members in the Northeast Kingdom provide safe, affordable drinking water to their communities. VRWA conducts the majority of continuing education training for water and wastewater operators in the NEK on system operations and maintenance. Some recent projects include:

- Ongoing assistance in Gilman and Lunenburg to help achieve long term sustainability of their drinking water and sewer systems
- Partnering with state agencies to help determine potential sources of nitrate contamination in Sutton
- Leak detection and water line location in Lyndonville, North Troy and Bloomfield
- Calibration flow check for the Derby Line wastewater collection system
- Source water protection planning activities for Greensboro Fire District 1 and Greensboro Bend drinking water systems

VRWA has also provided many other onsite system services and training classes in the Northeast Kingdom, including:

- Water treatment and distribution system troubleshooting
- Flushing program development and implementation
- Advice regarding sanitary survey response
- Smoke testing and sewer camera work

- Sampling plans for distribution system monitoring (Total Coliform Bacteria, Lead & Copper, Disinfection By-Products)
- Sludge profiling and long-term planning for sludge removal
- Board training on budget development and capital improvement planning
- Location and mapping of water and wastewater system assets
- Loan and priority list application assistance
- Operations and Maintenance (O&M) Manuals

For public water systems that have reached or may be nearing their system's physical capacity, strategies can be implemented to reduce water consumption. Some of these are billing customers based on metered water use; repairing leaks in the system; and structuring billing rate schedules so that heavier users pay more. The creation of individual community water systems for residential subdivisions has drawbacks because of ongoing management issues. The consolidation of the management of water systems is encouraged. Even if geographically separate, systems can share billing or management to increase efficiency. This also enables a more efficient and cost-effective process system monitoring, to ensure water quality is maintained.

*System funding and Development:* The most common problem facing towns or communities having, or seeking, a public water supply system is obtaining the funds to acquire or upgrade facilities. Problems that have occurred in community water systems in the Northeast Kingdom include lack of reserve capacity, aging equipment, and contamination of water supplies due to inadequate control over development within the source protection area.

It is important to note that centralized water systems allow more residents to share the high costs of acquisition and maintenance. Public water supply systems are also generally easier to maintain and protect than individual supplies in more densely populated areas. Extensions to existing, public community water systems greatly affect the location, density, type, and future pattern of development within a community. Therefore, considerable public discussion should occur regarding proposals for water main extensions. The state has a revolving loan program that provides assistance to communities seeking to develop capacity in their water system.

## Vermont Act 250

Criteria 2 and 3 of Vermont Act 250 deal with the issue of permitting for water supplies:

(a) Before granting a permit, the board or district commission shall find that the subdivision or development…

(2) Does have sufficient water available for the reasonably foreseeable needs of the subdivision or development.

(3) Will not cause an unreasonable burden on an existing water supply, if one is to be utilized.

[10 V.S.A. Section 6086 (a)(2) and (3)]

# GOALS AND STRATEGIES FOR WATER SUPPLY

## WATER SUPPLY GOALS

- Water supplies and water systems will not be contaminated, depleted, or degraded
- There will be sufficient quantities of water to meet existing and future residential, agricultural, commercial, industrial and recreational needs.

- Public investments will be made in utility facilities, services, and lands to support existing and future development within town centers, villages, or other designated and planned growth areas. Expansion of systems will not facilitate sprawl or strip development.
- Effective, efficient, and accessible public services will be promoted.

## WATER SUPPLY STRATEGIES

- Support local proposals to upgrade existing water supply systems.
- Support water conservation measures to reduce the demand for water and protect water supplies.
- Discourage development in Source Protection Areas, identified groundwater recharge areas, or other areas where water supplies are likely to be adversely impacted.
- Assist interested communities to identify, map, and plan for the protection of surface and groundwater resources.
- Assist towns and communities with the preparation of capital improvement plans and budgets to complement local plans and this plan.
- Assist municipalities seeking to share services and infrastructure with neighboring municipalities in order to reduce costs and increase efficiency

# VII. WASTEWATER, SEWAGE & STORMWATER MANAGEMENT

The treatment of wastewater is necessary to remove solids, destroy pathogens, and remove pollutants. Municipal sewage, domestic sewage, and industrial wastewater are the types of wastewater typically treated. Wastewater is either treated centrally by a municipal wastewater treatment facility, or by a decentralized "on-site" system, typically a septic tank with leach field.

**On-Site Wastewater Systems**

For our region, on-site systems (i.e. traditional septic systems) are by far the most common for wastewater treatment. Poor siting, installation, or maintenance of on-site systems often contributes to their failure and can result in human health risks through the contamination of public surface or ground water supplies. Maintaining and repairing on-site systems is important to prevent the deterioration of ground and surface water quality, and has associated costs far lower than those for purifying contaminated water supplies.

The Agency of Natural Resources, Department of Conservation Wastewater System and Potable Water Supply Rules were last updated in 2007. The rules "apply to the subdivision of land, the construction, modification, or change in use of a building or structure, the creation or modification of a campground, and the construction, modification, replacement and operation of their associated potable water supplies and wastewater disposal systems." The rules regulate soil-based disposal systems with design flows of less than 6,500 gallons per day, and sewerage connections of any size. They also regulate potable water supplies that are not subject to regulation under the Vermont Water Supply Rule as public water supplies.

The Rules primary purposes are:

1. To protect human health and the environment;
2. To prevent the creation of health hazards or unsanitary conditions;
3. To ensure the availability of an adequate supply of potable water;
4. To ensure that there is adequate effluent dispersal and drainage for the proper functioning of wastewater systems.

## Public Wastewater Facilities

Wastewater Treatment Facilities are regulated by the State Agency of Natural Resources, Department of Environmental Conservation, Watershed Management Division. Such facilities are required to be operated by certified individuals that meet particular requirements for experience and knowledge, as outlined in the Wastewater Treatment Facility Operator Certification Rule. The Rule was updated and became effective September 25, 2014, replacing the October 1985 version.

Domestic wastewater treatment facilities have five classification levels. Class 1 facilities have simplified treatment processes (i.e. pH adjustment only) with low design flows. Class 5 facilities are more complex and have design flows of greater than 5.0 MGD. Most of the Wastewater Treatment Facilities in the Northeast Kingdom are Class 1 or Class 2. The three largest systems -- in St. Johnsbury, Newport City, and Lyndonville -- are Class 3.

Industrial treatment facilities are classified in four categories; dairy, metal, paper and industrial. There are also three levels to each classification. Each level of classification is based on treatment process and design flow.

**Table 3.9**
**Wastewater Treatment Facilities**

| Municipal Wastewater Facilities: | Capacity in Million Gallons per Day (MGD) | Avg. Annual Flow (MGD)* | Percent of capacity used |
|---|---|---|---|
| **Caledonia County** | | | |
| Danville | 0.06 | 0.0319 | 53% |
| Hardwick | 0.371 | 0.1844 | 50% |
| Lyndonville | 0.75 | 0.1572 | 21% |
| Ryegate (Town) | 0.006 | 0.0040 | 67% |
| Ryegate Fire District #2 | .0103 | 0.0039 | 38% |
| St. Johnsbury | 1.6 | 0.7526 | 47% |
| **Essex County** | | | |
| Brighton (Island Pond) | 0.15 | 0.0701 | 41% |
| Canaan | 0.185 | 0.0943 | 51% |
| Lunenburg Fire District #2 | 0.076 | 0.0648 | 85% |
| **Orleans County** | | | |
| Barton | 0.265 | 0.1590 | 60% |
| Newport (City) | 1.3 | 0.6915 | 53% |
| Derby Center | 0.15 | Not provided | NA |
| Newport Town | 0.0415 | 0.0179 | 43% |
| North Troy | 0.11 | 0.0665 | 61% |
| Orleans | 0.19 | 0.0561 | 30% |
| Troy / Jay | 0.2 | 0.0758 | 38% |

* June 1, 2014 – May 31, 2015
Notes: Ryegate F.D. #2 average flow does not include May 2015; St. Johnsbury does not include April 2015 in average; Derby Center Village has an allocation from the Newport City WWTF.
Source: WWTF List dated July 2, 2015; data request, July 2015, VT Watershed Management Division, Wastewater Section

Table 3.9 shows the municipal wastewater treatment facilities in the Northeast Kingdom region. It is noted that the Village of Derby Center and the Town of Glover both have allocations in systems maintained by other towns. Glover has sewer capacity in the Barton system, and Derby Center has an allocation in Newport City's system. The percentage of capacity that the annual average flow represents shows how much of the system's capacity is currently being used, but it does not reflect committed capacity. Therefore, a system that is only using 50% of its design capacity does not necessarily have 50% of its capacity available for new development. The municipality that manages the system may have committed sewer capacity to an entity that is not fully using the allocation – for example, a residential developer may have secured an allocation for connections for a 10 lot subdivision, but the subdivision has not yet been built out. However, the annual average flow data does show which systems are using a high percentage of total capacity.

## Funding

In the 1960s-1970s, federal funding typically paid up to 90% of the cost for public sewage treatment plants. Today, it is exceedingly difficult for small towns to finance new facilities due to the high per user cost associated with central sewage treatment projects, and reductions in federal funding. While centralized, municipal treatment facilities may be the preferred types of systems, the rural nature of our region makes it difficult and expensive to provide such facilities for towns without a sufficient population density. While there are funding programs through USDA Rural Development, the ongoing maintenance cost to the municipality also needs to be considered. Municipalities that encourage and plan for denser development would benefit by being able to share the costs of providing centralized wastewater facilities due to a higher number of residents being served by the system.

## Sludge and Effluent Disposal

After wastewater is treated, there is the issue of sludge and effluent disposal. Sludge in the Northeast Kingdom is typically disposed of by land application, or it is de-watered and sent to a landfill. Shipping sludge to a landfill takes up valuable space. Incineration is not permitted in Vermont, but a few small communities may transport their sludge out of state for incineration. Effluent is what remains after solids have been removed from wastewater. Once wastewater has been treated, effluents are usually discharged to ground or surface waters. However, there are regulatory requirements that include testing for pH, residual chlorine, dissolved oxygen, suspended solids, bacteria, various metals, and organic compounds before discharge can occur. In communities with small wastewater systems, effluents may be discharged in a leach-field type of system similar to those used for on-site septic systems. Whether an on-site system or municipal wastewater treatment plant is used, the sludge and effluent are treated similarly. In our region, private haulers currently manage the septage generated by septic tanks from on-site facilities in municipalities without wastewater treatment facilities. Although septage and biosolids are byproducts of wastewater treatment, these wastes are categorized as "Solid Wastes" in Vermont, and are regulated by the Vermont Solid Waste Management Rules: (http://www.anr.state.vt.us/dec/wastediv/solid/documents/SWRule.final.pdf )

## Stormwater

An important issue related to water supply and wastewater is storm water. When it rains, or snow melts, the resulting "stormwater" is absorbed into the ground or it becomes "runoff" and flows over the land to a nearby lake, stream, or estuary. Stormwater runoff from vegetated land is typically low, since most rain or snow filters into the ground or is lost to evaporation. Stormwater runoff increases as the percentage of impervious surface cover increases (e.g., paved streets, parking lots, and rooftops), since the land's ability to absorb water is restricted. In addition to washing pollutants into our surface waters, improperly managed stormwater runoff can result in soil erosion and flooding. Stormwater recharges the groundwater supply, and proper management helps to reduce flooding and surface water contamination.

The Vermont Agency of Natural Resources, Department of Environmental Conservation, Watershed Management Division, provides information on permits needed for stormwater discharges at certain thresholds. Detailed information on stormwater permit applications and fees can be found on the Watershed Management Division's website at http://www.watershedmanagement.vt.gov/stormwater/htm/sw_permits.htm.

An alternative to traditional stormwater infrastructure systems is known as "Green Stormwater Infrastructure" (GSI), which is defined as "systems and practices that restore and maintain natural hydrologic processes in order to reduce the volume and water quality impacts of the built environment while providing multiple societal benefits."

More information about GSI can be found on the aforementioned website of the Watershed Management Division.

Municipal wastewater systems that collect both sewage and stormwater in the same pipes are called combined sewer systems. During intense storms, the high flow of sewage and stormwater can overwhelm combined sewer systems. Many combined systems were therefore designed to release excess flow through overflow points, called combined sewer overflow (CSO) outfalls. Without these CSO outfalls, large storms could cause sewage and stormwater to backup into basements and streets.

Three municipal wastewater systems in the Northeast Kingdom have CSO outfalls: Barton, Newport City and St. Johnsbury.

In September 2016, the Vermont Department of Environmental Conservation adopted a Combined Sewer Overflow Rule, which requires the municipalities that still have CSOs to implement technology-based controls, and develop Long Term Control Plans to bring all CSOs into compliance with federal and state water quality standards.

The Rule acknowledges that financial capability is a significant factor in abating and controlling overflows and meeting water quality standards, and therefore recognizes alternatives to separation of stormwater and sewer lines. These alternatives include adding storage tanks or retention basins to hold overflow during storm events; expanding treatment plant capacity; adding screening and disinfection facilities for the overflow; and incorporating green stormwater infrastructure to reduce stormwater flow.

## GOALS AND STRATEGIES FOR WASTEWATER, SEWAGE & STORMWATER MANAGEMENT

### WASTEWATER, SEWAGE & STORMWATER MANAGEMENT GOALS

- The region's towns will have adequate wastewater treatment facilities with sufficient capacity to meet current needs and projected future development.
- Public investments in new or expanded facilities and services shall be in agreement with local plans, shall be directed toward town centers, villages, or other designated and planned growth areas, and shall support the revitalization of established centers.
- Municipalities will incorporate Green Stormwater Infrastructure in planning improvements to local road infrastructure and public facilities; and will incorporate them into land use regulations, as appropriate.

### WASTEWATER, SEWAGE & STORMWATER MANAGEMENT STRATEGIES

- Support proposals to upgrade and improve existing wastewater treatment facilities.
- Encourage the proper disposal of hazardous materials, particularly household hazardous materials that are difficult to treat in secondary systems.
- Provide advice and technical assistance to communities and groups interested in developing community wastewater systems.
- Assist communities to interpret and abide by changes to state and federal laws regarding municipal and on-site wastewater systems and stormwater regulations.
- Conduct educational outreach to municipalities regarding the benefits of Green Stormwater Infrastructure.
- Assist communities with advanced planning activities for future upgrades and financing of local systems.

- Assist municipalities seeking to share services and infrastructure with neighboring municipalities in order to reduce costs and increase efficiency

# VIII. SOLID WASTE MANAGEMENT

## Municipal Solid Waste

Vermont statute [24 V.S.A. subsection 2202(a)] requires that all municipalities, either individually, or through a solid waste management district or inter-municipal association, adopt a Solid Waste Implementation Plan (SWIP) or Materials Management Plan (MMP). (The two terms are used interchangeably.) The plans need to conform with the State Materials Management Plan (MMP), which came into effect in June of 2014.

On average, Vermonters generate more than five pounds of waste each day[1]. Although Act 78 in 1987 made significant strides in reducing waste, the annual diversion rate (the amount of waste kept out of landfills or incinerators) has stagnated at around 30% to 36% for more than a decade, with more than half of the waste stream consisting of materials that could be recycled, donated, or composted. Act 148 was signed into law to introduce sweeping changes to the way we manage wastes. The MMP supports the implementation of Act 148, as well as a variety of initiatives to support a new vision for waste management built on four principles:

- Prevent waste from being generated.
- Promote sustainable materials management, with a preference for highest and best use.
- Minimize reliance of waste disposal (landfilling and incineration).
- Conserve resources, minimize energy consumption, and reduce greenhouse gas (GHG) emissions and other adverse environmental impacts.

Act 148 has been phased in over a six-year timeframe to give municipalities, waste districts, and waste haulers an opportunity to better align their facilities and services in order to comply with the law.:

| Date | Implementation Measure |
|---|---|
| **July 1, 2014** | • Transfer stations/Drop-off Facilities must accept residential recyclables at no separate charge.<br>• Food scrap generators of 104 tons/year (2 tons/week) must divert material to any certified facility within 20 miles |
| **July 1, 2015** | • Statewide unit based pricing takes effect, requiring residential trash charges be based on volume or weight (also known as "pay as you throw")<br>• Recyclables are banned from the landfill<br>• Transfer stations/Drop-off Facilities must accept leaf and yard debris. (Note: A variance has been granted to some transfer stations in the NEK Waste Management District for the duration of Materials Management Plan, which expires in November of 2020.<br>• Haulers must offer residential recycling collection at no separate charge. (Note: the NEK Waste Management District applied for and received an exemption for this requirement.) |

[1] Vermont Department of Environmental Conservation: Vermont Materials Management Program (2014, June 18)

| | |
|---|---|
| | • Public buildings must provide recycling containers alongside all trash containers in public spaces (exception for restrooms)<br>• Food scrap generators of 52 tons/year (1 ton/week) must divert material to any certified facility within 20 miles |
| **July 1, 2016** | • Leaf, yard, and clean wood debris are banned from the landfill<br>• Haulers must offer leaf and yard debris collection Food scrap generators of 26 tons/year (1/2 ton/week) must divert material to any certified facility within 20 miles |
| **July 1, 2017** | • Transfer stations/Drop-off Facilities must accept food scraps<br>• Haulers must offer food scrap collection. (Note: This deadline has been delayed to July 2018.)<br>• Food scrap generators of 18 tons/year (1/3 ton/week) must divert material to any certified facility within 20 miles |
| **July 1, 2020** | • All food scraps are banned from the landfill, with no exception for distance of a certified facility |

As the notations in the above table suggest, implementation of Act 148 has encountered some challenges.

- **Cost:** A 2015 report to the Vermont legislature by the Solid Waste Infrastructure Advisory Committee surmises that Vermont's existing infrastructure (composters, on-farm digesters, farm animal feed operations, and food rescue groups) possibly has the capacity to meet demand for handling organics diverted from the waste stream. However, nearly $30 million in infrastructure expansion, upgrades, and investments will be required by 2020 statewide.[2] Massive infrastructure investments alone will not, however, ensure successful implementation. The effort will depend a concerted effort of public outreach and education, supported by a flexible and creative network of onsite and offsite waste management operations.
- **Reduction of food waste:** Effectively banning food scraps from the landfill is intended to reduce food waste, a broader issue with far-ranging environmental, economic, and social issues. Generators of food waste, such as retailers and institutions, ultimately save on overhead and hauling costs, if they can systematically reduce waste through measures such as best-management practices and performance-based contracts with food service providers. This reduction has not been realized to date, and more outreach and technical assistance is needed.
- **Hauling capacity:** Two food scrap haulers are doing brisk business in the NEK. (See section on Food Waste below.) However, not all solid waste haulers have the capacity or ability to equip their vehicles for safe and proper food scrap management. As amendments to Act 148 continue to be examined, it is important to remember that food scrap hauling has viable business models in New England. Technical and business assistance needs to be regularly available for entrepreneurs who wish to enter this important field.

## Solid Waste Management Districts and Solid Waste Facilities

Solid waste services are provided for 44 towns in the NVDA region by the Northeast Kingdom Waste Management District (NEKWMD). Walden and Hardwick are part of the Central Vermont Solid Waste Management District, while Craftsbury is a member of the Lamoille Regional Solid Waste Management

[2] Solid Waste Infrastructure Advisory Committee. Report to the Vermont Legislature. (2015, February 4)

District. The remaining towns are not members of a Waste Management District and must maintain their own SWIPs. (See Table 3.10). Transfer stations, composting facilities, food scrap collection and yard and leaf facilities (including brush dumps) are shown on Figure 3.8. Detailed information, such as dates for collection of household hazardous waste are listed on the webpages of each waste management district serving towns in the Northeast Kingdom region.

**Table 3.10**
**Solid Waste Management Plans in the NEK**

| Municipality | District | SWIP |
|---|---|---|
| Craftsbury | Lamoille Solid Waste Management District (www.lrswmd.org) | Last amended September 2017 https://www.lrswmd.org/index.php/about/185-swip |
| Hardwick and Walden | Central Vermont Solid Waste Management District (www.cvswmd.org) | Last amended October 2016: http://www.cvswmd.org/our-plan.html |
| Barton | Independent | Last amended November 2015: Available from the Town of Barton web site https://sites.google.com/site/townofbarton/home |
| Burke | Independent | Last amended : http://www.burkevermont.org/documents.php |
| Canaan | Independent | Last amended December 2009: http://canaan-vt.org/images/swip_plan.pdf |
| Coventry | Independent | Last amended March 2016: http://www.coventryvt.org/solid-waste---recycling-.html |
| Lemington | Independent | |
| Lowell | Independent | Last amended 2015: http://www.townoflowell.org/recycling---solid-waste.html |
| Newport City | Independent | Last amended July 2015: http://newportvermont.org/website/news/solid-waste-implementation-plan-survey/ |
| St. Johnsbury | Independent | Last amended: http://stjvt.com/index.php/recycling-info.html/#solidwaste |
| All remaining 44 towns | Northeast Kingdom Solid Waste Management District | Last amended September 2015: http://www.nekwmd.org/pdf/MMP.pdf |

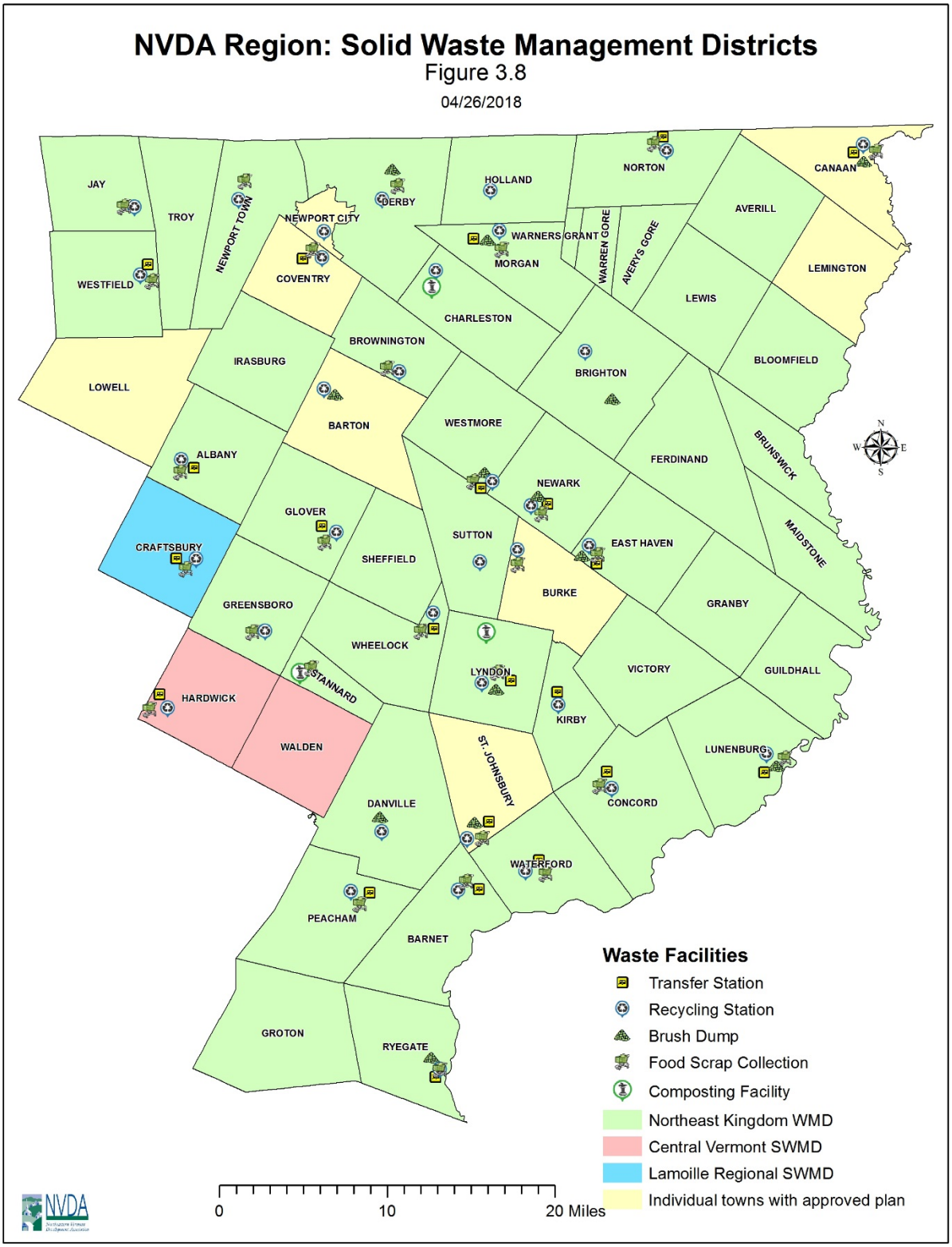
## Landfills

The Coventry Landfill is the only permitted landfill in the region. This is a lined facility, privately owned and operated by New England Waste Services of Vermont, a subsidiary of Casella Waste Management. In 2014, the landfill was approved for expansion. In 2005, Washington Electric Coop (WEC) established a landfill gas-to-energy generation plant. With capacity expansions completed in 2007 and 2009, the landfill gas methane generator currently supplies about two-thirds of WEC's power supply, before the sale of renewal energy certificates. (See NVDA's Energy Chapter for more details.) Casella is currently exploring a variety of uses for waste heat from the generator. Earlier efforts to establish a diversified on-site greenhouse production operation were not successful, but potential uses are still being explored.

Act 78 of 1987 resulted in the closure of a number of older, unlined landfills. The Solid Waste Management Rules, effective March 15, 2012, contains post-closure monitoring requirements for landfills. The Vermont Natural Resources Atlas (http://anrmaps.vermont.gov/websites/anra/) provides data on the locations of closed landfills and their status, under the "Waste Management" layer.

## Leaf and Yard Residuals

According to the Vermont 2013 Waste Composition Study, leaf and yard residuals account for only about 3% of the landfill. What is not managed onsite has relatively little market value, which limits the distance these wastes can be feasibly transported. The most likely uses for these materials are bulking agents for composting, animal bedding, or wood chips. (Some wastes, for example, ends up in the McNeil Woodchip plant.) Most NEK residents manage leaf and yard residuals on their property or haul to stump dumps. NEKWMD's Lyndon facility collected about six tons of leaf and yard waste in 2016. About 684 tons of wood waste were collected in various sites throughout the NEK, more than half of which was collected at Kingdom View Compost. More than 192 tons of "yard trimmings" (yard and leaf waste) were collected at various sites in 2016. The district also collected more than 50 tons of sawdust from Lyndon Furniture's Concord facility, which was used for composting.


NVDA Region: Solid Waste Management Districts
Figure 3.8
04/26/2018
JAY
TROY
NEWPORT TOWN
NEWPORT CITY
DERBY
HOLLAND
NORTON
CANAAN
AVERILL
LEMINGTON
WARNERS GRANT
WARREN GORE
AVERYS GORE
MORGAN
WESTFIELD
COVENTRY
LEWIS
CHARLESTON
BROWNINGTON
IRASBURG
BRIGHTON
BLOOMFIELD
LOWELL
BARTON
WESTMORE
FERDINAND
BRUNSWICK
ALBANY
NEWARK
GLOVER
SUTTON
EAST HAVEN
MAIDSTONE
CRAFTSBURY
SHEFFIELD
BURKE
GREENSBORO
GRANBY
WHEELOCK
LYNDON
VICTORY
GUILDHALL
STANNARD
HARDWICK
KIRBY
WALDEN
ST. JOHNSBURY
LUNENBURG
DANVILLE
CONCORD
WATERFORD
PEACHAM
BARNET
GROTON
RYEGATE
N
W
E
S
Waste Facilities
Transfer Station
Recycling Station
Brush Dump
Food Scrap Collection
Composting Facility
Northeast Kingdom WMD
Central Vermont SWMD
Lamoille Regional SWMD
Individual towns with approved plan
0
10
20 Miles
NVDA

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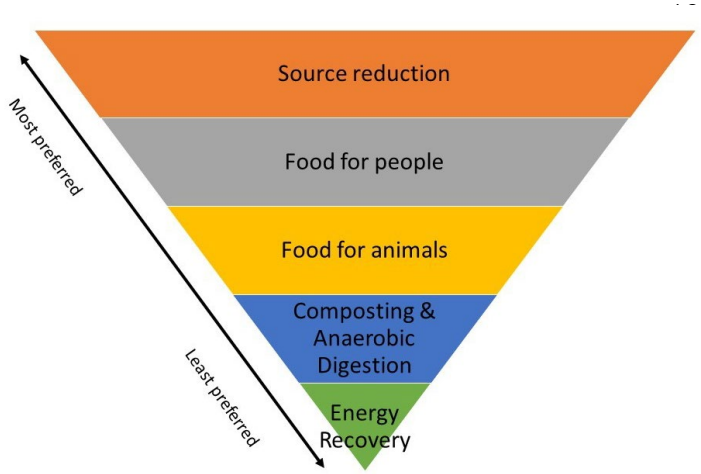
2

## Food Waste

According to Vermont's 2013 Waste Composition Study, food accounts for the largest share of organics in the waste stream. Food waste can occur at any point in the along the supply chain: Cosmetically challenged fruits and vegetables are left to rot in the field, food gets spoiled during shipping, retailers dispose of expired goods, and leftovers get scraped into the bin. What ends up in the landfill produces methane, which, as a greenhouse gas, is significantly more potent than CO2 because of its ability to retain heat.

The MMP focuses on promoting "highest and best use" on materials and waste management, which means that we can no longer think of about the management of food materials from a purely post-consumer end-of-useful-life perspective. The Food Recovery Hierarchy (Figure 3.9) prioritizes strategies for managing food materials with the greatest benefit to our environment, society, and the economy.

**Figure 3.9: Food Recovery Hierarchy**




**Source Reduction:** *Waste less by changing the way we source, distribute, and use food.* For households, reducing waste might mean planning meals in advance and carefully disregarding "sell by" labels. For institutions, this might entail using software systems that weigh and track food use and waste, or entering performance-based contracts with food service providers. Schools may also establish "food sharing tables" where students can place whole, unopened, and uneaten food. The Vermont Department of Health offers some guidelines for doing this safely.

**Food for People**: *Redirect nutritious, edible food to populations likely to be food insecure.* Gleaning is the act of harvesting excess or unmarketable produce from a farm. Salvation Farms, a statewide nonprofit committed to gleaning Vermont's agricultural surplus, estimates that 14.3 million pounds of Vermont-grown vegetables and berries are lost each year because produce is left in the field or goes unsold. Vermont Foodbank runs a statewide program that redistributes produce, and Northeast Kingdom farms contribute thousands of pounds to this program annually. Retailers, hotels, and restaurants must also find ways to manage food products that are no longer saleable. In 2015, the Vermont Food Bank reported a 25-30% increase in food donation and another 40% increase in 2016. Much of that increase could be attributed to fresh foods rather than canned goods.[3] However, perishables continue to present more of a challenge than shelf-stable products. Although the Bill Emerson Good Samaritan Food Donation Act protects individuals and entities who donate unsaleable food from liability, our region's rural and highly dispersed settlement pattern makes transporting donated perishables difficult. Some meal sites in the region are transporting donated food via the "Subaru network." The NEK Food Cycle Coalition, a task force of the NEK Food System, is currently exploring sustainable options for a distribution system that minimizes spoilage and carbon emissions.

**Food for Animals:** *Residuals and scraps can be used for farm animals to establish more sustainable and cost-effective agricultural practices.* Some residuals, like whey and spent brewer's grain are being fed to pigs and are covered under the Vermont Commercial Feed Law, administered by Vermont Agency of Agriculture Food and Markets. There are some documented cases of pathogens being transferred to humans from pigs fed food scraps, and the VAAFM prohibits this practice among commercial producers. Feeding food scraps to chickens, however, is a time-tested practice that goes back to the days of the Great Depression and World

[3] Vermont Dept. of Environmental Conservation: Vermont's Universal Recycling Law Status Report, 2016 December.

War II, when resources were scarce. There are significant economic and environmental benefits, especially for small egg producers, whose feed would normally account for 70% of all production expense.[4]

**Composting**: *Redirect food scraps to build soil quality, sequester carbon, reduce runoff, and increase crop production.* When food scraps and organics decompose in a landfill, they release methane, mostly due to the lack of oxygen in the landfill. Even when the landfill methane is managed, diverting organics to aerobic digestion through composting is more effective in reducing emissions.[5] The options range from backyard bins to the iconic "green cones," to commercial-scale production. Currently there are two ANR-certified composting operations in the Northeast Kingdom: Dane Farm in Charleston, and Kingdom View Composting in Lyndon. The former site is currently inactive. Black Dirt Farm in Stannard and Cloud's Path Farm are not composting facilities per se, but they provide commercial food scrap hauling in the region, drawing from a 200-mile radius. Some haulage is retained for feeding laying hens. In 2016, the NEKWMD has reported a 300% increase in food scrap drop-off.[6] There are currently 21 facilities collecting food scraps in the NEKWMD.

**Energy Recovery:** *Convert food residuals to renewable energy.* In addition to the region's landfill gas generation, there are opportunities to generate energy from food processing residuals. Waste oil from restaurants, for example, can be used to produce biofuel. Non-landfill methane generators primarily use cow manure, but it is possible to use "clean" food residuals, such as spent grains from brewing.

## Hazardous Wastes

Household Hazardous Wastes (HHW) are the most prevalent of all hazardous wastes generated within the region. Despite their availability and relative ease-of-use for residential and commercial sources, the toxins in many of these products can pose serious health and environmental hazards (oil, batteries, cleaning solvents, insecticides, fluorescent bulbs, etc.). Therefore, the proper disposal of wastes, empty containers, and the unused portions of products is essential. Pouring them down the drain or sending them to the landfill are never an option. Towns and solid waste districts hold hazardous waste collection events every year, two per year at minimum (spring and fall) and many common household hazardous wastes can be disposed of at these events.

The Vermont Legislature established the Paint Product Stewardship program in 2014. Under this program, manufacturers are responsible for collecting and managing leftover architectural paint (both oil and latex) through a stewardship organization called PaintCare. This program will allow for free paint recycling or disposal at many locations throughout the region, such as paint retailers, recycling centers, hazardous waste facilities and collection events. It is funded by a small fee included at the point of sale of paint cans throughout the state.

In 2014 a bill was passed that requires primary (single-use) battery manufacturers to fund and manage a take-back and recycling program on behalf of consumers. The Primary Battery Stewardship Law (Act 139) prohibits battery producers from selling batteries in Vermont unless they participate in a stewardship plan that offers free collection and recycling. Many of the sites in the Northeast Kingdom are recycling centers, but a few retailers have collection sites as well. To find locations in the region, visit https://www.call2recycle.org/locator/

(See the Land Use chapter of this Plan for a discussion of Brownfields)

[4] Black Dirt Farm. Feeding Food Scraps to Laying Hens in an Active Composting System, March 2017.
[5] Paul Hawken. Drawdown: The Most Comprehensive Plan Ever to Proposed to Reverse Global Warming. Penguin 2017.
[6] Vermont Dept. of Environmental Conservation. Vermont's University Recycling Law Status Report.

## Other Solid Waste Management Procedures

The Vermont Agency of Natural Resources, Waste Management Division currently has twenty one procedures in effect which address various aspects of solid waste management, from the disposal of dead animals to the disposal of clogged septic stone. These procedures can be found at: http://www.anr.state.vt.us/dec/wastediv/solid/procedures.htm

# GOALS AND STRATEGIES FOR SOLID WASTE MANAGEMENT

## SOLID WASTE MANAGEMENT GOALS

- Municipal and regional solid waste disposal systems shall be cost-effective, environmentally sound, and promote reduction, reuse, and recycling, and will support the State-wide goal of reducing the disposal rate of Municipal Solid Waste.
- Increase solid waste diversion rates to 50% by the year 2020.
- Hazardous wastes shall be disposed at facilities permitted by the Agency of Natural Resources to ensure proper handling.
- Support efforts to reduce food waste by half by the year 2030.

## SOLID WASTE MANAGEMENT STRATEGIES

- Assist member towns and solid waste management districts in the implementation of solid waste management plans.
- Encourage communities to meet the waste management and recycling goals established by the Northeast Kingdom Waste Management District and municipal waste management plans.
- Support public education to promote efforts to reduce and properly manage waste.
- Promote opportunities for schools and institutions to reduce food waste through best management practices and performance-based contracts.
- Provide technical assistance to entrepreneurs who are interested in food scrap hauling and composting-related businesses.
- Assist municipalities to adopt illegal dumping and burning ordinances.
- Encourage communities to create or expand local recycling facilities.
- Assist communities in sustainable reclamation of brownfields in the region.
- Support efforts to aggregate and distribute gleaned agriculture products.
- Support efforts to efficiently aggregate and distribute recovered food in a manner that minimizes spoilage and trucking miles.
- Support the expansion and viability of commercial composting operations.
- Help communities plan for and create municipal composting facilities, where feasible.
- Explore and facilitate the sustainable use of food residuals and other waste byproducts.

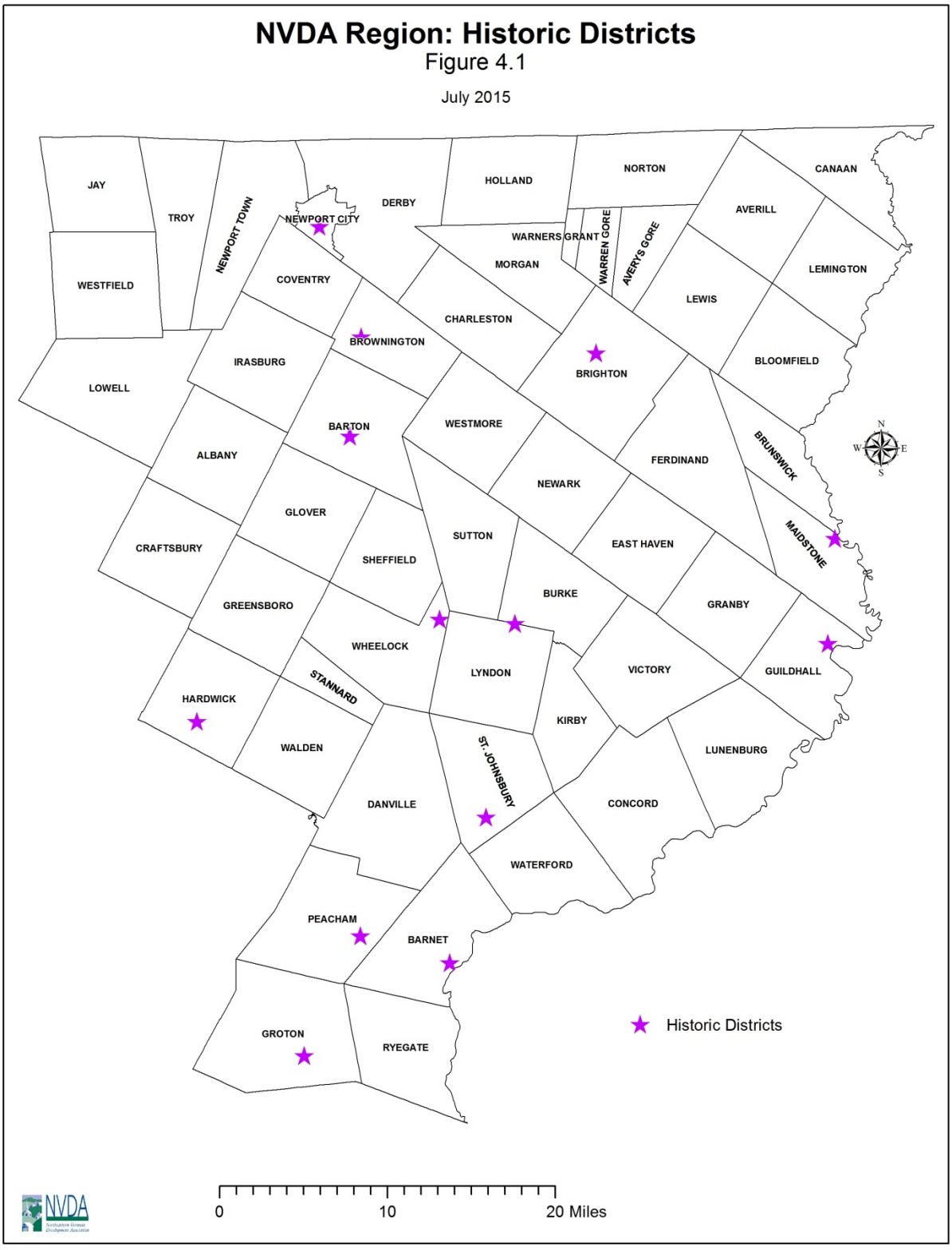
# Chapter Four: Historic, Cultural & Scenic Resources

## I. HISTORIC & SCENIC RESOURCES

Preserving historic, archeological, and scenic resources enables communities to retain links to their past, maintain their traditions (including quality of life), and can bring economic benefits through increased property values and tourism. Indeed, there are federal and state programs to assist communities with preservation. Tourism has been increasingly beneficial for much of the New England region, and particularly for Vermont due to its abundance of scenic resources. The Northeast Kingdom is fortunate to have communities that have already identified some of their assets and protected a significant number of historic resources. These include historic districts, a large number of historic buildings, archeological sites, covered bridges, barns, and areas of natural or scenic beauty. Despite the work that has already been done, there are many historic, community buildings and meeting houses still in need of restoration and preservation. Table 4.1 gives some representation of the existing historic and cultural resources within the region. For more information on individual properties listed on the state and national registers, go to http://orc.vermont.gov/Resource/Show-Resource-Table.aspx

**Table 4.1: Northeast Kingdom Historic Districts and State Parks Listed on the National Register of Historic Places**

| **Caledonia County:** | **Date** |
|---|---|
| Barnet Center Historic District | 07-12-1984 |
| Darling Estate Historic District, Burke and Lyndon | 08-23-2011 |
| Downtown Hardwick Village Historic District | 09-30-1982<br>Boundary increased<br>03-10-2004 |
| Hardwick Street Historic District, Hardwick | 06-22-1979 |
| Maple St./Clarks Ave. Historic District, St. Johnsbury | 04-05-1994 |
| Peacham Corner Historic District, Peacham | 12-18-2003 |
| Railroad Avenue Historic District, St. Johnsbury | 06-25-1974 |
| Ricker Pond State Park, Groton | 03-29-2002 |
| St. Johnsbury Historic District (extension of Railroad Street district to include Eastern Avenue and connect with Main Street) | 04-28-1980 |
| St. Johnsbury Main Street Historic District (along Main Street, Eastern and Western Avenues, Park and Belvidere Streets, and Summer Street Common) | 05-28-1975 |
| Stillwater State Park, Groton | 02-29-2002 |
| Wheelock Common Historic District, Wheelock | 08-30-2007 |
| **Essex County:** | |
| Guildhall Village Historic District | 09-27-1980 |
| Maidstone State Park | 11-29-2001 |
| Island Pond Historic District, Brighton | 01-31-1979 |
| **Orleans County:** | |
| Brownington Village Historic District | 05-09-1973 |
| Crystal Lake Falls Historic District, Barton | 07-07-1994 |
| Crystal Lake State Park, Barton | 08-30-2005 |
| Newport Downtown Historic District, Newport City (Main, Coventry, Central, Second Summer, Third, School, Bayview, Eastern, Field, Seymour, Fyfe) | 09-28-2006 |
| Source: National Park Service | |




Each historic district also contains a number of properties listed on, or eligible for the National Register.

## Historic Preservation Programs and Assistance

Criterion 8 of Act 250 protects scenic and aesthetic resources, historic sites, and rare or irreplaceable natural areas. A historic site is defined as "any site, structure, district or archeological landmark which has been officially included in the National Register of Historic Places and/or the state register of historic places or which is established by the Vermont Advisory Council on Historic Preservation as being historically significant." [10 V.S.A Section 6001 (9)]. If a site has been nominated, then designated as historic, the state provides a number of programs for communities and groups to help achieve their preservation goals.

The State of Vermont Division for Historic Preservation has a number of resources on its Web page explaining the programs available for historic and cultural preservation efforts, information, and technical assistance. http://accd.vermont.gov/strong_communities/preservation These programs are available to communities, neighborhoods, individuals, and businesses and provide many benefits.

## Other Regional Resources

Local area Chambers of Commerce can provide much of the information on business & industry, schools, housing, local attractions, and services available in or near a municipality. Table 4.2, below, is included as a resource for additional information.

**Table 4.2: Local Chambers of Commerce**

| | |
|---|---|
| Barton Area Chamber of Commerce, Barton | http://centerofthekingdom.com/ |
| Burke Area Chamber of Commerce, East Burke | www.burkevermont.com |
| Danville Chamber of Commerce, Danville | http://www.danvillevtchamber.org/ |
| Hardwick Area Chamber of Commerce, Hardwick | http://www.heartofvt.com/ |
| Island Pond Chamber of Commerce, Island Pond | http://islandpondchamber.org/ |
| Jay Peak Area Association, Troy | http://topofvt.com/ |
| Lyndon Area Chamber of Commerce, Lyndon | http://www.lyndonvermont.com/ |
| Northeast Kingdom Chamber of Commerce, St. Johnsbury | http://nekchamber.com/ |
| St. Johnsbury Chamber of Commerce, St. Johnsbury (also a Designated Downtown organization) | http://discoverstjohnsbury.com/ |
| Vermont's North Country Chamber of Commerce, Newport | http://www.vtnorthcountry.org/ |

Northeast Kingdom Travel and Tourism Association (NEKTTA), the regional marketing organization for the Northeast Kingdom partners with NVDA in many efforts. NEKTTA is also involved in assisting individual businesses and the local chambers of commerce shown above with their marketing efforts. More about the NEKTTA organization can be found at their Web site http://www.travelthekingdom.com/.

# II. CULTURAL RESOURCES

## Public Libraries

The Northeast Kingdom is fortunate to have many library resources as centers of learning (many of which are architecturally significant) to complement the region's educational systems. It is important to keep all of these facilities updated to meet the informational and technological needs of area residents.

1

| Table 4.3: Public Libraries in the Northeast Kingdom | | | |
|---|---|---|---|
| **Municipality** | **Library and Address** | **Phone** | **Web site** |
| Albany | Albany Public, 530 Main St. | (802) 755-6107 | http://localpubliclibrary.com/AlbanyVermontpubliclibrary |
| Barnet | Barnet Public, 147 Church Street | (802) 633-4436 | |
| Barnet | Macindoe Falls Academy, 37 Academy Lane | (802) 802-633-4472 | |
| Barton | Barton Public, 100 Church Street | (802) 525-6524 | http://barton-public-library.org/ |
| Barton | Jones Memorial Library, 1 Water Street, Orleans Village | (802) 754-6660 | http://centerofthekingdom.com/services/jones-memorial-library |
| Brighton | Island Pond Public Library, 49 Mill Street Ext | (802) 723-6134 | https://islandpondpubliclibrary.wordpress.com/ |
| Burke | East Burke Community Library, | (802) 626-9823 | http://www.burkevermont.org/library-east-burke.php |
| | West Burke Public Library, 135 Main Street, West Burke | (802) 467-3717 | http://www.burkevermont.org/library-west-burke.php |
| Canaan | Alice M. Ward Memorial, 27 Park Street | (802) 266-7135 | http://www.aliceward.org/ |
| Concord | Concord Public, 360 Main Street | (802) 695-2220 | http://www.concordvt.us/ |
| Craftsbury | Craftsbury Public, 12 Church Street, Craftsbury Common | 802 586-9683 | http://www.craftsburypubliclibrary.org/ |
| | John W. Simpson Memorial Library, 1972 E Craftsbury Rd East Craftsbury | (802) 586-9692 | |
| Danville | Pope Memorial Library, 121 Park Street | (802) 684-2256 | http://popememoriallibrary.org/ |
| | Brainerd Memorial Library, 4215 Bruce Badger Memorial Hwy, North Danville | (802) 424-1403 | http://www.brainerdmemoriallibraryvt.org/ |
| Derby | Dailey Memorial Library, 101 Junior High Drive | (802) 766-5063 | http://daileymemoriallibrary.org/ |
| Derby Line | Haskell Free Library and Opera House, 93 Caswell Avenue | (802) 873-3022 | http://haskellopera.com/library/ |
| Glover | Glover Public Library, 51 Bean Hill Road | (802) 525-4365 | http://gloverlibrary.org/ |
| Greensboro | Greensboro Free Library, 53 Wilson Street | (802) 533-2531 | http://www.greensborofreelibrary.org/ |
| Groton | Groton Free Public Library, 1304 Scott Hwy | (802) 584-3358 | http://grotonlibraryvt.org/ |
| Guildhall | Guildhall Public Library, 7218 Vt. Route 102 | (802) 676-3054 | |
| Hardwick | Jeudevine Memorial Library, 93 North Main Street | (802) 472-5948 | http://www.jeudevinememoriallibrary.org/ |
| Irasburg | Leach Public Library, 130 Park Avenue | (802) 754-2526 | |

| | | | |
|---|---|---|---|
| Lowell | Lowell Community Library, 100 Ranch Road | (802) 744-2447 | |
| Lunenburg | Gilman Public Library | (802) 892-5969 | |
| | Alden Balch Memorial Library, 24 E. Main St. | (802) 892-5365 | https://aldenbalchlibrary.wordpress.com/ |
| Lyndon | Cobleigh Public Library, 14 Depot Street, Lyndonville | (802) 626-5475 | http://cobleighlibrary.org/main/ |
| Newport | Goodrich Memorial Library, 202 Main Street | (802) 334-7902 | http://www.goodrichlibrary.org/ |
| Peacham | Peacham Library, 656 Bayley Hazen Rd | (802) 592-3216 | http://peachamlibrary.org/ |
| Ryegate | South Ryegate Public Library, 140 Church Street, South Ryegate | | |
| St. Johnsbury | St. Johnsbury Athenaeum, 1171 Main Street | (802) 748-8291 | http://www.stjathenaeum.org/ |
| Troy | William & Lucy Rand Memorial Library, 160 Railroad Street, North Troy | (802) 988-4741 | http://randmemoriallibrary.my-free.website/ |
| Walden | Walden Community Library, 135 Cahoon Farm Road, West Danville | (802) 563-3000 | |
| Waterford | Davies Memorial Library, 532 Maple Street, Lower Waterford | (802) 748-4609 | http://daviesmemoriallibrary.org |
| Westfield | Hitchcock Museum, 1252 Rte. 100 | (802) 744-8258 | http://hitchcocklibrary.blogspot.com/ |
| Source: NVDA 2015 | | | |

In addition to public library resources in the region, Table 4.4 shows a number of alternative public and private learning institutions possessing cultural and informational resources worthy of mention. Internet addresses have been provided as well.

**Table 4.4: Public and Private Learning Institutions**

| School | Location | Website |
|---|---|---|
| Community College of VT | St. Johnsbury/Newport | www.ccv.vsc.edu |
| Lyndon Institute | Lyndon Center | www.lyndoninstitute.org |
| Springfield College | St. Johnsbury | www.spfldcol.edu |
| Sterling College | Craftsbury | www.sterlingcollege.edu |
| Lyndon State College | Lyndonville | www.lsc.vsc.edu |
| North Country Career Center | Newport | http://nc3.ncsuvt.org/ |
| Burke Mountain Academy | East Burke | www.burkemtnacademy.org |
| Northwoods Stewardship Center | East Charleston | www.northwoodscenter.org |
| St. Johnsbury Academy | St. Johnsbury | www.stjohnsburyacademy.org |
| Source: NVDA 2015 | | |

## Museums

Museums are another excellent cultural and informational resource, as well as a link to the distant and recent past. There are many museums in the Northeast Kingdom worth visiting and popular ones include the Old Stone House Museum in Brownington; the offbeat Bread & Puppet Museum in Glover; and the Athenaeum,

Fairbanks, and Maple museums in St. Johnsbury. Each of these has a wide array of exhibits and programs for all ages. Table 4.5 lists the region's resources for historic information and museum collections.

| Table 4.5: Historical and Museum Collections in the Northeast Kingdom | |
|---|---|
| | **Location** |
| Barnet Historical Society – Goodwillie House | Barnet |
| Crystal Lake Falls Historical Society - Pierce House | Barton |
| Old Stone House Museum / Orleans County Historical Society | Brownington |
| Alice Ward Library | Canaan |
| Concord Historical Society (http://www.concordvthistorical.noconek.com/) | Concord |
| Craftsbury Public Library | Craftsbury |
| Derby Historical Society | Derby |
| Hardwick Historical Society (Memorial Bldg.) | Hardwick |
| Haskell Library and Opera House | Derby Line |
| White School Museum | East Burke |
| Bread and Puppet Museum | Glover |
| Greensboro Historical Society | Greensboro |
| Holland Historical Society | Holland |
| Island Pond Historical Society | Island Pond |
| Shores Memorial Museum | Lyndon Center |
| Goodrich Memorial Library | Newport |
| Missisquoi Valley Historical Society | North Troy |
| Peacham Historical Society | Peacham |
| Maple Grove Museum and Factory | St. Johnsbury |
| St. Johnsbury Athenaeum | St. Johnsbury |
| St. Johnsbury History & Heritage Center | St. Johnsbury |
| Fairbanks Museum and Planetarium | St. Johnsbury |
| Stannard Historical Society | Stannard |
| Hitchcock Memorial Library and Museum | Westfield |
| Source: NVDA 2015 | |

## GOALS AND STRATEGIES FOR HISTORIC, CULTURAL & SCENIC RESOURCES

### HISTORIC, CULTURAL & SCENIC RESOURCE GOALS

- Future development should follow traditional development patterns, while providing for economic development opportunities and livable communities.
- Significant historic, cultural, and scenic resources within the region should be identified and preserved.

### HISTORIC, CULTURAL & SCENIC RESOURCE STRATEGIES

- Promote local and regional tourism, since it is an important part of our economic base.
- Assist communities to preserve and maintain historic downtowns, village centers, buildings, and rural and scenic landscapes.

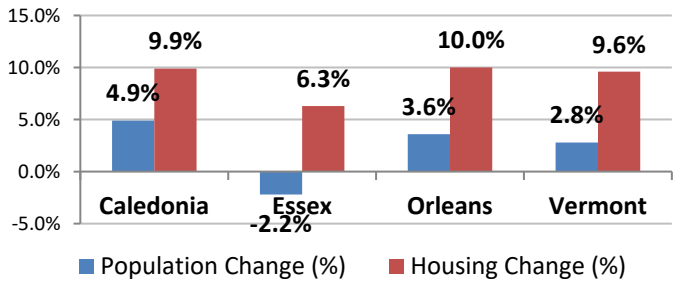
- Rehabilitate and re-use significant cultural, architectural, and historic sites, and community facilities, whenever feasible.
- Promote local traditions, skills, crafts, and the performing arts within the region.
- Utilize federal, state, and local programs for developing or preserving local cultural and historic assets.
- Disseminate information about historic tax credits to businesses and property owners.
- Assist communities to designate downtowns and village centers under the Vermont Downtown Program.
- Support local cultural resource initiatives to revitalize communities and downtowns.
- Assist municipalities with securing funding and technical assistance to conduct a comprehensive survey of local historic resources.

# Chapter Five: Housing

## I. HOUSING OVERVIEW

According to the 2010 Census, there are 37,123 housing units in the Northeast Kingdom, an increase of 9.4% from 33,939 units in the previous decade. The Census defines a "housing unit" as a house, apartment, mobile home, group of rooms, or a single room that is occupied (or if vacant, is intended for occupancy) as separate living quarters. According to the U.S. Census Bureau, the Northeast Kingdom's population in 2010 was 64,692, which represents a modest increase of 3.6% from the 2000 Census, far slower rate of growth than the region has seen in prior decades. The increase in housing units significantly outpaced the rate of population change, even in Essex County, which saw a net loss in population. (Figure 5.1)

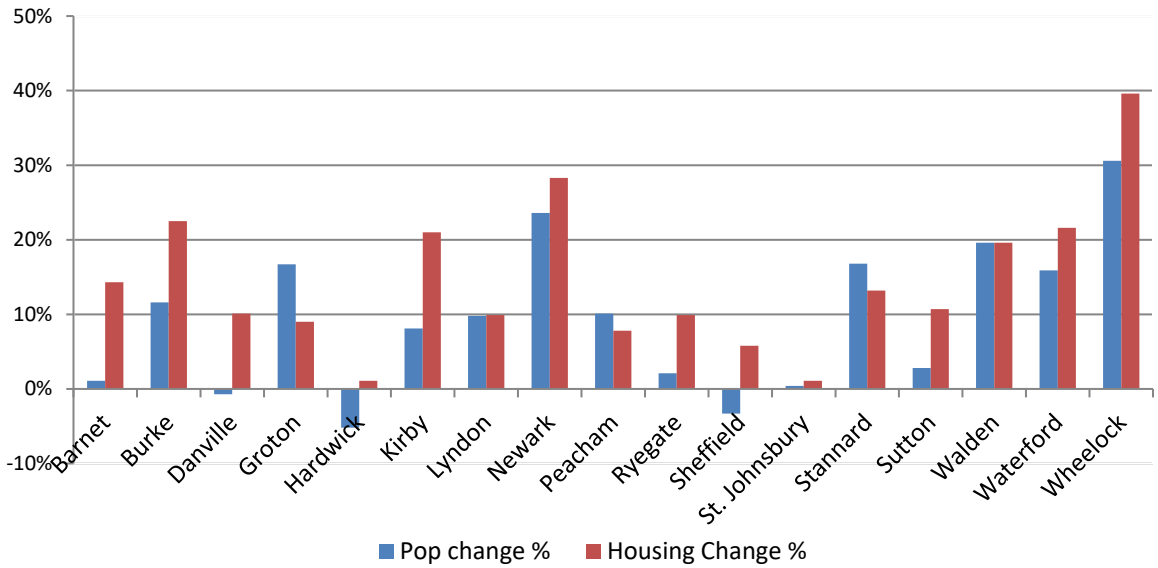
**Figure 5.1: Population and Housing Changes in the Northeast Kingdom, 2000-2010**




Source: US Census Bureau, 2000 Census and 2010 Census

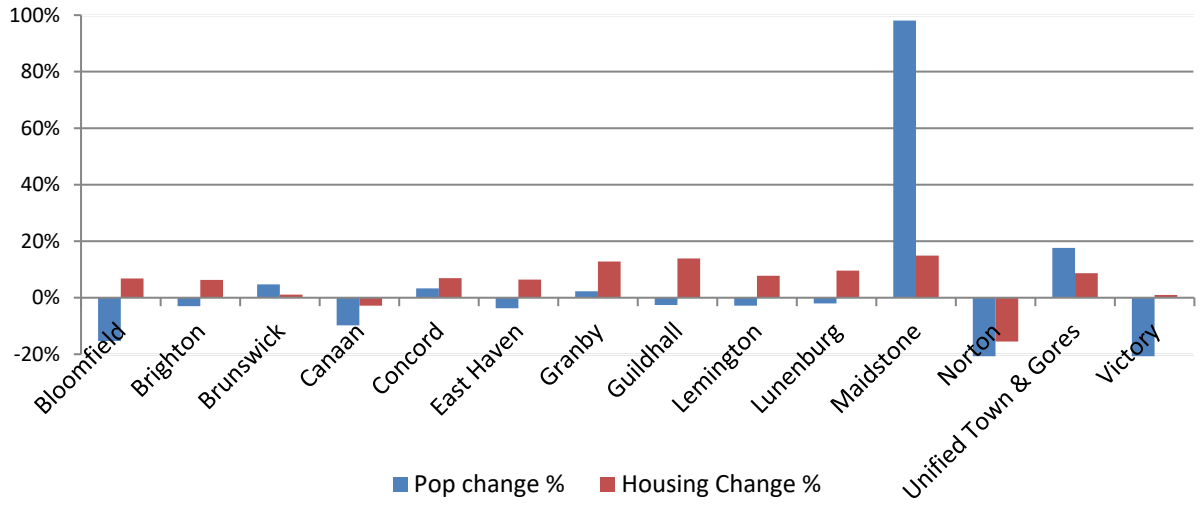
Municipalities throughout the Northeast Kingdom that lost population still saw in an increase in housing units: Bloomfield, Brighton, Danville, East Haven, Hardwick, Guildhall, Lemington, Lunenburg, Sheffield, and Victory. The exceptions to the rule were Canaan, Greensboro, Norton, and Newport City.

**Figure 5.2: Caledonia Changes in Population & Housing Units, 2000-2010**



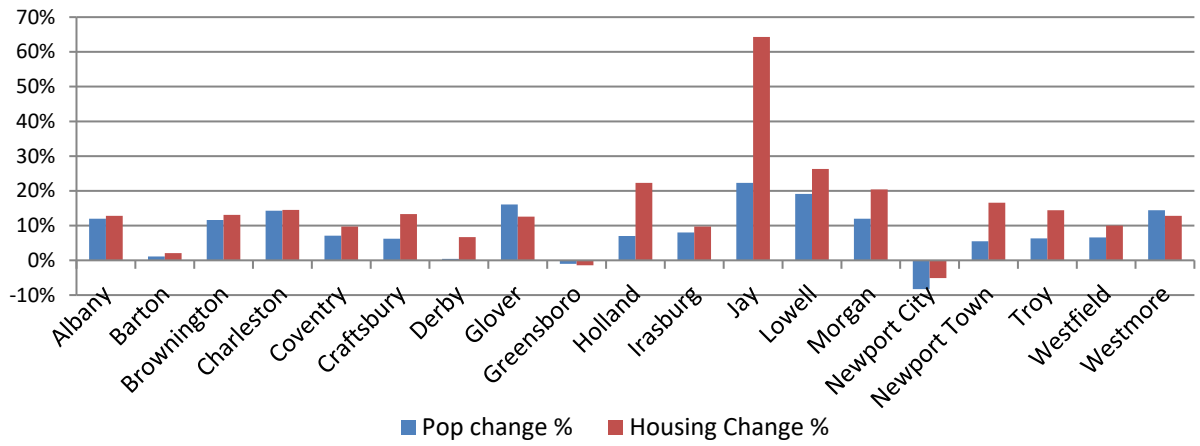

Source: US Census Bureau, 2000 Census and 2010 Census

**Figure 5.3: Essex Changes in Population & Housing Units, 2000-2010**




Source: US Census Bureau, 2000 Census and 2010 Census

**Figure 5.4: Orleans Changes in Population & Housing Units, 2000-2010**



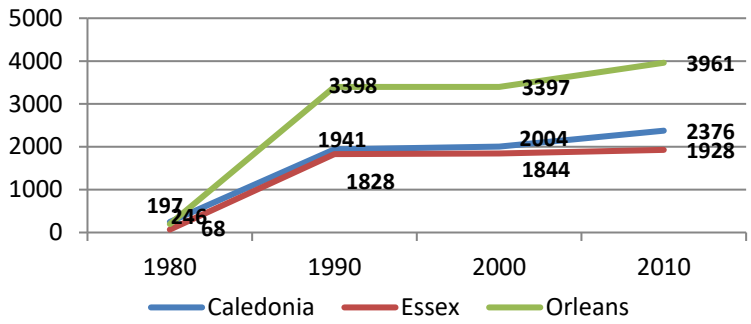

Source: US Census Bureau, 2000 Census and 2010 Census

## Seasonal Housing

A partial explanation for the discrepancy between population growth rates and housing units is the disproportionate share of seasonal and vacation housing. The Northeast Kingdom has traditionally had some the highest percentages of seasonal and vacation housing stock in the state. According to the 2010 Census, more than one out of every five housing units in the Northeast Kingdom is a vacant housing unit intended for "seasonal, recreational, or occasional use." By comparison, the statewide percentage of vacant seasonal housing stock is only 15.6%. Like the rest of Vermont, the Northeast Kingdom saw significant growth in seasonal housing units from 1980 to 1990. Growth slowed in the following decade, but appears to have picked up slightly from 2000 to 2010. (Figure 5.5)

In Orleans County, seasonal housing accounts for more than half of the housing stock in Greensboro (53.3%), Jay (63.4%), Morgan (58.0%) and Westmore (67.9%). In Essex, seasonal units account for more than half the housing stock in Brunswick (50.0%), Maidstone (69.7%), Norton (58.2%), and the Unified Towns and Gores (90.6%). Granby's seasonal stock is at 44.3%. Historically, Caledonia has had a smaller share of seasonal housing stock (currently only 14.9% of all housing units), but seasonal units account for close to half of all units in Newark (49.3%) and Peacham (40.2%).

**Figure 5.5: Vacant units for seasonal, recreational, or occasional use, 1980-2010**




Source: US Census Bureau, 1980, 1990, 2000 and 2010 Census

The high proportion of seasonal and vacation housing creates complicating factors in the region's housing scenario. As Vermont becomes a more attractive destination for retirees, long-time seasonal residents may be more likely to become full-time residents. This appears to be the case in Maidstone, where the population practically doubled from 2000 to 2010, the community's share of owner-occupied housing *increased* by more than 13% and the share of seasonal *decreased* by more than 13%. Growth in seasonal units during this period was largely concentrated in Barnet, Burke, and Jay (a net of 81, 97, and 200 units respectively).

**Table 5.1: Average and Median Real Estate Values in the Northeast Kingdom and Surrounding Counties, 2016**

| | Primary Residences Sold | | Vacation Residences Sold | |
|---|---|---|---|---|
| | **Average** | **Median** | **Average** | **Median** |
| **Caledonia** | $154,846 | $147,000 | $145,206 | $116,500 |
| **Essex** | $111,525 | $96,500 | $135,024 | $110,000 |
| **Orleans** | $160,428 | $146,000 | $183,015 | $128,000 |
| **Franklin** | $208,933 | $202,000 | $128,685 | $118,950 |
| **Lamoille** | $304,960 | $224,500 | $559,394 | $313,900 |
| **Washington** | $213,899 | $188,000 | $214,956 | $153,750 |
| **Orange** | $184,490 | $174,900 | $208,292 | $139,700 |
| **Vermont** | $242,332 | $205,000 | $289,547 | $205,000 |

Source: Vermont Department of Taxes, accessed from Housingdata.org. Average and Median figures include single family residences, mobile homes with land and condominiums sold in 2016.

The relatively lower cost of vacation homes in the Northeast Kingdom in comparison with the rest of the state is likely an ongoing attraction to potential seasonal home buyers. In all cases the median – the "middle" selling price of all residences when prices are sorted in ascending order – is lower than the average. This indicates that outliers -- sales of extremely high-priced homes -- are skewing averages upward.

Even though the average and median prices of primary residences in the Northeast Kingdom may be lower than statewide, real estate is not necessarily a bargain for those who live and work here, because median and mean (average) household and family incomes are lower than statewide incomes (Table 5.2).

**Table 5.2: Median and Mean Incomes in the Northeast Kingdom and Surrounding Counties**

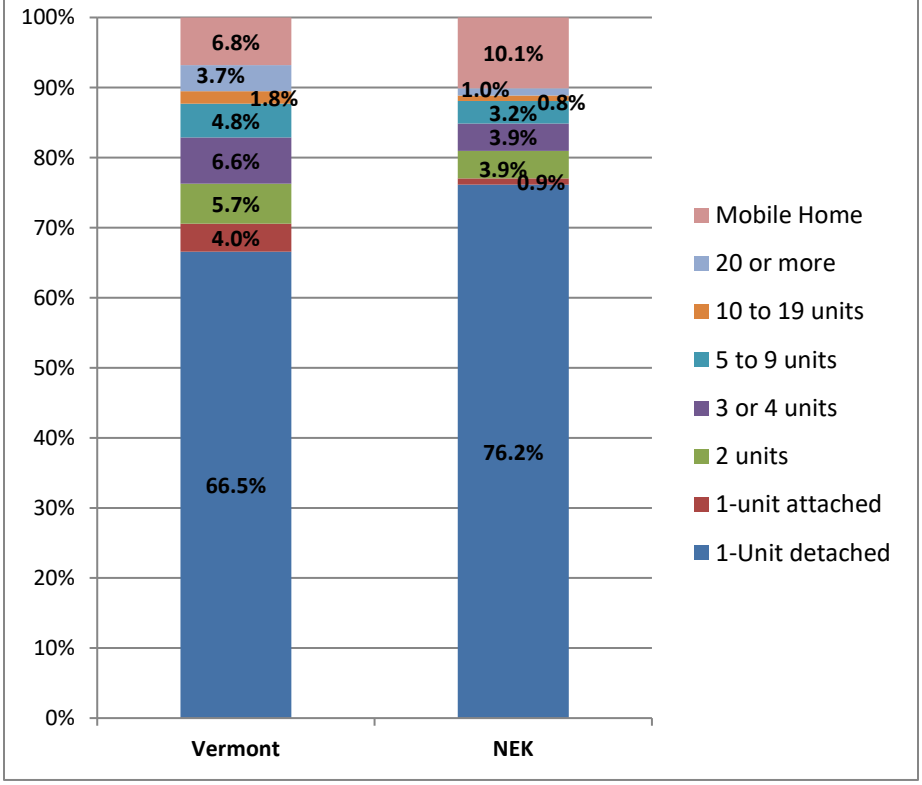
| | Household Income | | Family Income | |
|---|---|---|---|---|
| | Median | Mean | Median | Mean |
| **Caledonia** | $46,931 | $60,787 | $60,141 | $72,354 |
| **Essex** | $39,467 | $49,494 | $48,316 | $57,532 |
| **Orleans** | $43,959 | $56,883 | $55,101 | $66,155 |
| **Franklin** | $58,884 | $73,478 | $72,249 | $86,993 |
| **Lamoille** | $53,316 | $69,394 | $67,566 | $81,495 |
| **Washington** | $58,171 | $73,660 | $74,036 | $88,431 |
| **Orange** | $54,263 | $67,388 | $67,105 | $78,337 |
| **Vermont** | $56,104 | $73,016 | $71,465 | $88,340 |

Source: US Census Bureau- American Community Survey 5 Year Averages, 2012-2016

## Housing Supply

The Northeast Kingdom's supply of housing primarily consists of single family dwellings (1-unit unattached). Compared with statewide figures, single family homes and mobile homes account for a greater share of the overall housing stock. Multiunit dwellings and attached 1-unit dwellings (such as accessory dwelling units and apartments over a commercial use) account for a smaller share. (Figure 5.6) More than half of the region's housing units have three or more bedrooms. (Figure 5.7).

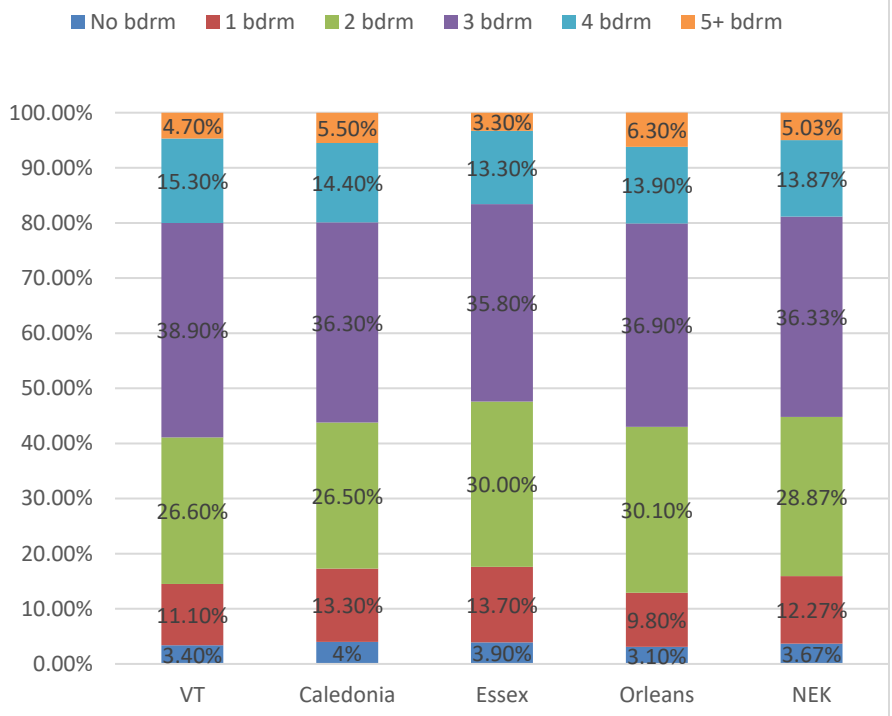
**Figure 5.6: Housing Types -- # of Units in Structure**




Source: US Census Bureau, American Community Survey 5-Year Estimates 2012-2016

Residential development trends have favored large lot rural residential in recent years. According to the 2016Grand List, there are 22,249 residential properties in the Northeast Kingdom (i.e. not seasonal or mobile homes). More than a third of residential properties (37.7%) are on lots that are six acres or larger. (Vermont Department of Taxes).

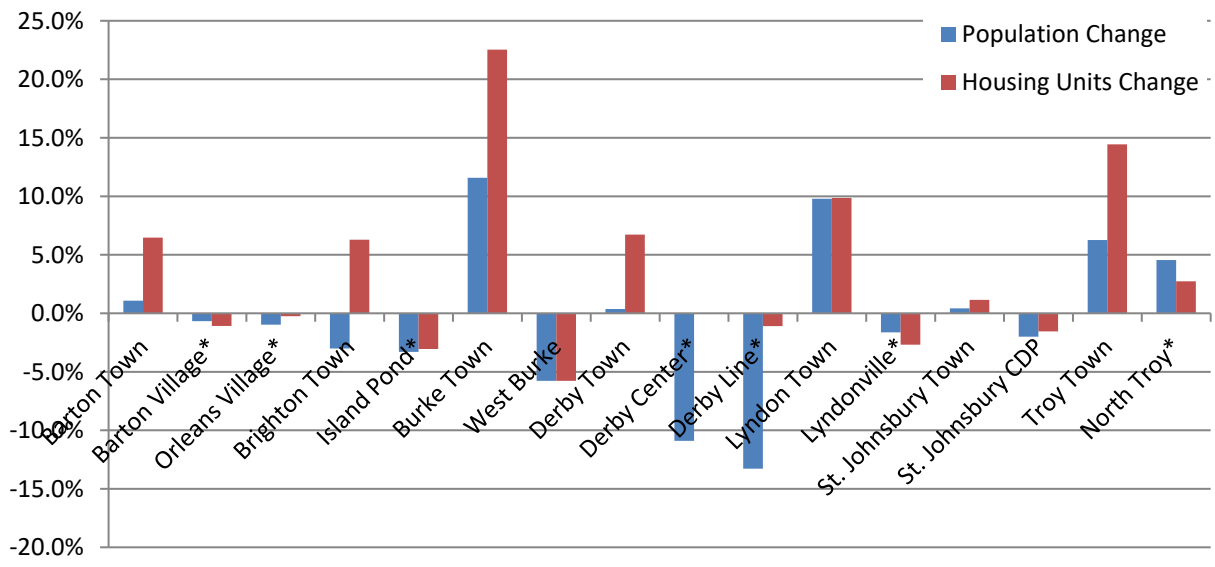
**Figure 5.7: Number of bedrooms in housing units**




Source: US Census Bureau, American Community Survey 5-Year Estimates 2012-2016

A key statewide planning goal is to plan development in order to maintain historic settlement patterns of compact villages and urban centers separated by rural countryside. (24 V.S.A. 4302(1)). Residential development in the Northeast Kingdom does not appear to be furthering this goal. A recent NVDA GIS analysis shows that over the past decade, more than 95% of residential development in the Northeast Kingdom has occurred outside of development centers (areas characterized by compact settlement patterns and clusters of mixed uses). Furthermore, a review of Census data from 2000 to 2010 shows a loss of population and housing units in "Census places," concentrated settled areas that are not necessarily incorporated. In Vermont, Census places often are traditional village settlement areas with the capacity to support additional housing opportunities with off-site water and sewer and provide convenient access to civic, cultural, and commercial amenities. Boundaries of Census places can change from one decennial Census to the next, so only the Census "places" with unchanged boundaries are evaluated here. Every Census place in the Northeast Kingdom with comparable historic data shows a loss of both population and housing units, with the exceptions of Derby Center (no net change in housing units) and North Troy (Figure 5.8)

**Figure 5.8: Population and Housing Units, 2000-2010 in Census Places**




Source: US Census Bureau, 2000 and 2010 Census

*contains areas served by offsite sewer and water

The Northeast Kingdom's housing stock is relatively old. With a few exceptions (Beecher Falls, Danville CDP, Derby Center, Barton Village, and Greensboro Bend) the majority of units built before 1939 are concentrated in the Census Designated Places. The deferred maintenance and energy inefficiency of these aging structures are likely to make them less attractive to potential homebuyers. This may be one reason why real estate markets in St. Johnsbury and Newport City – both of which contain the Northeast Kingdom's regional urban centers – are underperforming against the rest of their respective counties.

**Table 5.3 Percentage of Housing Stock Built Before 1939 in Municipalities with CDPs**

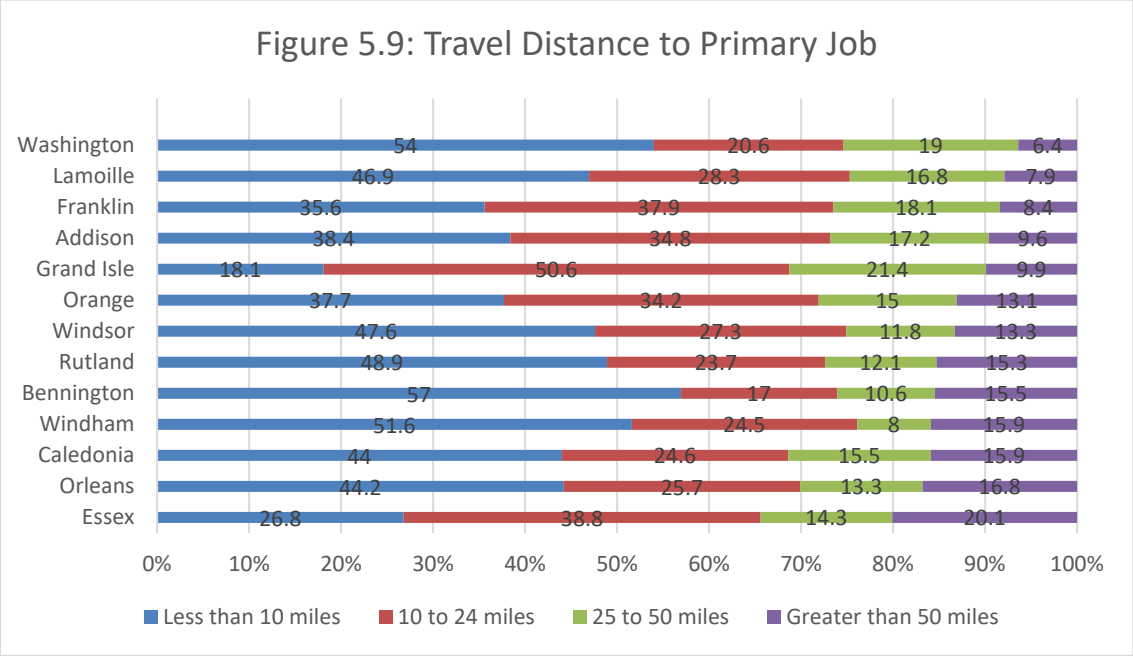
| Town/CDP | % of Stock Pre 1939 | Town/CDP | % of Stock Pre 1939 |
|---|---|---|---|
| Albany Town | 35.7% | Albany Village | 56.5% |
| Barnet Town | 38.5% | Barnet CDP | 60.0% |
| Barton Town | 42.9% | Barton Village | 48.2% |
| | | Orleans Village | 72.9% |
| Brighton Town | 36.3% | Island Pond CDP | 47.7% |
| Burke Town | 27.0% | East Burke CDP | 70.4% |
| | | West Burke Village | 65.5% |
| Canaan Town | 33.1% | Beecher Falls CDP | 25.6% |
| | | Canaan CDP | 54.9% |
| Concord Town | 21.8% | Concord CDP | 59.3% |
| Coventry Town | 21.8% | Coventry CDP | 51.9% |
| Danville Town | 30.6% | Danville CDP | 31.0% |
| Derby Town | 26.4% | Derby Center Village | 28.7% |
| | | Derby Line Village | 52.0% |
| Glover Town | 29.7% | Glover CDP | 39.6% |
| Greensboro Town | 45.3% | Greensboro CDP | 62.0% |
| | | Greensboro Bend CDP | 25.0% |
| Groton Town | 32.1% | Groton CDP | 56.9% |
| Hardwick Town | 51.5% | Hardwick CDP | 63.7% |
| Irasburg Town | 21.% | Irasburg CDP | 52.0% |

| | | | |
|---|---|---|---|
| Lyndon Town | 33.4% | Lyndonville Village | 70.6% |
| Newport City* | 54.0% | | |
| St. Johnsbury Town | 50.1% | St. Johnsbury CDP | 54.6% |
| Troy Town | 44.2% | North Troy Village | 70.6% |
| | | Troy CDP | 63.4% |
| Source: U.S. Census Bureau – American Community Survey 5-Year Averages, 2009-2013<br>* Newport City is a Census Designated Place and a County Subdivision. | | | |

In 2016, the Town of St. Johnsbury commissioned a Housing Study and Needs Assessment which was completed in December 2017 by Bowen National Research. The study included a comprehensive inventory of the Town's existing housing stock and identified strategies to improve the quality and range of housing options. One of the study's findings was that the Town's lack of diverse and modern housing alternatives put it at a competive disadvantage with surrounding rural communities. Suggested strategies noted in the report included not only building new housing units, but creating incentives to support reinvestment in the Town's historic neighborhoods. These existing neighborhoods, with an average density of 4 housing units per acre, typify the model of residential density that the State seeks to foster in order to retain the pattern of compact centers surrounded by rural working lands. However, the age and deteriorating condition of the housing stock hinders reinvestment.

A particular problem in communities with aging housing stock and depressed markets is that homeowners that want to use their home equity as collateral in seeking loans for renovations are hampered by low home appraisals. The loan needed to fund needed renovations and weatherization could well exceed the appraised value of the property, making traditional home equity loans inaccessible even if the homeowner has excellent credit and acceptable debt-to-income ratio. Auto Dependence

Auto dependence (particularly work-related) may be reinforcing scattered rural residential development patterns. Jobs are relatively scarce in this region, and residents are used to traveling far and wide to work. Essex, Orleans and Caledonia Counties have the state's highest percentages of residents who travel greater than 50 miles in one direction to their place of work. (Figure 5.9)




Source: U.S. Census Bureau, OnTheMap Application and LEHD Origin-Destination Employment Statistics (Beginning of Quarter Employment, 2nd Quarter of 2002-2015).

## Home Ownership

According to the U.S. Census Bureau 2010 Census, of the 26,691 occupied housing units in the Northeast Kingdom, 20,046 (75.1%) are owner-occupied. Of these owner-occupied units, 61.6% have a mortgage or loan, and 38.4% are owned free and clear. The Northeast Kingdom continues to have high percentages of owner-occupied housing units. However, higher owner occupancy rates are often typical of a rural area and are not necessarily an indicator of economic well-being or affordability. Rather, it may be a reflection of the relative lack of alternatives to home ownership, such as apartments and home shares. For example Essex County, which has the lowest median household income in the state, also has the second highest rate of owner occupancy in the state of just over 80%. By contrast, Chittenden County, which has the highest median household income, has the lowest rate of owner-occupancy in the state of just over 65%.

**Table 5.4 Owner-Occupied Housing Units in the Northeast Kingdom, 2000-2010**

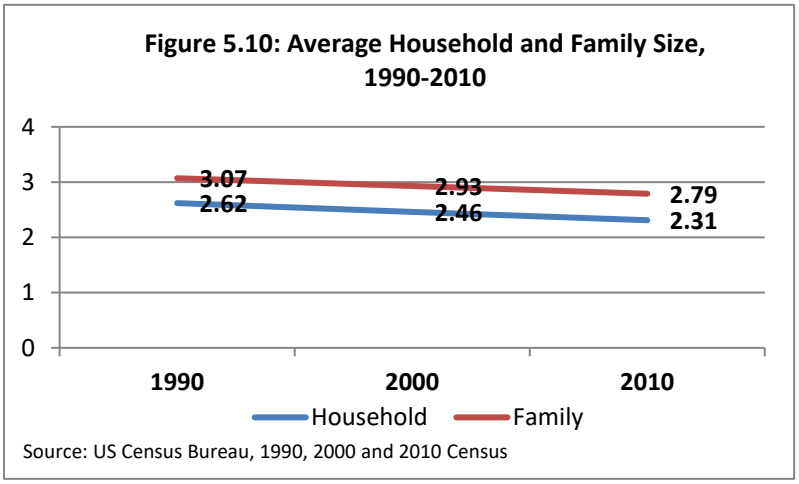
| | Occupied Housing Unit Change (Absolute) | Rate (%) of change | Owner Occupied Change (Absolute) | Rate (%) of change | % of occupied units that are owner occupied, 2000 | % of occupied units that are owner occupied, 2010 |
|---|---|---|---|---|---|---|
| **Caledonia** | 890 | 7.6 | 734 | 8.6 | 72.9 | 73.6 |
| **Essex** | 216 | 8.3 | 188 | 9.1 | 79.6 | 80.2 |
| **Orleans** | 874 | 8.4 | 816 | 10.5 | 74.1 | 75.6 |

Source: US Census Bureau, 2000 and 2010 Census

Owner-occupancy rates are lowest in the region's urban centers, where more rental housing is likely to be found: in 2010 the percentage of owner-occupied households in St. Johnsbury was 56.5%, Lyndon 68%, and Newport City 54.6%. It should be noted, however, that Newport City saw a net loss of 231 occupied units from 2000 to 2010. Despite modest gains in regional owner-occupancy rates from the previous decade, many communities experienced a decrease. In Caledonia County, only Burke, Danville, Hardwick, Peacham, Sheffield, St. Johnsbury, and Sutton saw modest increase in owner-occupancy rates from the previous decade. In Orleans County, eight communities saw a drop in owner-occupancy rates: Albany, Craftsbury, Derby, Glover, Jay, Lowell, Newport Town, and Westfield.

## Household and Family Characteristics

As is with the rest of Vermont, there has been significant shift in the makeup of the region's households that may have a profound impact on the region's housing supply and demand. The US Census Bureau defines a "household" as all the people who occupy a housing unit as their usual place of residence. A "family" is a group of two or more people who reside together and who are related by birth, marriage, or adoption. Both household sizes and family sizes are shrinking in the Northeast Kingdom (Figure 5.10)




There are three drivers behind this trend: 1) a smaller percentage of family households from the previous decade, 2) a net loss of families with children under the age of 18 from the

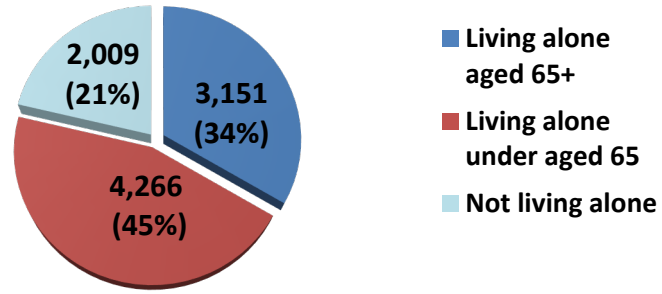
previous decade, and 3) an increase in the share of non-family households (Table 5.5).

| Table 5.5: Households and Families in the Northeast Kingdom, 2000-2010 | | | | | | |
|---|---|---|---|---|---|---|
| | Total Households | Families | % of Households | Families with Children < Age 18 | Non-Family Households | Householder Living Alone |
| 2000 | 24,711 | 16,861 | 68.2% | 7,962 | 7,850 | 6,248 |
| 2010 | 26,691 | 17,265 | 64.7% | 6,898 | 9,426 | 7,417 |
| Source: US Census Bureau, 2000 and 2010 Census | | | | | | |

Studies show that married couple households tends to have higher rates of home ownership due to a number of factors, such as dual incomes, better access to credit, and cost-efficiencies from sharing resources. According to the 2010 Census there were 13,389 married couple households in the Northeast Kingdom – the same number as in the previous decade –yet in 2010 they accounted for less than 50% of all households.

In 2010, non-family households accounted for more than 35% of all households in the Northeast Kingdom, up from just under 28% in 1990. The overwhelming majority of non-family households are individuals who live alone. More than a third of those who live alone are 65 years or older. (Figure 5.11). This sector of the region's population grew by more than 15% over the previous decade.

**Figure 5.11: Non-family Households**




Source: US Census Bureau, 2010 Census

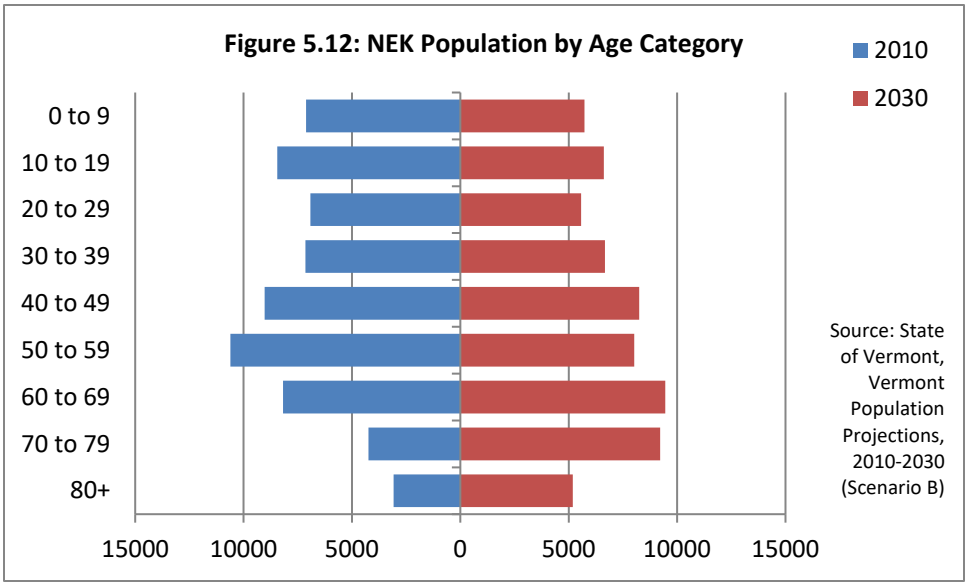
## Aging Population

According to the 2010 Census, about just under a quarter of the Northeast Kingdom's population was aged 65 and older. By 2030 this age group could account for nearly 40% of the population. In 2013, the State of Vermont released two sets of population projections:

A) Based on more robust growth and migration rates seen in the 1990s, and

B) Based on slower migration rates seen in the 2000s.

Both sets of projections show a decrease in every age group under 60 and an increase in every age group over 60. This demographic shift could have a dramatic impact on future housing demands, such as smaller, lower maintenance homes that are located closer to goods and services.




Successful aging in place requires "livable communities," ones that are characterized by safe, appropriate, accessible and affordable housing located in walkable neighborhoods with convenient access to goods and services. Newport City has taken on this challenge by receiving Vermont's first "Age-Friendly Community" designation from AARP. In 2014, an advisory council completed an exhaustive survey of the residents in Newport City and Orleans County age 45 and up. Among their findings:

Orleans county residents have lived in Orleans County and their town for a long time and are likely to remain there as they get older. 53% have lived in Orleans County for at least 45 years *and* 53% have lived in their current town for at least 25 years. More than a third said it was extremely or very important to stay in their town as they aged, and 71% said they are not very or not at all likely to move outside of Orleans County after retirement.[1]

Existing housing supply in the region is not likely to meet the needs of an aging population. According to the AARP Liveability Index, less than 3% of housing units nationwide provide "basic passage," which is determined by doorways and hallways that are at least 36" wide, floors with no steps between rooms, and at least one entry level bedroom and bathroom.

NVDA encourages municipalities to inventory existing housing stock at the town level.

The 2017 St. Johnsbury housing study has identified a need for senior housing, as homeowners seek to downsize and find more accessible housing options. The study notes demographic trends regarding senior homeowners in the secondary study area (SSA), which includes the balance of Caledonia County:

> "Within the SSA, it is projected that the greatest growth will occur among senior homeowners with incomes of $50,000 and higher (292 households, or 13.5%). An increase of 107 households (4.1%) is also projected to occur among senior owner households earning less than $50,000."

There are very limited housing options in the NEK region reserved for independent seniors. Even among those units reserved for elderly tenants, a limited number have the proper doorway widths and other features that earn the designation of "accessible." A list of subsidized housing units are shown on Table 5:10, indicating those units reserved for seniors, as well as how many units are accessible. Most of these units are reserved for tenants with incomes no higher than 80% of Area Median Income. Housing options for

[1] AARP Research, "Successful Aging in Orleans County: The 2014 Survey of Community Residents Age 45+ in Orleans County, Vermont," April 2015

independent seniors that have accessible design and are available at a variety of price points are needed in the region.

For seniors who are unable to live independently, options in the State include Assisted Living Residences, Residential Care Homes, and Nursing Facilities. These facilities are licensed by the Vermont Department Disabilities, Aging and Independent Living, and are not necessarily limited to seniors but also serve persons of any age with a variety of disabilities.

Assisted Living facilities combine housing, health and supportive services to support resident independence, and offer, at a minimum, a private bedroom, private bath, living space, kitchen capacity, and a lockable door. There are no Assisted Living facilitites in the NEK region, although there are 12 such facilities in other parts of Vermont.

Residential Care Homes provide room, board, personal care, general supervision, medication management and nursing overview; while Nursing facilities provide a high level of care with 24-hour nursing services, including room & board. In the NEK region there are 13 licensed Residential Care Homes with a total capacity of 207; and 8 licensed Nursing Homes with a total capacity of 421 (see table below).

**Table 5.6: Residential Care Homes and Nursing Facilities in the NEK**

| **Caledonia County** | | | |
|---|---|---|---|
| **Town** | **Facility Name** | **Facility Type** | **Capacity** |
| Danville | Cedar Lane Home | Residential Care Home | 4 |
| Lyndon | Pines Rehabilitation and Health Center | Nursing Home | 60 |
| Lyndon | Pine Knoll Community Care Home | Residential Care Home | 10 |
| St. Johnsbury | Canterbury Inn | Residential Care Home | 42 |
| St. Johnsbury | St. Johnsbury Health and Rehab | Nursing Home | 99 |
| Waterford | Waterford Group Home | Residential Care Home | 4 |
| Total for County | | | 219 |
| **Essex County** | | | |
| **Town** | **Facility Name** | **Facility Type** | **Capacity** |
| Concord | Loch Lomond | Residential Care Home | 16 |
| Total for County | | | 16 |
| **Orleans County** | | | |
| **Town** | **Facility Name** | **Facility Type** | **Capacity** |
| Barton | Maple Lane Nursing Home | Nursing Home | 71 |
| Barton | Maple Lane Retirement Home | Residential Care Home | 16 |
| Craftsbury | Craftsbury Community Care | Residential Care Home | 24 |
| Derby | Derby Green Nursing Home | Nursing Home | 23 |
| Derby Line | Michaud Memorial Manor | Residential Care Home | 34 |
| Glover | Union House Nursing Home | Nursing Home | 44 |
| Greensboro | Greensboro Nursing Home | Nursing Home | 30 |
| Newport | Bel_Aire Quality Center | Nursing Home | 44 |
| Newport | Bel_Aire Center | Residential Care Home | 14 |
| Newport | Kingdom Way Group Home | Residential Care Home | 6 |
| Newport | Newport Health Care | Nursing Home | 50 |
| Newport | Newport Residential Care Center | Residential Care Home | 8 |
| Newport | South Bay Home | Residential Care Home | 4 |
| Westfield | Scenic View Rural Edge | Residential Care Home | 25 |
| Total for County | | | 393 |
| Source: Vermont Department Disabilities, Aging and Independent Living, January 2018 | | | |

## Safety of Housing Stock

**Fire** poses the greatest safety risk to the region's housing supply. According to the 2016 Annual Report of the State Fire Marshal, first responders were called to 373 structure fires in the Northeast Kingdom that year. According to statewide data, residential properties account for the majority of structure fires and civilian fatalities. The senior population is particularly vulnerable. The 2016 State Fire Marshal's report notes that over the last five years, 54.2% of Vermont's fire deaths have been seniors over the age of 60. There a number of factors that exacerbate the risk of fire in the Northeast Kingdom:

- **Age of housing stock**: The region's housing stock is relatively old and more likely to be noncompliant with fire and safety codes. About 36% of the region's housing stock was built before 1950, compared to just under 31% statewide. (American Community Survey 5 Year Estimates) Additionally, Vermont Housing Conservation Board reports that more than a fifth of the state's mobile homes were built before 1976, predating federal safety standards, such as prohibiting louvered windows that obstruct escape from fire.
- **Scattered rural development**: Rural low-density development is likely to lead to greater response times.
- **Long cold winters**: The State Fire Marshal reports that 43% of residential structure fires in 2014 were caused by heating appliances. Rising heating costs may force lower income individuals to turn to unsafe or improperly installed heating alternatives.

Towns do have the authority to address unsafe housing conditions by enforcing rental housing codes. Typically enforced by a town health officer or fire chief, local codes may address fire safety hazards, in addition to lead, mold, sewer, and water. Lyndon and St. Johnsbury have local rental housing codes.

**Junky yards**, accumulation of household debris, and hoarding create nuisances and reduce property values, but they also pose public health hazards and threaten drinking water supplies. NVDA regularly receives requests from municipalities for assistance with enforcement, which can require a degree of tenacity and perseverance. In 2009 the regulation of salvage yards – the outdoor storage of junk, motor vehicles, metal scrap, appliances, etc. – was delegated to the Agency of Natural Resources. ANR's criteria for jurisdiction is *any* place or outdoor storage or junk, regardless of whether the activity is connected with a business.

Municipalities may adopt salvage or junk ordinances that meet or exceed ANR standards. They may also request enforcement assistance from ANR's Dept. of Environmental Conservation Salvage Yard Program. ANR will evaluate and prioritize requests based on a number of factors, including whether of the municipality has a duly adopted salvage yard ordinance in place. To date only a handful of communities have such ordinances: Concord, Ryegate, Barton, and Burke.

**Flooding** and flood-related losses can be financially ruinous for any homeowner, but the region's lower income populations may be most vulnerable. Older housing, which is often located in traditional centers of development, may be more likely to be located near rivers. To date, NVDA has assisted two communities with FEMA buyouts of two repetitive loss properties. Mobile home dwellers are also more prone to flood-related losses. Statewide, about 15% of all properties affected by Tropical Storm Irene were mobile homes. Two mobile home parks in the region –in Lyndon and Concord – have lots that are either located in mapped inundation areas or in areas close to rivers and streams prone to fluvial erosion. Most of the region's flood maps are paper, which makes it difficult to quantify the extent of risk to residential properties. NVDA is likely to develop better data as individual communities develop Local Hazard Mitigation Plans. (See Flood Resilience Chapter.)

## Potential Housing Developments

Several significant commercial developments in the northern part of the region, including Jay, Newport and Burke, were proposed in the last decade. While not all projects have come to fruition, investments in the

region's recreational resources have brought, and are expected to continue to bring, more visitors and permanent residents to the region, as well as additional employment.

Over the last decade Jay Peak Resort has undertaken a major expansion of its facilities, including a new indoor ice arena, golf course, hotel, restaurant, spa, conference center, and an indoor waterpark. In late 2017 Jay Peak opened an indoor recreation center adjacent to the Stateside Hotel, featuring a climbing wall and a movie theater, and in early 2018 applied for an Act 250 permit to install two synthetic turf soccer fields.

In 2016, the 116-unit Burke Mountain Hotel and Conference Center was completed, and a partnership between Burke Mountain Resort, the U.S. Ski and Snowboard Association (USSA) and Burke Mountain Academy (BMA) resulted in the designation of Burke Mountain as an official U.S. Ski Team Development Site.

These and other additions to outdoor recreational offerings in the region, particularly trail developments, are expected to attract new residents – both permanent and part-time – to the region.

Residential development in the NEK has historically occurred piecemeal, and multi-unit residential developments that rise to the threshold of Act 250 have typically been rare. It is therefore significant that there are three pending residential developments in Orleans County (Newport City, Derby and Jay) comprising 28 single-family house lots, 20 multifamily units and 84 attached units. Construction of all three of these projects were delayed due to uncertainty regarding market conditions, and have received extensions of their original Act 250 permits, allowing construction to be completed as late as 2022.

## II. AFFORDABLE HOUSING NEEDS IN THE NORTHEAST KINGDOM

A household's total housing costs should be 30% or less of the household income in order to be considered affordable. While the 30% rule applies to housing costs for all income brackets, Vermont statute provides a definition for affordable **housing** which is tied to the incomes of those living in the housing. This definition was recently amended, in response to the Act 157 report which found that Vermonters with incomes higher than 80% of area median income were having difficulty finding suitable housing options that were affordable, and few programs existed to assist these households or provide incentives to developers to create housing for this income range.[2] The new definition of affordable housing sets different income limits for owner-occupied housing and for rental housing. Rental housing is still only classified as "affordable" if it serves households earning no more than 80% of median income, while owner-occupied housing is considered affordable if it is priced to serve households earning up to 120% of median income. Another significant change in the definition is that the higher of the State or area median income (AMI) is now the measure that is used. This change recognized that in areas with high poverty and low median incomes, full-time wage earners, even those in entry level jobs, are often disqualified from subsidized housing because their incomes are just over the limit established by AMI. The housing and rental housing stock that is both affordable and available to this middle income group is typically low-quality. By statutory definition, housing costs for home owners include principal, interest, taxes, insurance, and association fees. For renters, costs include rent, utilities, and association fees.

In the Northeast Kingdom, traditional forms of affordable housing are mobile homes, multi- units dwellings (three units or more), and accessory unit dwellings.

[2] Act 157 Report to the Vermont General Assembly on ways to improve the quality and quantity of housing and tools to finance infrastructure, Agency of Commerce and Community Development, January 15, 2017

## Mobile Homes and Mobile Home Parks

Mobile homes are the more prevalent form of affordable housing in the Northeast Kingdom. Overall they comprise roughly 10% of the region's housing stock (compared to 7% statewide), but even higher concentrations can be found in the most rural communities with very small or no centers of development.

| Table 5.7: Mobile Homes as a % of Total Housing Units, (20% or more) | | | | | |
|---|---|---|---|---|---|
| **Caledonia County** | | | | **Orleans County** | |
| **Municipality** | **%** | | | **Municipality** | **%** |
| Stannard | 29% | | | Coventry | 33% |
| Sutton | 30% | | | Brownington | 21% |
| Sheffield | 21% | | | | |
| Source: US Census Bureau, American Community Survey, 2012-2016 | | | | | |

Although mobile homes are a significant source of affordable housing in our region, the lower price tag may come at the expense of energy efficiency: Vermont Energy Efficiency Investment Corporation estimates that mobile home owners spend about 66% more of their income on energy costs than owners of stick-built properties. The Vermont Housing & Conservation Board (VHCB) recently concluded a pilot project to site Vermod high-performance single-wide mobile homes. When equipped with a solar panel, these energy efficient homes are nearly net-zero. To date there are two Vermod homes in the Evergreen Manor Mobile Home Park in Hardwick.

Vermont statute defines a **mobile home park** as a parcel (or contiguous lots) of land that contains three or more mobile homes. Subdivided lots with more than two mobile homes are also a mobile home park when the lots are owned or controlled by the same person even if there are only one or two mobile homes on each lot. There are 23 mobile home parks in the region. All lot rents run well below the statewide median of $334 (Caledonia $285, Essex, $226, and Orleans $280), and vacancy rates run above the statewide average of just over 5% (Caledonia is 9%, Essex 7.1%, and Orleans 5.7%) When a park is slated for closure, Vermont law requires the owner to give sufficient notice to residents so that a purchase of the park – coordinated among the residents or with a non-profit housing provider – may be established in order to keep the park open. There are four such parks in the region now operated by non-profits.

| Table 5.8: Mobile Home Parks in the Northeast Kingdom | | | | | | |
|---|---|---|---|---|---|---|
| **County** | **Town** | **Ownership** | **Lots** | **Vacant Lots** | **MHs Owned by MHP Owner** | **MHs Owned by Lease-holder** |
| Caledonia | Burke (Glenwood) | For-profit | 33 | 3 | 0 | 10 |
| Caledonia | Hardwick (BCP MHP) | For-profit | 7 | 0 | 0 | 6 |
| Caledonia | Hardwick (Evergreen Manor) | Non-profit (Lamoille Housing Partnership) | 32 | 1 | 13 | 18 |
| Caledonia | Hardwick (Strong's MHP) | For-profit | 3 | 0 | 1 | 2 |
| Caledonia | Lyndon (Maple Ridge MHP) | Non-profit (Rural Edge) | 41 | 3 | 0 | 38 |
| Caledonia | Lyndon (Northern Hill Estates) | For-profit | 29 | 0 | 4 | 25 |
| Caledonia | Lyndon (Riverview Estates) | For-profit | 33 | 2 | 5 | 26 |
| Caledonia | Lyndon (Woodland Heights) | For-profit | 34 | 0 | 2 | 32 |
| Caledonia | St. Johnsbury (Green Lantern MHP) | For-profit | 55 | 18 | 0 | 36 |
| Caledonia | St. Johnsbury (McGill Avenue MHP) | For-profit | 10 | 1 | 7 | 2 |
| Caledonia | St. Johnsbury (Mt. Pleasant MHP) | For-profit | 93 | 1 | 27 | 64 |
| Caledonia | St. Johnsbury (Oak Street MHP) | For-profit | 8 | 5 | 0 | 3 |
| Essex | Canaan (Canaan MHP) | For-profit | 18 | 0 | 0 | 18 |
| Essex | Concord (North Concord Trailer Park) | For-profit | 24 | 3 | 2 | 19 |
| Orleans | Barton (Fairview Estates) | For-profit | 32 | 2 | 10 | 20 |
| Orleans | Coventry (Nadeau MHP) | For-profit | 16 | 6 | 1 | 9 |
| Orleans | Coventry (Nadeau MHP) | For-profit | 8 | 2 | 1 | 5 |
| Orleans | Coventry (Poginy's MHP) | For-profit | 4 | 0 | 2 | 2 |
| Orleans | Derby (Derby Center Mobile Court) | For-profit | 11 | 0 | 11 | 0 |
| Orleans | Derby (Derby MHP) | Non-profit (Housing Foundation) | 95 | 1 | 0 | 94 |
| Orleans | Derby (Shattuck Hill MHP) | Non-profit (Rural Edge) | 48 | 1 | 0 | 47 |
| Orleans | Derby (Grenier MHP) | For-profit | 9 | 0 | 9 | 0 |
| Orleans | Irasburg (Piette's MHP) | For-profit | 5 | 1 | 0 | 3 |
| | | **Total** | **648** | **50** | **95** | **479** |
| Source: Vt. Dept. of Housing and Community Development: Vermont Mobile Home Program 2017 Registry and Mobile Home Parks Report | | | | | | |

## Multi-unit housing

According to latest American Community Survey 5-year estimates, multi-unit housing stock is largely concentrated in the Northeast Kingdom's population centers. Jay and Burke also have a high concentration

of multi-unit dwellings, but these are generally associated with resort populations. Multi-unit dwellings are relatively scarce in remaining municipalities, and many have none at all.

**Table 5.9: Multi-Unit Dwellings (3 or more units in structure) as a % of Total Housing Units, (10% or more)**

| Caledonia County | | Essex County | | Orleans County | |
|---|---|---|---|---|---|
| **Municipality** | **%** | **Municipality** | **%** | **Municipality** | **%** |
| St. Johnsbury | 33% | Brighton | 13% | Jay* | 30% |
| Lyndon | 20% | | | Newport City | 20% |
| Burke* | 23% | | | | |
| Hardwick | 12% | | | | |

Source: US Census Bureau, American Community Survey Five Year Estimates, 2012-2016 *Likely associated with resort populations.

## Accessory dwelling units

Accessory dwelling units (also called "mother-in-law suites") are dispersed throughout the region. In 2004 a change in State statute required accessory unit dwellings to be treated as a permitted use of an owner-occupied single family dwelling. However, not all towns in the region have zoning, and these developments may be inconsistently tracked and reported in lister data. Most recent American Community Survey five-year estimates indicate that the majority of "1-unit attached" dwellings are located in Caledonia and Orleans County (182 and 193 respectively) and that there are only 13 such units in Essex County.

## Subsidized housing

The term **subsidized housing** refers to government-sponsored economic assistance to help alleviate the cost of housing (usually rental) for people with low to moderate incomes. Funding typically originates from the U.S. Department of Housing and Urban Development and follows one of two models:

1. Project-based assistance: Where the subsidy is assigned to a specific housing unit built, developed, and/or managed specifically for the purpose of accepting low-income tenants.
2. Tenant-based assistance: Where the recipient receives financial assistance, usually in the form of a Housing Choice Voucher (HCV) to help cover the costs of any qualified housing unit. The housing unit may be privately developed and it does not have to have been specifically developed for housing low-income tenants. Because vouchers provide low-income recipients with a range of housing choices, they may, in theory, support efforts to integrate disadvantaged families into mixed-income communities. This mobility may help to break the cycle of poverty for future generations. A recent study has indicated that young children (about 8 years old) whose families had been given housing choice vouchers to move to a "high opportunity" neighborhood increased the child's total lifetime earnings by about $302,000.[3] Private landlords may refuse to accept vouchers, but landlords who have received low-income housing tax credits (see below) are required to accept them. How tax credits are allocated may ultimately determine (or restrict) housing choices for voucher recipients.

Table 5.10 includes properties listed in the VHFA's database of Affordable Housing, as well as the number of housing choice vouchers utilized in the region. These housing developments have been created through a variety of subsidy programs, most of which require that a percentage of the units be restricted to low and moderate-income tenants for a set period of time. Most of the units listed in the table below are income-restricted. It is noted that the regional centers of St. Johnsbury and Newport City have many additional

[3] Chetty, Hendren, and Katz: "The Effects of Exposure to Better Neighborhoods on Children: New Evidence from the Moving to Opportunity Experiment," Harvard University, May 2015

multi-family units that are not subsidized but have rents as low, or even lower, than the subsidized units. Unfortunately, the quality of these rental units are often poor, as noted in the St. Johnsbury Housing Study and Needs Assessment completed in 2017.

**Table 5.10: Affordable Housing Units and HCV use by Town and County**

| **Caledonia County** | | | | | | |
|---|---|---|---|---|---|---|
| **Town** | **Total Units** | **Senior only** | **Senior or Disabled** | **Accessible** | **Income restricted** | **HCVs*** |
| Barnet | 0 | NA | NA | NA | NA | 2 |
| Burke | 15 | 9 | 12 | 2 | 15 | 0 |
| Danville | 12 | 0 | 9 | 0 | 12 | 3 |
| Groton | 27 | 9 | 9 | 7 | 27 | 1 |
| Hardwick | 60 | 0 | 30 | 10 | 58 | 22 |
| Lyndon | 102 | 27 | 60 | 5 | 80 | 29 |
| Peacham | 6 | 6 | 6 | 0 | 6 | 3 |
| Ryegate | 7 | 0 | 0 | 0 | 7 | 2 |
| Sheffield | 0 | NA | NA | NA | NA | 1 |
| St. Johnsbury | 316 | 89 | 89 | 68 | 285 | 126 |
| Waterford | 1 | 0 | 0 | 0 | 0 | 0 |
| **Totals for County** | **546** | **140** | **215** | **92** | **490** | **189** |
| **Essex County** | | | | | | |
| **Town** | **Total Units** | **Senior Only** | **Senior or Disabled** | **Accessible** | **Income Restricted** | **HCVs** |
| Brighton | 55 | 0 | 32 | 3 | 48 | 18 |
| Canaan | 12 | 0 | 12 | 2 | 12 | 2 |
| Concord | 0 | 0 | 0 | 0 | 0 | 2 |
| Lunenburg | 10 | 0 | 10 | 0 | 10 | 0 |
| **Totals for County** | **77** | **0** | **54** | **5** | **70** | **22** |
| **Orleans County** | | | | | | |
| **Town** | **Total Units** | **Senior Only** | **Senior or Disabled** | **Accessible** | **Income Restricted** | **HCVs** |
| Barton Town | 82 | 0 | 67 | 7 | 62 | 9 |
| Coventry | 7 | 7 | 7 | 7 | 6 | 0 |
| Craftsbury | 24 | 24 | 24 | 24 | 0 | 1 |
| Derby | 34 | 0 | 11 | 5 | 17 | 27 |
| Glover | 12 | 0 | 12 | 1 | 12 | 1 |
| Greensboro | 10 | 0 | 10 | 1 | 10 | 1 |
| Irasburg | 10 | 0 | 10 | 1 | 10 | 0 |
| Newport City | 75 | 15 | 63 | 6 | 75 | 61 |
| Newport Town | 56 | 13 | 13 | 8 | 55 | 4 |
| Troy | 14 | 0 | 6 | 0 | 14 | 4 |
| **Total for County** | 324 | 59 | 223 | 60 | 261 | 108 |

**Source: Vermont Housing Data (www.housingdata.org), accessed January 2018**
***Vermont State Housing Authority, September 2017**

## Workforce Housing

**Workforce housing** is a term that has been used increasingly by planners, governments, and organizations that advocate for housing policy. It is typically used to describe housing for those who are gainfully employed in occupations that are essential to a community, such as teachers, healthcare workers, first responders, as well as occupations that may pay relatively lower incomes, such as food services, retail, hospitality and tourism. Workforce housing typically does NOT include age-restricted developments. Rather, it is:

- affordable to the local workforce (with or without a subsidy);
- sited in or reasonably near the place of employment; and
- usually available to households that earn up to 120 percent of the area median income.

Most HUD programs are limited to low-income recipients (up to 80% of the area median income) and most subsidized rental housing in the region is restricted to households with incomes of no higher than 60% of area median income. While these subsidized units serve a segment of the workforce, including those with seasonal or part-time jobs, it does not serve working households earning over these thresholds, meaning that other funding sources, including private investment, is needed to create workforce housing for these households.

## Affordable Housing Partners

The Northeast Kingdom is served by two non-profit housing development corporations. Rural Edge (formerly known as Gilman Housing) serves all three counties and currently manages about 500 flat rate and income-based housing units throughout the region. Its Homebuyer Education Program provides financial literacy counseling to about 200 individuals a year. Lamoille Housing Partnership also develops and rehabilitates properties for rent or purchase by low- to moderate-income residents. Based in Morrisville they also serve Hardwick. Both non-profits manage mobile home parks in the region.

Additionally, Northeast Kingdom Community Action (NEKCA) provides assistance with locating emergency housing, electrical disconnect, and crisis fuel assistance throughout the NEK in Newport, St. Johnsbury, Canaan, and Island Pond.

## Funding Sources

Housing Tax Credits, also known as federal Low Income Housing Tax Credits (LIHTC), have produced most of Vermont's affordable rental housing developed since the program's inception in 1987. Credits reduce federal tax liability for a 10-year period. Qualified recipients must agree to certain operating restrictions and reporting and monitoring requirements for at least 15 years. Vermont's allocation of federal credit for 2017 was capped at $2.71 million. Vermont also has state affordable housing tax credits which can be used in tandem with the federal Housing Tax Credit to assist in the creation and preservation of affordable rental housing. Both federal and state tax credits can be sold in order to create equity. Investors purchase the "present value" of ten years' worth of credits. For this reason, the equity raised from syndicating tax credits can be substantial. Tax credits are awarded through a highly competitive process administered by the Vermont Housing Finance Agency. Funding rounds are consistently oversubscribed. Allocation is based on the annual Qualified Allocation Plan (QAP), which establishes priorities for awarding credits. In the 2018 QAP, there are five "top tier" priorities, and nine "second tier" priorities. Additionally, in an effort to affirmatively further fair housing as required under Federal housing rules, the 2018 QAP states that VHFA prioritizes geographic targeting towards communities with no affordable housing.

Federal Bond Credits are similar to Allocated Credits, but provide a lower level of credits and therefore lower equity investment to the project. Since 2004 nearly $ 2 million in State and Federal tax credits and tax-exempt bonds have been awarded to projects in the Northeast Kingdom to acquire, develop, or rehabilitate 234

housing units, in St. Johnsbury, Hardwick, Lyndonville, Newport, Glover, and Groton. Local partners and sponsors have been Rural Edge, Lamoille Housing Partnership, NCIC and Housing Vermont.

**Table 5.11: Federal (F) and State (S) Housing Tax Credits and Tax-Exempt (TE) Bonds in the Northeast Kingdom, 2004 to Present**

| Year | Project | Local Partner/Sponsor | Location | Type | Amount | # Units |
|---|---|---|---|---|---|---|
| 2004 | Moose River Housing | Gilman Housing Trust*/Housing Vermont | St. Johnsbury | Acquisition, Rehabilitation | $163,594 (TE Bonds) | 28 |
| 2006 | Groton Redevelopment | Gilman Housing Trust*/Housing Vermont | Groton | Rehabilitation | $44,000 (S)<br>$125,845 (TE Bonds) | 18 |
| 2007 | Passumpsic North & South | Housing Vermont | St. Johnsbury | Acquisition, Rehabilitation | $95,000 (TE Bonds) | 28 |
| 2007 | Hardwick Family Housing | Lamoille Housing Partnership/Housing Vermont | Hardwick | Rehabilitation | $39,065 (TE Bonds) | 8 |
| 2007 | Bemis Block | Lamoille Housing Partnership/Housing Vermont | Hardwick | Rehabilitation | $98,000 (F) | 14 |
| 2007 | Glover Senior Housing | Gilman Housing Trust* | Glover | New Construction, Rehabilitation | $75,755 (TE Bonds) | 12 |
| 2009 | Newport Senior Housing | Gilman Housing Trust* | Newport | Acquisition, Rehabilitation | $95,665 (TE Bonds) | 13 |
| 2011 | Newport Family Housing | Gilman Housing Trust*/Housing Vermont | Newport | New Construction, Acquisition, Rehabilitation | $390,000 (F) | 21 |
| 2012 | St. Johnsbury Historic Green Rehab | Gilman Housing Trust*/Housing Vermont | St. Johnsbury | Rehabilitation | $350,000 (F) | 29 |
| 2013 - 2014 | Maple Street Senior Apartments | Housing Vermont | Hardwick | Acquisition, Rehabilitation | $54,200 (TE Bonds)<br>$61,199 (TE Bonds)<br>$25,000 (S) | 16 |
| 2016 | Darling Inn | Gilman Housing Trust* | Lyndonville | Rehabilitation | $52,600 (S) | 28 |
| 2017 | Hardwick Housing | NCIC | Hardwick | New Construction | $250,000 (F) | 7 |
| 2017 | Parkview Apartments | Gilman Housing Trust* | Newport | Rehabilitation | 83,000( S)<br>$107,000 (TE Bonds) | 12 |

Source: Vermont Housing Finance Agency, Allocations and Reservations (website accessed January 2018)

*Now called Rural Edge

## III. CHALLENGES TO AFFORDABILITY

Affordability in the region is measured through American Community Survey, and through housing wages determined by the National Low-Income Housing Coalition. HUD also provides a methodology that factors in the cost of commuting. By any measure, the region's supply of affordable and workforce housing is inadequate to meet the needs of the region. Lagging incomes, scarcity of higher-paying jobs, and aging housing stock are contributing factors. Additional challenges are identified below.

According to most recent American Community Survey 5-Year Estimates, more than a third of homeowners in the Northeast Kingdom pay 30% or more of their income on costs for properties with a mortgage, and at least 20% pay 30% or more on a properties that are owned free and clear. Housing costs include utilities and fuels, which can be quite high during Vermont winters especially if the house is poorly insulated. More than half of renters in Caledonia and Orleans counties pay 30% or more of income on housing. Compared to statewide averages, housing in Orleans County is more likely to be unaffordable, and rental housing in Caledonia and Orleans is more likely to be unaffordable.

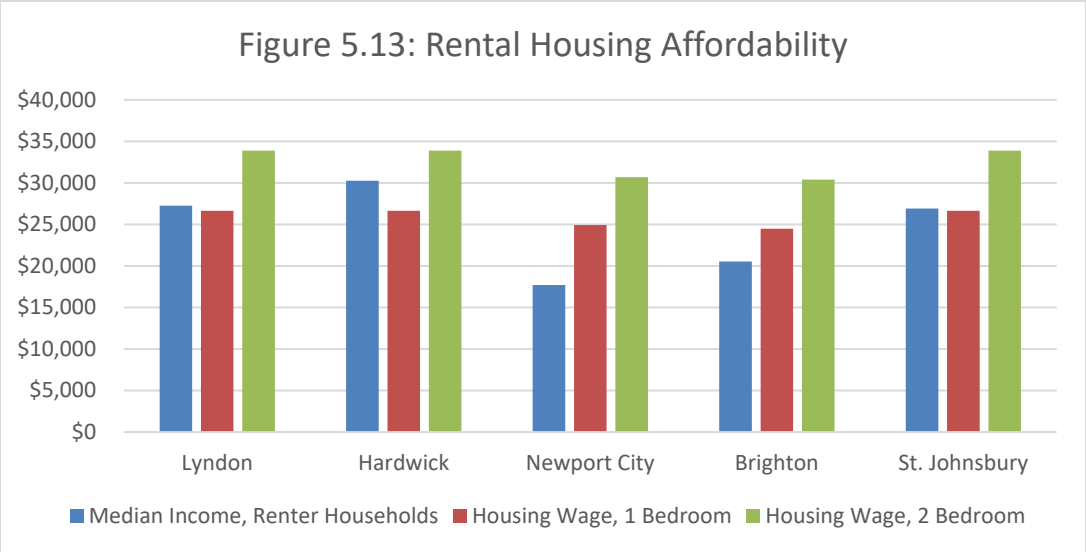
**Table 5.12: % of Housing Units with costs at or greater than 30% of Household Income**

| | Selected Monthly Owner Costs* as a % of Household Income | | Gross Rent** |
|---|---|---|---|
| | Housing Units w/ Mortgage | Housing Units w/o Mortgage | Occupied Units Paying Rent |
| **Caledonia** | 35.0 % | 21.5 % | 54.2% |
| **Essex** | 32.2 % | 22.4 % | 41.1% |
| **Orleans** | 37.2 % | 24.8% | 52.4% |
| **Vermont** | 34.6 % | 23.2% | 51.0% |

Source: US Census Bureau: American Community Survey 5-Year Estimates, 2012-2016, Table DP04

* Selected monthly owner costs are the sum of payments for mortgages, deeds, contracts to purchase, or similar debts on the property. It also include property taxes, insurance, utilities, fuels, and where appropriate condominium and association fees or mobile home costs.

** Gross rent includes the estimated average monthly cost of utilities and fuel.



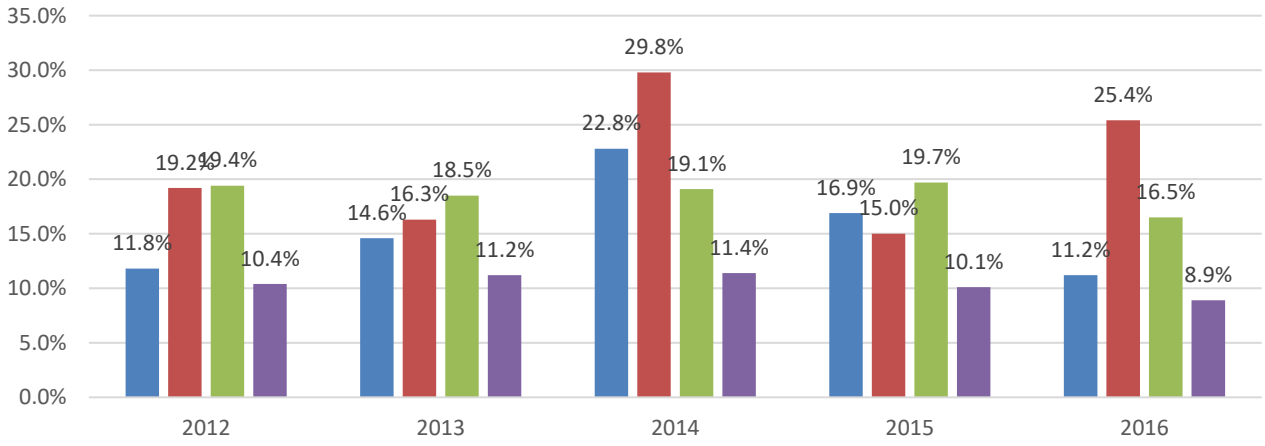

Source: American Community Survey 5-Year Estimates, 2012-2016; www.housingdata.org

In the Caledonia County towns of Lyndon, Hardwick and St. Johnsbury, median household incomes for renters allow for a one-bedroom apartment, but fall short of the housing wage needed for a two-bedroom apartment at HUD's Fair Market Rate (FMR), as indicated by the Vermont Housing Finance Agency (VHFA). HUD's FMRs are published annually by bedroom size and are for a modest apartment, costing about 10% less than the area median rents. In the towns of Newport City and Brighton, the median household income of renters is less than the housing wage needed for both one and two-bedroom apartments. Note: Figure 5.14 includes only communities where multi-unit structures account

for at least 10% of housing stock and excludes Jay and Burke, where multi-unit housing is more likely to be related to resort development.

**Credit Access**: Homebuyers – particularly first-time ones – may face considerable barriers. To afford a home costing the median price in Caledonia of $147,000, the average homebuyer would need a household income of $43,013 and $14,950 cash on hand at closing.4 Lending programs vary, but in general, a 20% down payment is required to avoid private mortgage insurance, and debt-to-income ratios are capped at 43%. Manufactured housing can be harder to finance because they depreciate faster. Loan terms for a used

Figure 5.14: Loan Denials for Home Purchase, Owner-Occupied as a Primary Dwelling




Source: Home Mortgage Disclosure Act, www.consumerfinance.gov/data-research/hmda/

manufactured unit, for example, will be limited to 10 to 15 years. According to five years of data from the Home Mortgage Disclosure Act, prospective home buyers in the Northeast Kingdom are more likely to be denied a mortgage when compared to the rest of the State. The most cited reason was debt-to-income ratio.

**The Hidden Cost of Rural Living**: Travel is another cost driver for housing in the Northeast Kingdom. Travel from households to destinations (like work) varies on the location of the home, and is considered affordable when it accounts for 15% of household income or less. Combined, housing and transportation costs are considered unaffordable when they account for more than 45% of household income. According the HUD Location Affordability Index, transportation accounts for about a third of household income in the region. Even in St. Johnsbury/Lyndon and Newport City – the regional urban center – transportation accounts for 28% and 32% of household income respectively.

[4] Home Mortgage Calculator, www.housingdata.org.

| Table 5.13: HUD Location Affordability by County (for Renters and Owners) | | | | |
|---|---|---|---|---|
| **County** | **Annual Income for Median-Income Family (4 people, 2 commuters)** | **Average Cost of Housing as a % of Income** | **Avg. Cost of Transportation as a % of Income** | **Location Affordability** |
| **Caledonia** | $44,435 | **26%** -- $11,553 | **32%** -- $14,219 | **58%** -- $25,772 |
| **Essex** | $40,842 | **25%** -- $10,214 | **37%** -- $15,116 | **62%** -- $25,330 |
| **Orleans** | $41,618 | **26%** -- $10,821 | **35%** -- $14,566 | **61%** -- $25,387 |
| Source: HUD Location Affordability Portal, Version 2 (http://locationaffordability.info/) | | | | |

**Mismatched housing supply**: The region's housing stock is mainly single-family with 3 bedrooms or more, with more than a third sited on large lots. It falls short of the needs of financially strained first-time buyers and aging baby boomers, who may be looking for smaller homes located near jobs, services, and amenities. The region's downtowns and village centers could provide opportunities for more dense development and lower land costs, but most of the region's village centers lack off-site water and sewer to support dense development. Non-profit housing developers have had success creating income-restricted rental housing in downtowns and village centers served by public water and sewer infrastructure, but market-rate housing has continued to consist mainly of single-family detached homes located outside of established centers. Denser forms of market-rate housing, such as townhouses, have not yet materialized in the region's established centers.

**Perceptions about subsidized housing**: One of the most common objections to subsidized housing development is that it will decrease values of surrounding properties. For the most part these concerns are unfounded. The Center for Housing Policy has reviewed numerous studies on the impact of such housing on property values. Developments that are well managed and maintained and attractively designed to blend with surrounding neighborhood properties are more likely to have no effect or even a positive effect on nearby properties. Rehabilitation of distressed properties may positively impact property values as well. However, large concentrations of income-restricted housing should be avoided. Several researchers have found that concentrated income-restricted housing developments were more likely to have a negative impact on neighboring properties. *As long as it is not overly concentrated,* siting low and moderate-income housing developments in strong neighborhoods with stable home values and low poverty rates is unlikely to have adverse effects on neighboring property values.

These findings affirm the trend toward mixed income housing and communities.[5] Mixed-income housing is central to any smart growth strategy because it can support a more diverse population and achieve a more equitable distribution of households of all income levels.[6]

NVDA supports the development of affordable housing that is well managed and maintained and is context-sensitive to existing concentrations of poverty and surrounding property values. Mixed-income housing offers numerous social and economic benefits to a community by preventing residential economic segregation and promoting vitality of urban and village centers. The vast majority of residential development in the Northeast Kingdom has occurred outside of established development centers over the past decade, running counter to the long-range planning goal of maintaining the historic settlement pattern of compact village and urban centers separated by rural countryside. Reversing this trend will require a sustained effort that supports a

[5] The Center for Housing Policy. *"Don't Put it Here!" Does Affordable Housing Cause Nearby Property Values to Decline?"* Insights from Housing Policy Research (Policy Brief Series published between 2008 and 2011.)
[6] Smart Growth Online (http://smartgrowth.org/smart-growth-principles/)

range of attractive housing opportunities and choices – for all income levels and age groups -- both in and immediately adjacent to our region's downtowns and village centers. NVDA supports housing policies and programs that incentivize mixed-income housing development, avoids concentrations of poverty, and supports vibrant and livable neighborhoods that are near existing services, amenities and employment opportunities.

## IV. TAKING ACTION: TOOLS FOR MUNICIPALITIES TO PROMOTE HOUSING FOR ALL

**Affirmatively furthering fair housing:** The federal Fair Housing Act prohibits discrimination based on race, color, religion, gender, family status, or disability in the sale, rental, or advertisement of housing. Vermont statute extends this prohibition to include discrimination based on age, marital status, sexual orientation, or reception of public assistance. 24 V.S.A., Chapter 117, the statute that regulates planning and zoning, contains requirements and provisions to protect and promote affordable housing. For example:

- Single- and two-family homes cannot be subjected to site plan review.
- It is illegal to prohibit mobile homes or mobile home parks from a municipality.
- Municipalities must designate appropriate districts for multi-unit and multi-family dwellings.
- Residential care and group homes serving up to eight individuals must be considered a single-family residential use of property unless it is located within 1,000 feet of another such home.
- Accessory dwelling units (one-bedroom apartments or efficiencies) subordinate to a single-family dwelling must be considered a permitted use.
- Duly adopted municipal plans must include recommendations for addressing the housing needs of low- and moderate-income individuals and should account for accessory dwelling units as a form of affordable housing.

**Promoting density:** Enabling dense, compact development near downtowns and village centers may reduce land costs for new housing. Although density may be limited by lack of off-site water and sewer, municipalities with zoning should not require minimum lot sizes larger than what is necessary to accommodate on-site water and septic systems in areas in village centers. Traditional opposition to dense residential development is often based on preconceived notions of crowded, monotonous development with little or no privacy. These objections can be overcome with attractive, context sensitive site designs that fit with a rural setting. Design charrettes and buildout analyses might help residents better visualize appropriate housing development.

**Regulatory incentives and inclusionary zoning**: Planned unit development is authorized in Vermont statute to provide for compact, pedestrian-oriented development especially in and adjacent to downtowns and village centers. It is also a popular regulatory tool for promoting affordable housing, provided a strong housing market exists Provisions for planned unit development may include "density bonuses" to encourage affordable and mixed-income projects. Municipalities also may provide bonuses to homes with smaller footprints (e.g. 1,500 feet or less) or universal access design. A number of communities in the region provide for planned unit development or some form of residential clustering with density incentives. There is no statutory limit to density bonuses, but experience has shown that a minimum of at least 50% density bonus may be needed to incentivize developers. In more urban settings, zoning incentives may include waiver of parking requirements and permitting fees. Unlike density bonuses, **inclusionary zoning** is mandatory, and developers are required to build a percentage of affordable units in developments of a certain scale. As with impact fees, inclusionary zoning should be based on clearly stated local housing policies and well documented housing needs.

**Vermont Community Development Program Grants**: Municipalities with duly adopted plans may apply for Vermont Community Development Program (VCDP) grants to support low and moderate-income

housing, which is one of the program's top priorities for funding. Because municipalities in the Northeast Kingdom lack the administrative and fiscal resources to develop such housing, they often subgrant to qualified housing partners to develop and rehabilitate affordable housing stock. Municipalities that receive VCDP grants must complete fair housing trainings that are offered throughout the year.

**Local incentives**: In addition to low-interest loans (such as a revolving loan fund capitalized by the VCDP grant), municipalities may be able to encourage housing investments through tax stabilization or abatement programs (e.g. hold the tax rate for a rehabilitated property to its pre-construction value for five years or more).

**Downtown and Village Center Designation:** Qualifying municipalities may pursue downtown or village center designation. Once conferred, the designation is valid for five years. The primary benefit of the program is eligibility for state tax credits for historic rehabilitations, façade improvements, and code improvements (including installation of elevators and sprinkler systems). Income-producing properties (including mixed-use and multi-family structures) can be eligible, and are not required to be income-restricted to qualify for the tax credit. Unlike federal tax credits, state tax credits are relatively accessible to private property owners because they are easy to administer and sell. To date, the Northeast Kingdom has received nearly $3.1 million in tax credits for 16 projects that included some form of housing, including market-rate housing units. Although tax credits are awarded annually, the Northeast Kingdom has been under-represented in some funding rounds. It is possible that property owners are still not aware of the benefits of Downtown and Village Center designation. Additional benefits of designation include priority consideration for grant program (such as VCDP funds) and Low-Income Housing Tax Credits. (For a map of existing designated Downtowns and Village Centers, see Future Land Use in the Land Use Section.)

**Sales Tax Reallocation**: Municipalities and developers of qualified projects in designated downtowns may jointly apply for a reallocation of sales taxes on construction materials. If awarded, reallocated funds must be used by the municipality to support the project (e.g. sidewalks, stormwater management, streetscape improvements, etc.

**Neighborhood Development Area Designation**: This adjunct to the Downtown and Village Center designation encourages municipalities and developers to plan for new infill housing in pedestrian-oriented neighborhoods within walking distance from the designation areas (1/2 mile from downtown and ¼ mile from village center). Incentives and benefits include exemption from Act 250 for qualified "mixed-income" projects, and for projects that don't qualify for a full exemption, a 50% discount on application fees. Waste water review from the Agency of Natural Resources can be capped at $50.00, and projects can be exempt from land gains tax. "Mixed-income" housing is defined in State statute at 10 VSA Section 6001, and can include both owner-occupied and rental housing.

To qualify for a neighborhood development area designation, the municipality has to incorporate pedestrian design into local planning and zoning (i.e. "complete streets") and allow for a density of at least four detached single family dwelling units per acre. Newport and St. Johnsbury officials have explored the feasibility of new neighborhood designation. NVDA supports further exploration of this program in order to incent the establishment of pedestrian-oriented neighborhoods that offer a full array of housing choices – affordable, workforce, and market rate.

**Reducing local permitting restrictions**: Revisiting zoning regulations and waiving restrictions such as parking requirements and height of structures may be an inexpensive way for a community to encourage housing in appropriate areas. Permit fees may be reduced or eliminated in some cases. In some communities, where zoning permit fees are not very expensive, eliminating permitting requirements for single- or two-family homes may be appropriate for areas where dense development is encouraged.

**Housing Studies**: Municipalities with duly adopted plans are required to include a "recommended program for addressing low and moderate income persons' housing needs as identified by the regional planning commission." Local planning commissions can gain greater insight into housing needs through studies that quantify local housing needs, determine capacities for greater densities (through GIS-based buildouts) and

examine potential impacts of housing policies on property values. Studies may also identify appropriate areas for rehabilitation and new infill housing development, such as brownfields or abandoned, derelict, or underutilized properties.

**Local Housing Commissions**: Municipalities are authorized by statute to create advisory commissions composed of individuals with expertise or interest in specific areas such as historic preservation, design, and housing. Such commissions can assist and advise the planning commission and other officials on housing studies, as well as policies and programs to further affordable housing and improve housing stock.

**Local Rental Codes and Local Enforcement**: State rental housing codes help to promote safe and healthy living conditions. Communities may take this further by enacting local codes and create local registries, or they may enforce state codes locally.

**Derelict/Abandoned Buildings Ordinances**: Local enforcement can help to protect neighborhoods from blight. The Town of St. Johnsbury recently established a rental registry in an effort to identify properties that pose unsafe or blighted conditions, and to better enforce the local housing standards currently on the books.

**Charrettes/Master Planning**: Downtown master plans may help to inspire and attract private investors to new housing opportunities. Newport City's Regional/Urban Design Assistance Team set off an intense two-day envisioning process that ultimately led to the implementation of form-based codes and removed barriers to vertical and infill development. Although planning at this level can be expensive, grant programs are available to cover the cost. (See below.)

**USDA Loans and Grants:** US Department of Agriculture offers home purchase and repair assistance. Households with incomes under a certain threshold may be eligible for the USDA Direct Home Ownership program. Loan terms can be as long as 33 years, and interest rates vary from 1 percent to 3.65 percent. No down payment is required. A household that earns too much to qualify for the direct loan program may qualify for a USDA guarantee on a bank loan, which enables a prospective homeowner to purchase a home at a low interest with no money down. USDA also offers home repair loans to make homes safer and more accessible (e.g. wiring, roof, energy efficiency, ramps and other accessibility modifications). Home repair loans are only 1 percent with a 20 year term. Seniors and very low-income individuals may even qualify a direct grant of up to $7,500 to improve livability. USDA grants and loans are made directly to qualifying individuals; however, municipalities, local planning commissions, local housing commissions, and NVDA can help to raise awareness of this underutilized resource.

**Other Grant Programs**: Municipal Planning Grants are available annually to communities with a confirmed planning process. Eligible activities include zoning bylaw updates, planning for downtown and village center revitalization and redevelopment. VTrans also offers grant opportunities (Strong Communities Better Connection) to help communities integrate transportation with land use to create safe, convenient and more walkable communities. Downtown Transportation Fund provides grant funds for public capital improvements in Designated Downtowns, including sidewalks and streetscape improvements.

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## GOALS AND STRATEGIES FOR HOUSING

## HOUSING GOALS

- An adequate supply of safe, attractive, and energy-efficient housing will be available to the region's residents in a proportionate balance of affordable, workforce, and market rate housing.
- Existing housing stock – particularly that located in downtowns, village centers, and older neighborhoods in existing centers of development – will be preserved.
- Overall quality, safety, and energy efficiency of existing housing stock in the region will improve.

- Housing will be available in a variety of types that meet the needs of all income groups and ages, and will be located near employment, services, commercial, civic, and recreational uses.
- Partnerships with regional housing and human service providers will be strengthened, allowing for more effective service provision.
- New housing development in downtowns and villages will conform to existing traditional patterns.
- Municipalities will be supported in determining local housing needs.

## HOUSING POLICIES

- Support the efforts of local and regional housing providers and organizations, government agencies, private lenders, and developers in identifying and meeting housing needs of the region.
- Encourage innovative strategies that reverse the long-term trend of disinvestment in established development centers. Development resources should be strengthened and directed toward existing neighborhoods.
- Community revitalization and economic development plans should include the needs of all age and income groups.
- Ensure that existing housing programs and incentives promote a proportionate balance of affordable, workforce, and market-rate housing.
- Encourage the development of rental housing on a scale and design compatible with existing neighborhoods.
- Support and sustain livable communities that offer comprehensive mobility options (including alternatives to driving).
- Promote and support zoning that allows for greater densities for the purpose of providing a full range of housing choices (affordable, workforce, market-rate) in a manner that preserves the character of older neighborhoods in downtowns, village center, and other established centers of development.
- Locate affordable and special needs housing in areas with access to appropriate services.
- Support home ownership and property upkeep efforts of citizens and municipalities.

## HOUSING STRATEGIES

- Work with regional housing and human service providers, including Rural Edge, NEK Enterprise Collaborative, Lamoille Housing Partnership and NEK Community Action to identify housing needs and support economically integrated communities.
- Review and comment on proposed plans and policies that will impact future affordable housing development (e.g. downtown designation, Qualified Allocation Plan).
- Assist towns to create housing policies that address the affordable housing needs of low-income residents.
- Identify incentives for the development and rehabilitation of work-force and market-rate housing in established centers.
- Assist communities interested in adopting local building codes.
- Assist communities interested in adopting and enforcing "junkyard ordinances."

- Assist communities applying for designation under the Vermont Downtown Program, Village Center Designation Program, and where appropriate, the Neighborhood Development Area Designation Program.
- Provide outreach and education to property owners of old or substandard housing units in Designated Downtowns and Village Centers.
- Encourage the use of innovative incentives, including density bonuses or tax stabilization for mixed-income developments, universal access design, and small footprint housing.
- Help communities evaluate needs through housing studies and build-out analyses.
- Provide outreach and education on housing programs that improve housing stock and promote home ownership.
- Facilitate fair housing trainings for municipal officials and other interested groups.
- Ensure that NVDA member communities remain eligible for Municipal Planning Grants.

# Chapter Six: Economic Development

*Note:* The Northeast Kingdom, along with Franklin, Lamoille, and Grand Isle Counties, comprise the region's local Economic Development District (EDD) – a district approved by the federal Economic Development Administration (EDA). The Economic Development District of Northern Vermont covers the six counties of Caledonia, Essex, Orleans, Lamoille, Franklin, and Grand Isle. The governing board maintains a Comprehensive Economic Development Strategy for the region, which enables communities and organizations within the district to apply for funds from the Economic Development Administration and the Northern Borders Regional Commission, which both regularly support economic development initiatives.

The Comprehensive Economic Development Strategy also guides economic development initiatives in the region's Rural Economic Area Partnership (REAP) Zone, a designation granted to the three counties of the Northeast Kingdom by USDA Rural Development in 2000. One of only four such areas in the U.S., the zone was established to help address longstanding issues of poverty, low incomes, and lack of opportunity. Special set-aside funds are made available for REAP areas by USDA Rural Development. Since its inception, the REAP Zone has attracted hundreds of millions of dollars in investments for housing, community facilities, public infrastructure, and business development. REAP Zone projects are monitored by the Northeast Kingdom Collaborative, a body comprised of representatives from the many regional organizations that serve the three-county area.

Where applicable, this section of NVDA's Regional Plan incorporates information from the Comprehensive Economic Development Strategy:
http://www.nvda.net/files/ComprehensiveEconomicDevelopmentStrategy.2015-2020.pdf

## I. OVERVIEW

### Employment Characteristics

According to the Vermont Department of Labor, the three counties of the Northeast Kingdom had an estimated labor force of 31,250, which accounts for 9.1% of the state's workforce. The region's covered employment, which includes all private and public ownerships, totals 22,486 and accounts for 7.3% of statewide covered employment. [1]

The regional economy is a diversified mix of manufacturing, health care, tourism, professional services, education, and public-sector employment. Agriculture remains an important component of the region's economy and cultural image.

**Table 6.1: Employment in the Northeast Kingdom by Sector**

| **Largest Industry Sectors *by Number of Businesses*[2]** | **Number** | **%** | **Largest Industry Sectors by Employees[3]** | **Number** | **%** |
|---|---|---|---|---|---|
| Retail (44-45) | 300 | 14.2% | Educational services, and health care and social assistance | 8,223 | 27.8% |
| Construction (23) | 278 | 13.2% | Manufacturing | 3,444 | 11.6% |
| Professional & Technical Services (54) | 166 | 7.9% | Retail trade | 3,368 | 11.4% |
| Healthcare and Social Assistance (62) | 159 | 7.5% | Construction | 2,915 | 9.8% |

[1] Vermont Department of Labor: An Economic-Demographic Profile of Vermont 2017 http://www.vtlmi.info/profile2017.pdf
[2] Covered employment establishments, Vermont Department of Labor, Economic and Labor Market Information
[3] American Community Survey 5-Year Estimates, 2012-2016

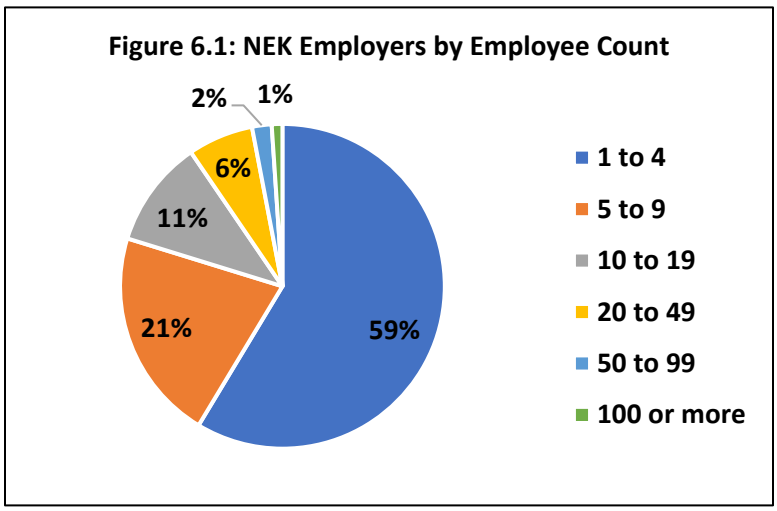
| | | | | | |
|---|---|---|---|---|---|
| Other services, except public administration (81) | 156 | 7.4% | Arts, entertainment, and recreation, and accommodation and food services | 2,218 | 7.5% |
| Accommodation & Food Services (72) | 138 | 6.5% | Public administration | 1,819 | 6.1% |
| Manufacturing (31-33) | 113 | 5.4% | Professional, scientific, and management, and administrative and waste management services | 1,671 | 5.6% |
| Public Administration (92) | 112 | 5.3% | Agriculture, forestry, fishing and hunting, and mining | 1,501 | 5.1% |
| Educational services (61) | 82 | 3.9% | Other services, except public administration | 1,385 | 4.7% |
| Finance & Insurance (52) | 69 | 3.3% | Finance and insurance, and real estate and rental and leasing | 1,263 | 4.3% |
| Real Estate, Rental & Leasing (53) | 46 | 2.2% | Transportation and warehousing, and utilities | 1,044 | 3.5% |
| | | | Wholesale trade | 395 | 1.3% |
| | | | Information | 382 | 1.3% |

While statewide covered employment grew by 4.2% during the past five years, Caledonia and Essex Counties saw a drop of 2.5% over the same period. By contrast, Orleans County experienced robust growth in employment by 8.5%. Gains are attributed to growth in the food and accommodation sectors (most likely stemming from expansions to Jay Peak), as well as retail development and expansions in existing manufacturing operations such as durables and food production.

While Vermont has seen a significant shift from a "goods-producing" to a "service-producing" economy, this trend is still not as pronounced in the Northeast Kingdom. (The goods-producing industries include natural resource sectors of agriculture, forestry, and mining, as well as construction and manufacturing. Services-producing sectors include transportation and warehousing, utilities and information; finance and insurance; real estate and rental; educational services; health care and social assistance; professional and technical services; management of companies, administrative and waste services; arts, entertainment, and recreation; accommodation and food services; wholesale and retail trade; and government.) Statewide, goods-producing jobs account for 19.3% of all private-sector employment. In the Northeast Kingdom, good-producing jobs account for more than one-quarter of all private-sector employment, in Essex County more than 44%.

The companies listed below provide a representation of the region's traditional manufacturing and natural resource base. These are also some of the region's largest employers.

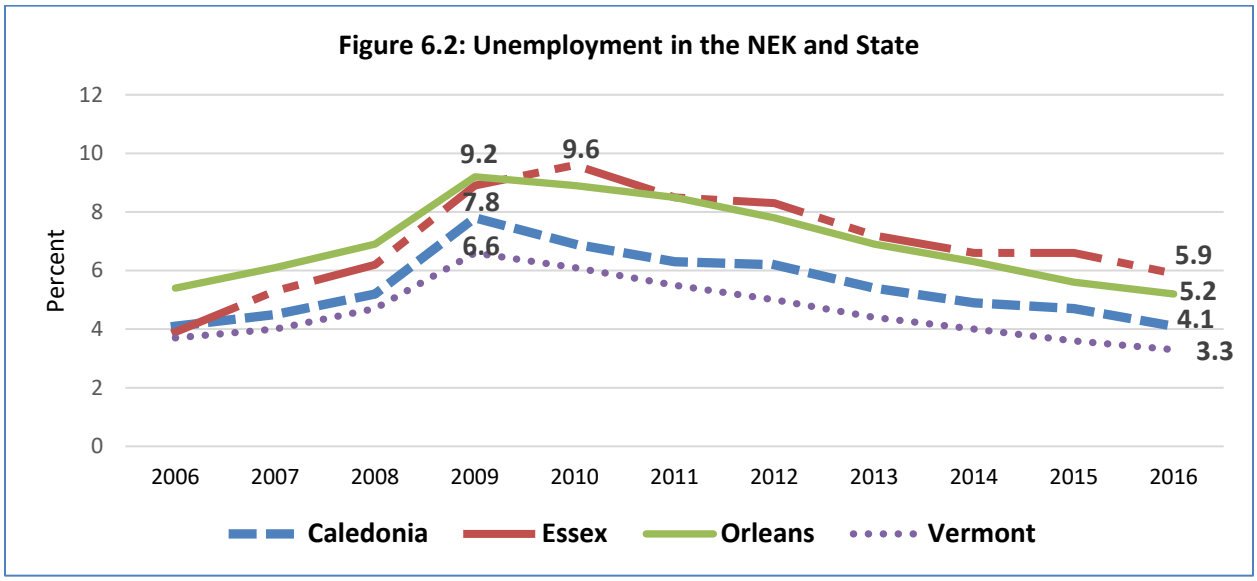
- Ethan Allen, Essex and Orleans Counties
- EHV Weidmann, Caledonia County
- Columbia Forest Products, Orleans County
- NSA Industries, Caledonia County
- Fairbanks Scales, Caledonia County
- Tivoly USA, Orleans County
- Lyndon Woodworking, Caledonia and Essex Counties
- Vermont Aerospace, Caledonia County




The bulk of employers in the region, however, are very small. According to 2015 data from County Business Patterns, 80% of the region's employers have fewer than 10 employees. (Figure 6.1)

## Unemployment

Since its peak in 2009, the state's unemployment rate has been on a downward trend, averaging 3.3% in 2016. Unemployment rates in the region, however, have traditionally outpaced statewide rates. The highest rates of unemployment are in Essex and Orleans Counties at 5.9% and 5.2% respectively. Caledonia County has the fourth highest rate at 4.1%.




Source: Vermont Department of Labor (*not seasonally adjusted)

Unemployment rates do not reflect a complete picture of the economic conditions of the region, as they only reflect covered employment. In 2015, self-employed workers represented about 19% of the regional workforce, compared to 17% of the state workforce.[4] The U.S. Census Bureau reports on *nonemployers* using tax return information from the Internal Revenue Service. These are largely self-employed individuals operating unincorporated businesses (known as sole proprietorships), which may not be the owner's principal source of income. The data consist of the number of businesses and total receipts by industry. More than half of these non-employers are engaged in construction; retail trade; professional and technical services; forestry, fishing, and agricultural support services; healthcare and social assistance, and other services.

[4] US. Census Bureau, Nonemployer Statistics

## II. REGIONAL ECONOMIC SECTORS

In 2011, NVDA commissioned a study by Economic & Policy Resources to identify and analyze key industry clusters for the Northeast Kingdom using an iterative analysis of sector data, including employment concentration, wage performance and stability, growth and change, and supply chain interrelationships. (See inset for an explanation of rankings.)

**Industry Cluster Rankings**

**Mature**: Traditional mainstay companies having a large number of employees, a high level of concentration (as measured by employment specialization ratio), but in recent years their collective performance is one of stagnation or decline

**Opportunity:** Potential or emerging, with strong growth in both firms and employment in a number of segments, but overall lack the critical mass or collective concentration. For instance, if a cluster is composed of about 10 interrelated industries, an opportunity or emerging cluster would show firms and employment in only about half to two-thirds of these industries.

**Star:** These clusters are identified as stars given both their high level of concentration and their solid recent performance. Given the recent "great recession" in the United States, there are few star clusters that have retained their economic luster in any particular geographic region.

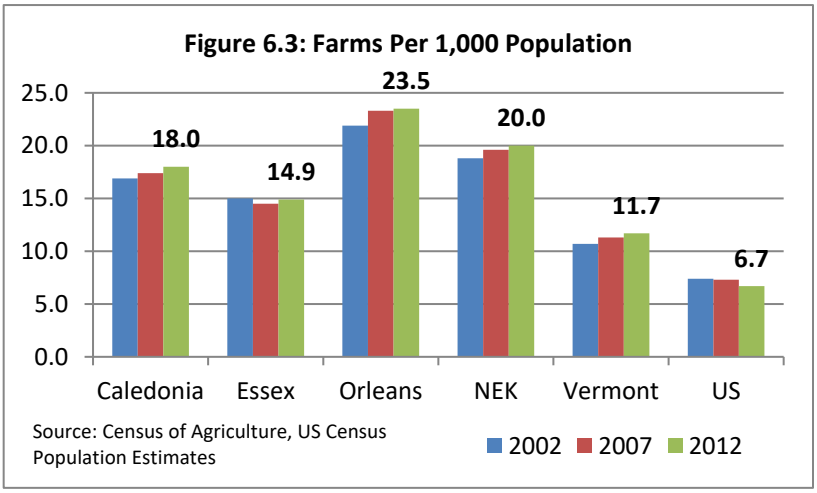
### Fabricated Metals and Machinery Manufacturing (Mature)

The diversified fabricated metals and machinery manufacturing cluster is in the midst of a recovery after the debilitating Great Recession. Given the significant orientation toward national and international markets, many firms within this cluster are once again showing signs of life and beginning to hire workers and expand production. Workforce training issues are paramount within this cluster.

Precision metal fabrication is deeply rooted in the region's history. Fairbanks Scales, for example, has manufactured platform scales in St. Johnsbury since the mid-1800's. There are numerous other precision metal industries in the Northeast Kingdom, among them NSA Industries in Lyndonville, Vermont Aerospace in St. Johnsbury, and Tivoly USA and North Country Engineering in Derby. EHV Weidmann, in St. Johnsbury, manufactures industrial insulators.

### Agribusiness, Food Processing & Technology (Star)

This cluster, comprised of twelve production, processing and distribution segments, had a 2009 critical mass of 75 establishments, employing 654 workers with average wages of $33,270; this cluster has exhibited strong growth over the business cycle period of 2001-2009. Its measure of economic specialization (called location quotient) has increased over time; meaning its export orientation continues to strengthen. Overall, the Northeast Kingdom's agribusiness cluster has outperformed its national counterpart over the study period. Finally, this regional cluster has not gone unnoticed—growth and developments in the Northeast Kingdom agribusiness cluster has been cited in national studies and the popular press.




This cluster also represents a tie to the traditional land-based economy, a critical part of the region's traditional landscape that enhances the region's scenic beauty. Approximately 18% of Vermont's farmland is located within the Northeast Kingdom. According to the 2012 Census of

Agriculture, there are 1,291 farms in the Northeast Kingdom, which represents an 8.9% increase from 2002. The region has more farms per population than statewide. (Figure 6.3)

**Agricultural Trends**

The total market value of all Northeast Kingdom agricultural products (crops and livestock) grew to $148,204,000 in 2012, an increase of 6.2% since 2007. While the value of livestock sales in the Northeast Kingdom dropped by 4.6% from 2007 to 2012, it still accounted for the majority (83%) of the value of all agricultural sales in the region.

**Table 6.2 Market Value of Agricultural Products Sold 2012, 2007***

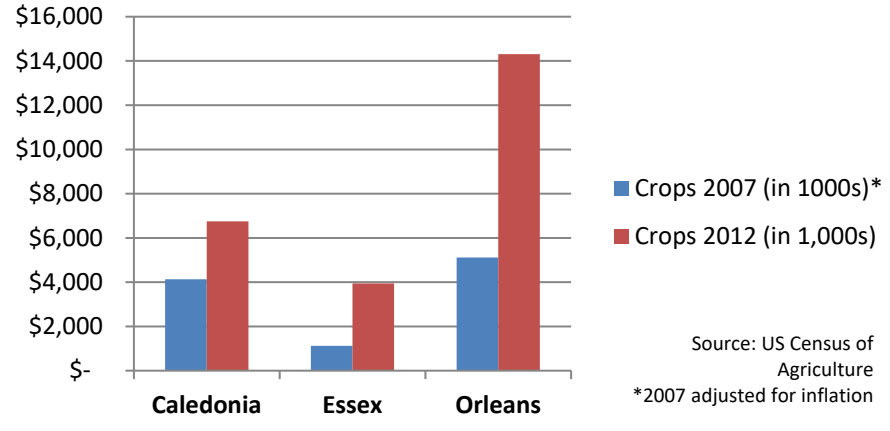
| | Vermont | | Caledonia | | Essex | | Orleans | | Northeast Kingdom | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **2012** | **2007** | **2012** | **2007** | **2012** | **2007** | **2012** | **2007** | **2012** | **2007** |
| Crops ($1,000) | 177,726 | 109,915 | 6,748 | 4,134 | 3,945 | 1,123 | 14,305 | 5,116 | 24,998 | 10,373 |
| Livestock ($1,000) | 598,379 | 636,101 | 30,498 | 30,793 | 7,706 | 12,328 | 85,003 | 86,070 | 123,207 | 129,191 |
| All Agricultural Sales ($1,000) | 776,105 | 746,016 | 37,245 | 34,927 | 11,651 | 13,451 | 99,308 | 91,186 | 1,809,889 | 139,564 |

Source: 2012 Census of Agriculture, USDA
*Adjusted to 2012 dollars using Bureau of Labor CPI Inflation Calculator

Orleans leads in agricultural sales in the Northeast Kingdom, as shown on Table 6.4. Although there was no increase in the number of cattle and calves from 2007 to 2012, these animals still far outnumber other livestock in the Northeast Kingdom. However, sharp increases between 2007 and 2012 in the goat and sheep inventories in Orleans County, with a more modest rise in Caledonia County, indicates that livestock is beginning to diversify, and other animal products may account for a larger share of total livestock sales in future years.

The value of crop sales in the Northeast Kingdom saw a dramatic increase of 140% from 2007 to 2012. While crop sales only accounted for 7.4% of Northeast Kingdom total agricultural sales in 2007, it represented 17% in 2012. Crops include nursery and greenhouse crops. This may signal a trend in more local production of food.

**Figure 6.4 Value of Agricultural Products Sold -- All Crops, 2007-2012**




Dairy farming is still the main agricultural driver in Orleans County. The county has more than 21,000 dairy cows – fewer than only Addison and Franklin Counties – accounting for 15.7% of all dairy cows statewide and $77.5 million in milk sales. The impact of dairy activity, however, goes well beyond milk sales. A conservative estimate on its direct and induced

impacts statewide is about $2.2 billion per year.[5]
There has traditionally been little farming in Essex County due to poor agricultural soils and rugged terrain, but a large amount of the county's land area is covered by spruce-fir forest that is harvested commercially. While a significant amount of forested lands has been converted into conservation use, some large parcels have been developed for increased maple production. The Sweet Tree 1 project includes a maple processing facility in Island Pond (in the former Ethan Allen plant), a large commercial sugar house in Avery's Gore, and thousands of acres of sugarbush in northern Essex County. Similarly, the Island Pond Maple Factory, a bulk maple processing company located in the former Island Pond Woodworkers facility has adaptively re-used an existing building and employs local residents.

## Forest and Wood Products (Mature)

This cluster includes sectors such as wood products manufacturing, paper manufacturing, and furniture products manufacturing. The forest industry is an intricate part of the region's economic and social identity. Essex County's large percentage of goods-producing industries is largely due to the presence of the Ethan Allen Furniture processing plant in Beecher Falls. Ethan Allen has its primary production facility in the village of Orleans. The company has remained stable over recent years as it transitioned to special order manufacturing. Lyndon Woodworking, Appalachian Engineered Flooring, and Newport Furniture Parts (Built By Newport) are other wood manufacturers located in the Northeast Kingdom. In addition, Columbia Forest Products manufactures plywood in Newport City.

Harvest data compiled by the Vermont Department of Forests, Parks and Recreation indicate a gradual decline in sawlog harvesting in response to the softening of the lumber market. The decline in pulpwood harvesting, however, has been more dramatic, largely due to the loss of pulp mills in New Hampshire over the past decade.

Even though showing this cluster has experienced a decline in its employment base, the churning has spawned a number of developments in niche markets. As in the agribusiness and food processing cluster, forest and wood products is part of the traditional land-based economy of the Northeast Kingdom, which has many opportunities for convergence and intersection with other economic activities, including visitor and tourism. Changes to market conditions will likely continue to have a negative impact on demand for sawlogs and pulpwood. If the region shifts to renewable energy sources, however, the demand for whole tree chips and other biomass sources could expand opportunities for the forestry products industry.

A 2010 study estimates that the annual supply of Net Available Low-grade Growth (NALG) wood – wood that would be appropriate for use as a biomass fuel above and beyond current levels of harvesting – is slightly less than one million green tons statewide. Caledonia County has the lowest concentration of NALG in the state, and collectively, Essex and Orleans Counties have just over 107,000 green tons. However, the region borders NALG-rich Grafton and Coos counties, which have more than a half-million green tons each. While these estimates are far from precise and are highly sensitive to a number of external factors, our region should continue to support additional research to develop the biomass market in a sustainable manner.

The output in whole tree chip harvesting increased around 2008, when fossil fuel prices were high. End users for chips are typically power plants, such as the McNeil Plant in Burlington and the Ryegate Power Plant. Currently, the wholesale price of power, driven by relatively inexpensive natural gas, is keeping wood chips prices low. The lower prices, in turn, dictate how far chips can be transported cost-effectively. Given current conditions, it is reasonable to assume that the market area for the region's whole tree chip harvest is a 50- to 75-mile radius.

In 2012, Act 142 created the Working Lands Enterprise Fund and the Working Lands Enterprise Board (WLEB). The WLEB is made up State agencies and private sector members in the supply chains of

[5] Vermont Dairy Promotion Council, Vermont Agency of Commerce and Community Development, Vermont Agency of Agriculture, Food and Markets: Milk Matters: The Role of Dairy in Vermont, December 2014

agriculture and forestry. The forestry subcommittee of the WLEB has created an "asset map" that includes information on the location and scale of facilities and businesses within the primary and secondary forestry industry. (http://workinglands.vermont.gov/node/736) Additionally, the Vermont Department of Forests, Parks, and Recreation hosts an online searchable directory of Vermont sawmills and veneer mills which is intended to help connect wood-using industries in the state to other businesses, as well as to policy and decision makers. (http://fpr.vermont.gov/forest/forest_business/sawmills) As of 2017 there were a total of 83 sawmills in the state, 19 of which were in the Northeast Kingdom: 9 in Caledonia County, and 10 in Orleans County.

Other industry support groups and programs include the Vermont Wood Manufacturer's Association, Vermont Technical College, the Vermont Community College System, the University of Vermont's Forestry Department, and the Small Business Development Center Program.

### Sustainable Forestry

Keeping forests healthy simply makes economic sense. Many Vermont landowners already practice what is considered "sustainable" management without being certified. However, for consumers wishing to promote good environmental stewardship, certification is the only way to distinguish between wood products from an ecologically-sound forestry operation and wood from a less ecologically-sound operation. A growing number of consumers are willing to pay higher prices for certified wood from the former, and it may benefit landowners and manufacturers to be recognized for their responsible practices.

There are a number of certification programs available to landowners and forest product manufacturers. Third party certification involves an independent audit of forest management practices and certification that forestland is being managed in a sustainable fashion. Once certified, landowners can gain access to markets for sustainably produced wood products.

Certification programs are available through the Forest Stewardship Council, Vermont Family Forests, Sustainable Forestry Initiative and the Vermont Tree Farm Program. Because the cost of certification can be prohibitive for small operations, there is certification available for groups of landowners at lower costs. Certification is also available to groups of manufacturers.

The Vermont Sustainable Jobs Fund created the "Green Guide Specs," last updated in 2009, for use by architects, builders, facility managers and communities as a way to assist them in sourcing third-party-certified Vermont forest products for construction projects.

## Visitor and Tourism (Star)

This industry cluster, which consists of leisure, hospitality, and recreation, has experienced significant growth, due in part to investments that have helped to make the region a year-round destination. Though these developments will continue to add jobs to its solid base of nearly 1,000 workers; wages remain relatively low within this industry.

The cluster thrives on a nexus with farming and forestry, which lend authenticity to the visitor experience. The working landscape has a noted "multiplier effect" on visitor and tourism businesses. Agri-tourism, which includes farm stays and tours and direct marketing of local agricultural products, is a growing trend within the region, as is eco-tourism. Forest-related recreation and tourism contribute about $1.9 million annually to the state's economy.[6]

Among the leading leisure and hospitality industries in the area, the Jay Peak Resort continues its expansion with the addition of new facilities, equipment and new ski runs. From the continuing development of seasonal homes, hotels, condominiums, and recreational facilities Jay Peak Resort has become a four-season vacation resort. To provide some perspective on Jay's contribution to the regional economy, rooms tax

[6] 2013. The Economic Importance of Vermont's Forest-based Economy, Northeast State Foresters Association.

receipts in Jay (town wide) account for more than 83% of all room tax receipts in the Essex/Orleans area. Burke Mountain has also made recent expansions, including a 100+ unit hotel, and recreation facilities.

The regional tourism industry also incorporates activities such as: biking, snowmobiling, hunting, cross-country skiing, and hiking to attract numerous visitors to the Northeast Kingdom. Along with the Jay Peak Resort and Burke Mountain, the four-season destinations mentioned above, there are numerous cross-country ski and cycling centers in the region. Kingdom Trails, the Craftsbury Outdoor Center, the Northwoods Stewardship Center, Lyndon Outing Club, Mempremagog Ski Touring Association, and Jay Peak include a thorough network of cross-country ski and cycling trails. The Vermont Association of Snow Travelers (VAST) has an extensive system of trails throughout the region for snowmobiles. As the Lamoille Valley Rail Trail continues to develop, this will bring additional visitors to the NEK region.

Fishing and boating are popular activities on the region's many lakes and streams. Recognized water trails located within the Northeast Kingdom include the Passumpsic Valley Riverway, a 20-mile water trail from East Burke to Barnet; the Northern Forest Canoe Trail, a 723-mile historic trail, follows a route used by native Americans to move from Lake Champlain to the Connecticut River Watershed; and the recently designated Connecticut River Water Trail are all popular canoeing waters. In the northwest part of the region, the Missisquoi River was recently designated as Wild & Scenic River by the federal government.

Fall foliage and scenic landscapes continue to be popular attractions. The Northeast Kingdom has developed a reputation as one of the best places to bicycle in the country. Many cyclists come during the foliage season or during the summer months, and most tour along the state highways. NVDA, with Agency of Transportation financing assistance, has identified a network of on and off-road bicycle touring routes throughout the Northeast Kingdom, consisting of a "loop and link" system, with courses ranging from 10 miles to 80 miles. Kingdom Trails, in East Burke, has an extensive all-season trail network, which is nationally popular with mountain bike enthusiasts (60,000+ visitors annually) and cross-country skiers. Other bicycle path projects are still in the planning stages including paths in St. Johnsbury and Newport.

## Education and Knowledge Creation (Opportunity Cluster)

Composed of private education services, publishers and other information services, the education and knowledge creation cluster is in its incipient stage. This cluster showcases a number of nationally (and internationally renowned) educational institutions such as the St. Johnsbury Academy, Burke Mountain Academy, and Sterling College. While connections with other sectors of the regional economy are currently limited, forging stronger partnerships with these institutions (as well as the region's Career and Technical Centers) will be critical to building a skilled labor force.

## Other Sectors

### Health Care

The Northeastern Vermont Regional Hospital in St. Johnsbury and the North Country Hospital in Newport are among the largest employers the Northeast Kingdom. Employee counts in Essex are suppressed, but this sector, along with social assistance and education, make up the largest employment sector in the Northeast Kingdom.

### Retail

Retail trade remains a challenge for many Northeast Kingdom communities. Taking into account the region's low population densities and changes in the retail industry, it has been difficult to attract or retain retailers of all sizes. There has been some growth through the 'dollar store' chains in a number of communities – Island Pond, North Troy, Hardwick, and Orleans. Other retail businesses that have located or remained in the region have often found the best strategy is to identify and concentrate on "niche" markets for specialty goods and services. These are areas where large retailers typically cannot compete efficiently or effectively. With a new Wal-Mart Supercenter in Derby, this strategy may make sense. Local merchants have been able to

fill some retail needs in most communities, but some local officials continue to seek retail opportunities for area residents.

The Town of St. Johnsbury continues working to revitalize its Railroad Street retail district. Several long-time retailers remain in downtown St. Johnsbury, and may attract other businesses. Rather than compete with Littleton for the same retail customer base, St. Johnsbury looks to develop its own niche in the retail sector, with a collection of unique destination shops and restaurants. That fact that St. Johnsbury has many cultural and historic assets provides a good basis for current economic recovery efforts.

Newport City is revitalizing its downtown retail sector through a comprehensive community development strategy. The development of the downtown, lakefront, rehabilitation of community facilities, streetscape beautification, and the relocation of state and federal government offices to the downtown, have aided the transformation of Newport's downtown central business district into an economically viable commercial area and place of employment.

Recent commercial growth in the region has been greatest in the following three areas:

1. U.S. Route 5 corridor between Derby and Newport City.
2. U.S. Route 5 in Lyndonville between the Interstate 91 and the village center.
3. U.S. Route 5 in St. Johnsbury, near the Interstate 91 exit (Exit 22) north of the city.

### Government

Government, or public-sector, employment includes local, state, and federal employment opportunities. Educational institutions are typically large employers within the state and local government sectors. In 2016, 4,456 persons were employed by local, state, or federal governments, representing nearly one-fifth of all covered employment in the region. This sector has also includes individuals employed in public schools.

## III. FOREIGN TRADE ZONE

In 2013, NVDA received a designation from the U.S. Department of Commerce to operate a Foreign Trade Zone (FTZ) for the three-county region. Lamoille County was added to NVDA's FTZ #286 in 2015. The FTZ program primarily benefits companies that import foreign materials, components, or goods for their processing or distribution. A number of manufacturers in the four-county region have been provided information on the FTZ program and it is likely that a few will sign up for participation in the near future.

## IV. ECONOMIC INDICATORS

### Wages and Income

Vermont's average weekly wage of $870 falls well below the U.S. average of $1,020. Wages for all three counties in the region fall well below the state average.[7] Median, average, and per capita incomes in the Northeast Kingdom also fall below state levels. Essex County fares the worst, with incomes that are roughly 70% of state income levels. (Table 6.3) When broken out by gender, the statistics are even bleaker for working women across the state. In Vermont, median annual income for women working full-time is $7,000 less than the median annual salary for men. This translates into a wage gap of 16 cents on every dollar earned by a man. The gap narrows to 14% when a woman holds a college degree, but if a woman has dependent

[7] U.S. Bureau of Labor Statistics, 2nd Quarter 2017, All Establishments.

children, the wage gap increases to 23%[8]. About 6% of all NEK households are headed by a woman with dependent children, so this income gap has critical economic implications for the region.

Correlating to income levels, the three counties of the Northeast Kingdom have high poverty rates. According to American Community Survey 5-Year Estimates, Essex and Orleans Counties have the highest poverty rates – 14.8% and 14.6% respectively. Caledonia County has a poverty rate of 12.8%, well above the statewide rate of 11.6%.

**Table 6.3: Wages and Income**

| | Average Weekly Wage | Median Household Income | Average Household Income | Per Capita Income |
|---|---|---|---|---|
| Caledonia | $765 | $46,931 | $60,787 | $24,948 |
| Essex | $724 | $39,467 | $49,494 | $22,191 |
| Orleans | $681 | $43,959 | $56,883 | $24,204 |
| Vermont | $870 | $56,104 | $73,016 | $30,663 |
| U.S. | $1,020 | $55,322 | $77,866 | $29,829 |

## Education and Career Pathway Training

Education attainment is a defining marker of income inequality. In the Northeast Kingdom's population of 25 and older:

- 38.2% have only a high school diploma (or equivalent), compared to 29.9% of the population statewide.
- 11.6% have no high school diploma (or equivalent), compared to 8.1% of the population statewide.

More than two-thirds of Vermont's jobs will require some form of postsecondary education by 2020. Unfortunately, employers in advanced manufacturing and healthcare sectors in particular are already reporting shortages of qualified workers. Meeting the needs of a changing workforce will require doubling the number of Vermonters with either a college degree or credential of value[9].

**Table 6.4 Higher Education in the Northeast Kingdom and Vermont**

| | Caledonia | Essex | Orleans | Vermont |
|---|---|---|---|---|
| Total Population 25 and older | 21,616 | 4,658 | 19,573 | 437,304 |
| Less than 9th Grade | 2.9% | 6.9% | 4.6% | 2.8% |
| 9th to 12th Grade, No Diploma | 6.5% | 8.8% | 8.4% | 5.3% |
| High School Graduate (includes equivalency) | 36.4% | 44.1% | 38.7% | 29.9% |
| Some College, No Degree | 18.1% | 14.6% | 18.5% | 17.3% |
| Associate's Degree | 8.5% | 9.7% | 7.8% | 8.6% |
| Bachelor's Degree | 16.5% | 10.2% | 14.5% | 21.7% |
| Graduate/Professional Degree | 11.2% | 5.6% | 7.6% | 14.5% |

Workforce development continues to be one of the keys to economic development in the region. The Regional Technical Centers in Newport, Lyndonville, and St. Johnsbury, the Northeast Kingdom Collaborative, and area businesses agree that a lack of employees with specific skills is the greatest barrier to attracting new businesses and expanding existing businesses. Fifty-six percent of Northeast Kingdom businesses, responding to a survey, said that an available, trained workforce was the biggest challenge facing their business.

[8] Change the Story 2016 Status Report: Women, Work and Wages in Vermont.

[9] 70x2025vt, a partnership between Vermont leaders in education, business, nonprofits, philanthropy, and local, state and federal government, defines as "credential of value" as a credential that indicates completion of a post-secondary academic or professional program that documents a set of skills or experiences as part of a career pathway that leads to employment and/or further educational opportunities.

### Population

The past two censuses confirmed a slow growth rate in Vermont's population, with an annual growth rate of only 0.3%, compared to the nationwide growth rate of 9.7%. Vermont's population continues to show an overall slower rate of population growth, the three counties of the NEK are losing population. From 2010 to 2016[10], Caledonia and Essex lost more than 2% of their respective populations. Orleans County lost more than one percent of its population over the same period. A perceived lack of attractive employment opportunities likely contributes to the out-migration of younger workers from the area.

## V. EXTERNAL TRENDS AND FORCES

People have been concerned about future economic growth in the Northeast Kingdom, fearing that it will lead to unattractive commercial development and loss of the traditional Vermont landscape. Business interests view this concern as a potential threat to economic progress. Everyone agrees that efforts to revitalize downtowns can have economic and cultural benefits, but some people oppose limiting growth to existing growth centers and downtowns. Also, attempts to create a "livable wage" in Vermont continue to raise concerns about retaining existing businesses and attracting new ones, especially when similar wage initiatives are not happening in nearby states. It is acknowledged, however, that it is extremely difficult for someone earning minimum wage to improve their standard of living.

The availability of adequate and affordable childcare remains a challenge for many in the workforce and for those moving from welfare to work. The need for affordable childcare was identified by 85 % of the respondents in the Northeast Kingdom survey conducted by the Rural Economic Area Partnership. A lack of public transportation is another limiting factor for many low-income workers in rural communities where local employment opportunities are limited or nonexistent.

Property tax reform continues to be an issue for too many residents and businesses in the region. Education in Vermont is primarily funded by statewide property taxes which have steadily risen despite declining numbers of students in local schools.

Neighboring regions to the south and in New Hampshire seemingly put the Northeast Kingdom at competitive disadvantage in recruiting and retaining businesses. New Hampshire has no state sales or income tax and offers very low worker's compensation rates. Other Vermont regions are nearer large population centers and have access to a wider variety of goods and services. In addition, the nearest commercial airports (Burlington VT, Montreal QC, and Manchester NH) are two or more hours away from most Northeast Kingdom locations. However, recent expansions to the Northeast Kingdom International Airport may boost economic activity in the region over time.

Due to the rural character of the Northeast Kingdom, telecommunications companies continue to be slow to develop high-speed telecommunications systems throughout much of the region, thereby frustrating the growth of e-commerce and those wishing to "telecommute" from home. This can be attributed in part to a widely scattered population (customer) base and poor economic conditions, and less to environmental sensitivities regarding the location of new of telecommunication facilities.

## VI. BUSINESS ASSISTANCE & FINANCING

There are many opportunities for business and financial assistance in the region. Several organizations provide a variety of services to help expand businesses and employment within the region. These organizations include:

- Northeastern Vermont Development Association (NVDA), with offices in St. Johnsbury and Newport, is a primary contact for Northeast Kingdom businesses. NVDA contacts and prospects for in-state and out-of-state clients that will fit the region, including participating in recruitment efforts in

[10] US Census Bureau. Annual Estimates of the Resident Population, April 1, 2016 to July 1, 2016.

the province of Quebec. NVDA, in partnership with the Small Business Development Center, provides technical assistance for reviewing business plans, and connects with the appropriate state agencies for marketing assistance, workforce training funds, and growth incentive funds. NVDA submits grant proposals for community and economic development projects to a number of funding agencies. NVDA has lending programs that can provide loans of up to $100,000. Funds are used to provide financial assistance for business start-ups, expansions, or relocations to the region.

- Northern Community Investment Corporation (NCIC), a regional partner, offers Small Business Administration (SBA) loans, lines of credit, direct loans up to $100,000; loan guarantees; an equipment-leasing program; equity investments; arranges bank loans, and SBA 504 Fixed Asset Financing.
- Small Business Development Center (SBDC), a program of the U.S. Small Business Administration, maintains a presence at NVDA offices in St. Johnsbury and Newport, providing assistance to for-profit businesses to develop business plans for internal use or for loan proposals. The SBDC also offers management, marketing, financial, and production support to fledgling businesses.
- The Procurement and Technical Assistance Center (PTAC) is located in the NVDA Newport Office. The PTAC Counselor is available to assist businesses in the region get set up in a system that allows them to receive bid opportunities from local, state, and federal government agencies.
- Northeast Kingdom Community Action (NEKCA) Micro-Business Development Program provides information on how to start a business, creating marketing and financial plans, as well as general troubleshooting for micro-businesses.
- Vermont Economic Development Authority (VEDA) serves the entire state and offers a variety of business incentive programs. VEDA maintains an office in NVDA's St. Johnsbury building.

### Local Revolving Loan Funds

The towns of St. Johnsbury, Lyndon, Barton, Hardwick, Brighton, Newport, and Canaan all have revolving loan funds for businesses that are capitalized in a variety of ways. Some of these are used solely for business development; others are broader in scope and are used for various community development projects.

### Tax Stabilization Policies

Newport City, St. Johnsbury, Lyndon, and Hardwick each have adopted municipal tax stabilization policies that allow them to provide temporary benefits to new or expanding businesses that create employment in their respective communities.

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## GOALS AND STRATEGIES FOR ECONOMIC DEVELOPMENT

## ECONOMIC DEVELOPMENT GOALS

- Reduce the region's unemployment rate.
- Train new and existing workers to meet the needs of area businesses and increase workers' salaries.
- Create higher-wage jobs.
- Coordinate economic development functions in the Northeast Kingdom.
- Assist municipalities in their economic development efforts.
- Increase and diversify the region's agricultural output, especially value-added production using local staple products and raw materials.

- Improve the economic infrastructure capacity (physical assets and workforce) in the Northeast Kingdom to meet current and future needs.
- Modernize and expand the region's telecommunications infrastructure to allow telecommuting and information technology-focused companies to grow and thrive.
- Maintain and revitalize the downtowns and village centers in the Northeast Kingdom.
- Make quality, affordable child care available to workers with children in the Northeast Kingdom.
- Expand tourism in the Northeast Kingdom, and make eco-based businesses a part of the region's landscape.
- Mitigate the negative effects that some past businesses have had on the environment.
- Increase research and start-up funds to aid value-added processing and to diversify the economy, especially for the region's farmers.
- Strengthen manufacturing, particularly in the forest products and industrial machinery sectors.
- Promote small business sectors, e.g. telecommuting, specialty foods, value-added businesses, arts and crafts and e-commerce.

## ECONOMIC DEVELOPMENT STRATEGIES

- Provide technical and referral assistance for new and expanding businesses, and recruit new businesses.
- Market the programs and resources of NVDA.
- Assist existing manufacturing companies to grow by identifying and sharing new markets, technologies, and opportunities.
- Assess opportunities for coordination of economic development organizations.
- Provide greater access to revolving loan funds.
- Participate in regional and statewide economic development strategy efforts that involve the Northeast Kingdom region (CEDS, USDA REAP Zone, etc.).
- Participate in the development and implementation of a comprehensive workforce development strategy for the region.
- Assist with the revitalization of distressed areas and threatened employment sectors within the Northeast Kingdom.
- When possible, provide grant and technical assistance and project management to towns, organizations, and businesses throughout the Northeast Kingdom.
- Assist local planning commissions and development organizations in the Northeast Kingdom with economic development planning.
- Partner in economic development events with SBDC, PTAC, VMEC, VEOC, and others where regional businesses may benefit.
- Host business financing events so that businesses are aware of capital resources available.

- Assist municipalities with the planning, development, and maintenance of infrastructure projects that will improve economic opportunities, e.g. water, sewer, industrial sites, broadband, and transportation.
- Identify, prioritize and implement brownfield mitigation projects within the region.
- Support telecommunications infrastructure and knowledge capabilities by creating effective partnerships, and by advocating for increased infrastructure.
- Promote and advocate for economic development projects in village and downtown areas.
- Promote and maintain Downtown Designation and Village Center Designation where appropriate.

# Chapter Seven: Natural Resources

## I. OVERVIEW

The Northeast Kingdom is recognized for its diverse wildlife, large undeveloped areas, and vast woodlands. The region's natural resources (depicted in Figure 7.1 on the following page) provide residents and others a variety of benefits. The largest source of revenue in the region is from outdoor recreation, and much of the tourism industry relies on the healthy and scenic environment to remain viable.

Therefore, the natural resources in the Northeast Kingdom have intrinsic scenic and economic values that require careful consideration when making planning decisions. The overarching goal for the region is to balance local economic needs with the protection of the resources that so many of region's residents enjoy and depend upon.

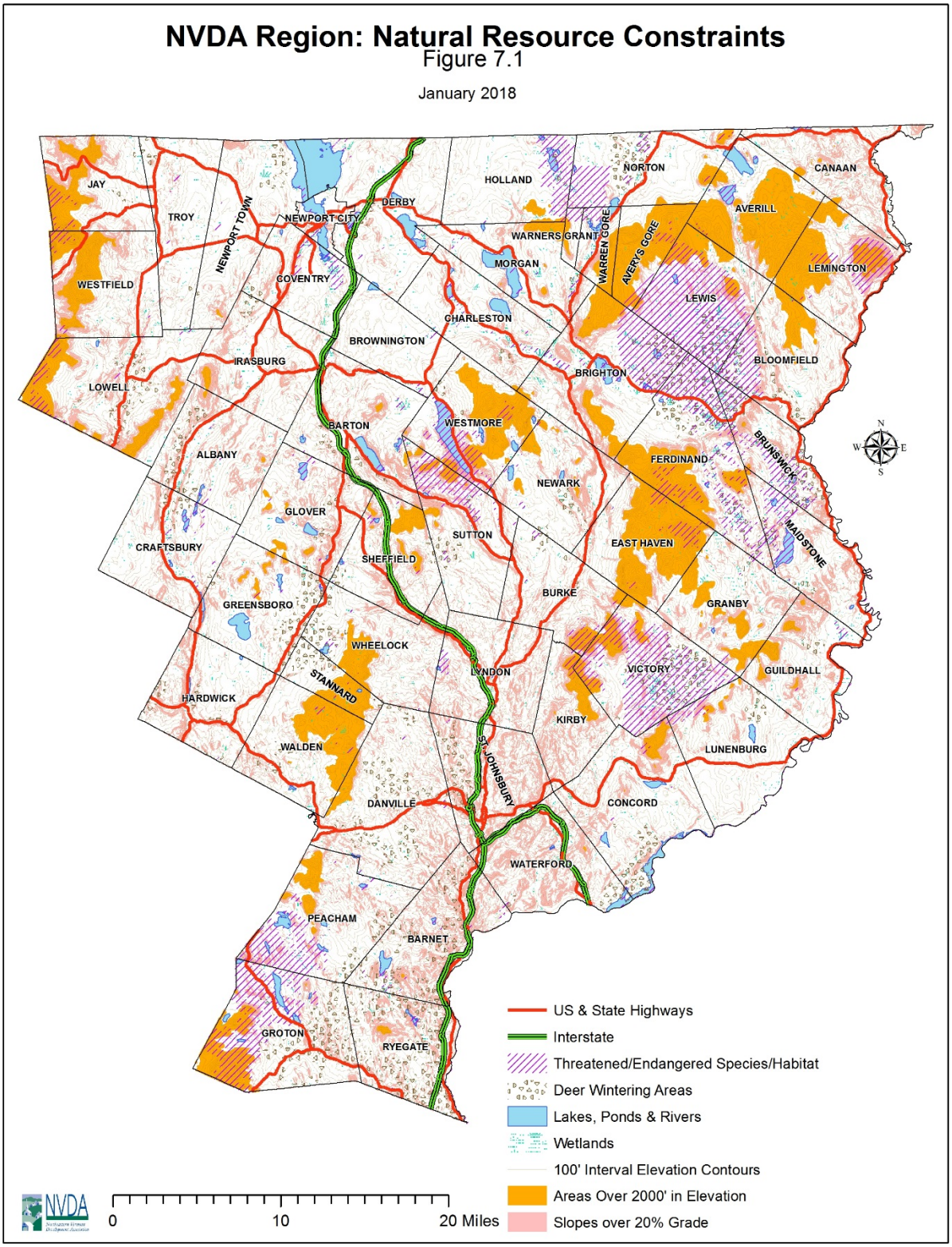
The Northeast Kingdom lies mostly within three physiographic regions:

- *The Northeast Highlands*, an extension of New Hampshire's White Mountains, make up most of Essex County and northern Caledonia County. On average, this area is cooler than the rest of the state. The growing season here averages less than 90 days and snowfall accumulation frequently exceeds 36 inches.
- In much of Orleans County and parts of Caledonian County the topography is primarily *rolling hills* interspersed with occasional plains of fertile agricultural soils. Both of these physiographic regions have extensive glacial deposits.
- The third region is the *Connecticut River Valley*, which extends the length of the region along its eastern border. Level topography and rich alluvial soils well suited for agriculture characterize this physiographic region.

The forests are mainly northern hardwoods with large stands of red spruce and balsam fir. Black spruce and succession species such as white pine and aspen fill recent clearings. The region contains some of the State's largest bog and wetlands complexes, with fabulous stands of red pine, black spruce, hemlock, northern white cedar and hardwoods dispersed throughout. Essex County has more wetlands than any other county in Vermont.

The majority of the region's water drains either north to Quebec as part of the St. Francois River watershed or east and south as part of the Connecticut River watershed. Much of the region's western edge drains north and west as part of the vast Lake Champlain basin. The region's lakes, ponds, streams and rivers are famous for the excellent and diverse fishing opportunities they offer. The more than 130 lakes and ponds found concentrated in the region represent a disproportionately high share of the State's total. This region is home to most of Vermont's larger, deeper lakes and the legendary 20-30 pound lake trout that have inhabited them since the last ice age.

This combination of forest and water resources creates prime habitat for many wildlife species, and draws many tourist and visitors to the Northeast Kingdom to enjoy them.


NVDA Region: Natural Resource Constraints
Figure 7.1
January 2018
JAY
TROY
NEWPORT TOWN
NEWPORT CITY
DERBY
HOLLAND
NORTON
CANAAN
AVERILL
WARNERS GRANT
WARREN GORE
AVERY'S GORE
LEMINGTON
MORGAN
WESTFIELD
COVENTRY
LEWIS
CHARLESTON
BROWNINGTON
IRASBURG
BRIGHTON
BLOOMFIELD
LOWELL
BARTON
WESTMORE
ALBANY
FERDINAND
BRUNSWICK
NEWARK
GLOVER
SUTTON
EAST HAVEN
MAIDSTONE
CRAFTSBURY
SHEFFIELD
BURKE
GRANBY
GREENSBORO
WHEELOCK
LYNDON
VICTORY
GUILDHALL
STANNARD
HARDWICK
KIRBY
WALDEN
LUNENBURG
ST. JOHNSBURY
DANVILLE
CONCORD
WATERFORD
PEACHAM
BARNET
GROTON
RYEGATE
US & State Highways
Interstate
Threatened/Endangered Species/Habitat
Deer Wintering Areas
Lakes, Ponds & Rivers
Wetlands
100' Interval Elevation Contours
Areas Over 2000' in Elevation
Slopes over 20% Grade
NVDA
0
10
20 Miles

## II. WATER RESOURCES

## Water Quality

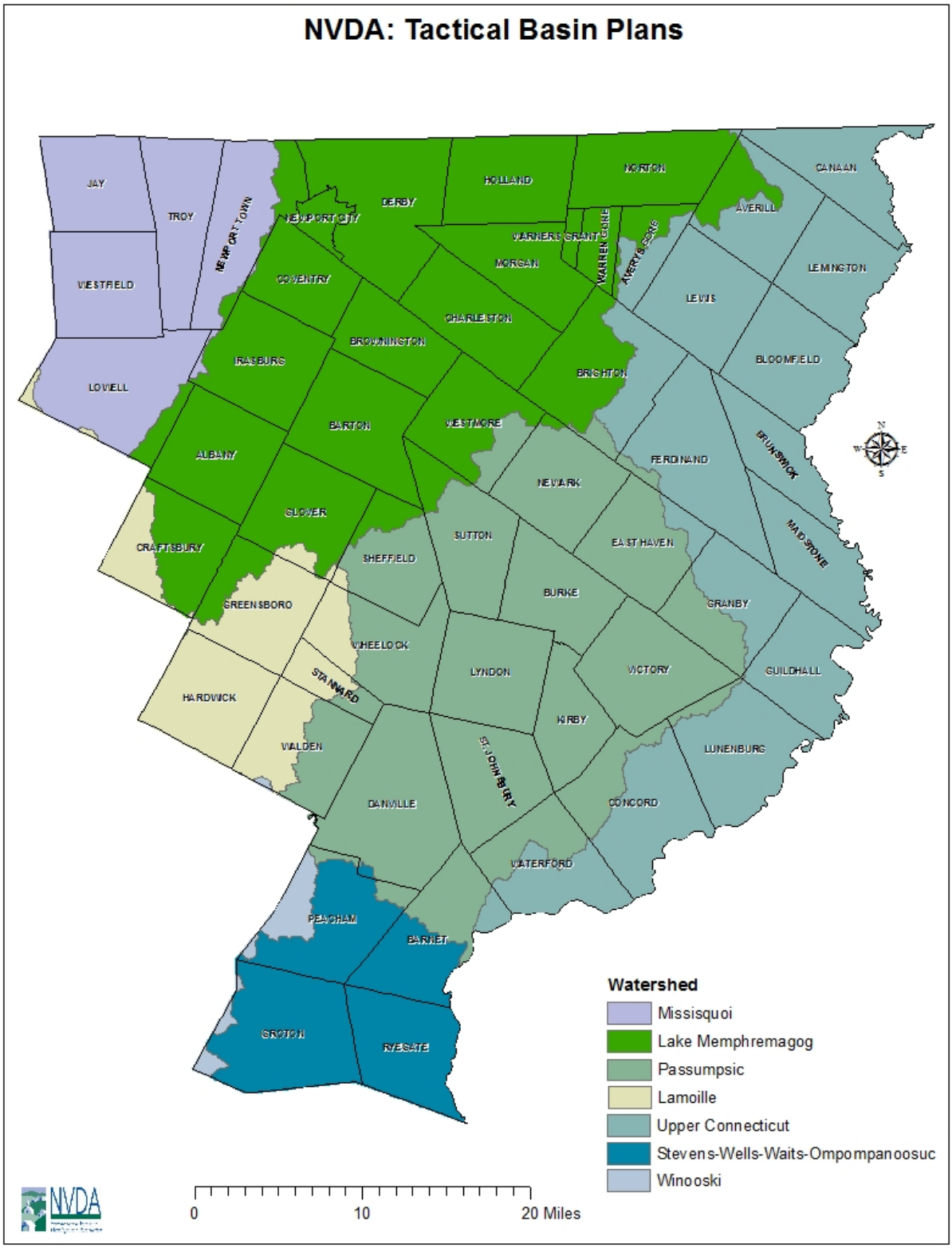
The Vermont Clean Water Act enacted in 2015 the purpose is to manage and regulate the waters of the State so that water quality is improved and not degraded. To authorize and prioritize proactive measures designed to implement the Total Maximum Daily Load or TMDL of phosphorous concentrations in Lake Champlain and Lake Memphremagog and improve water quality across the state. One key step in Vermont's clean water efforts has been bolstering the cooperation and coordination between the Municipalities, Regional Planning Commissions and the Department of Environmental Conservation watershed management division through the Tactical Basin Plans.

A drainage basin is any area of land where precipitation collects and drains off into a common outlet, such as into a river, bay, or other body of water. The drainage basin includes all the surface water from rain runoff, snowmelt, and nearby streams that run downslope towards the shared outlet, as well as the groundwater underneath the earth's surface A watershed is simply the area of land that catches rain and snow and drains or seeps into a marsh, stream, river, lake or groundwater. There are 17 basins in the State 7 of which are within our region. Basin 6 Missiqoui Bay, Basin 7 Lamiolle River, and Basin 8 Winooski River all drain into Lake Champlain and are subject to the Lake Champlain TMDL. Basin 17 Lake Mempremagog is subject to the Lake Mempremagog TMDL approved by the EPA in 2017. Basin 16 Upper Connecticut River is expected to need a TMDL to regulate Nitrogen concentrations in the future. Basin 15 Passumpsic River is the most central and encompassing basin. Basin 14 Wells-Waits-Ompompanoosic is the southernmost basin. The Vermont Legislature has directed the Vermont DEC to prioritize funds to project with the greatest reduction in phosphorous. In collaboration with Regional Planning Commissions and their member municipalizes DEC is analyzing and recommending projects for funding to reduce phosphorus in the waters of the State.

Joint working groups were formed to address agricultural issues and lake/river water quality monitoring and objectives. The Lake Memphremagog Quebec/Vermont Working Group, established by the governments of Quebec and Vermont in 1989, completed their *Final Report on Managing Lake Memphremagog and its Environment* in 1993. Recommendations were made to reduce point and non-point sources of pollution, and a Vermont Memphremagog Steering Committee was formed in the spring of 1995 to work with its Quebec counterpart to implement priority recommendations.

The Connecticut River Joint Commissions were established by the legislatures of New Hampshire and Vermont and directed to serve in an advisory capacity, promoting public involvement in decisions affecting the Connecticut River and its watershed. Five local river subcommittees operate along the river in Vermont and New Hampshire. The two subcommittees in our region are the Headwaters and the Riverbend. The Connecticut River Conservancy is another citizen-based advocate for the environmental well-being of the Connecticut River. This organization founded in 1952, includes representatives from the four states where the river flows: Vermont, New Hampshire, Massachusetts and Connecticut. This organization conducts research, produces publications, awards small project grants, and initiates programs to generate local activism in the River watershed.

There are also several local Lake Associations involved in watershed activities throughout our region. In the Lake Memphremagog watershed a Stormwater Collaborative has been formed bringing together multiple agencies and municipalities to address water quality degradation in the watershed. Another example is the Lake Parker Association in West Glover, which has done work with watershed assessment, road erosion control, shoreland vegetation enhancement, lay monitoring and invasive aquatic species prevention. These lake associations have created a network for local citizens to help restore the health of their water systems.


NVDA: Tactical Basin Plans
JAY
TROY
NEWPORT TOWN
DERBY
NEWPORT CITY
HOLLAND
NORTON
CANAAN
AVERILL
WARNERS GRANT
WARREN GORE
AVERYS GORE
LEMINGTON
VIESTFIELD
MORGAN
COVENTRY
LEVIS
CHARLESTON
BROWNINGTON
IRASBURG
BRIGHTON
BLOOMFIELD
LOVIELL
BARTON
VIESTMORE
ALBANY
FERDINAND
BRUNSWICK
NEWARK
GLOVER
SUTTON
CRAFTSBURY
SHEFFIELD
EAST HAVEN
MAIDSTONE
BURKE
GREENSBORO
GRANBY
WHEELOCK
LYNDON
VICTORY
GUILDHALL
HARDVICK
STANNARD
KIRBY
WALDEN
LUNENBURG
ST JOHNSBURY
DANVILLE
CONCORD
WATERFORD
PEACHAM
BARNET
GROTON
RYEGATE
N
W
E
S
Watershed
Missisquoi
Lake Memphremagog
Passumpsic
Lamoille
Upper Connecticut
Stevens-Wells-Waits-Ompompanoosuc
Winooski
NVDA
0
10
20 Miles

No comprehensive studies have been completed on the quality of Vermont's groundwater, yet based on the small number of public water supplies throughout the state that have detected any contamination, the Water Quality Department describes Vermont's groundwater as "excellent."

Vermont's classification system for surface water establishes management goals and practical uses. The Water Resources Board classifies all surface waters in Vermont as either Class A or Class B. The October 30, 2014 Water Quality Standards recognize two categories of Class A waters. Class A(1) waters are ecological waters, which are managed to maintain waters in a natural condition. All of the waters above 2,500 feet in elevation are classified A(1). Class A(2) waters are managed as public water supplies and therefore allow moderate water level fluctuation. Class B waters are designated as being either Water Management Type 1, 2, or 3 depending upon their protection and management. An overlay of both Class A and Class B waters is an Outstanding Resource Water (ORW). These waters are designated by the Water Resources Board as having exceptional natural, recreational, cultural, or scenic value. Most waters in the Northeast Kingdom, like in the rest of Vermont, are Class B, which is consistent with State policy to achieve and maintain Class B waters with suitability for swimming, boating, and drinking with treatment as well as for irrigation and livestock watering.

The Water Quality Division maintains a river and lake assessment database listing impaired surface waters. This database is updated every two years with the most recent information and data from a variety of sources. Table 7.1 displays the impaired lakes and rivers within the Northeast Kingdom from this database. Threats listed are addressed at the local, regional, state or federal levels. For instance, agricultural runoff is a local and regional issue, whereas sewage overflows and mercury issues should be addressed across the entire range of management levels.

**Table 7.1: State Targeted-Impaired Surface Waters**

| Water Body | Threat or Impairment |
|---|---|
| Burgess Brook | Sediment: Asbestos mine tailings erosion/ asbestos fibers |
| Coburn Brook -- Newport | Agricultural activity and runoff |
| Mud Creek, from Vt./Que border | Agricultural runoff/nutrients enrichment |
| Passumpsic River Tremont St. Downstream – 5 miles through St. Johnsbury | E Coli: St. Johnsbury WWTF passes combined sewer overflows |
| Lower Sleepers River – St. Johnsbury | E Coli: St. Johnsbury WWTF passes combined sewer overflows |
| Lake Memphremagog – Newport | Phosphorous: Excessive algae growth; nutrient enrichment |
| Stearns Brook & Tributary – Holland | Nutrients: Agricultural runoff |

Source: State of Vermont 303(d) List of Impaired Waters, September 2014

| Table 7.2: Local Lake Associations | |
|---|---|
| Local Associations involved in Watershed Activities: | Programs Conducted by Local Lake Associations: |
| **Lake Memphremagog Watershed** | |
| Averill Lakes Assoc. (Great and Little Averill, Forest Lake)<br>Crystal Lake Reservation Assoc.<br>Daniel's Pond Assoc.<br>Echo Lake Assoc.<br>Elligo Lake Assoc.<br>Friends of Little Hosmer<br>Island Pond Assoc.<br>Lake Parker Assoc.<br>Memphremagog Watershed Assoc.<br>Salem Lake Assoc.<br>Seymour Lake Assoc.<br>Shadow Lake Assoc.<br>Westmore Assoc. (Lake Willoughby, Long Pond, Bald Hill Pond) | Bacteria Monitoring<br>Exotic Species Spread Prevention<br>Lake Assessment<br>Lake Protection Through Town Zoning<br>Land Conservation<br>Landowner Education<br>Lay Monitoring Program<br>Local Advocacy<br>Road Erosion Control<br>Runoff Diversion<br>Shoreland Vegetation Enhancement<br>Testing of Shoreline Septic Systems<br>Watershed Assessment<br><br>Watershed Management Committee |
| **Lamoille River Watershed** | |
| Greensboro Assoc. (Caspian Lake) | |
| **Passumpsic River Watershed** | |
| Cole's Pond Assoc.<br>Joe's Pond Assoc.<br>Lyford Pond Assoc.<br>South End Newark Pond Assoc. | Basin 14: SEWER Save Everyone's Wells River<br>Passumpsic River Network<br>Passumpsic Valley Land Trust |
| **Stevens River Watershed** | CT River Watershed Advisory Commission |
| Harvey's Lake Assoc. | Barton River CPP Program |
| **Upper Connecticut River Watershed** | Lamoille River Anglers Association |
| Maidstone Lake Assoc.<br>Miles Pond Assoc.<br>Neal Pond Assoc. | Missisquoi River Basin Association |
| Source: VT Agency of Natural Resources, Water Quality Division, Pamphlet: "Watershed and Lake Associations of Vermont", October 2003 | |

## Surface Waters

The Northeast Kingdom has the largest amount of surface water of any region in Vermont, excluding Lake Champlain. The region is famous for its pristine trout and salmon lakes, and the general diversity of fishery resources. Lakes such Willoughby, Seymour, and Caspian offer high quality trout fishing, while Lake Memphremagog and the Moore Reservoir are known for small-mouth bass. The Clyde, Black, Barton and Willoughby Rivers, primary tributaries to Lake Memphremagog, draw anglers from all over the Northeast for the large leaping rainbow trout, brown trout, and landlocked Atlantic salmon that migrate upstream from the big lake. The region's lakes and rivers serve as significant sources of recreation for residents and visitors, as well as being the source of drinking water for some communities.

## Ground Water

Ground water is a critical resource for the rural areas of Vermont. Approximately 60 percent of Vermont's citizens depend upon ground water for drinking and general uses. According to the state Water Quality Division, in many rural communities nearly 100 percent of the public and private drinking water sources are from ground water. Ground water occurs in two general hydrogeologic settings, bedrock and unconsolidated aquifers. Igneous and metamorphic crystalline bedrock along with carbonate bedrock form the bedrock aquifers within the state. Unconsolidated deposits are comprised of glacial till, which is basically sand and gravel.

As ground water moves through these materials, the organic and mineral substances that are dissolved or picked up dictate the quality of water. These water sources often tend to be better quality than surface water because of the leaching process. However, toxic substances can stay with ground water for very long distances. Although groundwater quality is generally good, the resource is nonetheless fragile. Contaminated wells destroy property value. The cost of developing and installing new groundwater sources for public water supply is estimated between $500,000 and $1,000,000 (Water Quality Division, 2000). This cost is prohibitive for many towns in the Northeast Kingdom, making prevention and education critical management tools.
One way to avoid costly groundwater contamination cleanup is to begin a Well Head Protection Program (WHPP). This is addressed in the Water Supply section of the Utilities and Facilities chapter of this document.

## Wetlands

Vermont's wetlands are defined as those areas of the state that are inundated by surface or ground water with a frequency sufficient to support plants and animals that depend on saturated or seasonally saturated soil conditions for growth and reproduction. These areas are commonly known as ponds, bogs, fens, marshes, wet meadows, shrub swamps, and wooded swamps. Wetlands often occur in association with lakes, ponds, rivers, and streams, creating transitional areas between dry land and open water. However, wetlands can also be isolated from any obvious connection to surface water. In order to be classified as a wetland under Vermont law, an area must have wetland soils and wetland plants, in addition to at least seasonal water.
Wetland soils are often anaerobic and the plants have adapted to growing in such waterlogged conditions.

Every town in the region contains wetlands that have been designated by the state as significant The Vermont Wetland Rules classify all wetlands into one of three classes. Classes One and Two are considered " significant" and protected under the Vermont Wetland Rules. All three wetland types are protected by Vermont's Act 250. The online Vermont Natural Resources Atlas contains an atlas layer that depicts the three classes of wetlands designated by the State. The information is found on the Watershed Protection layer of the Atlas, under the sublayer "Outstanding Water Resources" and "Wetlands." The Vermont Natural Resources Atlas can be viewed here: http://anrmaps.vermont.gov/websites/anra/

Wetlands provide important ecological functions, including flood and erosion control, and providing habitat for fish and wildlife. They aid in the maintenance of water supplies by trapping nutrients and sediments and recharging groundwater, and they provide recreational and educational opportunities.

Wetlands were once considered wastelands and were thought to be "improved" by draining and filling. As a result, nearly half of Vermont's original wetland resources have been lost, and hundreds of acres are lost annually. Human activities and development continue to encroach upon this finite resource. Agriculture and forestry activities as well as residential, commercial and industrial development all result in wetland alteration. Replacing new wetlands is costly and often impractical, so wetlands preservation is important.

## Floodplains

Floodplain maps identify flood hazard areas, defined as those areas that are inundated by the waters of the 100-year flood. Limiting extensive development in flood-prone areas is the best way to prevent flood damage while allowing the floodplain to function as it should. Overdevelopment in flood hazard areas increases risks to human life, property damage, and leads to habitat loss for wildlife species. Preventative measures, such as flood hazard regulations, can reduce these risks. Flood hazard regulations enable property owners to obtain both flood insurance and mortgage loans for property in flood hazard areas. Overdevelopment in floodplains can lead to an increase in intensity and frequency of flooding. This is especially true in areas that are losing wetlands due to development. Wetlands act like sponges-soaking up excess water-and when these are filled in or altered, there is an increased potential for flooding along other parts of the stream banks. Prevention is the best strategy for reducing environmental and human impacts from flooding. Preventative strategies include various planning and zoning tools, open space preservation, and watershed management.

### Pollution

The Connecticut River Joint Commissions' *The Watershed Guide* indicates that most aquifer contamination comes from "non-point" sources. This means that contaminants can come from drainage areas some distance away from the point of contamination. Contamination sources include "point" sources such as leaking gasoline storage tanks, failing septic systems, salt storage piles, landfills, storage tanks, or "non-point" sources such as urban and agricultural runoff, and mining operations. Cleanup of bedrock aquifers is costly and often ineffective.

Many farmers use Best Management Practices (BMPs) to reduce the amount of pollution entering waterways. Millions of dollars in state funds have been committed to help farms implement Best Management Practices. These practices are also useful for landowners and towns to avoid polluting waterways. There are BMPs for timber harvesting, construction and development, septic system care, road construction, road salting and dumping, golf courses, site excavation, sand and gravel operations, urban runoff, chemical and petroleum products, land application of bio-solids, and docks, moorings, and marinas. Education and voluntary compliance are essential to mitigating the production of non-point source pollution.

### Erosion and Sedimentation

Erosion and discharge of sediment into rivers, lakes, and streams can cause significant damage to aquatic communities. Sediments suspended in the water or deposited on bottoms can adversely affect the growth, feeding, and reproduction of many organisms. Other impacts include loss of topsoil, contamination of water by heavy metals, increased flooding potentials and high municipal costs for ditch, culvert, and drain cleanup. The rate of erosion is influenced by the type of soil, vegetative cover, topography, and climate.

Vermont's extensive network of dirt roads are a cause of erosion and sedimentation which can transport phosphorus, nitrogen, and/or pollutants into waterbodies. Part of the implementation of the VCWA and efforts to meet EPA standards for phosphorus concentrations in Lake Champlain and Lake Memphremagog has been to regulate Vermont's road network as stormwater infrastructure. Beginning in 2018 the Municipal Roads General Permit will regulate all municipal roads in order to reduce phosphorus run off from the municipal road network. The central means of accomplishing this goal is to install best management practices that reduce or eliminate erosion and sedimentation in the road network.

### Failing Septic Systems

Failing septic systems can be a major source of pollution. Septic systems fail due to inadequate soils, poor design or construction, inadequate maintenance, or increased use from seasonal to year-round use. Failing septic systems can result in either effluent surfacing on the ground or contamination of ground water. Both situations contaminate water supplies and are hazardous to human health.

## III. MINERAL RESOURCES

### Soils

In general, soils can be classified as clay, silt or sand. Combinations of one or more of these can create many variations of soil. Soil is influenced by the organic matter that is deposited on the surface and by the organisms that exists within it, in combination with parent materials. Within soils, organisms and fungi provide food for animals and create organic matter for more efficient vegetative production. This vegetative layer, in turn, helps to purify surface water.

The availability of soils suitable for cultivation plays a crucial role in agricultural productivity. Out of the 257,000 acres of potentially primary agricultural soils in the Northeast Kingdom, 133,565 acres were in production in 1992 as compared to 142,832 acres in 1987. It should be noted that less than 8% of these acres are found in Essex County, where most of the terrain and soil composition is better suited for the forestry industry. Despite this fact, there are still important agricultural soils in Essex County along the Connecticut River.

### Sand and Gravel

The primary sources of sand and gravel follow streams and waterways or are adjacent to water bodies. During the ice age streams tunneled through ice sheets. These streams allowed deposits of sand and gravel and other debris to build up, creating deposits called eskers. Water flow is easier through these deposits, forming rivers and streams. The Passumpsic River corridor in Caledonia County is one of the largest, continuous eskers in the region, approximately 24 miles in length. Clear, clay-free materials of eskers are excellent for concrete and asphalt aggregates, roadbeds and other construction uses.

Sand and gravel deposition also happened when large glacial ice remnants melted. Much of the remaining sand and gravel was deposited in the valleys along waterways. One of the largest areas of sand and gravel deposits in the region extends from west of Island Pond to the eastern border of the Nulhegan Basin.

Sand and gravel deposits often serve as important areas for groundwater aquifer recharge and filtration. Disturbance of these areas can result in a reduction of their natural ability to retain and filter groundwater. As minerals are extracted, deposits become shallower and less able to filter contaminants from the water. Because of these infiltration concerns, the distances from gravel pits to surface and ground water supplies should be examined.

The prospects for sand and gravel extraction are difficult to measure. While the 1990 Census identified only three sources of sand and gravel extraction activity, the District 7 Act 250 Office has issued over 50 permits in the Northeast Kingdom counties for extraction of sand and gravel. In addition to these, there are small pits like many town sources for local road maintenance not subject to Act 250 standards. The contribution of mineral extraction to the local economy is difficult to ascertain because most extraction is done as part of some other business or is additional income for entrepreneurs. There are active granite quarries in Ryegate and South Ryegate.

Earth resources such as sand and gravel are commonly utilized by local and state road departments, railroads, and commercial paving operations. Other mineral resources like granite, talc, and soapstone have been important for communities in the past, and along with other mineral resources may become useful again.
From a regional perspective, it is good to have mineral resources available locally as transportation costs are reduced and the extraction process may create local employment. For local planning efforts, NVDA encourages towns to identify important mineral resource deposits and develop policies that would minimize potential conflicts between land uses should the extraction of sand, gravel, or other

mineral resources become feasible. A site reclamation or rehabilitation plan shall be developed for any earth extraction activity that requires an Act 250 permit or meets the definition of "substantial regional impact" as defined in this plan.

As mineral resource extractions and their transport have the potential to be damaging to the environment and public infrastructure if carried out improperly, NVDA recommends that mitigation policies consider negative impacts such as:

1. Excessive dust and noise which may result in unreasonable nuisance to neighboring properties and create air quality issues,
2. Improper site management which may lead to excessive soil erosion, soil compaction, water quality impacts, or inadequate site restoration,
3. Site degradation which may result in aesthetically unpleasing conditions in the immediate vicinity of the project and/or the community, and
4. Deterioration of town and state highways or other public infrastructure due to frequent truck traffic.

Many local zoning bylaws contain special provisions designed to minimize the environmental impacts of earth resources extraction, and to assure reclamation or restoration of the site once work is completed. This is desirable. However, there are large sand and gravel pits and former mined sites that pre-date local and state regulations that require rehabilitation. Towns should consider connecting the owners of these pits and the Natural Resource Conservation Service (or other state agencies or organizations) to develop reclamation or rehabilitation plans that will stabilize the sites and minimize impacts. Towns should also identify and consider possible new uses for these old sites in their local plans. Solar facilities and outdoor recreational uses have taken advantage of former pit sites in some communities.

### Soil Compaction

Compacted soil, which occurs naturally, as well as through land development and industrial processes, makes it more difficult for water to be absorbed. This creates two changes to the soil formation process. First, water cannot flow through the soils in order to leach contaminated particles. Second, it creates erosion and carries away soil. As discussed under water resources, erosion contributes to flooding, removal of productive topsoil, distribution of chemicals on the soil, and sedimentation of surface water.

## IV. AIR QUALITY

The air we breathe is less tangible than other resources, but equally important. Air quality is adversely affected by industrial, residential, and transportation emissions. The cyclical patterns of air are intricately connected with all other biological systems where change in one affects the others. Although the Northeast Kingdom is the antithesis of cityscapes where industrial pollution may be visible on a daily basis, there are still sources of air pollution that persist.

### Industrial Emissions

Toxins such as sulfur dioxide and nitrogen oxide, emitted into the atmosphere when fossil fuels are burned, contribute to the acidification of our surface waters. The sulfates and nitrates remain in the atmosphere until rain transports them to the earth's surface where they increase the acidity of the soil and water. A study conducted for the Vermont Department of Environmental Conservation's Air Pollution Control Division concluded that 99.9 percent of the pollutants responsible for wet sulfate deposition in Vermont originate from out-of-state industrial sources.

### Residential Emissions

The number one generator of air pollution in Vermont is the automobile, and its use continues to grow.

Issues related to automobiles are addressed in the Transportation section of this regional plan. Household emissions include heating systems using wood and fossil fuel, and trash burning. Although municipalities no longer burn trash, there are many households that continue to burn residential wastes. The dioxins, hydrochlorides, carbon monoxide and various carcinogens released into the atmosphere pose risks to our health, the health of the surrounding ecosystems and create obnoxious odors for numerous neighbors.

## Light Pollution

As development increases, outdoor lighting may become an issue for some residents. Neighbors of new developments with significant outdoor lighting can be particularly sensitive this. Directing outdoor lighting in new developments to reduce excessive light reduces complaints and allows people to enjoy the night sky.

# V. WILDLIFE HABITATS

All wildlife species have three basic needs for survival: food, water and cover. The spatial relationship of these factors and their availability comprise the habitat of a given species. To promote a diversity of wildlife species, it is important to conserve various habitat types as well as critical areas that support basic needs for some species. For example, white-tailed deer live in a variety of forested and non-forested areas, but specific softwood wintering areas are critical for their survival. The deer have adapted to this habitat for their survival and without it they would not survive the harsh winters in Vermont.

Almost every kind of human development results in the loss of some wildlife habitat. Single developments, even at a large-scale, do not usually destroy a wildlife population. It is the cumulative impact of developments that gradually diminish wildlife habitats. It is difficult to plan for the protection of wildlife habitat because their ranges tend to cross human defined political boundaries. This may require municipalities to work together on habitat protection issues.

The region's large tracts of undeveloped land provide excellent habitat for a variety of species. Both residents and visitors enjoy the variety of wildlife present. A 1996 survey by the Vermont Department of Fish and Wildlife revealed that 242,000 Vermont residents 16 years and older engaged in fishing, hunting, or wildlife- watching activities. In the same year, both resident and nonresidents spent $341 million on wildlife-associated recreation in Vermont. This is a significant portion of our economic base and warrants attention.

## Habitat Connectors

Habitat connectors refers to land or water that links larger patches of habitat within a landscape to allow for the movement, migration, and dispersal of animals and plants. They can be a forest block, riparian area, or a specific road crossing that wildlife repeatedly use. Examples include small habitat blocks that serve as stepping stones between core forest, riparian habitat along streams and rivers, strips of forest cover between developed areas, hedgerows, or fencerows. Sizes can range from a fraction of an acre to one or two hundred acres.

Movement of animals from one habitat patch to another is the most common function attributed to habitat connectors. This is true for both wide and small ranged animals. Bobcats and black bears might use connections quite frequently, whereas spotted salamanders might use them only a few nights each spring to move from hibernation sites to breeding pools.

Habitat connectors should be considered at two scales: landscape and local. Landscape scale connectivity is important for connecting populations of wildlife over large areas or within a region. This allows for genetic variability and ensures migration. Examples of a large forest pattern that includes forest blocks and habitat connectors are the connections between the Green Mountains of Vermont and the White Mountains of New Hampshire. The habitat connectors between both mountain ranges allow for diverse and abundant wildlife populations that are able to withstand the effects of disease or other significant impacts. At this large

scale, there is some overlap between forest blocks and habitat connectors. Very small forest blocks of minimal habitat or forestry value can function as connecting habitat. These smaller blocks serve an important connectivity role at a large landscape scale.
Habitat connectivity at the local scale occurs where roads overlap with the network of connected habitat. In some cases, fish and wildlife movement associated with specific road crossing areas is seasonal, as evidenced by salamander spawning migrations in early spring. In other cases, movement could be simple happenstance of an animal curious for new food sources on the other side of the road. Many species of wildlife are selective to specific habitat conditions along roads and are faithful to crossing them in the same place as long as those habitat conditions persist.

## Deer Wintering Areas

One of the most prized game species; the white-tailed deer is very adaptable and thrives in this area due to the diversity of landscapes. The home range of white-tailed deer includes many habitats such as edges between fields and forests, wetlands, and broadleaf and coniferous forests. During the winter, it is critical for deer to stay in forested areas sheltered by needle-leaf softwoods such as balsam fir, cedar, spruce, hemlock, and white pine. These evergreens intercept the snow and create a refuge for the deer. Such a canopy offers thermal protection and greater mobility on the ground in deep winter. Although these "wintering areas" may only be a fraction (10%) of their yearly range, they are the single most important factor in determining the carrying capacity of the land. Without such habitat, the deer population would virtually die off in this region.

## Black Bear Habitat

Unlike deer wintering habitat, the Department of Fish and Wildlife has not completely mapped the critical black bear habitat in Vermont. Bear require large uninterrupted tracts of forestland that often contain American beech stands, wetlands and high elevations. In other areas, black bear populations have dwindled due to habitat loss resulting from highway and urban development. Unlike the wild turkey, black bear in Vermont were able to escape to high elevations during the 1800s when forested land was scarce. Habitat changes returned the black bear population, some say, to where it was before European settlers arrived. The black bear population in Vermont is now estimated at 3000. Public support, increased awareness of construction impacts on habitat, and private responsibility are necessary to protect the remote and extensive forestland necessary for the bear's survival.

## River and Riparian Habitat

Vermont's river corridors provide critical habitat for many species of plants and animals, including some that are classified as endangered or threatened. Along the rivers of the state, there are 27 species included on the Federal Endangered Species List. River and riparian habitats serve important functions for many plants and animals.

A riparian buffer is a unique ecosystem. It provides food and shelter for everything from caddis flies to brook trout to food for mammals and birds such as the river otter and kingfisher. The mink, bald eagle, Louisiana water thrush, dusky salamander, black bear and wood turtle all require streamside woods. These areas provide vital food supplies and safe corridors for game species as well. Natural riparian forest along rivers in Vermont is greatly reduced, removed for farming, development, highway and rail corridors, and landowner access to the river.

Maintaining and repairing riparian buffers is inexpensive and can provide many economic benefits. A municipality will spend more money on bank stabilization, stormwater control and water quality improvements than it would by leaving or replanting riparian vegetation. Riparian buffers, which can eliminate the need for costly riprap, are an effective tool to avoid the costs of bridge collapse, and washed out roads. Farmers sometimes lose land when they clear riparian vegetation to grow crops because

unstable banks can create a situation during floods when the rivers jump their channels and cut a new ones into cropland.

## Threatened and Endangered Species

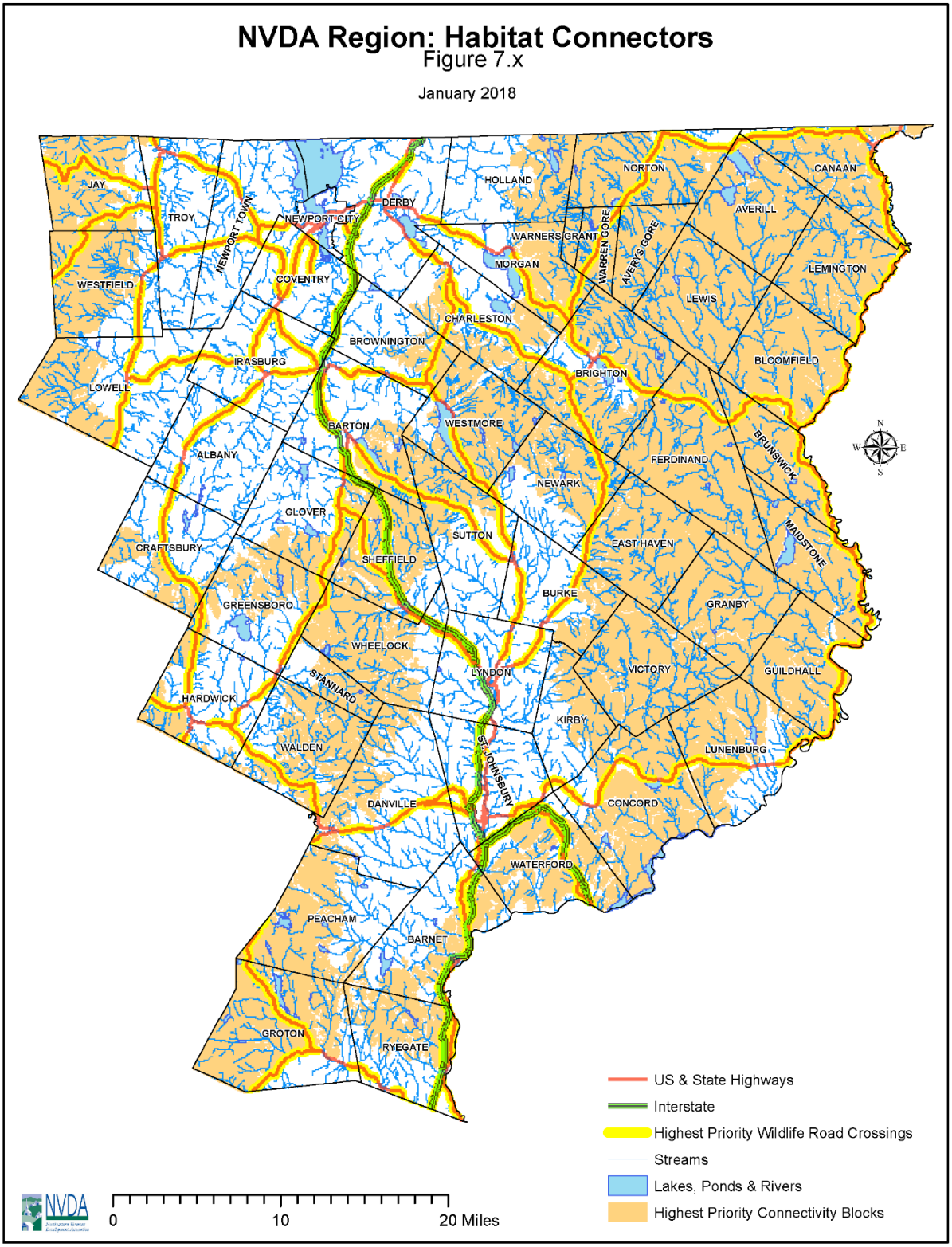
The Endangered Species Listing by the U.S. Fish and Wildlife Service shows that there are six animal species and two plant species in our region whose survival is in question. Threatened species include the Bald Eagle, Canada Lynx, and Puritan Tiger Beetle. Endangered species include the Indiana Bat, Eastern Puma, Dwarf Wedge Mussel, Jesup's Milk-Vetch and the Northeastern Bulrush.

Often the preservation of these threatened and endangered species has more to do with habitat protection than any other factor. A species is considered endangered if it normally occurs in the state, and its continued existence appears to be in jeopardy. A species is threatened if its numbers are significantly declining due to loss of habitat or human disturbance. Habitat loss and degradation is the principle cause of the decline in biological diversity and is the number one factor relating to species endangerment. Human development is the primary cause of habitat loss and degradation.

## Non-native Invasive Species

Many non-native species introduced to this region intentionally or otherwise are creating significant problems in both terrestrial and aquatic ecosystems. Because they have been imported here from outside the region, there are no natural predators to control the spread of these non-native species. They often take over an area by out-competing the existing flora or fauna, choking out native species.

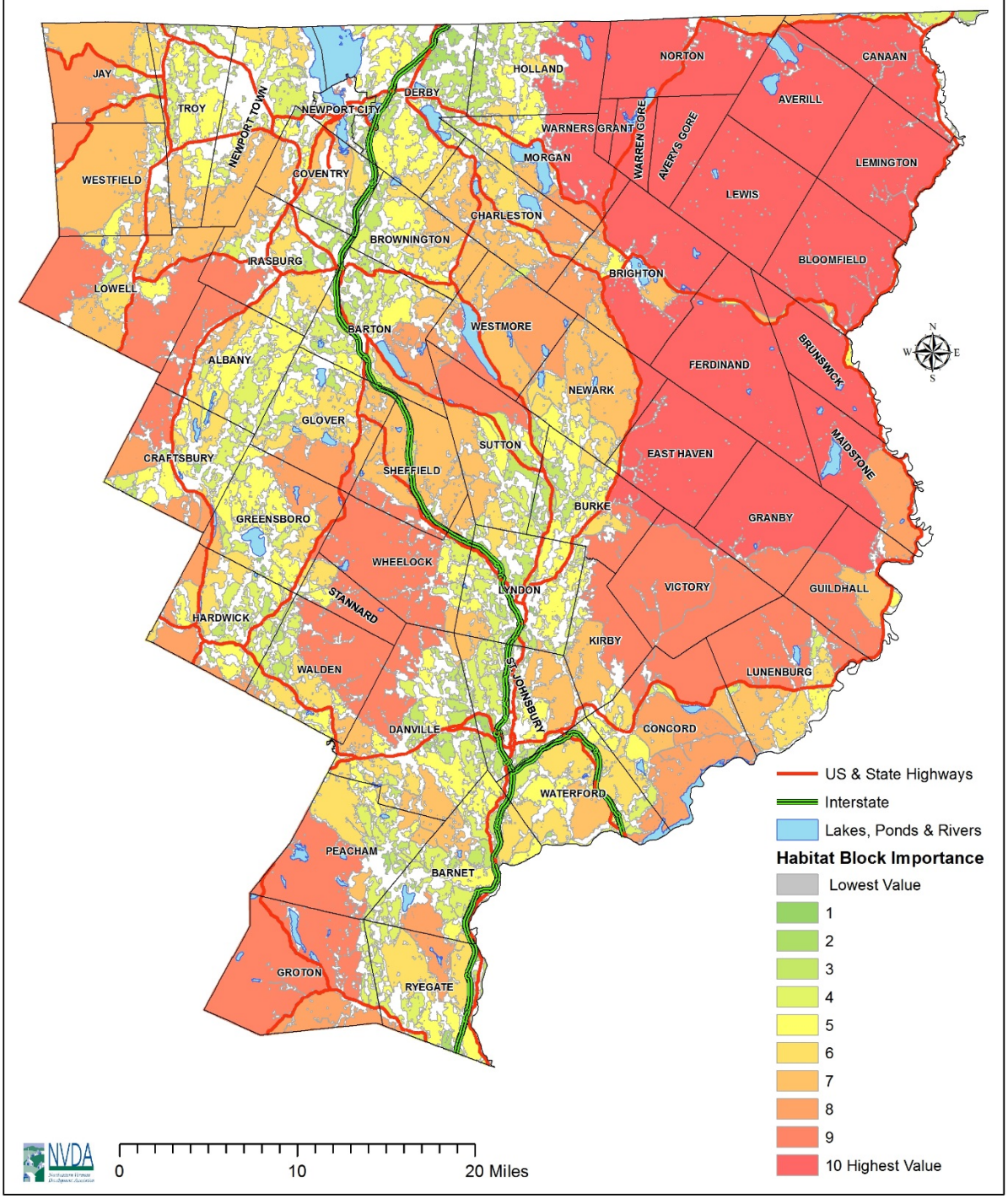
Purple Loosestrife and Eurasian Water milfoil are two invasive aquatic plants that currently infest a number o f lakes, ponds, and wetlands in our region. Purple Loosestrife is a wetland perennial that has infested thousands of acres in Vermont and can be found in almost every town in our region. It chokes out the native vegetation and can decrease the food and shelter for native wildlife species. Eurasian Water milfoil has also taken hold in several lakes of our region, including Brownington and Clyde Ponds and Lakes Elligo, Salem, Crystal, Willoughby, and Memphremagog. This freshwater seaweed creates a dense, impenetrable canopy of stems and leaves that consumes large quantities of oxygen, suffocating fish and other creatures. Preventing its expansion to other water bodies through education and controlling it within each lake's boundaries is currently the most effective way to manage it.


NVDA Region: Habitat Connectors
Figure 7.x
January 2018
JAY
TROY
NEWPORT TOWN
NEWPORT CITY
DERBY
HOLLAND
NORTON
CANAAN
AVERILL
WARNERS GRANT
WARREN GORE
AVERY'S GORE
MORGAN
LEMINGTON
WESTFIELD
COVENTRY
LEWIS
CHARLESTON
BROWNINGTON
IRASBURG
BRIGHTON
BLOOMFIELD
LOWELL
BARTON
WESTMORE
ALBANY
FERDINAND
BRUNSWICK
NEWARK
GLOVER
SUTTON
MAIDSTONE
CRAFTSBURY
EAST HAVEN
SHEFFIELD
BURKE
GRANBY
GREENSBORO
WHEELOCK
LYNDON
VICTORY
GUILDHALL
STANNARD
HARDWICK
KIRBY
WALDEN
LUNENBURG
ST. JOHNSBURY
DANVILLE
CONCORD
WATERFORD
PEACHAM
BARNET
GROTON
RYEGATE
N
W
E
S
US & State Highways
Interstate
Highest Priority Wildlife Road Crossings
Streams
Lakes, Ponds & Rivers
Highest Priority Connectivity Blocks
NVDA
0
10
20 Miles

# NVDA Region: Wildlife Habitat Blocks

Figure 7.4

January 2018



## Open Space

The Northeast Kingdom is composed of rolling hills, farmlands, lakes and rivers, forests, country roads, and compact village centers. These areas combined create an open, picturesque landscape unlike any other. Open space provides not only scenic beauty and wildlife habitat, but is necessary for the numerous outdoor activities enjoyed by the region's residents and visitors, and is key to the agricultural and forestry traditions of the region. The region contains more than 1,300,000 acres of land. Almost 200,000 acres are either publicly owned or have public recreation/access easements. Many recreational activities rely on private landowners allowing access to their properties, so it is the responsibility of users to respect the landowner and their land. Vermont landowner liability law (12 V.S.A. 5793) maintains "an owner shall not be liable for property damage or personal injury sustained by a person who, without consideration, enters or goes upon the owner's land for a recreational use unless the damage or injury is the result of the willful or wanton misconduct of the owner." Still, according to the Vermont Department of Forests, Parks & Recreation, posting of private land in the state doubled in the last decade from approximately 100,000 acres in 1988 to approximately 250,000 acres in 1997.

## Public Lands

The region contains many conserved public lands. Recently, more than 132,000 acres of remote forestland, primarily in Essex County, was conserved by Vermont's largest land conservation project. Of this, 84,000 acres was resold to Essex Timber Co. LLC, with easements to ensure that these lands are conserved as a working forest for the sustainable production of wood products as well as to maintain public access. In the same transaction, U.S. Fish and Wildlife Service formed the Silvio O. Conte National Wildlife Refuge in the towns of Lewis, Ferdinand, Bloomfield and Brunswick totaling nearly 28,000 acres. The 23,000 acre West Mountain Wildlife Management Area was created in this land transfer, as well. The goals of this purchase were to protect public access to the land; conserve and protect biological diversity, wildlife habitat and natural communities; and conduct sustainable management and utilization of forest products.

**Table 7.3: Public Lands in the NEK**

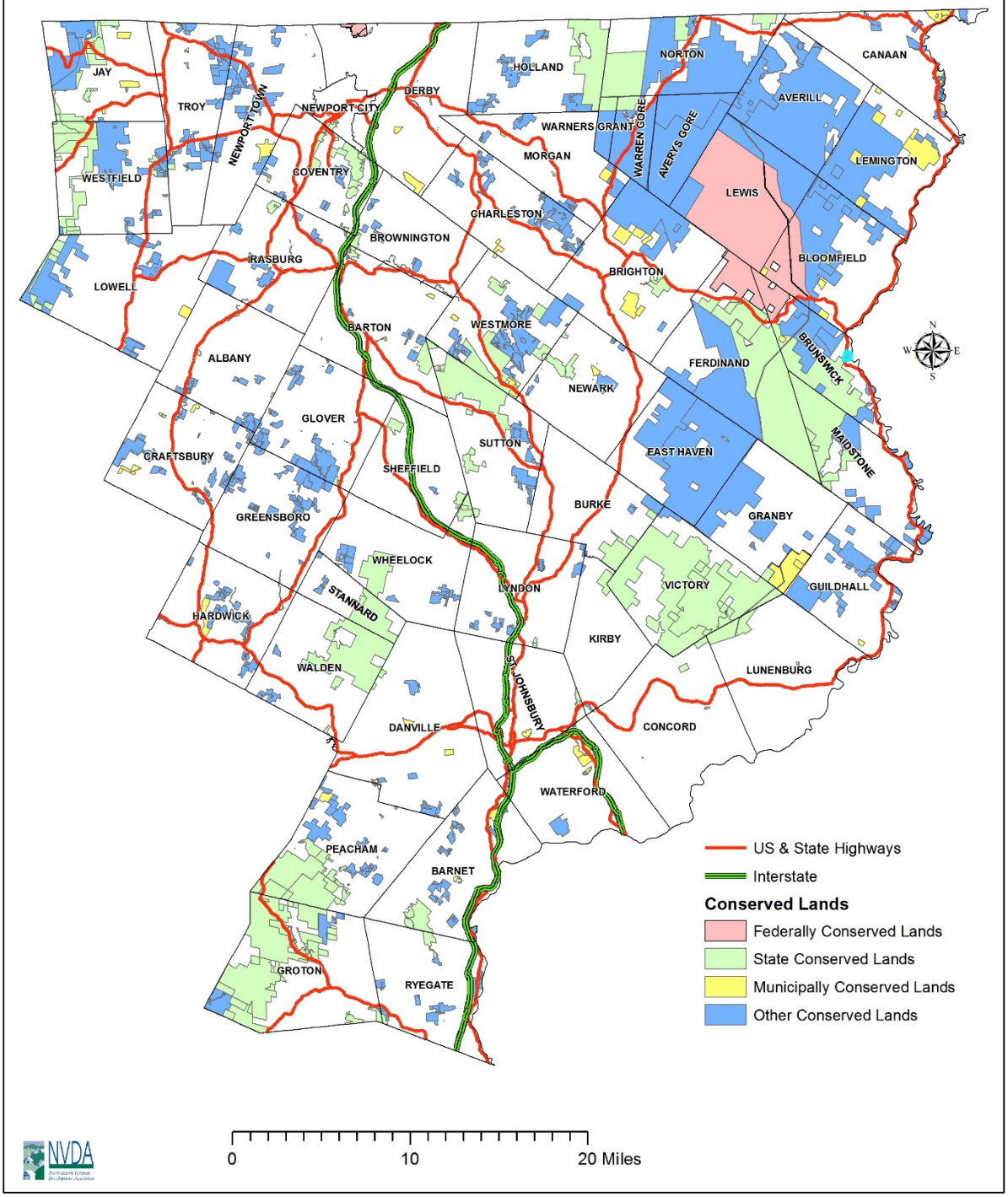
| Town | Parcel Name | Acres |
|---|---|---|
| Averill | Averill Mountain WMA | 510 |
| Newark | Bald Hill Wildlife Management Area | 932 |
| Troy | Big Falls SP | 16 |
| Holland | Bill Sladyk WMA | 9,496 |
| Norton | Black Turn Brook SF | 593 |
| Brighton | Brighton SP | 152 |
| Sutton | Calendar Brook WMA | 340 |
| Barton | Crystal Lake SP | 16 |
| Burke | Darling State Park | 1,997 |
| Groton, Peacham | Groton SF | 23,706 |
| Burke | Hazens Notch SP | 307 |
| Sheffield | Holbrook SP | 202 |
| Jay | Jay SF | 3,877 |
| Peacham | Levi Pond WMA | 260 |
| Jay | Long Trail SF | 2,774 |
| Lyndon | Lyndon State Forest | 72 |
| Maidstone | Maidstone SF | 475 |
| Wheelock, Sheffield | Mathewson SF | 795 |
| Rvegate, Barnet | Roy Mountain WMA | 1,590 |
| Westmore | Sentinel Rock SP | 330 |
| Irasburg | South Bay WMA | 1,515 |
| Walden, Stannard, Wheelock | Steam Mill Brook | 10,421 |
| Victory | Victory Basin WMA | 4,970 |
| Victory, Lunenburg | Victory SF | 15,997 |
| Barton | Wenlock WMA | 1,994 |
| Brunswick, Ferdinand, Maidstone | West Mountain WMA | 22,738 |
| Barton | Willoughby Falls WMA | 130 |
| Westmore, Sutton | Willoughby SF | 7,300 |

Source: NVDA, 2002

# NVDA Region: Conserved Lands

FIgure 7.3

January 2018



## GOALS AND STRATEGIES FOR NATURAL RESOURCES

### NATURAL RESOURCE GOALS

- The overarching goal for the region is to balance local economic needs with the protection of the natural resource that so many of the region's residents enjoy and depend upon.
- The quality and quantity of the region's surface waters should be protected, maintained, and restored.
- The quality and quantity of existing and potential groundwater resources should be protected and improved.
- Significant wetlands within the region should be protected. The region's mineral and soil resources should be used in a manner that will support the sustainable growth and development of the region.
- A consistently high level of air quality should be maintained for the health, safety, and enjoyment of the region's residents and visitors.
- Adequate resource information for the region should be maintained to improve the region's ability to plan for protection of wildlife resources in the area.
- Critical wildlife habitat should be protected.
- The native biodiversity of the region should be maintained, and restored when appropriate.
- Private, public and community interests should be considered in matters affecting local recreation and open space.

### NATURAL RESOURCE STRATEGIES

- Provide public education on state and local water quality issues as they relate to local planning and development.
- Discourage inappropriate development in flood hazard areas and floodplains. Support compatible land uses in flood areas, such as agriculture and passive recreation.
- Support the efforts of watershed organizations working in the region.
- Coordinate the region's basin planning efforts with local plans and related activities.
- Encourage and assist communities to identify and protect community water supplies. Education on water conservation and resource protection should accompany these efforts.
- Prevent the degradation of significant wetlands through public education.
- Minimize the negative impacts of mineral and earth resource extraction and processing facilities.
- Support development of new markets and uses for local mineral resources. Encourage the use of locally obtained minerals for building construction and highway construction and maintenance.
- Support efforts to reduce air pollutants generated in the region from the residential, commercial, industrial, and transportation sectors.

- Support broader state and regional efforts to minimize pollutants entering the region from out of state.
- Support local and state efforts that inventory, delineate and map important habitats and wetlands.
- Support local efforts to protect critical wildlife habitat and maintain habitat connectivity.
- Assist interested towns with planning and mapping for the protection of habitats and natural resources.
- Support state and local efforts to mitigate the impacts of the non-native species through ecologically sound methods (e.g. insect control, etc.).
- Support the protection of endangered and threatened native species.
- Maintain and improve the resource stewardship in the area by supporting and advocating for recreation and environmental education opportunities.

# Chapter Eight: Flood Resilience

## I. INTRODUCTION

This chapter of the regional plan describes the hydrological setting of the region, identifies general areas subject to flooding and fluvial erosion and factors that can exacerbate flood damage; identifies data sources that municipalities can use in the preparation of local flood resilience plans; and provides recommendations on strategies to mitigate the risks to public safety, critical infrastructure, historic structures and public investments.

In general, any new development should occur outside of identified flood hazard, and fluvial erosion hazard areas. If new development is built in such areas, it should be done in such a way as to not exacerbate flooding and fluvial erosion. In addition to avoiding development in flood hazard areas, attention should be given to the protection and restoration of floodplains and upland forested areas that attenuate and moderate flooding and fluvial erosion. Finally, emergency preparedness and response planning will save lives and promote resilience in the face of flood events.

## II. EXISTING CONDITIONS:

### Watershed

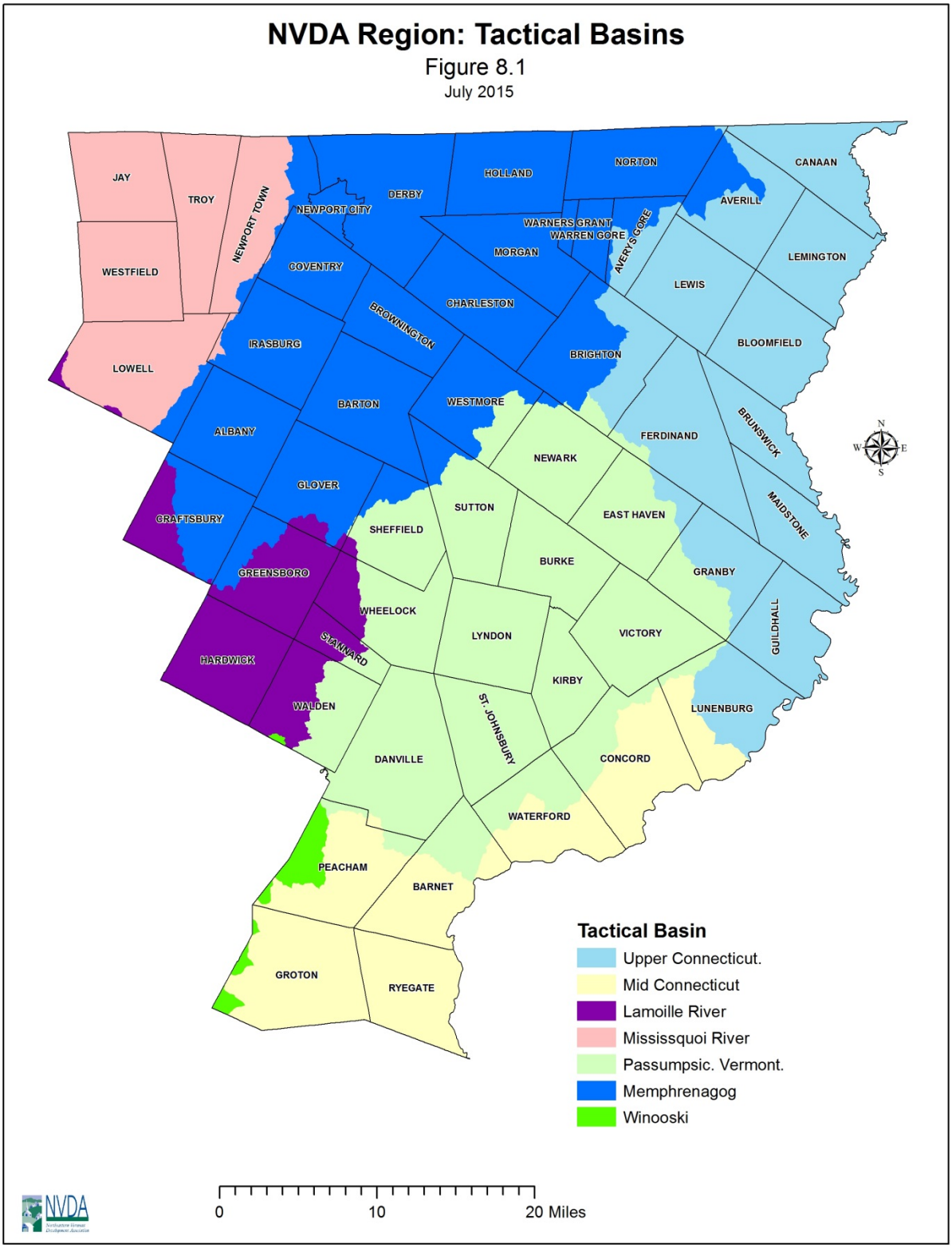
A watershed is a geographic area in which all water flows into a single river. There are seven large watersheds (basins) that extend across the region. The delineation of watersheds follows the topography, so does not respect political boundaries. The Northeast Kingdom region shares watersheds with counties in Vermont to the south and west, with Canada to the north and New Hampshire to the east.

The seven drainage basins in the region are: Basin 6, the Missisquoi; Basin 7, the Lamoille; Basin 8, the Winooski; Basin 14, which includes the Stevens, Wells, Waits and Ompompanoosuc subwatersheds; Basin 15, the Passumpsic; Basin 16, which includes the Upper Connecticut, Nulhagan, Willard Stream, and Paul Stream subwatersheds; and Basin 17, which includes the Lake Memphremagog, Coaticook & Tomifobia subwatersheds. (see Figure 8.1)

### Topography, soils and wetlands

Topography and soils factor into how susceptible an area is to erosion hazards. Areas of steep slopes with shallow soils are susceptible to erosion, particularly if cleared of natural vegetation.

Figures 8.2 through 8.4 depict the distribution of soils classified by different degrees of erodibility throughout the region. The soil erodibility classification system was developed by the Natural Resources Conservation Service (NRCS). In general, soils with greater permeability, higher levels of organic matter and improved soil structure have a greater resistance to erosion. Soils that contain silt, very fine sand and expansive clays (having a high shrink-swell capacity) tend to have increased susceptibility to erosion.




Wetlands provide a variety of beneficial functions, including mitigation of risk of flood damage. The location of mapped wetlands are depicted on figures 8.2 through 8.4.

Wetlands have the capacity to store stormwater during high runoff events. When located in a floodplain, wetlands can store flood waters that overflow riverbanks. As flood waters recede, the water is released slowly from the wetland soils. By slowing the rate that water re-enters the stream channel, wetlands can reduce the severity of downstream flooding and erosion. The Vermont Watershed Management Division reports that in watersheds where wetlands have been lost, flood peaks may increase by as much as 80 percent.

Vegetated wetlands along river and streambanks can protect against erosion caused by fast-moving waters during floods and storms. Wetland plants serve to absorb the energy of the current and bind soil and deposited sediments in their dense root systems.

Additional values of wetlands, including their role in providing plant and wildlife habitat and maintaining water quality, are discussed in the Natural Resources section of this plan.

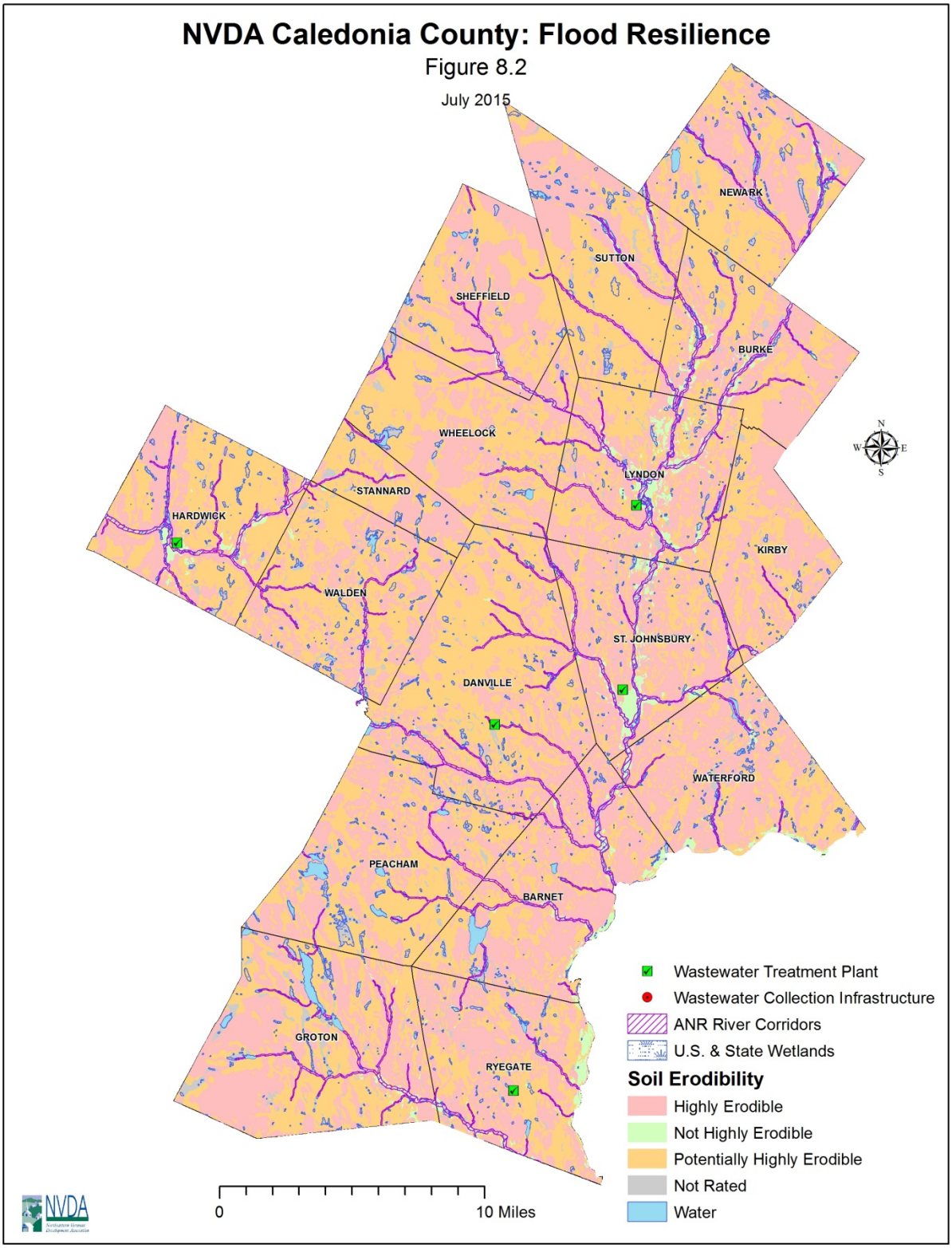
## Identified Flood Hazard Areas

In Vermont, there are two primary means of identifying areas subject to flood hazard: the areas mapped by the Federal Emergency Management Agency (FEMA) as areas of special flood hazard; and areas mapped by the State of Vermont Department of Environmental Conservation known as the State-wide River Corridors. The FEMA maps primarily identify areas of inundation (rising floodwaters), while the River Corridors identify areas subject to fluvial erosion hazards (when fast moving water in a river or stream erodes the streambank and adjacent land). The State-Wide River Corridors in Caledonia, Essex and Orleans counties are depicted on figures 8.2 through 8.4

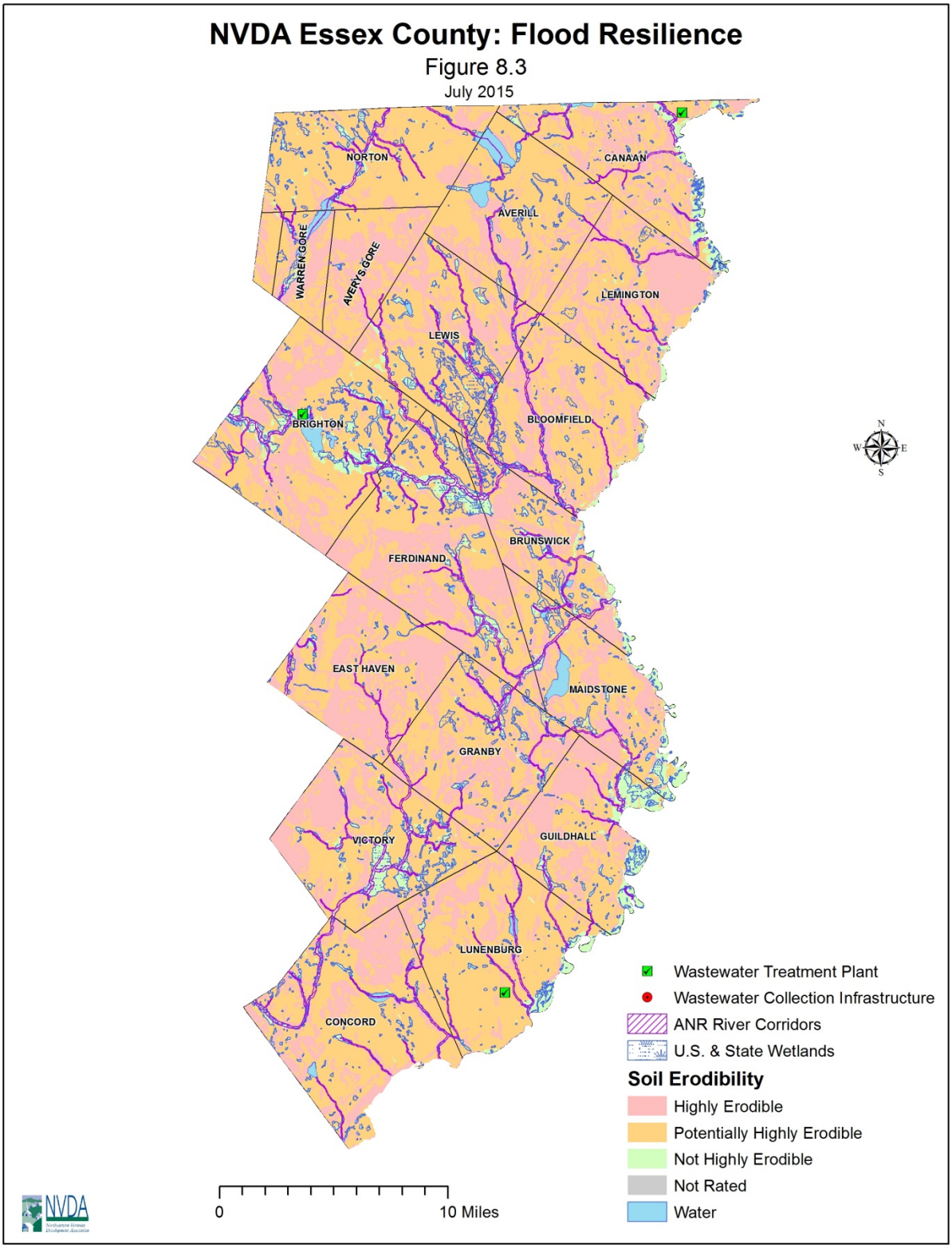
The FEMA maps are known as the Flood Insurance Rate Maps (FIRM) because of their use in the National Flood Insurance Program (NFIP). The flood hazard and risk information presented on the FIRMs is the result of engineering studies that are approved by FEMA. The Special Flood Hazard Area shown on a FIRM is the area that has a 1-percent or greater chance of flooding in any given year; this area is also referred to as the 1-percent-annual-chance floodplain, base floodplain or the 100-year floodplain.

In the Northeast Kingdom region, most of the FIRM maps are over 30 years old. Only two municipalities in the region currently have up-to-date, FEMA maps: Jay and Hardwick. These digitized maps (known as D-FIRMs) have a much higher level of accuracy than the older maps because the flood hazard information is in a GIS format that can be easily integrated with other local GIS data layers. This allows more clear identification of land areas and existing development that is within the flood hazard area. Although the older FIRM maps lack this level of accuracy, they have been scanned and are available for viewing online at the FEMA map Center site: https://msc.fema.gov/portal.

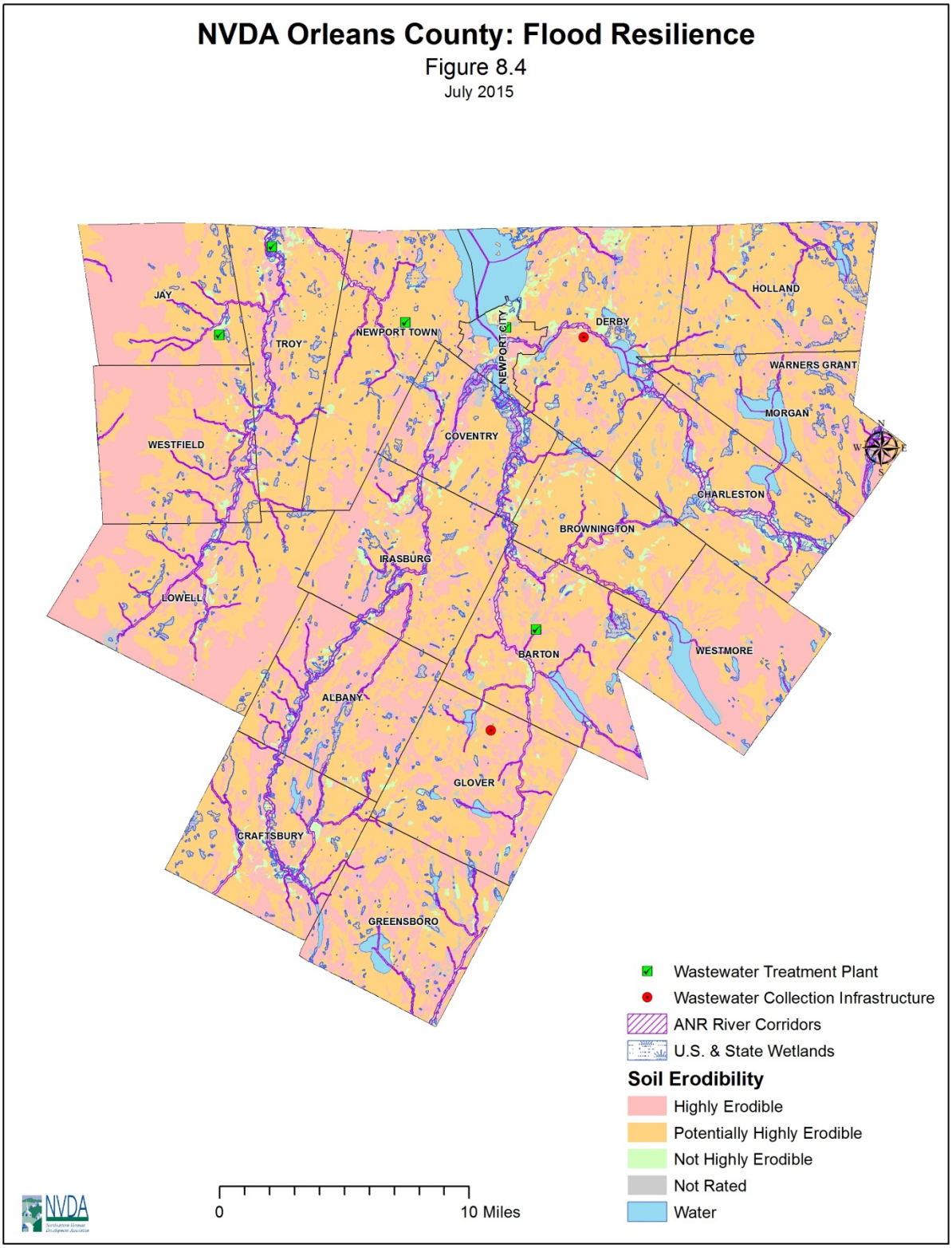
Because of errors on the FIRMs that are due to scale or inaccuracies on the source maps, FEMA has an administrative procedure to change the designation of properties on the FIRM. These


NVDA Caledonia County: Flood Resilience
Figure 8.2
July 2015
NEWARK
SUTTON
SHEFFIELD
BURKE
WHEELOCK
LYNDON
STANNARD
HARDWICK
KIRBY
WALDEN
ST. JOHNSBURY
DANVILLE
WATERFORD
PEACHAM
BARNET
GROTON
RYEGATE
N
W
E
S
0
10 Miles
Wastewater Treatment Plant
Wastewater Collection Infrastructure
ANR River Corridors
U.S. & State Wetlands
Soil Erodibility
Highly Erodible
Not Highly Erodible
Potentially Highly Erodible
Not Rated
Water

1


NVDA Essex County: Flood Resilience
Figure 8.3
July 2015
NORTON
CANAAN
AVERILL
WARREN GORE
AVERYS GORE
LEMINGTON
LEWIS
BRIGHTON
BLOOMFIELD
BRUNSWICK
FERDINAND
EAST HAVEN
MAIDSTONE
GRANBY
VICTORY
GUILDHALL
LUNENBURG
CONCORD
N
W
E
S
0
10 Miles
Wastewater Treatment Plant
Wastewater Collection Infrastructure
ANR River Corridors
U.S. & State Wetlands
Soil Erodibility
Highly Erodible
Potentially Highly Erodible
Not Highly Erodible
Not Rated
Water

1




processes are referred to as the Letter of Map Amendment (LOMA) process, and the Letter of Map Revision Based on Fill (LOMR-F) process. Through these processes, an individual who owns, rents or leases property

may submit mapping and survey information to FEMA and request that FEMA issue a document that officially removes a property and/or structure from the Special Flood Hazard Area. In most cases, the applicant will need to hire a licensed land surveyor or Professional Engineer to prepare an "Elevation Certificate" for the property.

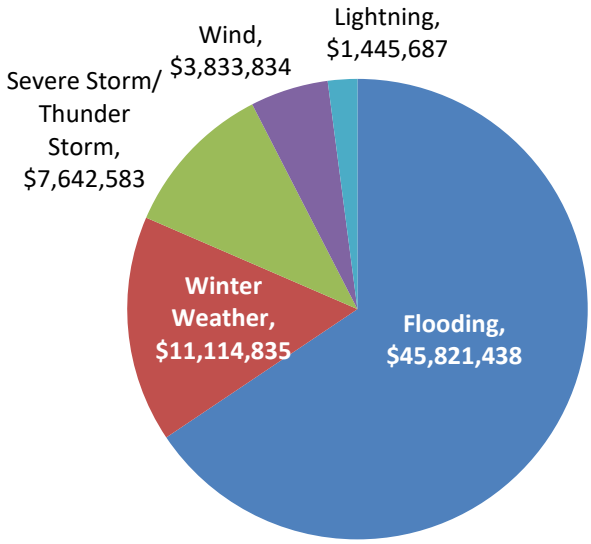
Membership in the NFIP is done at the municipal level. Membership allows residents of the town to secure flood insurance if they are within the FEMA-mapped flood hazard area, and affords residents outside the mapped flood hazard area a better rate on flood insurance. If a Town wishes to be a member of the NFIP, the town must agree to regulate the development of land within the areas of special flood hazard, as shown on the FIRM, to minimum standards established by FEMA.

It is noted that not every town in the region has FIRMs, even if they are susceptible to flooding. This is true for some towns that have had historically low populations and structures in areas prone to flooding. However, this does not mean that those communities are not subject to flood hazards.

## Structures in Flood Hazard Areas

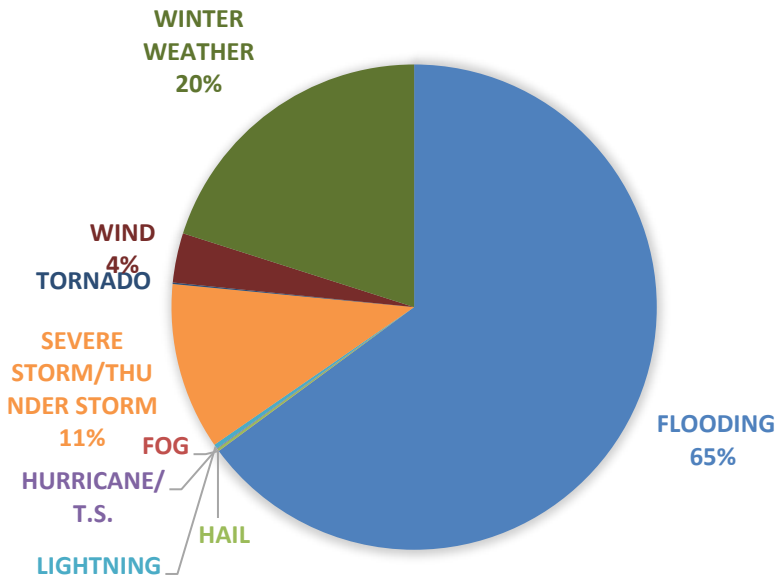
For the reasons noted above, getting an accurate count of structures within the FEMA-mapped flood hazard area is difficult. Moreover, such a count does not necessarily predict the risk of flood damage within a community, since FEMA's mapping is elevation-based and does not consider fluvial erosion factors. A structure on a highly elevated river bank could get washed away due to erosive action of the stream course, but not be identified as at-risk under FEMA's methodology.

**Figure 8.5 Distribution of Losses in Caledonia County (1960-2013)**




For this reason, towns are advised to identify structures both in the FEMA-mapped flood hazard area and the mapped State-wide River Corridors when preparing a local flood resilience plan. Also, since the State-wide River Corridors are provided in standard GIS format, they have a much higher level of accuracy than the older FIRMS.

FIGURE 8.6 DISTRIBUTION OF LOSSES IN ESSEX COUNTY (1960-2013)




**Trends in Flood Damage.** FEMA provides data on the number of projects and cost for repairing damage due to a variety of disaster events.

A database known as SHELDUS (Spatial Hazard Events and Losses Database for the US provides data on disaster events by county. In the Northeast Kingdom region (as in the rest of the State) damage due to flooding has been the most costly.

## RESOURCES

There a number of reports and sites that provide detailed information on the conditions within the region's watersheds, and provide guidance on specific projects that can serve to mitigate future damage due to flooding and fluvial erosion.

### Tactical Basin Plans

The Watershed Management Division of the Department of Environmental Conservation (DEC) within the Vermont Agency of Natural Resources (ANR) undertakes assessments and provides guidance on issues related to both water quality and flood resilience. Flooding and fluvial erosion not only cause damage to buildings and road infrastructure, but can adversely affect water quality. Likewise, mitigation measures that are undertaken to improve water quality can also serve to mitigate flood hazards.

The Watershed Management Division produces Tactical Basin Plans to manage surface waters in each of the State's 17 basins (see Figure 8.1). The tactical plans include monitoring and assessment data, and the protection and restoration tools pertaining to rivers, lakes, wetlands and stormwater. Each plan prioritizes projects for funding within the watershed, and integrates priority items from complementary plans, including River Corridor Plans, Stormwater Master Plans, Backroads Inventories, and Agricultural Environmental Assessments.

Although the main focus of the Tactical Basin Plans is water quality, these plans are a good place to start when a municipality begins to develop a flood resilience section as part of their Town Plan, since they incorporate a host of studies pertaining to surface water management. Tactical Basin plans can be found on the Watershed Management Division site here: http://www.watershedmanagement.vt.gov/planning.htm.

As previously noted, the basins follow hydrological boundaries rather than political boundaries, so each Tactical Basin Plan produced by the Watershed Management Division covers a number of municipalities that may lie in different counties. Basin Plans pertaining to the Northeast Kingdom region are as follows:

- *Missisquoi Bay Basin Water Quality Management Plan*, **(Basin 6)** Approved March 2013. Covering the towns of Jay, Westfield, Troy and portions of Irasburg, Newport Town, and Lowell.

- *Lamoille River Basin Water Quality Management Plan,* **(Basin 7)** Draft, February 2009. Covering the town of Hardwick and portions of the towns of Craftsbury, Glover, Greensboro, Stannard, Walden and Wheelock.

- *Winooski River Basin Water Quality Management Plan*, **(Basin 8)** Approved May 2012. Covering portions of Groton, Peacham and Walden.

- *Basin 14 Tactical Basin Plan-2015, including the Stevens River, Wells River, Waits River, Ompompanoosuc River, and Mid-Connecticut River Direct Tributaries Watersheds,* Draft, June 2015. Covering the town of Ryegate and portions of Barnet, Danville, Groton, and Peacham.

- *Passumpsic and Upper Connecticut River Tactical Basin Plan*, (**Basin 15 and Basin 16)** Approved June 2014. Covering the towns of Bloomfield, Brunswick, Burke, Canaan, Concord, East Haven, Ferdinand, Granby, Guildhall, Kirby, Lemington, Lunenburg, Lyndon, Maidstone, St. Johnsbury, Victory, and Waterford; and portions of Averill, Avery's Gore, Barnet, Brighton, Danville, Peacham, Newark, Norton, Sheffield, Stannard, Sutton, Westmore, Wheelock, and Walden.

- *Basin 17 Water Quality Management Plan,* Approved January 2012. Covering the towns of Albany, Barton, Brownington, Charleston, Coventry, Derby, Holland, Morgan, Newport City, Warners Grant; and portions of Averill, Avery's Gore, Brighton, Craftsbury, Greensboro, Glover, Irasburg, Newport Town, Newark, Norton, Sheffield, Sutton, Westmore, and Warren Gore.

### River Corridor Plans

River Corridor Plans are more detailed studies of streams and rivers within the subwatersheds of the larger basins. These plans include an assessment of the natural tendencies of a stream, its current condition, and what changes may be anticipated in the future (also known as "stream geomorphic assessments"). The River Corridor plans use the results of the assessments to provide both general and site-specific guidance on ways to alleviate flood hazards and improve water quality within those areas. Recommended projects can range from enlarging culverts to alleviate channel constriction, reducing erosion potential along stream banks by revegetation, to reconnecting floodplains to the adjacent river in order to reduce flood risk downstream. River Corridor Plans can be found on the Watershed Management Division's site, here https://anrweb.vt.gov/DEC/SGA/finalReports.aspx

### Natural Resources Atlas

The Natural Resources Atlas at http://anrmaps.vermont.gov/websites/anra/ contains a "road erosion risk" layer, which ranks the erosion risk of unpaved Class 2, 3 and 4 Town roads as well as driveways longer than 1,000 feet. Features considered in assessing risk include undersized culverts, elevation and slopes, soil types, and proximity to rivers, lakes, and wetlands. The result is an identification of road segments that have a "low", "moderate" or "high" erosion risk. This is a useful tool for communities to identify potential road hazards during storm events.

### Flood Ready Website

The State of Vermont maintains a "Flood Ready" website that acts as a clearinghouse of all information related to flood resilience planning. The site contains good examples of local flood resilience plans, mitigation measures, identifies funding sources, and provides an overview of the Emergency Relief Assistance Fund (ERAF) rules, identifying the measures needed by municipalities to qualify for the highest level of funding under this program.

## PLANNING CONSIDERATIONS

Guiding new development to areas that are not within flood and fluvial erosion hazard areas is first on the list for mitigating future flood loss. Preserving floodplain wetlands to provide area for floodwater storage, and in

some cases taking action to reconnect stream course to these floodplains is also a key step that can alleviate future flood damage. As noted previously, loss of wetlands has been shown to substantially increase flood risk.

For structures that are already within flood hazard areas, there are steps that can be taken to mitigate against future flood risk. FEMA has published a guide entitled "Protecting Your Home and Property From Flood Damage, Mitigation Ideas for Reducing Flood Loss."(October 2010) The guide begins with guidance on how to go about repairing a flood damaged house, from getting back in safely to selecting a contractor and water-resistance building materials. The guide also provides a list of mitigation strategies when rebuilding after a flood, including relocating or elevating the structure, installing floodwalls and foundation drainage systems.

### Local Land Use Regulations

One of the requirements of membership in the NFIP is that the Town administer flood hazard regulations. While these regulations address the flood hazard areas identified by FEMA, they do not necessarily address fluvial erosion hazard areas associated with the movement of rivers and streams. It is recommended that Towns also consider including the state-mapped river corridors in the areas to be regulated by flood hazard regulations. Although this is not intended to affect flood insurance requirements of properties with the designated river corridor, it is a way for towns to better mitigate future flood risk. The Watershed Management Division of the DEC has prepared model flood hazard regulations that include regulation of land in river corridors.

The provision for Planned Unit Developments in local land use regulations is another way to facilitate development that reduces the risk of floods. They allow more flexible requirements for developments that achieve environmental benefits, such as preservation of open space, and minimization of impervious surfaces.

Towns may also wish to establish limits on impervious coverage, clearing on areas of steep slopes, and disturbance to steep slopes as part of their land use regulations. Such measures will mitigate against damage caused by erosion of steep slopes and excessive stormwater runoff, which can overwhelm drainage infrastructure during storm events.

Of the 33 towns in the Northeast Kingdom region with land use regulations, 19 include a provision for Planned Unit Developments, 6 include limits on impervious surfaces, and 8 limit disturbance to steep slopes.

### Infrastructure planning

Planned improvements to road and stormwater infrastructure, including road culverts and bridges, should take into consideration the priorities and site specific projects identified in the tactical basin plans, and river corridor plans for the region.

New roads to serve residential or commercial development should not occur within flood hazard areas identified by FEMA, or within fluvial erosion hazard areas as depicted on the State-wide River Corridors, or as identified in a stream geomorphic assessment report.

The State Road and Bridge Standards are based on best management practices to guard against damage to road infrastructure from erosion and flood damage. Although implementation of the standards on all roadways in a municipality may have high up-front costs, the long range savings in maintenance and repair to roadways can result in long-term savings to municipalities.

### Historic Structures and Critical Facilities

Identification of historic properties and other critical infrastructure, such as public buildings used for shelters, emergency services buildings, and water and wastewater treatment facilities, will help communities better plan for emergencies. Such an inventory will help municipalities be in a better position when requesting funding for mitigation actions, such as flood-proofing or moving a structure to higher ground or outside of a fluvial erosion zone. (See the historic resources section of this plan for a discussion of resources in the region.) Because critical facilities are defined by their ability to quickly and efficiently respond to and recover from floods, critical facilities should never be flooded, and their critical actions should never be conducted in

floodplains if at all avoidable. The Association of State Floodplain Managers recommends that where critical facilities are located adjacent to special flood hazard areas, their flood protection elevation should be two feet above the elevation with a 0.2% chance of flooding (the 500 year floodplain.

**ERAF**

The Emergency Relief Assistance Fund (ERAF) provides Public Assistance grants through FEMA to help Vermont municipalities repair damaged infrastructure after a presidentially-declared disaster. In past years, ERAF funding typically covered half the required 25% non-federal match for approved projects (i.e., the State would provide 12.5% and the municipality 12.5%, with FEMA covering 75% of the total project costs).

Effective October 23, 2014 Towns must have adopted four flood hazard mitigation measures in order to maintain the same level of state funding in the event of such a disaster: 1) Flood Hazard Regulations that meet minimum standards for enrollment in the National Flood Insurance Program; 2) the most recent Agency of Transportation Road and Bridge Standards; 3) a Local Emergency Operations Plan (LEOP); and 4) a Local Hazard Mitigation Plan and submit to FEMA for approval.

Local Flood Hazard Regulations that include protection of State River Corridors are afforded a greater share of State matching funds – the State's portion of the match is increased to 17.5%.

Table 8.1 below shows the "ERAF status" of Towns as of July 2015.

**Table 8.1**
**ERAF Status of Northeast Kingdom Towns as of July 2015**

| Towns | ERAF Rate (%) | NFIP | Road and Bridge Stand. | LHMP | LEOP | R.C. Bylaw |
|---|---|---|---|---|---|---|
| Albany | 7.5 | No | Yes | No | Yes | |
| Barnet | 7.5 | Yes | No | No | No | |
| Barton Town | Pending | Yes | Yes | Yes | Pending | |
| Barton Village | 12.5 | Yes | Yes | Yes | Yes | |
| Bloomfield | 7.5 | Yes | Yes | No | No | |
| Brighton | 7.5 | Yes | Yes | Plan in progress | Yes | |
| Brownington | 7.5 | No | Yes | No | Yes | |
| Brunswick | 7.5 | Yes | Yes | No | No | |
| Burke | 7.5 | Yes | Yes | No | No | |
| Canaan | 12.5 | Yes | Yes | Yes | Yes | |
| Charleston | 7.5 | No | Yes | Yes | No | |
| Concord | 7.5 | Yes | Yes | No | Yes | |
| Coventry | 7.5 | Yes | Yes | No | Yes | |
| Craftsbury | 7.5 | Yes | Yes | No | No | |
| Danville | 7.5 | Yes | No | No | Yes | |
| Derby | 7.5 | Yes | Yes | No | No | |
| East Haven | 7.5 | No | Yes | No | Yes | |
| Glover | 12.5 | Yes | Yes | Yes | Yes | |
| Granby | 7.5 | Yes | Yes | No | No | Interim |
| Greensboro | 7.5 | Yes | Yes | No | Yes | |

| Table 8.1<br>ERAF Status of Northeast Kingdom Towns as of July 2015 | | | | | | |
|---|---|---|---|---|---|---|
| **Towns** | **ERAF Rate (%)** | **NFIP** | **Road and Bridge Stand.** | **LHMP** | **LEOP** | **R.C. Bylaw** |
| Groton | 7.5 | Yes | Yes | No | Yes | |
| Groton Village | 7.5 | Yes | Yes | No | Yes | |
| Guildhall | 17.5 | Yes | Yes | Yes | Yes | Interim |
| Hardwick | 7.5 | Yes | Yes | Yes | No | |
| Holland | 7.5 | No | Yes | No | Yes | |
| Irasburg | 7.5 | No | Yes | No | Yes | |
| Jay | 7.5 | Yes | Yes | No | Yes | |
| Kirby | 7.5 | Yes | Yes | No | Yes | Interim |
| Lemington | 7.5 | Yes | Yes | No | No | |
| Lowell | 7.5 | Yes | Yes | No | Yes | |
| Lunenburg | 7.5 | No | Yes | No | No | |
| Lyndon | 7.5 | Yes | Yes | Plan in Progress | No | |
| Lyndonville Vill. | 7.5 | Yes | Yes | Plan in Progress | No | |
| Maidstone | 7.5 | No | No | No | No | |
| Morgan | 7.5 | No | Yes | No | Yes | |
| Newark | 7.5 | No | No | No | No | |
| Newport Town | 7.5 | Yes | Yes | No | No | |
| Newport City | 7.5 | Yes | Yes | Plan in Progress | Yes | |
| North Troy Village | 7.5 | Yes | No | No | Yes | |
| Norton | 7.5 | Yes | Yes | No | Yes | Yes |
| Peacham | 7.5 | Yes | No | No | Yes | Interim |
| Ryegate | 12.5 | Yes | Yes | Yes | Yes | |
| Sheffield | 7.5 | No | No | No | Yes | |
| South Ryegate Vill. | 7.5 | Yes | Yes | Yes | No | |
| St. Johnsbury | 12.5 | Yes | Yes | Yes. | Yes | |
| Stannard | 7.5 | Yes | No | No | No | |
| Sutton | 7.5 | No | Yes | No | No | |
| Troy | 7.5 | Yes | Yes | No | Yes | Interim |
| UTG | 7.5 | Yes | Yes | Plan in Progress | Yes | Yes |
| Victory | 7.5 | No | Yes | No | No | |
| Walden | 7.5 | No | No | No | Yes | |
| Waterford | 7.5 | Yes | Yes | Plan in Progress | Yes | |
| Westfield | 7.5 | Yes | Yes | No | Yes | |
| Westmore | 7.5 | No | Yes | No | No | |
| Wheelock | 7.5 | No | No | No | Yes | |

It is noted that besides the funding benefits under ERAF, each of the four required elements are beneficial on their own. As previously noted, membership in the NFIP enables residents to secure flood insurance, which is required if a federally-backed mortgage is sought for the property. It also lowers rates for all flood insurance policy holders in Town. It is noted that some Towns may wish to join the National Flood Insurance Program for the benefits available to residents, but do not have FEMA Flood Insurance Rate Maps (FIRMs) on which to base local flood hazard regulations. In this case, other data may be developed to establish the area that would be subject to local flood hazard regulations. Peacham is one such town in the region that never had FIRMs, but was able to join the NFIP through the use of data established by stream geomorphic assessment reports.

## GOALS AND STRATEGIES FOR FLOOD RESILIENCE

### FLOOD RESILIENCE GOALS

- Increase awareness of the most effective means of reducing future flood damage, as identified in Tactical Basin Plans and Stream Geomorphic Assessments (River Corridor Plans)
- Protect areas identified and designated as flood plains, river corridors and land adjacent to streams
- Mitigate risks to public safety, critical infrastructure, historic structures, and municipal investments.

### FLOOD RESILIENCE STRATEGIES

- Coordinate with the County Conservation Districts in hosting flood mitigation workshops for residential landowners and business owners, to educate them on measures to reduce flood risk and damage.
- Encourage Towns to include restriction of development within River Corridors, as mapped by the Vermont Agency of Natural Resources.
- Encourage Towns to amend zoning and subdivision regulations to include limits on clearing and impervious coverage, and that avoids impacts to wetlands and steep slopes (slopes greater than 20%).
- Encourage Towns to incorporate Planned Unit Development provisions in their bylaws as a means to minimize impervious coverage and clearing.
- Encourage towns to engage in a working partnership with adjacent communities to address control of stormwater runoff and actions that will allow rivers and streams to regain access to floodplains.
- Assist Towns in seeking funding to implement hazard mitigation projects identified in plans.

# Northeastern Vermont Development Association

# Regional Transportation Plan for the Northeast Kingdom

## 2012 Update

## March 2013

# *Section 1*
# Introduction

The Northeast Kingdom Regional Transportation Plan puts forth a 5-year guide for developing and improving the transportation system in the Region. This plan is an update of the previous plan prepared in 2006. The Northeastern Vermont Development Association (NVDA) has been responsible for the development of this and previous plans. They have addressed the various means of transportation in use in the Northeast Kingdom. The plan looked at the various modes of transportation to determine how they can play an important role in the future development of the region.

In 1991, the Federal Government passed the Inter-modal Surface Transportation and Efficiency Act (ISTEA) with broad goals toward the development of a transportation system that is efficient, economical, respectful of local needs, and integrated with land use planning. The State of Vermont responded to ISTEA by establishing the Transportation Planning Initiative (TPI). The TPI embraces a strong element of local participation and the meaningful consideration of alternative modes of travel.

In 2005, the Federal Government signed into law the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). SAFETEA-LU promotes more efficient and effective Federal surface transportation programs by focusing on transportation issues of national significance, while giving State and local transportation flexibility for solving transportation problems in their communities. SAFETEA-LU was set to expire on September 30, 2009, but Congress has passed a series of extensions while it works on a new transportation bill.

To ensure the local participation mandated by ISTEA and SAFETEA-LU, NVDA has overseen the development of this Regional Transportation Plan (RTP) for Caledonia, Essex and Orleans Counties (the Northeast Kingdom).

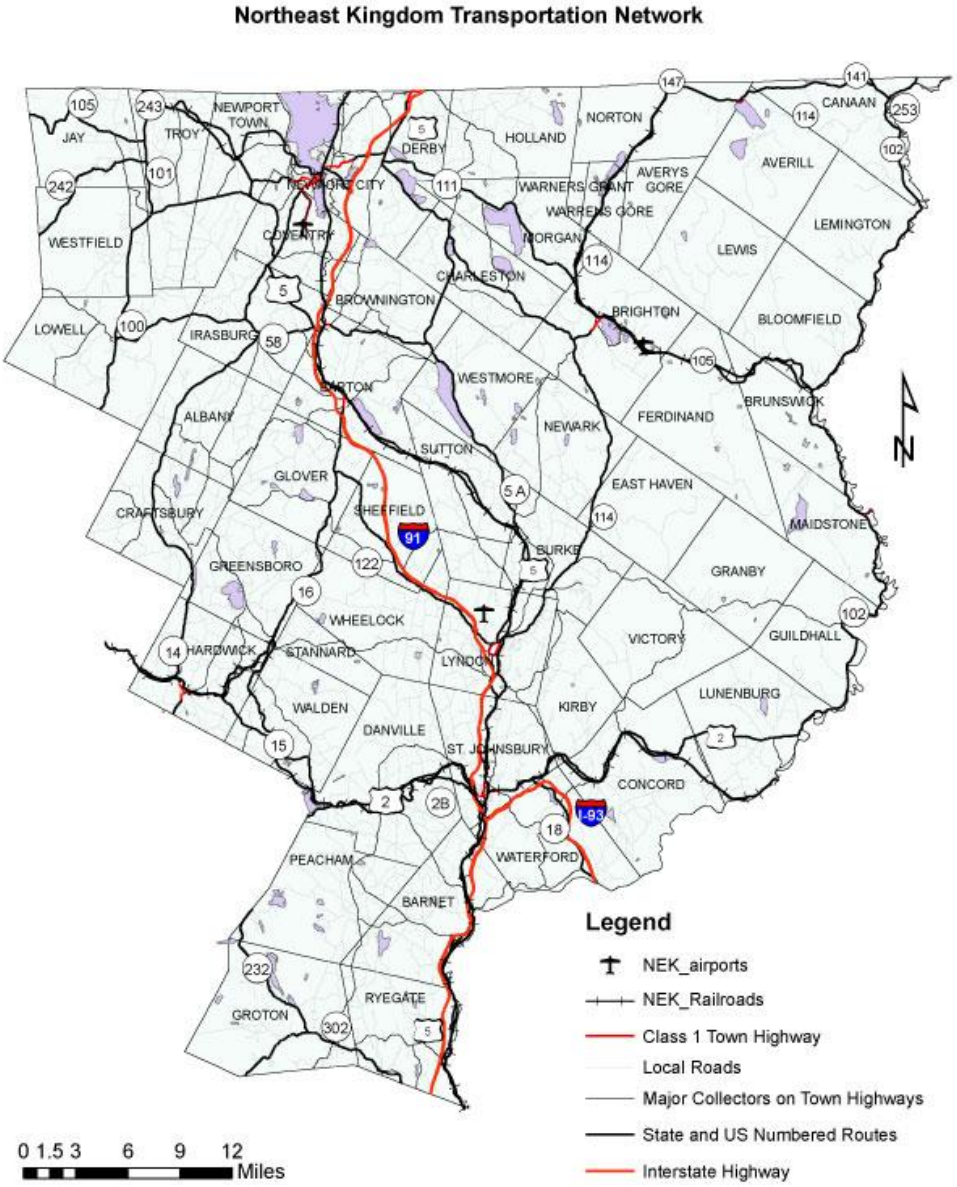
(NVDA) anticipates that it will update this plan again in five years, in accordance with current SAFETEA-LU guidance. The plan was prepared with the assistance of the NVDA Transportation Advisory Committee (TAC), the local municipalities and the residents of the Northeast Kingdom. It will serve as the Transportation Element of the regional plan for the region.

The Plan has been prepared to respond to the characteristics of the Northeast Kingdom. It is also compatible with the State's Long Range Transportation Plan, which emphasizes maintenance, intermodal connections and links to land use.

This plan departs from past efforts in that it will look to address more fully all modes of transportation that are available to the regions residents and visitors. In the past this plan has focused primarily on the auto centered and will now focus on recommendations by corridor.

# The Region

The Northeast Kingdom encompasses 55 municipalities, grants and gores, situated in the northeastern most corner of Vermont, as shown in Figures 1.1 and 1.2. The region consists of three counties, Caledonia, Orleans and Essex. It is bordered on the east by the Connecticut River and New Hampshire; to the west by Franklin, Lamoille and Washington Counties; to the north by the Province of Quebec, Canada; and the south by Orange County. The Region's total land area is 2,027 square miles, encompassing about 21% of the State.

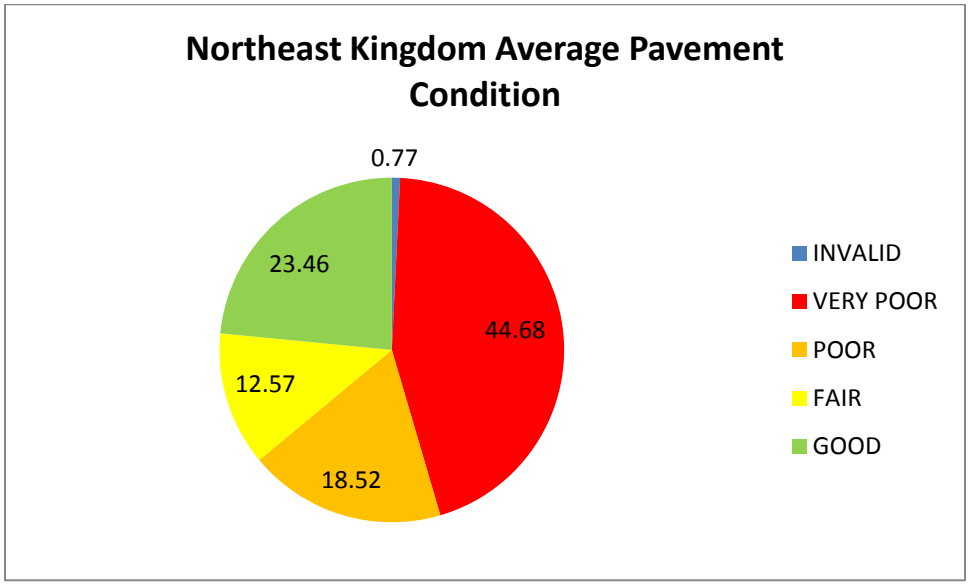


The Northeast Kingdom is the largest, most sparsely populated (10% of Vermont's population) and economically challenged of all the regions in the State.

The State of Vermont uses an asset management strategy to determine where best to allocate limited funding to get the most return for investment. Due to the regions relative low population and thus traffic volumes compared to other areas, the regions share of state transportation infrastructure does not compete well for limited maintenance funding. The result of this situation is illustrated below.

**COUNTIES RANKED BY AVERAGE PAVEMENT CONDITION**

| County | Miles | Avg Condition | % VERY POOR |
|---|---|---|---|
| Grand Isle | 45.127 | 70 | 8 |
| Bennington | 174.173 | 66 | 15 |
| Rutland | 269.709 | 63 | 18 |
| Windham | 173.520 | 62 | 22 |
| Chittenden | 141.601 | 59 | 24 |
| Essex | 121.921 | 57 | 33 |
| Washington | 187.347 | 56 | 27 |
| Franklin | 191.462 | 55 | 30 |
| Windsor | 307.443 | 52 | 36 |
| Lamoille | 123.592 | 51 | 35 |
| Addison | 194.522 | 48 | 43 |
| Caledonia | 161.884 | 42 | 49 |
| Orange | 173.521 | 41 | 53 |
| Orleans | 204.800 | 39 | 53 |




Source: VTrans 2010 Pavement Management

# *Section 2*
# Vision and Goals

## Vision for Transportation System Development and Improvement

The Vision for the Transportation System in the Northeast Kingdom is one that supports a diverse economy and high quality of life for all residents. It addresses the mobility needs and mode choices of all residents, and provides for the safe, efficient and cost-effective movement of people, goods and services while integrating land use and transportation in a comprehensive and cooperative decision-making process.

This vision strives to provide transportation infrastructures that efficiently and safely handles traffic during natural hazard events and other emergency situations, promotes a funding strategy that realizes the maximum use of all available resources to ensure adequate funding to address the Region's and towns' priority needs of the existing transportation system while preserving environmental, historic, scenic and cultural resources.

## Goals and Objectives

Goals and objectives are the necessary cornerstones of any plan. They synthesize the region's vision and represent the general direction of transportation planning for the regional community. The goals and objectives of this regional transportation plan are consistent with the vision presented in the region's general plan and the goals presented in the State Transportation Plan. They are as follows:

### ***Goals***

**Goal A: Maintain Adequate Road and Bridge Capacity and Mobility**

The importance or providing adequate maintenance to our existing infrastructure across all modes and infrastructure asset classes cannot be understated. Where existing facilities have degraded to the point that effective maintenance cannot be employed, support investment to bring the infrastructure up to a maintainable level.

**Goal B: Guarantee a Regional Transportation System that Facilitates Economic Development**

Economic activity relies upon having the infrastructure in place in good repair to support those activities. Just in-time shipping practices and the global market place require a well maintained and integrated transportation network to be competitive business. These requirements include access to Interstate Highways, Rail, and Air Shipping.

**Goal C: Ensure Good Quality of Life**

Make transportation investment decisions to enhance the overall quality of life and minimize any negative impacts on natural, cultural, and/or scenic resources without compromising maximum safety conditions. Roadway upgrades and new roadways should be planned so as not to fragment agricultural and forestry lands, or existing and planned growth centers.

**Goal D: Ensure Availability of Alternative Transportation Modes to Address Residents' Needs**

Seek a reduction in the dependence of the private automobile as the principal means of transportation. Expand and support new and existing public transportation services that are affordable to regional residents and are energy efficient.

Address the problems associated with rural transportation including the movement of people and goods, and access to recreation opportunities and economic development.

Support efforts towards retaining in full use and good repair the operating rail and air service within and to/from the region.

Promote transportation in growth centers, downtowns, and village centers that feature bicycle, pedestrian and other non-motorized forms of transportation.

Promote the development of park-and-ride lots.

Encourage the creation of a barrier-free transportation environment; and support transportation services for senior citizens, low-income groups and the handicapped.

Promote the development of charging stations to facilitate increased use of electric vehicles.

## ***Objectives***

Objective 1: Develop Mechanisms for Effective Management and Maintenance of the Region's Transportation System

- Slow the deterioration of individual transportation modes, and assist in reducing/averting costly repairs.
- Increase efficiency and structural longevity of system by supporting access management and preservation of the functional classification of State and US numbered routes.
- Encourage more effective modal linkages.
- Protect and enhance the region's development investments.
- Maintain a consistent level of transportation service and safety.
- Preserve public rights of way by reclassifying Class 4 roads to Legal Trails where towns do not wish to maintain the road but want to preserve access for farming, forestry, or recreation.
- Preserve Abandoned Railroad Rights of Way as Rail Banked corridors. Interim use as a recreational trails should be supported.

Objective 2: Integrate Transportation Planning with Local Land Use and Activity Center Development

- Facilitate a consistent and more effective comprehensive planning process at the regional and local level.
- Insure that transportation concerns are addressed appropriately in light of land use impacts as well as community facility needs.
- Prevent waste of natural and financial resources.
- Encourage the development of inter-city and inter-regional public transportation systems where feasible.
- Policies, plans, projects, and programs should emphasize cooperation with all transportation organizations and with municipalities, major employers, and private landowners.

- Seek to attain consistency with local plans within the planning and project prioritization process.
- Coordinate transportation improvements and management objectives across regional boundaries.

Objective 3: Identify a Variety of Funding Mechanisms to Assist Towns in Maintaining Local Road Infrastructure

- Reduce the dependency on state Capital Program and Project Development.
- Encourage local participation by individual municipalities with respect to project development, design, and scheduling.
- Assist in reducing negative impacts on local town budgets for transportation maintenance and construction.
- Encourage public/private partnerships to fund infrastructure improvements where appropriate.

Objective 4: Enhance Economic Development and the Efficient Movement of Goods and Services While Reducing the Impact of Commercial Traffic on Local Communities

- Reduce time-in-transit for the driving public as well as commercial vehicles.
- Reduce energy consumption in Transportation.
- Initiate projects that will increase the level of safety on local and state highways.
- Manage noise levels associated with transportation activities.
- Encourage and aid neighboring municipalities to work cooperatively on transportation projects of large scope, thus reducing the burden on any one municipality.
- Support regional and extra-regional cooperation in the development of recreation and bicycle trails.

# *Section 3*
# Regional Transportation Network

This Section provides a brief overview of the transportation modes available to residents, visitors, and businesses of Caledonia, Essex, and Orleans Counties. The goals and objectives for these will be discussed in more detail within the specific corridor chapters.

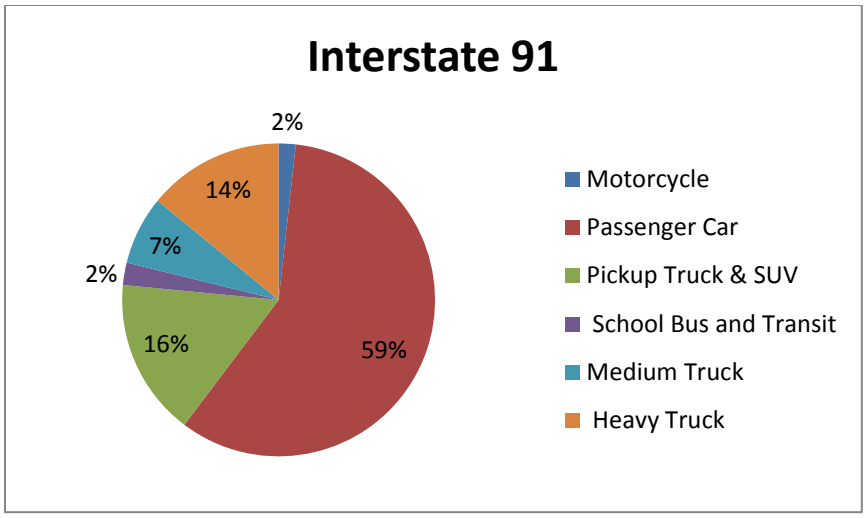
## Roadway

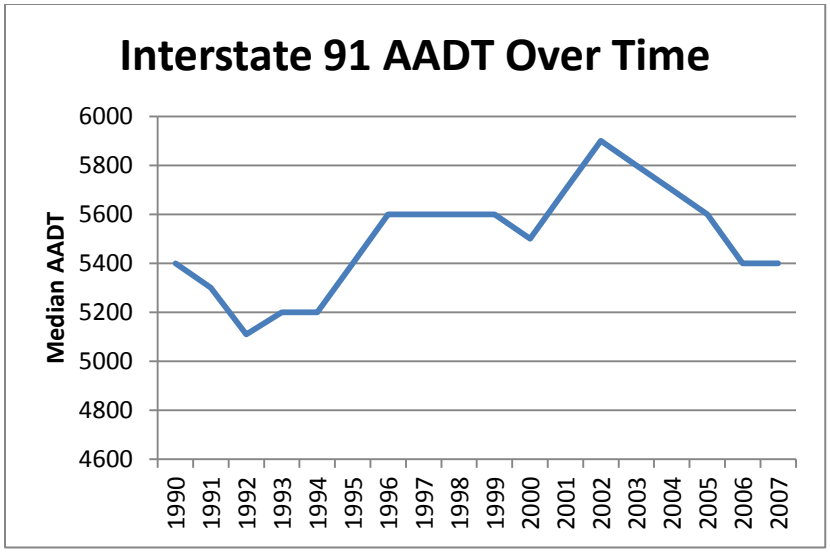
The highway network of the Northeast Kingdom is the by far the most commonly used mode of transportation. There are 2507.5 miles of roadway located in the region that range from Interstates 91 and 93 to local gravel roads and everything in between. Residents in the region totaled 743 million miles in vehicle miles traveled (VMT) in 2009. (UVM TRC Transportation Energy Report 2011).

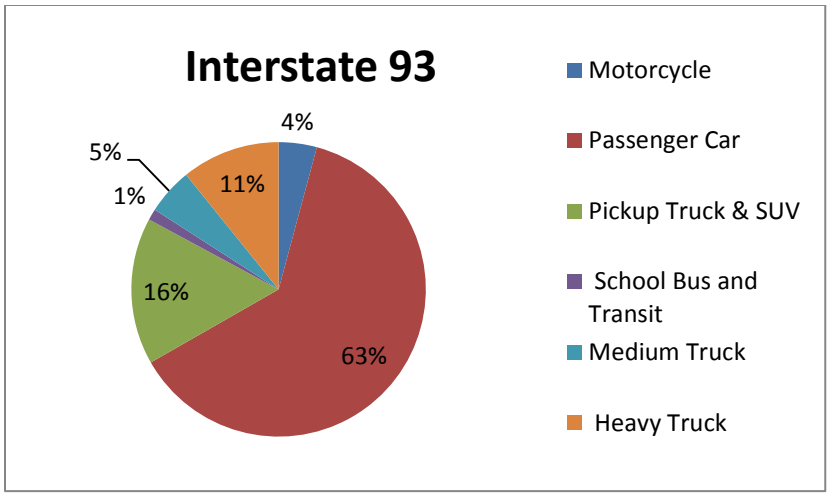
## Interstate Highway

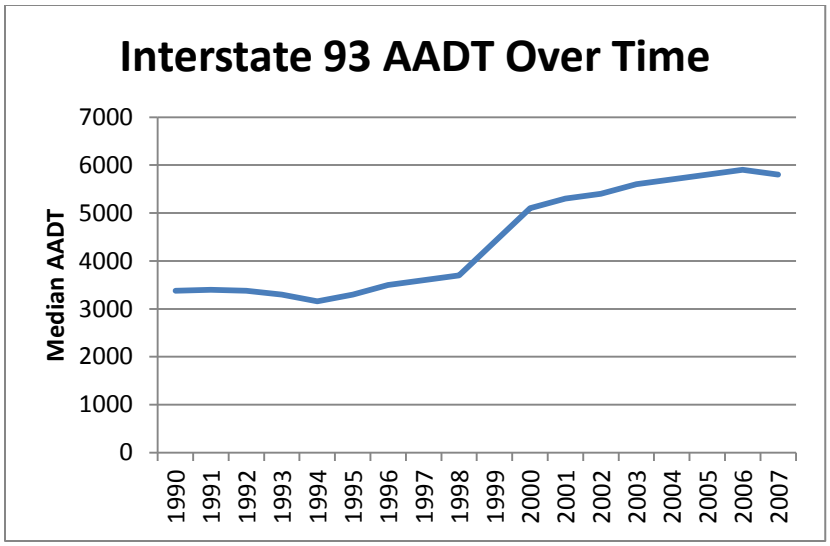
There are approximately 66 miles of Interstate 91 and approximately 11 miles of Interstate 93 located in the region. These roadways provide good north-south access for the region with Interstate

93 connecting to New Hampshire continuing south to Boston and Interstate 91 connecting the region to Canada in the north and South to Massachusetts. They provide higher speed and greater capacity for travelers and goods.






## National Highway System (NHS)

The NHS was designated in the Inter-modal Surface Transportation Equity Act (ISTEA) of 1991. Roadways with NHS designation are seen as major roads used to connect important regional destinations. In the Northeast Kingdom, the entire length of Interstate 91 and 93 as well as US Route 2 Form the Cabot Town Line to the New Hampshire Line comprise the total of NHS roadways.

## State Highway

State Highways are roadways maintained by the state that are not Interstates or NHS roadways. These include US 5, VT 14, VT 15, VT 16, VT 18, VT 58, VT 100, VT 101, VT 102, VT 105, VT 111, VT 114, VT 122, VT 141, VT 147, VT 191, VT 232, VT 242, VT 243, VT 253, US 302.

## Local Roads

Any roadway not previously listed is a local road. Of the 2507.5 miles of roads in the Northeast Kingdom, 1476.95 miles (58.9%) are unpaved. 1947.9 miles (77.7%) of the total regional mileage is maintained by towns.

## Railroads

The Northeast Kingdom has three active rail lines; Washington County Railroad (WACR) and St. Lawrence and Atlantic Railway (SLR), Montreal Maine and Atlantic Railway (MM&A), one inactive line, Twin State Railroad (TSR), and two rail banked rail lines , one converted and open,the Beebe Spur Trail in Derby and one undergoing conversion to a Rail Trail; the Lamoille Valley Rail Trail. There is no passenger service in the NEK but one can access passenger Rail (Amtrak) in either White River Junction or Montpelier.

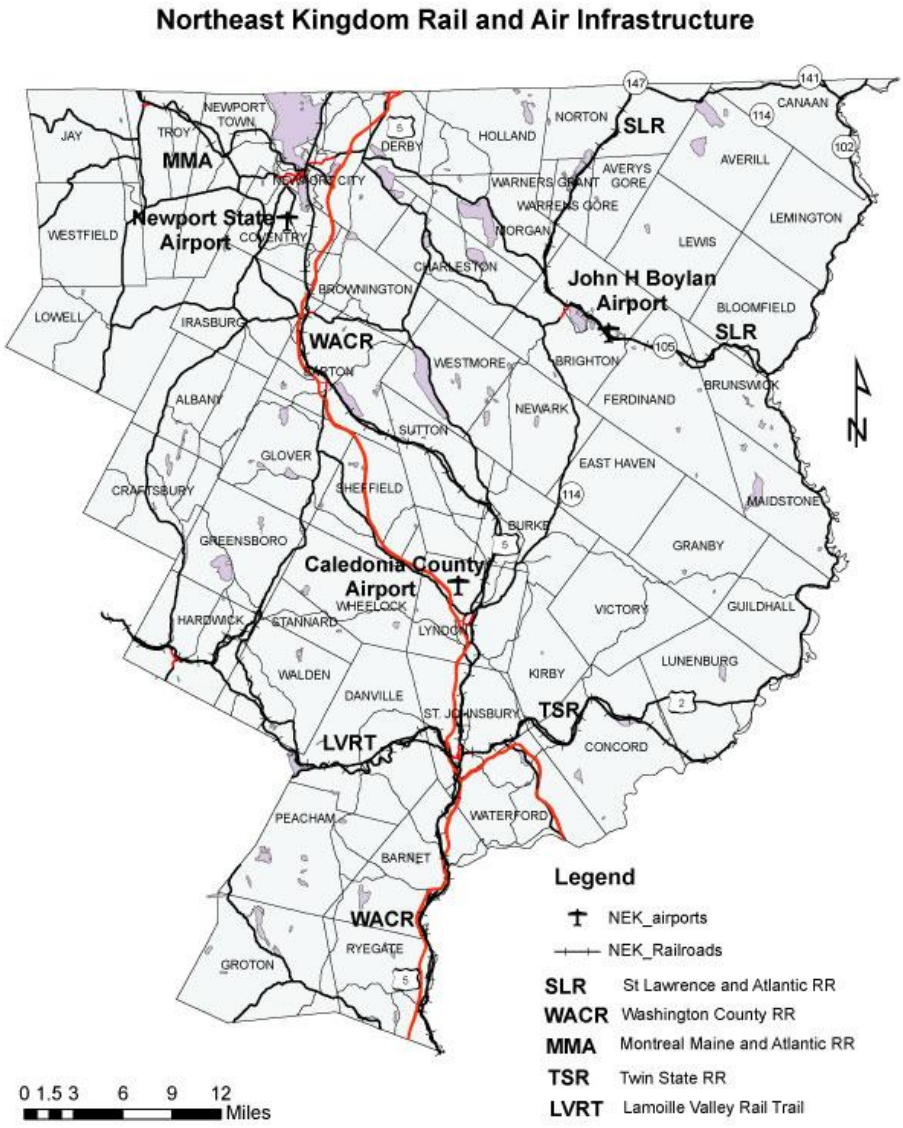
The St. Lawrence and Atlantic Railway (SL&A) operates 30.65 miles of track from Norton VT to North Stratford NH. It is capable of handling double stacked car loads on its entire length. Approximately 26,000 annual carloads of SL&A traffic travel through Vermont, of which approximately 2,060 carloads originate or terminate in Vermont. SLR operates two through freight trains seven days per week. Freight handled consists of carload and mixed intermodal shipments of paper, forest products, chemicals, grain, salt, and various consumer goods. Presently, there are no passenger operations on the line; however potential passenger service exists between Montreal, Vermont, New Hampshire, and Portland, Maine. Part of SL&A, between Portland and Auburn, Maine, has been designated by FRA as a high-speed corridor for passenger rail, and there is an initiative to extend that to Vermont and on to Montreal.

The Washington County Railroad (WACR) Connecticut River Division is a State owned segment of track from White River Jct., to the southern limit of the Newport yard. It is operated by the Washington County Railroad, a subsidiary of Vermont Rail System. It connects with the Montreal, Maine and Atlantic in Newport and in White River with NECR, PAR, and the Claremont Concord Railroad. The Connecticut River Division has seen substantial growth over the past several years. WACR handles 1951 car loadings annually. The condition of the line is consistent with the types and volume of traffic that it serves. WACR handles originating and terminating traffic including corn, petroleum products, calcium chloride, grains, lumber, malt, potassium chloride, soy, urea and wood pulp. Bridge traffic includes lumber, paper, potatoes, sand and fertilizer. The WACR operates daily.

The Montreal, Maine, and Atlantic Railway (MM&A) operates 24.40 miles in Vermont, and associated trackage rights formerly operated as the Bangor and Aroostook Railroad, Canadian American Railroad, Northern Vermont Railroad, Quebec Southern Railway, and Van Buren Bridge Company. It operates from the Newport rail yard through Troy, Vermont into Quebec and reenters Vermont to serve Richford. The line then continues back into Quebec and points north. MM&A handles 3077 car loadings annually. The condition of the line is consistent with the types and volume of traffic that it serves. MM&A carries paper, lumber, grain, round wood and plastics. MM&A operates local freight service on a five-day-a-week basis.

Maine Central Railroad (MEC)/Twin State Railroad (TSR) The MEC runs 19.7 miles from St.Johnsbury to Gilman, Vermont; the 8.36-mile-long connecting segment of former MEC track between Gilman, Vermont and Whitefield, New Hampshire was purchased by the State of New Hampshire in 2002. A former operator, the Twin State Railroad (TSR), still has operating rights over the New Hampshire-owned segment between Gilman and Whitefield. TSR also claims salvage rights

to the entire 28.06 miles between St. Johnsbury and Whitefield. The entire length of this line in Vermont is currently inactive.




Rail infrastructure in the Northeast Kingdom is critical to our competitiveness in the long term. According to the Btu per vehicle mile to freight car-mile, railroads were 56% more efficient than heavy single-unit and combination trucks. Looking at this simple fact shows that as energy costs increase more efficient transportation options will become more important to the region's vitality.

# Public Transit

Rural Community Transportation, Inc. (RCT) provides a range of transit services to meet the diverse needs of the traveling public. These include year-round shuttles that serve trips for all purposes, commuter services that operate during peak periods, and shopping shuttles and other demand-response services oriented toward seniors, people with disabilities, and others who have limited transportation alternative

RCT shuttle routes serve St. Johnsbury, Lyndon/Lyndonville, Newport and Derby/Derby Line. Taken together, these cities/towns had a total population of 22,794 in 2010, making up 35% of the population of the Northeast Kingdom (Caledonia, Essex and Orleans counties combined).The US 2 Commuter route connects St. Johnsbury to Montpelier, East Montpelier, Plainfield, Marshfield, and Danville. The Route 2 commuter is operated by RCT in cooperation with Green Mountain Transit Agency (GMTA). RCT's other commuter service includes a pair of express trips operated along the alignment of the Jay-Lyn Shuttle with limited stops and a schedule oriented toward commuters.

U.S. Census population results for the year 2010 at the block level were used to determine the approximate number of persons within easy walking distance of RCT shuttle and commuter route service. Assuming an even population distribution within individual Census blocks, about 16,000 persons live within a 1/4-mile radius of RCT shuttle and commuter route services (equivalent to a 5-minute walk). Another 10,000 people live within 3/4 of a mile from an RCT route (equivalent to a 15-minute walk).

RCT maintains a Regional Short-Range Transit Plan for the Northeast Kingdom and Lamoille County. For more information on the transit plan contact RCT at (802)748-8170 or www.riderct.org.

# Air

There are three state-owned airports in the NEK, including the Caledonia State Airport (Lyndon), Newport State Airport (Coventry), and John H. Boylan Airport (Brighton). State-owned airports primarily serve the needs of general aviation. General aviation airports typically provide facilities for privately owned aircraft which are used for business activities and or private flying. Other uses for general aviation airports include flight instructions, aerial photography, crop dusting, and recreational flying. In addition, they provide facilities for local pilots, and provide charter air service to business and recreational travelers. Airports that support aviation related businesses provide the local economies with needed employment opportunities. Recently, the Agency of Transportation has been promoting development opportunities in within the Caledonia and Newport airport facilities. The Newport facility was included as a magnet site in NVDA's Foreign Trade Zone initiative. Most importantly, these airports make up a system linking travelers to the Northeast Kingdom and local residents to the rest of Vermont and the greater New England region.

# Bicycle and Pedestrian

The NEK has 38.56 miles of sidewalks in Caledonia (17.37), Essex (2.7), and Orleans (18.49) counties. Aside from these municipal facilities there are three completed Rail Trails (The Beebe Spur, The Cross Vermont Trail ~14 miles and the Three Rivers Bike Path) and one currently undergoing conversion The Lamoille Valley Rail Trail).

With the completion of its bike path the City of Newport has significantly enhanced its downtown and improved access within the community. St.Johnsbury is expecting similar results as it moves forward with the completion of its long-planned bike path. Facilities like these provide mobility and access options for residents and visitors without having to use an automobile. The need for greater access for elders and people with disabilities will continue to increase as our population ages.

Bike and Pedestrian activities are also recognized as having significant economic impact in Vermont. VTrans conducted a study (Economic Impact of Walking and Biking in Vermont 2012) to examine this impact and among its findings were that for the study year (2009), Bike and Pedestrian infrastructure provided significant employment opportunities in construction that resulted in $9.9 million in labor earnings, Bicycle-pedestrian-oriented businesses in Vermont generated a total of 56.3 million in output and supported 1,025 direct and indirect jobs with $26.3 million in labor earnings (wages & salaries plus proprietor income). 40 major Bike and Pedestrian events attracted over 16,000 participants. Combined with associated family and friends, these visitors spent over $6 million in the state. Further analysis indicates these events generate $9.5 million in total output and supports 160 direct and indirect jobs with $4.7 million in labor earnings.

Given these findings it makes sense not only from a quality of life perspective but from an economic development perspective to support the development of these types of facilities and the activities that they attract. The Kingdom Trails organization and multi-use trail network, located in Burke, provides the best example of recreational economic development in the region and Vermont, if not all of New England. The extensive trail network and connection with Burke Mountain ski area is now bringing tens of thousands of visitors to the region each summer.

The table below provides the amount of sidewalks by mile in Northeast Kingdom communities as of (2012):

| County | Community | Subarea | Length |
|---|---|---|---|
| Caledonia | | | |
| | Burke | West Burke | 0.14 |
| | Burke | East Burke | 0.26 |
| | Danville | Danville Village | 0.39 |
| | Groton | Groton Village | 0.41 |
| | Hardwick | East Hardwick | 0.18 |
| | Hardwick | Hardwick Village | 2.07 |
| | Lyndon | Broad St out to Lyndon Corner | 0.73 |
| | Lyndon | Lyndonville | 1.64 |
| | Ryegate | East Ryegate | 0.45 |
| | St Johnsbury | St J center | 0.06 |
| | St Johnsbury | UCZ | 11.45 |
| | | | |
| | | County | 17.78 |
| Orleans | | | |
| | Barton | Barton Village | 2.2 |
| | Barton | Orleans Village | 2.34 |
| | Derby | Derby Line | 1.08 |
| | Derby | Derby Center | 1.2 |
| | Glover | Glover Village | 0.45 |
| | Greensboro | Greensboro Village | 0.55 |
| | Newport City | Newport City | 8.06 |
| | Troy | North Troy | 2.61 |
| | | | |
| | | County | 18.49 |
| Essex | | | |
| | Brighton | Island Pond | 1.12 |
| | Canaan | Canaan Village | 0.42 |
| | Canaan | Beecher Falls | 0.36 |
| | Concord | East Concord | 0.04 |
| | Guildhall | Guildhall Village | 0.1 |
| | Lunenburg | Lunenburg Village | 0.36 |
| | Lunenburg | Gilman | 0.3 |
| | | | |
| | | County | 2.7 |
| | | | |
| | | Region | 38.97 |

# Intermodal Facilities

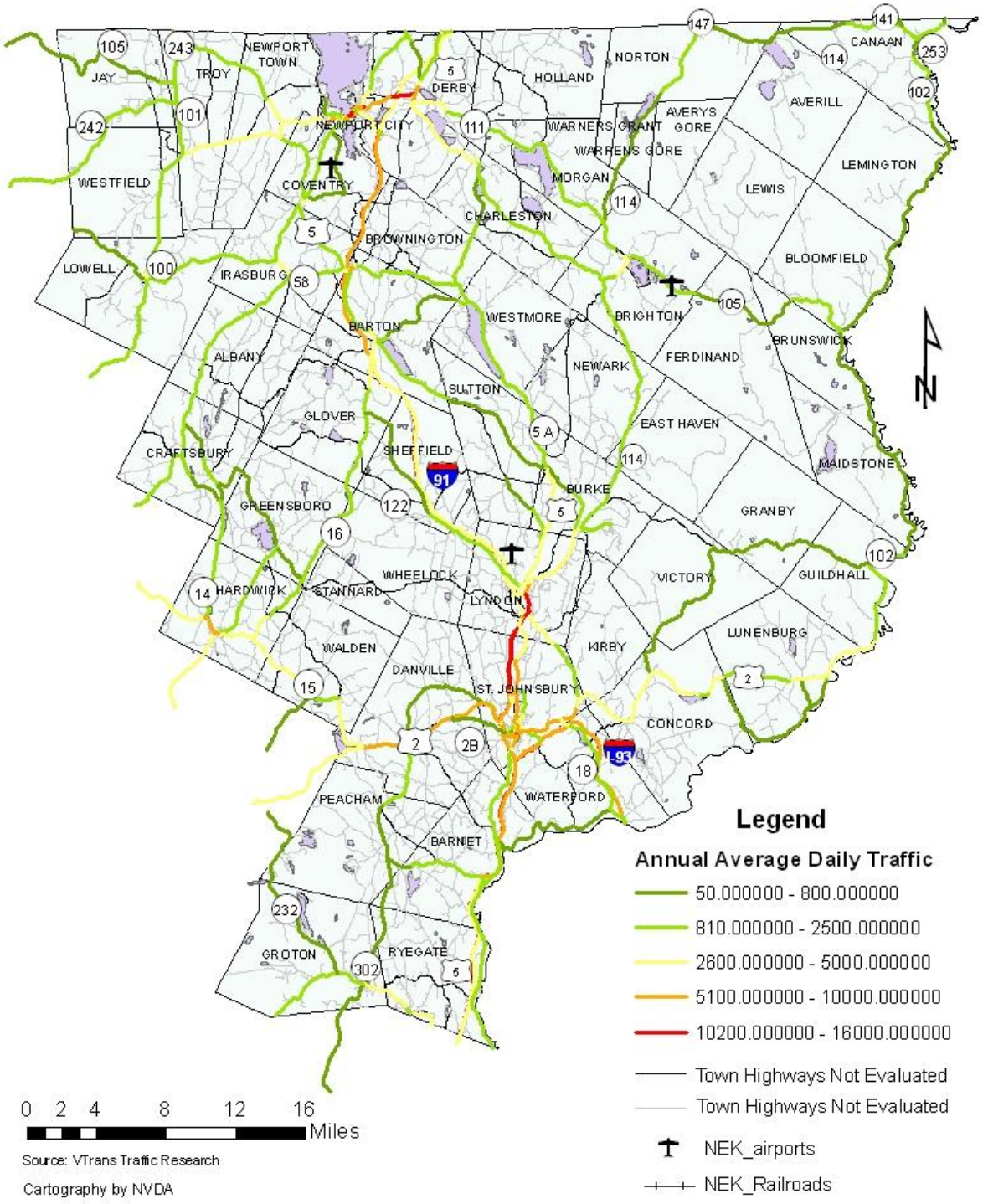
Inter-modal facilities are locations where commuters, tourists, travelers, and/or freight are transferred from one mode of transportation to another. Consequently, the modal-linkages provided by inter-modal facilities are key components of effective multi-modal transportation systems. Park and ride lots, bus stations, airports, and rail yards and sidings are examples of inter-modal facilities found in the Northeast Kingdom.

The automobile is by far the dominant mode of transportation in the Northeastern Vermont. Therefore most inter-modal facilities have automobile parking to accommodate people who drive to an inter-modal facility and switch to another mode of transportation (carpool, vanpool, transit, bus, etc.).

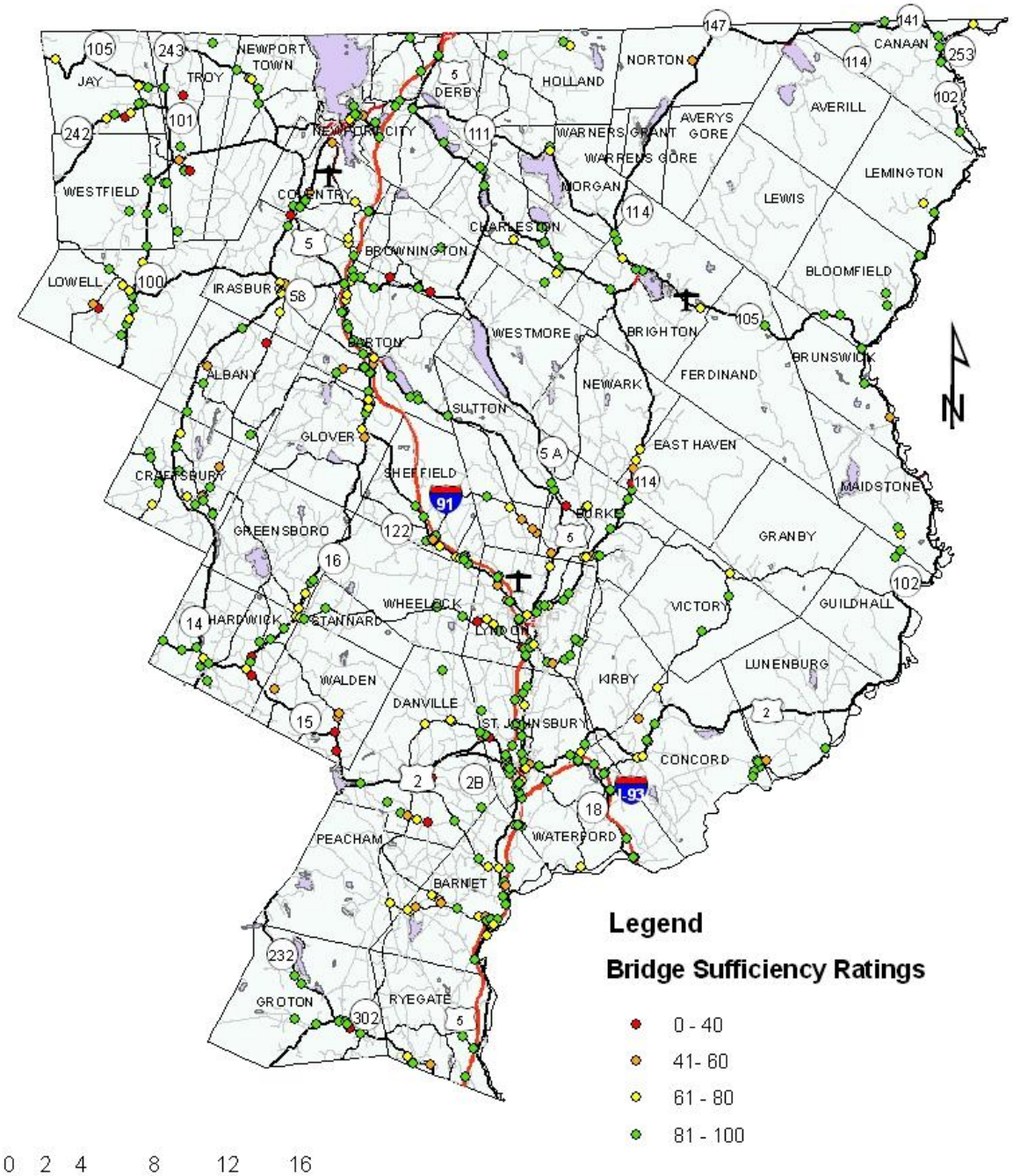
A large percentage of the region's residents work outside their home communities. This creates a demand for transportation services and infrastructure in order to get residents to their places of work and home again. As this demand increases over time, efforts to combine infrastructure capacity improvements with increased public transportation services should be examined at every possible opportunity. The impact of daily commuter migration extends beyond the 'wear and tear' to regional transportation infrastructure such as where the commuters purchase goods and services.

Below are a series of maps that relate information on Traffic Volume, Bridge Sufficiency Rating, High Crash Locations and Pavement condition for the regions highways as well as formal Park and Ride Locations. These maps will be broken out into corridor specific maps so as to provide a more detailed view of existing conditions within each corridor.

# Northeast Kingdom Traffic Volume



# Northeast Kingdom Bridge Sufficiency Ratings

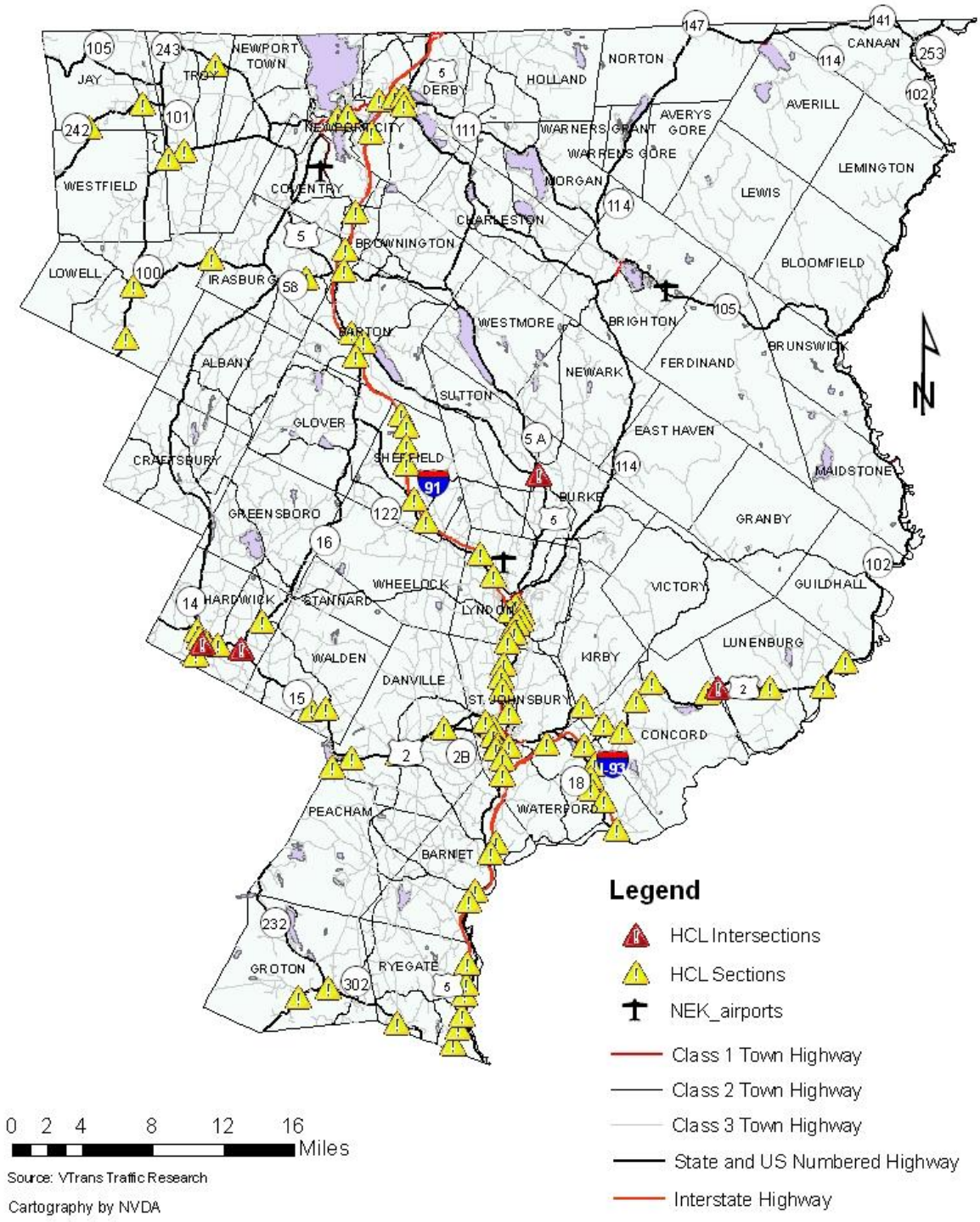



Source: VTrans Pavement Management

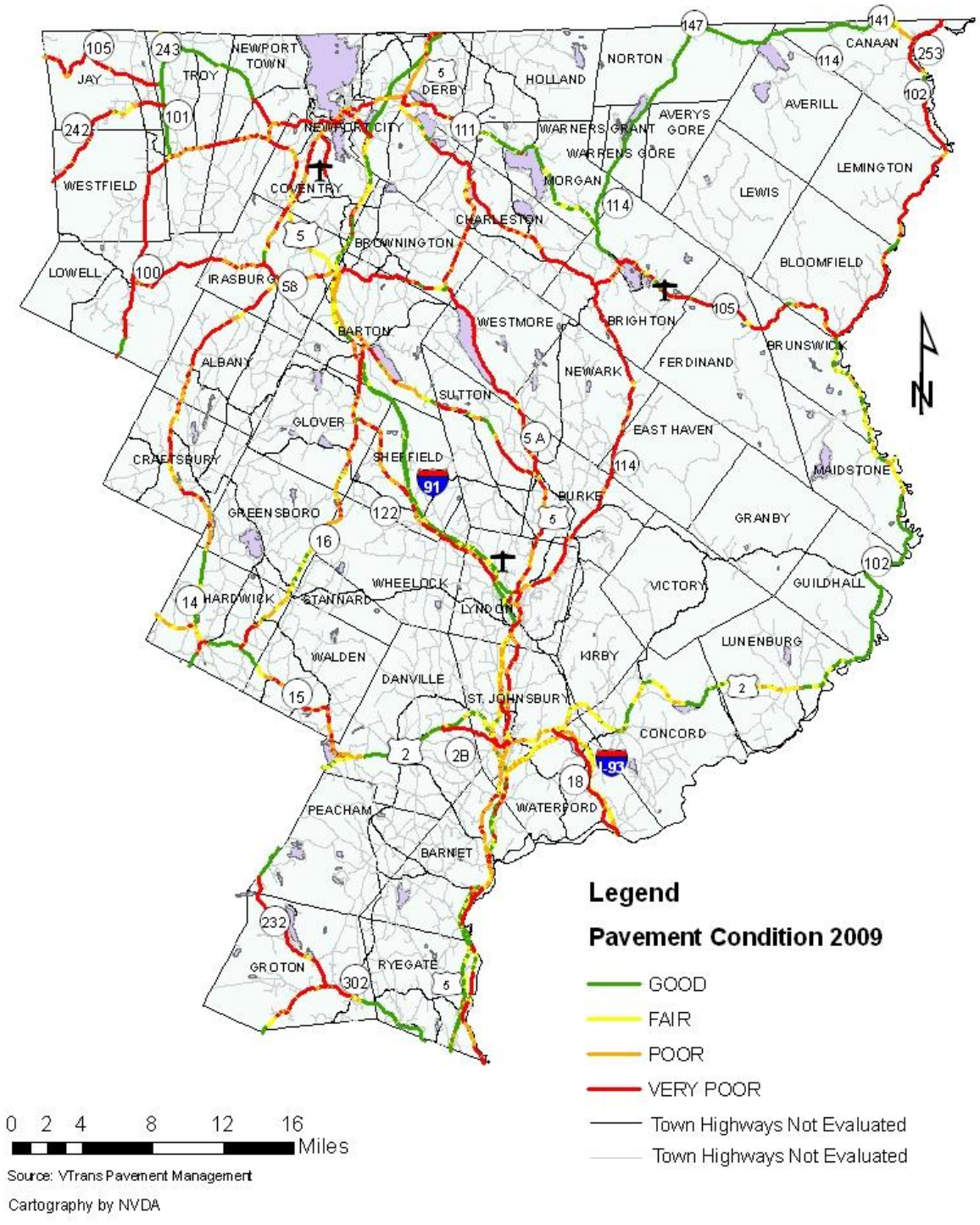
Cartography by NVDA

**Completed in 2010, this sufficiency rating is based on structural condition, bridge geometry and traffic considerations. Bridges or culverts longer than20 feet are inspected by VAOT at least every two years.**

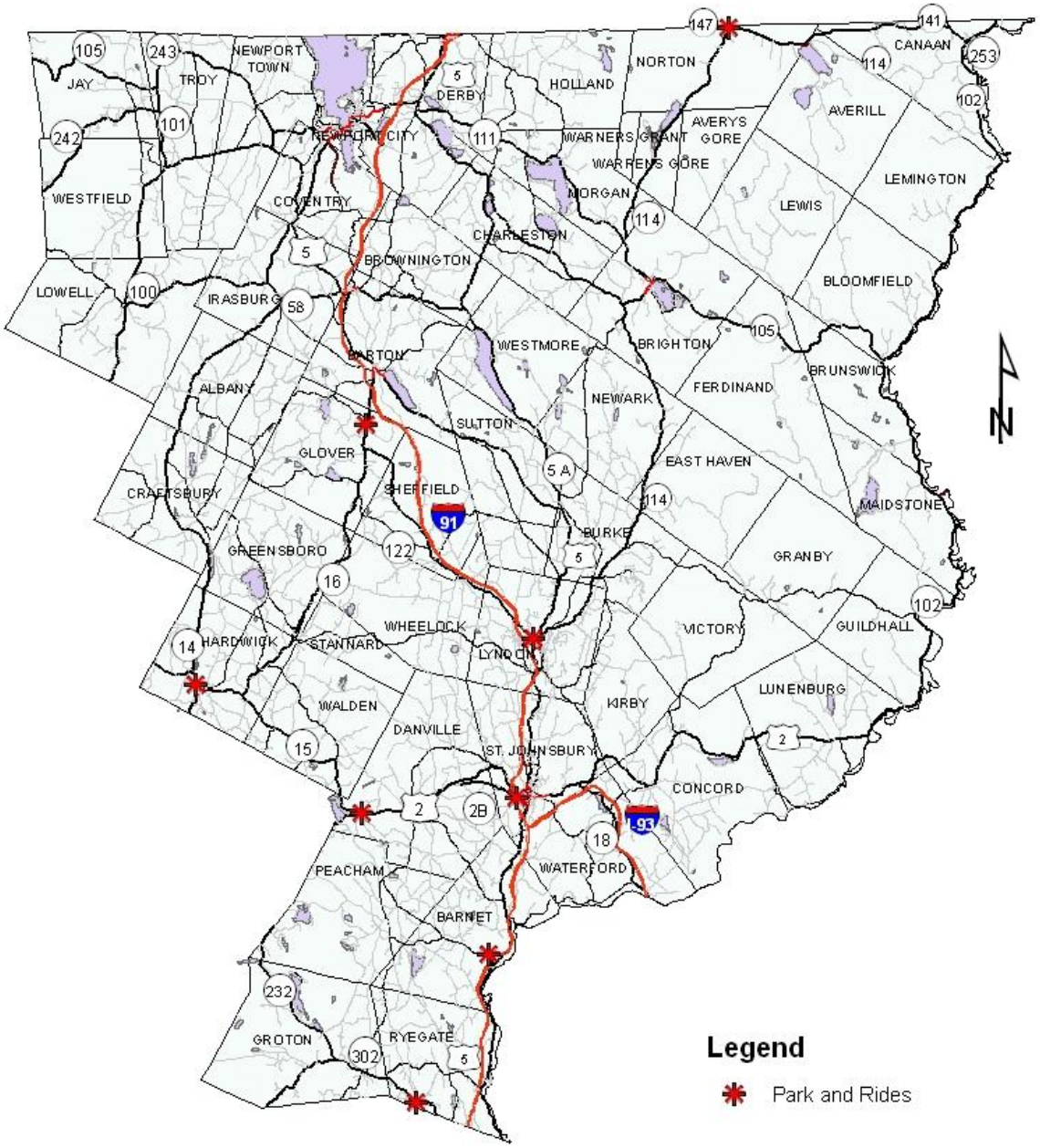
# Northeast Kingdom High Crash Locations 2006-2010



# Northeast Kingdom Pavement Condition 2009



# Northeast Kingdom Park and Ride Locations 2012




Source: VTrans Park and Ride Program

Cartography by NVDA

The remainder of the Transportation Plan will now focus regional transportation corridors. The corridor discussion will identify known issues and incorporate existing data relevant to that corridor, as well as provide specific goals and recommendations for corridor maintenance and improvement. For additional information on Agency of Transportation plans, programs, and resources please visit the Agency's website: http://www.aot.state.vt.us/ .

# *Section 4*
# *Regional Corridor Details/Recommendations*

## *US Route 2*
### Narrative
US Route 2 serves as a major east-west inter-regional connection between the New Hampshire Border at Guildhall continuing on to Maine to the East and to the New York Border in the west beyond the regions Borders which end in Danville. This highway is Functionally Classified as a Principal Arterial and as such should be managed to preserve a high level of mobility. Aside from its major role with commuters and freight movements within the southern part of the region and beyond, US Route 2 also serves as the main street for the many communities in Essex and Caledonia Counties through which it traverses. This dual purpose can create challenges for communities with regard to safety of non-motorized users as well as accommodating the need for freight to move through and within these communities without sacrificing the unique character of these historic population centers.

Also included in this corridor is VT Route 18 which runs from the intersection of US Route 2 in St Johnsbury and runs generally southerly through Waterford to the New Hampshire Border and the Connecticut River. VT Route 18 becomes NH Route 18 in New Hampshire and goes on to Littleton. VT Route 18 is classified functionally as a major collector and as such is should be managed with equal consideration to both mobility and land access.

This corridor has two somewhat dated studies.
US Rte 2 Corridor Multimodal Access Management Plan 1996
Study develops corridor concepts which better balance competing demands for access, necessitated by town centers, and mobility, generated by the increasing inter-regional significance of US Rte 2 for commerce and daily commuting. Study completed by Louis Berger & Associates.

US Rte 2 Corridor Study, St Johnsbury to Guildhall 2000
Study compares existing conditions to state standards and identifies problem areas and recommends ways of correcting them. Study was done as part of a tri state application to the National Corridor planning and Development Program as well as the Coordinated Border Infrastructure Program. Study completed by Vanasee,Hangen Burstlin, Inc.

Based on the fact of the dates of these studies and the increased importance of this corridor to the region and as a conduit for inter-regional connectivity this corridor should be the focus of renewed study in the next 5 years.

## Roadway Sufficiency Ratings

The majority of US Route 2 in the Northeast Kingdom has either a Good (39.2%) or Fair (17.9%) sufficiency rating. US Route 2 has a large percentage in Poor (25%) or Bad (17.9%) condition as well. The Bad sections are comprised of five sections. The first and second sections are located starting at the eastern terminus of US Route 2 at the Cabot town line and continue a combined 1.43 miles just past Woodward Rd in West Danville. The third is .75 miles starting west of the Danville School and continuing through the Village of Danville ending just west of Marty's First Stop. The Fourth and Fifth Section begins approximately at the US Route 2 and VT Route 18 Intersection and continues1.39 miles essentially to the end of the village of East St Johnsbury. There have been or are currently ongoing projects to address some of the worst sections in Danville so these numbers should improve as sufficiency ratings for this roadway is updated.

The majority of VT Route 18 is in Fair condition (57.1%) with the remainder (42.9%) in Good condition.

Completed in 2008, this sufficiency rating is based on the structural condition of the road (including pavement surface, foundation and ditches), safety (including road bed width, shoulder width and stopping sight distances) and service (including safe operating speed and passing sight distances).

## Bridge Sufficiency Ratings

The sufficiency rating for the majority of structures on US Route 2 are unknown. There are ratings for 10 structures over 20ft on Route 2. Seven are in Good condition and three are in Fair condition.

On VT Route 18 the majority of sufficiency ratings are unknown. There is one structure over 20 ft in good condition on VT route 18.

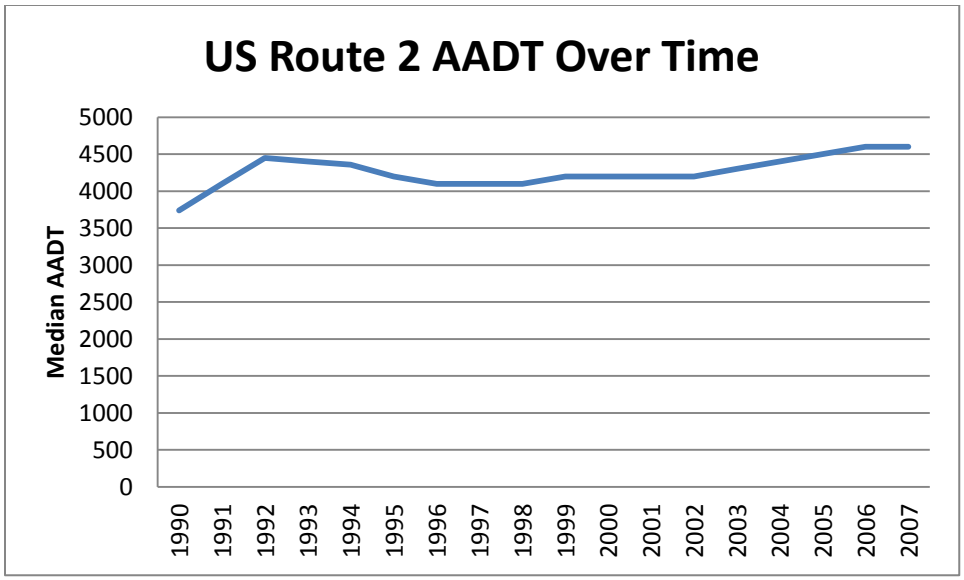
## High Crash Locations

High Crash Locations (HCL) are intersections and discrete sections of highway that have a critical number of accidents over time. This report utilizes accident data between the years 2006-2010 and is focused exclusively on roads that fall under the Federal Aid Highway System. US Route 2 has 17 HCL Sections and 1 HCL intersection.

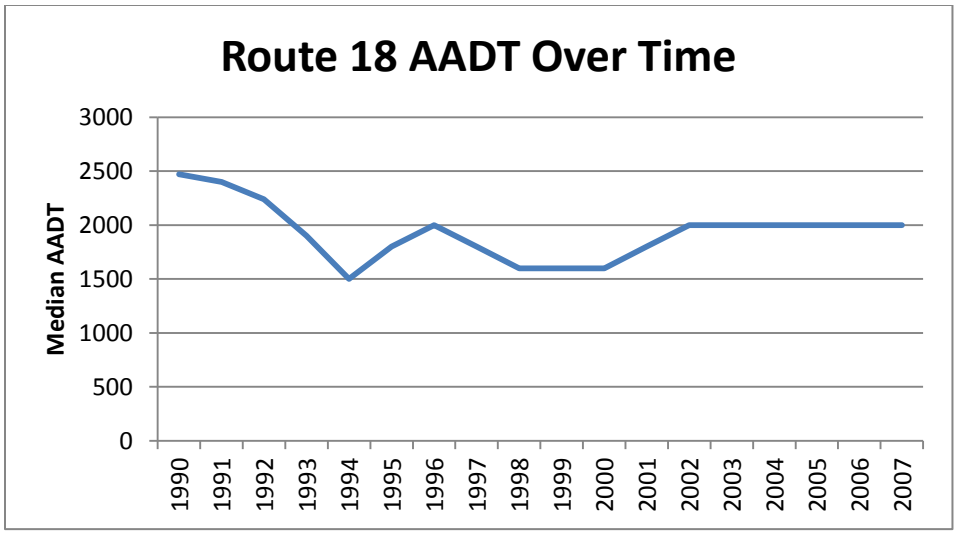
## Traffic Volumes

Traffic volume along US Route 2 has experienced relatively slow steady growth with minor decline in some segments. The highest traffic volumes on US Route 2 on the NEK are located within the St

Johnsbury Urban Compact Zone (UCZ) (8600 ADDT) on Portland St between Rail Road St and Caledonia St. The majority of Traffic Volumes for the non UCZ locations do not exceed 4400 AADT.




VT Route 18 has experienced significant growth on the section between US Route 2 and Interstate 93. In 1990 Traffic Volume between US Route 2 and the Waterford town line was 1430 AADT; in 2007 the ADDT was 3800 at the same location. The rest of this corridor has experienced relatively minor growth or remained flat.

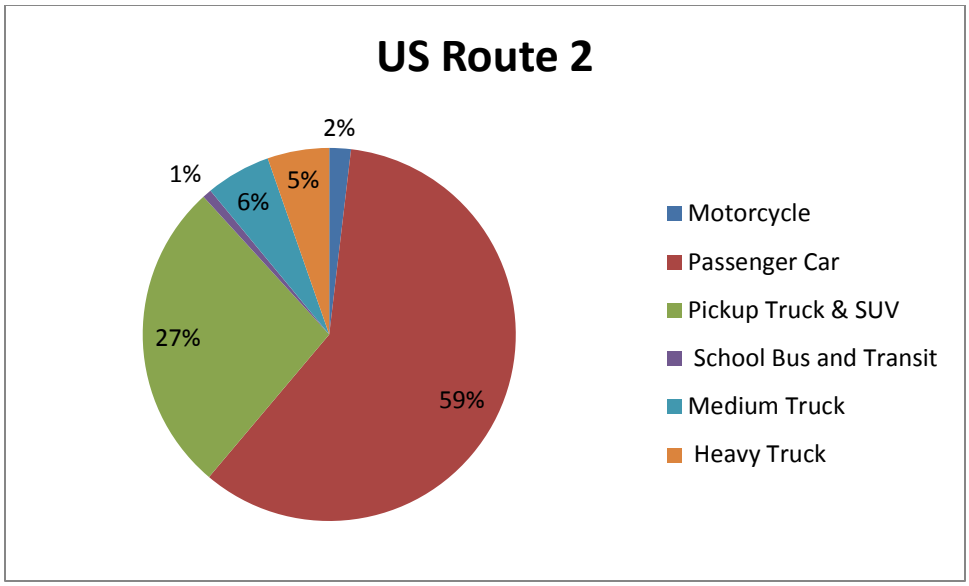



## Border Crossing

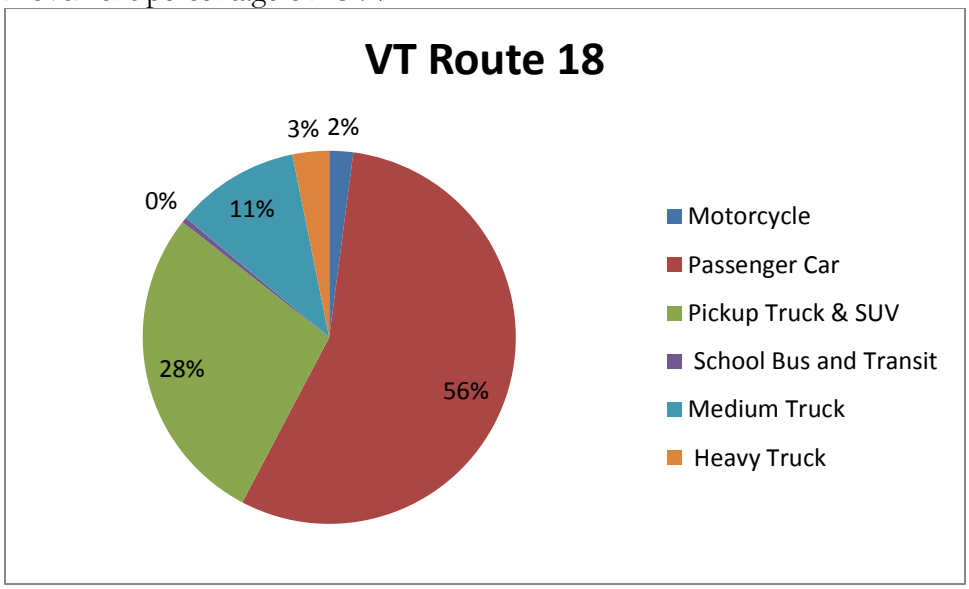
There are no international crossings on US Route 2 in the NEK region.

## Goods Movement

In 2010 there was significant variability along the corridor from 16.28% Truck traffic in Concord to 8.33% in Danville w of 2B. The breakdown of vehicle classification is provided below.




Vermont Route 18 has a similar split of vehicle types as US Route 2. It has an overall freight movement percentage of 13.9%.




## Local Public Transit

RCT and GMTA operate the US 2 Commuter. This service connects Montpelier to St. Johnsbury. There are four full-route round-trips per weekday (split between the two agencies) and one additional round-trip just between Montpelier and Marshfield, operated by GMTA. Aside from this fixed route RCT operates an on demand service.

## Airports
There are no airports along this corridor.

## Bike & Ped
There are several Villages that claim US Route 2 as their "Main St" or as a major corridor for their residents. This can lead to lead to perceived conflicts between users. There are significant pedestrian facilities in the Villages of Danville, St Johnsbury, and Concord. Outside of the core settlement areas pedestrians must use road shoulders which can be a challenge for both older and younger travelers.

The Lamoille Valley Rail Trail – a 96 mile trail on a rail banked state owned Right of Way that extends from St Johnsbury to Swanton. This trail roughly parallels US Route 2 between St. Johnsbury and West Danville. Total miles within the region are ~ 35.5 miles and ~15 miles between St Johnsbury and West Danville.

Three Rivers Bike Path – approximately 1.5 mile multi use path that begins at the terminus of the Lamoille Valley Rail Trail at Mt Vernon St. and runs easterly to S Main St.

## Railroad
Freight Rail Service is available through the Connecticut River subdivision of Washington County Railroad in St Johnsbury. There are 10 sidings on this line; 5 double ended passing sidings and 5 industrial sidings. There is also a limited multimodal transfer capability at the Rail yard in St Johnsbury. There is also an inactive rail line (Twin State Railroad) that could serve as an important East West connection for Northern New England.

## Intermodal
There are two Park and Rides along US Route 2. One is located in St Johnsbury at the intersection of US Route 2 and 2B. In St Johnsbury the town's Welcome Center functions as a multi modal transfer center. The Route 2 Commuter line begins and ends at this location.

## US Route 2 Corridor Goals and Objectives

**Goal A; Maintain Adequate Road and Bridge Capacity and Mobility**

1. Update Corridor Management /Access Management Plan for US Route 2.

**Goal B: Guarantee a Regional Transportation System that Facilitates Economic Development**

1. Work to facilitate greater efficiency in agricultural freight movements to include shipping and distribution nodal development.
2. Support Access Management and in Village development.
3. Support the widening of shoulders on all paving projects where feasible.

**Goal C: Ensure Good Quality of Life**

1. Support Municipalities, Businesses and Residents in the development of the Lamoille Valley Rail Trail.
2. Support the development and maintenance of pedestrian facilities within traditional villages.
3. Support the widening of shoulders on all paving projects where feasible.

**Goal** D: **Ensure Availability of Alternative Transportation Modes to Address Residents' Needs**

1. Support increased development of inter-city transit service.
2. Continue to support efforts to increase walking and bicycling for schools and workers within a 2 mile radius of traditional Village centers.
3. Encourage/facilitate the preservation of the Twin State Railroad Right of Way and pursue the restoration of this line for freight rail service.
4. Work to identify locations for electric vehicle charging stations.

# *US Route 5*

## *Narrative*

US Route 5 is an important north south connector that serves functionally as a major collector that connects to central and Southern Vermont through Newbury to the south and to the Canadian Border in Derby at Derby Line. This Route serves as a main street to many of the villages through which it travels. US Route 5 was at one time the principal route for the center of the region as well as the only major north south route to regions beyond our own. The legacy of this importance is that this route still serves as the major economic corridor for the towns through which it flows. In some towns this has created sprawl-like development that has now been recognized as problematic. US Route 5 is classified functionally as a major collector and as such is should be managed with equal consideration to both mobility and land access.

There are two US Route 5 focused studies commissioned by NVDA; one corridor wide and one more focused on the Newport - Derby Section of US Route 5. NVDA has also conducted a regional study of transportation infrastructure focused on development by the Burke Mountain Resort that looked in detail at US Route 5 from the US Route 5, VT Route 114 intersection to Exit 23 on Interstate 91.

US 5 Corridor/Access Management Plan (1997)

Study looks at land use and local planning and zoning documents of municipalities along the corridor and makes specific recommendations to address current and future conflicts. Major focus is on maintaining roadway capacity. Study completed by T.Y. Lin International.

US Rte 5 Newport City- Derby Center Corridor Study (2006)
Study looks out 20 year and includes build out analysis of corridor. There are recommendations for infrastructure improvements at specific locations along corridor as well as critiques of planning and zoning documents of municipalities. Study conducted by Resource Systems Group.

Burke Mountain Area Transportation Infrastructure Study (2007)
This study focuses on the current and future transportation infrastructure needs and land use regulation recommendations in Burke and Lyndon, as well as a review of related needs in the surrounding towns. The major transportation facilities in the study area include: I-91 Exit 23 and 24, US 5, VT 114, VT 122, Back Center Road, and Stevens Loop. This plan identifies transportation improvements for all modes and recommends changes to existing land use regulations to help accommodate future growth in a sensible manner. Study completed by Resource Systems Group.

## Roadway Sufficiency Ratings

The majority of US Route 5 in the NEK is in Poor condition (52%) with 27% in Fair condition, 16% in Good condition and 5% in Bad condition. There are two contiguous sections in Bad condition in the Town of Lyndon beginning at the St Johnsbury Town Line and continuing north1.32 miles to approximately York St.

The Majority of VT Route 5A is in Fair condition (60%) with the remaining 40% in Poor condition. The worst segments of VT Route 5a are located between Westmore and Charleston.

The entirety of VT Route 191 is in Good condition.

Completed in 2008, this sufficiency rating is based on the structural condition of the road (including pavement surface, foundation and ditches), safety (including road bed width, shoulder width and stopping sight distances) and service (including safe operating speed and passing sight distances).

## Bridge Sufficiency Ratings

There are 21 structures over 20 ft. on US Route 5. Fourteen of these are in good condition and seven are in Fair condition.

There are two structures on VT Route 5A with known sufficiency ratings. They are both in Good condition.

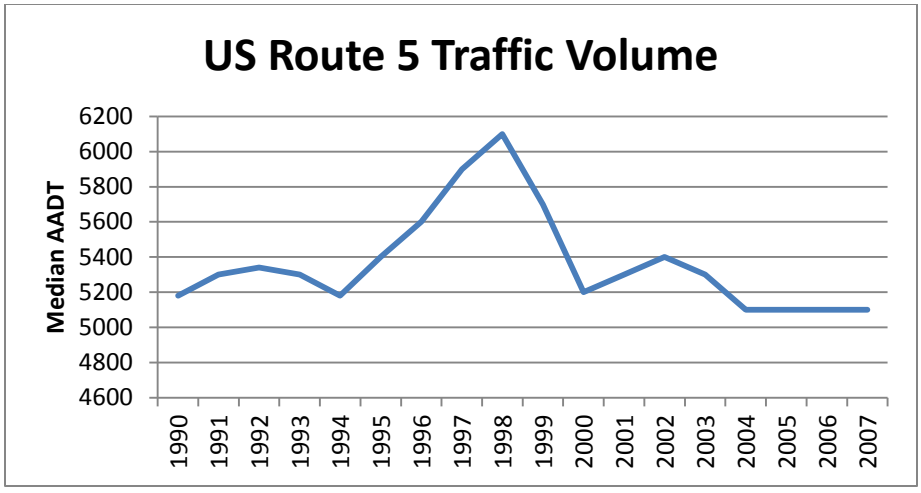
There are two structures in VT Route 191 with known sufficiency ratings. They are both in Good condition.

## High Crash Locations

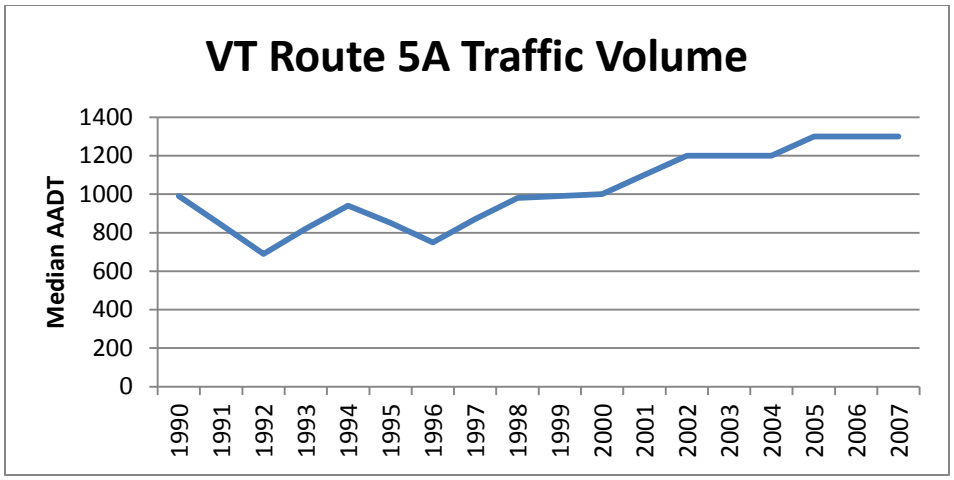
High Crash Locations (HCL) are intersections and discrete sections of highway that have a critical number of accidents over time. This report utilizes accident data between the years 2006-2010 and is focused exclusively on roads that fall under the Federal Aid Highway System. US Route 5 has 14 HCL and 1 HCL Intersection.

## Traffic Volumes

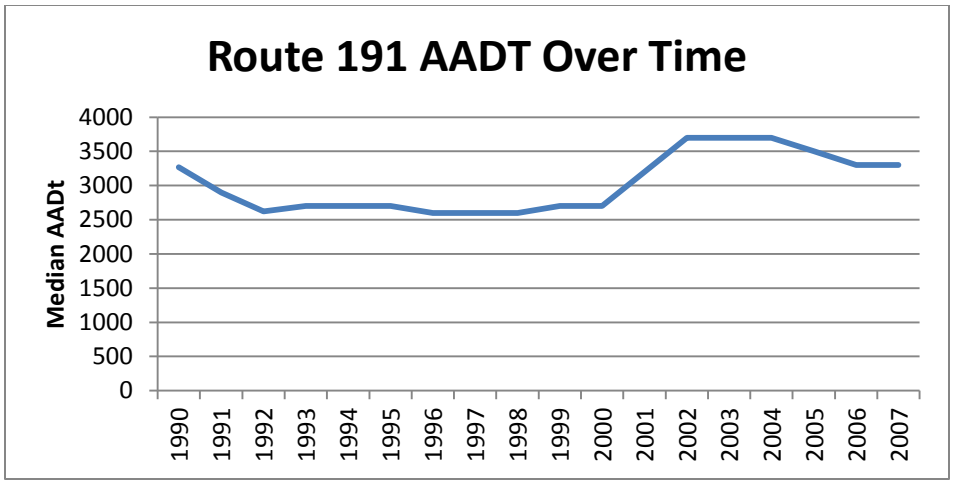
Traffic Volumes on US Route 5 have generally remained flat or have declined over the period between 1990 and 2007. There are exceptions but generally this trend holds and mirrors the trend elsewhere on the National Highway system in Vermont. There is also a spit in the data between very distinct sections of relatively high traffic volumes and a lower volume of mostly local traffic on the rest of this corridor. The focus of high volume traffic segments are located in the Newport City-Derby area and the St Johnsbury and Lyndon Area. The highest Traffic Volumes are between Coventry St and the Long Bridge in Newport City (16000 AADT), Broad St between Back Center Rd and Red Village Rd in Lyndon (14000 AADT), and Railroad St between Portland and Concord Ave in St. Johnsbury (8600 AADT). The majority of the remainder outside these "urban" boundaries does not exceed 4000 AADT.




Traffic Volume along the VT Route 5A corridor has remained relatively flat over the period between 1990 and 2007. The highest traffic volume on VT route 5A is in the village of West Burke between US Route 5 and Burke Hollow Rd (2200).



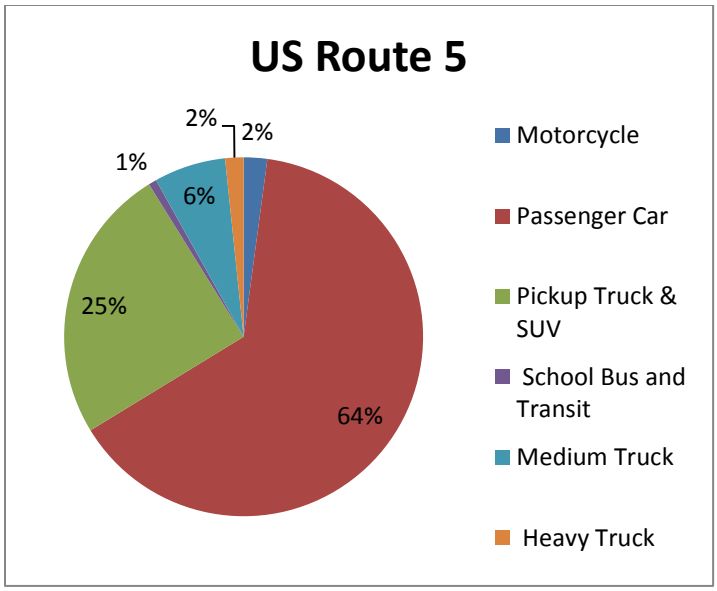

Traffic Volume along the Route 191 corridor has remained relatively flat or grown slightly over the period between the 1990 and 2007. The highest traffic volume on VT Route 191 is between the Derby town line and Western Ave (3300 AADT). Traffic Volume between Western Ave and US Route 5 is 1100 AADT.

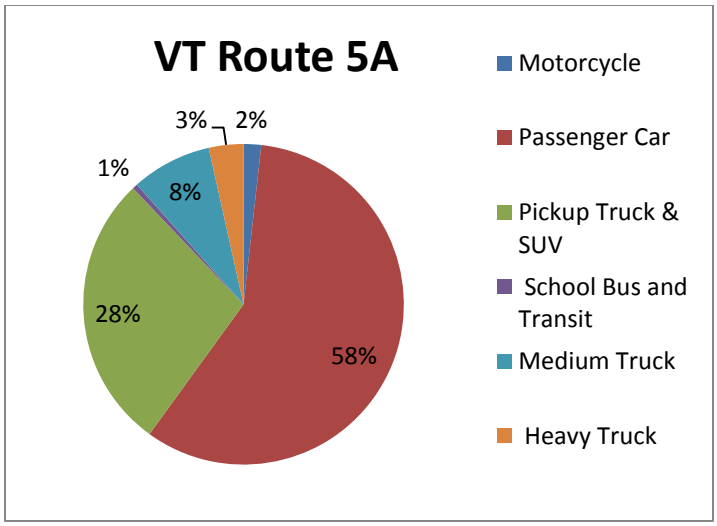



## Border Crossing

US Route 5 provides access to the very busy border crossing in the village of Derby Line at the northern terminus of US Route 5. This crossing is within the village and has significant traffic impacts for local traffic and those just passing through. US Route 5 also provides indirect access to the Interstate 91 Border crossing at Derby Line which is a major crossing point.

## Goods Movement




There was no classification data available for VT Route 191.

## Local Public Transit

There are two deviated fixed route lines on US Route 5. They are the Jay Lyn Shuttle between St Johnsbury and Lyndonville and the Highlander between Newport City and Derby Line.

## Airports

US Route 5 services both the Caledonia County State Airport and the Newport State Airport in Coventry. Neither facility is directly located on US Route 5 but they are the closest major route to each. Detailed information on the regions airports is available from the State of Vermont http://aviation.vermont.gov/airports.

## Bike & Ped

The Three Rivers Bike Path is a 1.5 mile multi-use path located in the Town of St. Johnsbury on the former Lamoille Valley Railroad. It is the beginning/terminus of the Lamoille Valley Rail Trail and was completed in 2012. It provides a multi-use path that is available for village residents as well serving as an added attraction for visitors. The Town of St. Johnsbury is continuing to develop an extension of the three Rivers Bike Path.

The Beebee Spur Bike Path is a 4-mile rail-trail running from Newport City towards the Canadian border. It follows Lake Memphremagog for most of the way, offering outstanding views of the water, as well as the Green Mountains. Although fairly level, mountain bikes are recommended due to the trail's packed gravel surface.

## Railroad

Freight Rail Service is available through the Connecticut River subdivision of Washington County Railroad which closely parallels US Route 5 for its entire length. There are 10 sidings on this line; 5 double ended passing sidings and 5 industrial sidings. There is also a limited multi-modal transfer capability at the Rail yard in St. Johnsbury.

## Intermodal

There is a multi-modal transfer center located at the former St. Johnsbury Train station, now the St. Johnsbury Welcome Center. It currently serves as the start/terminus of the Route 2 commuter line. This is a deviated fixed route that is operated jointly between RCT and GMTA. There is also the Jay Lyn shuttle that services a deviated fixed route between St. Johnsbury and Lyndon that operates out of the Welcome Center. There is an informal Park and Ride located at the Interstate 91 exit 23 northbound off ramp. There is an informal Park and Ride located on the Village of Orleans at the intersection of US Route 5 and VT Route 58.

## US Route 5 Corridor Goals and Objectives

**Goal A: Maintain Adequate Road and Bridge Capacity and Mobility**

1. Update US Route 5 Corridor Management Plan to include the latest development plans focused on Jay Peak and Burke Mountain and Newport City.

2. Implement recommendations of Burke Mountain Area Transportation Infrastructure Study and US Rte 5 Newport City- Derby Center Corridor Study.
3. Support the Broad St. Project in Lyndon/Lyndonville.

**Goal B: Guarantee a Regional Transportation System that Facilitates Economic Development**

1. Work to facilitate greater efficiency in agricultural freight movements to include shipping and distribution nodal development.
2. Encourage the development of Freight Rail transportation to fully utilize existing sidings and the development on new sidings.
3. Support upgrading of Rail infrastructure to accommodate 286,000 lb. loading and double stack cars.

**Goal C: Ensure Good Quality of Life**

1. Support the development and maintenance of pedestrian facilities.
2. Facilitate increased awareness of the health benefits of both walking and bicycling as well as the legal rights of all users to access transportation corridors.
3. Support the widening of shoulders on all paving projects where feasible.

**Goal D: Ensure Availability of Alternative Transportation Modes to Address Residents' Needs**

1. Encourage high density mixed-use development within traditional village/city limits.
2. Work to identify locations for electric vehicle charging stations.

# *VT Route 15*

## Narrative

VT Route 15 serves as one of the few East –West Highways in Northern Vermont and as such is of significant importance in both economic and quality of life terms. This Highway begins in the region in West Danville at the intersection of US Route 2 at Joe's Pond. It generally travels in a westerly direction and leaves the region at the Hardwick/Wolcott Town Line. VT Route 15 is a Minor Arterial Highway and thus should be managed to preserve a higher level of mobility. Regardless of this designation, VT Route 15 provides access to numerous farms and agricultural enterprises and thus sees frequent usage by various agricultural vehicles throughout the fair weather. This Highway

serves as the Main St. for the town of Hardwick and as such needs special consideration at this location. It also roughly parallels the Lamoille Valley Rail Trail between West Danville and the Hardwick/ Wolcott Town Line.

There are two studies looking at VT Route 15 completed for NVDA in the recent past. One is a corridor study that evaluated capacity and infrastructure needs. The second study looked specifically at the section of VT Route 15 in the Village of Hardwick. This study looks at capacity, access management and infrastructure needs.

VT Rte 15 Corridor Analysis Study Hardwick to West Danville 1998
Study looks at current and projected transportation deficiencies. Recommends improvements and provides a schedule for the improvements. Study completed by North Woods Engineering.

Hardwick Village VT Route 15 Transportation Assessment 2009
This interim report evaluates and summarizes the existing transportation, infrastructure, and land use characteristics along the VT 15 study corridor and present preliminary recommendations for improvement.

VT Rte 15 &14 Access Management Plan Hardwick to Danville 1998
Study looks at VT Rte 15 and VT Rte 14 around Hardwick Village to identify problems regarding access and develops solutions. Main focus of study is to maintain roadway capacity. Specific changes to current access points, local zoning and regulatory processes are recommended. Study completed by North Woods Engineering.

## Roadway Sufficiency Ratings

The majority of VT Route 15 (83.3%) is in Fair condition with 16.7%in Poor condition. The Poor segment correlates to the entire 7.16 mile length in the town of Walden.

Completed in 2008, this sufficiency rating is based on the structural condition of the road (including pavement surface, foundation and ditches), safety (including road bed width, shoulder width and stopping sight distances) and service (including safe operating speed and passing sight distances).

## Bridge Sufficiency Ratings

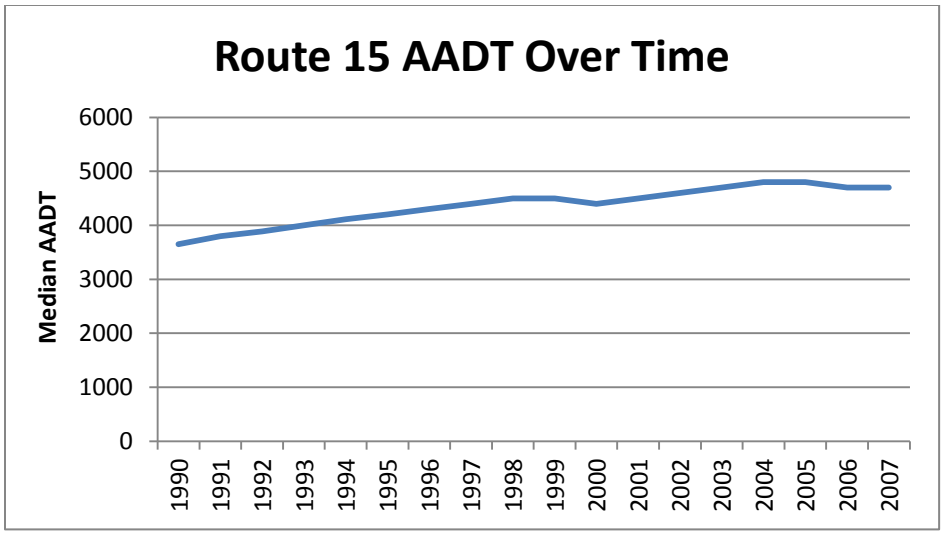
The vast majority of structures on VT Route 15 are of unknown sufficiency. There is one structure in good condition, one in fair, and one in bad condition. This structure, over Joe's Brook Rd, is slated to be replaced in 2015.

## High Crash Locations

High Crash Locations (HCL) are intersections and discrete sections of highway that have a critical number of accidents over time. This report utilizes accident data between the years 2006-2010 and is focused exclusively on roads that fall under the Federal Aid Highway System. There are two HCL intersections on VT Route 15; one at the intersection of VT Routes 15 and 16, and one at the intersection of VT Routes 15 and 14. There are 6 HCL sections on VT Route 15, One HCL Section on VT Route 16, One HCL Section on VT Route 1.

## Traffic Volumes

Traffic volumes have grown relatively steadily over time from 3650 vehicles per day in 1990 to 4700 vehicles per day in 2007. The highest volumes on VT Route 15 are concentrated in the Hardwick Village (Wolcott St/Main St) area with a count in 2010 of 6100 vehicles per day near Lamoille Valley Ford and 8600 vehicles per day just west of Granite St. Outside of Hardwick Village traffic volumes do not exceed 3500 vehicles per day.

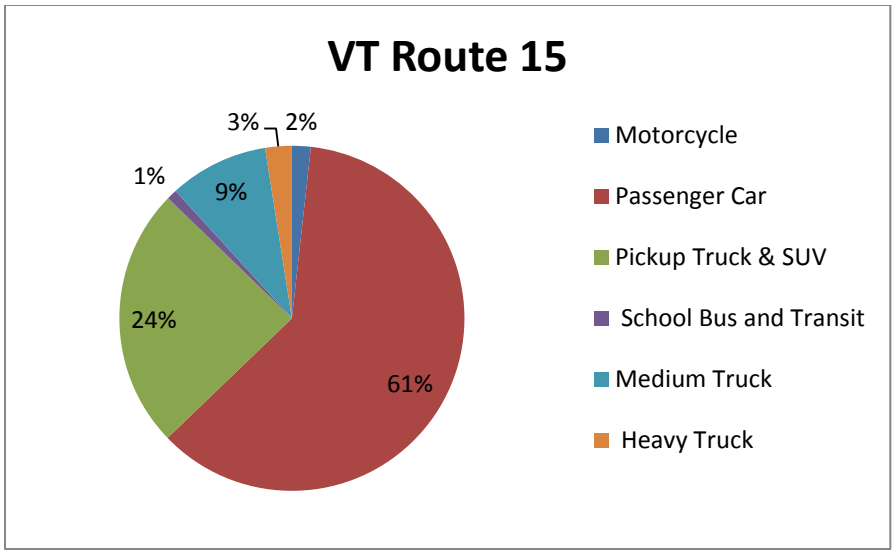



## Border Crossing

There are no border crossings on this corridor.

## Goods Movement

Trucks are the primary means of goods distribution along VT Route 15 and in Caledonia County. Currently freight movements make up 11.8% of total traffic volume. The statewide average for a road of this class is ~7.3%. By far the largest share of traffic on VT Route 15 is made up of passenger cars (61%) and pickup trucks and SUV's (24%).




## Local Public Transit

There is no fixed route transit along the VT Route 15 corridor. RCT does operate the Route 2 commuter with a stop in West Danville at the terminus of VT Route 15. There is potential for a fixed transit route between Hardwick and Montpelier on VT Route 14. There has been discussion by GMTA to operate such a route coupled with strong community support.

## Airports

There no airports along the VT Route 15 Corridor.

## Bike & Ped

The Lamoille Valley Rail Trail – a 96-mile trail on a rail banked state-owned Right of Way that extends from St. Johnsbury to Swanton. This trail roughly parallels VT Route 15 between West Danville and the Hardwick/Wolcott Town Line.

## Railroad

There are no active rail lines within the Route 15 corridor.

## Intermodal

There are two formal and one informal Park and Ride facilities along the VT Route 15 corridor. A state-owned park and ride at the junction US Route 2 and VT Route 15 is the location of a regular stop for the Route 2 Commuter operated jointly by RCT and GMTA. There is a state funded, municipal park and ride at the Hardwick fire station. There is also an informal lot that is located on state property at the junction of VT Routes 15 and 16.

## VT Route 15 Corridor Goals and Objectives

**Goal A: Maintain Adequate Road and Bridge Capacity and Mobility**

1. Support the rehabilitation of Wolcott St in Hardwick.
2. Support the rehabilitation of VT Route 15 in Walden.
3. Work to address HCL's intersections and sections.

**Goal B: Guarantee a Regional Transportation System that Facilitates Economic Development**

1. Work to facilitate greater efficiency in agricultural freight movements to include shipping and distribution nodal development.

**Goal C: Ensure Good Quality of Life**

1. Support Municipalities, Businesses and Residents in the development of the Lamoille Valley Rail Trail.
2. Support the widening of shoulders on all paving projects where feasible.

**Goal** D: **Ensure Availability of Alternative Transportation Modes to Address Residents' Needs**

1. Support the development of new inter-regional transit service between Hardwick and Montpelier.
2. Support the formalization of new park and ride facilities which would ideally be connected by coordinated transit service.
3. Work to identify locations for electric vehicle charging stations.

# *VT Route 14/VT Route 16/ VT Route 122*

## *Narrative*

VT Route 14 is a Major Collector and serves as an inter-regional corridor between Northern Orleans County and Central Vermont and on to New Hampshire at White River Junction. It provides a high level of mobility for the rural residents of this part of our region and conveys significant amount of commuters as well as freight movements.

VT Route 16 is a Minor Arterial and serves as an inter-regional connector between southern Orleans and Caledonia Counties and to Central Vermont and beyond. It should be managed to maintain to preserve a relatively high level of mobility.

VT Route 122 is a Major Collector and serves as an intra-regional corridor. It is primarily used by residents between southern Orleans and northern Caledonia counties. It should be managed for a balance of mobility and land access.

All of these state highways are relatively similar in their profile of land use and function.

VT Rte 15 &14 Access Management Plan Hardwick to Danville 1998
Study looks at VT Rte 15 and VT Rte 14 around Hardwick Village to identify problems regarding access and develops solutions. Main focus of study is to maintain roadway capacity. Specific changes to current access points, local zoning and regulatory processes are recommended. Study completed by North Woods Engineering.

VT Rte 14 & 100 Corridor Study 1997
Study looks at both VT Rte 100 & 14, and VT Rte 58 from Irasburg to Lowell and makes recommendations for improvements. Includes an addendum with all technical data used to derive study findings. Study completed by Resource Systems Group.

## Roadway Sufficiency Ratings

VT Route 14 is overwhelmingly (92%) in Fair condition, with 8% in Poor condition. VT Route 16 is largely in Fair condition (62.5%) with 25% in Good condition and 12.5% in Poor condition. VT Route 122 is roughly evenly split between Fair (45.4%) and Poor (36.4%) condition with the remainder (18%) in Bad condition.

Completed in 2008, this sufficiency rating is based on the structural condition of the road (including pavement surface, foundation and ditches), safety (including road bed width, shoulder width and stopping sight distances) and service (including safe operating speed and passing sight distances).

## Bridge Sufficiency Ratings

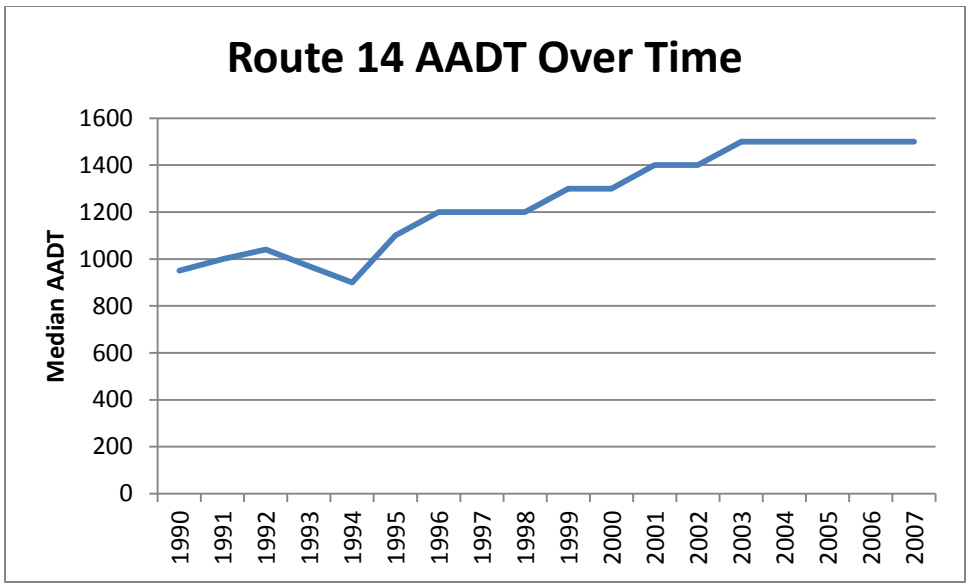
The vast majority of sufficiency ratings for structures on VT Routes 14 and 16 are unknown. There are 3 structures on VT Route 14 with a Good rating and 2 with a Fair rating. On VT Route 16 there are 2 structures with a Good rating and 4 structures with a Poor rating.

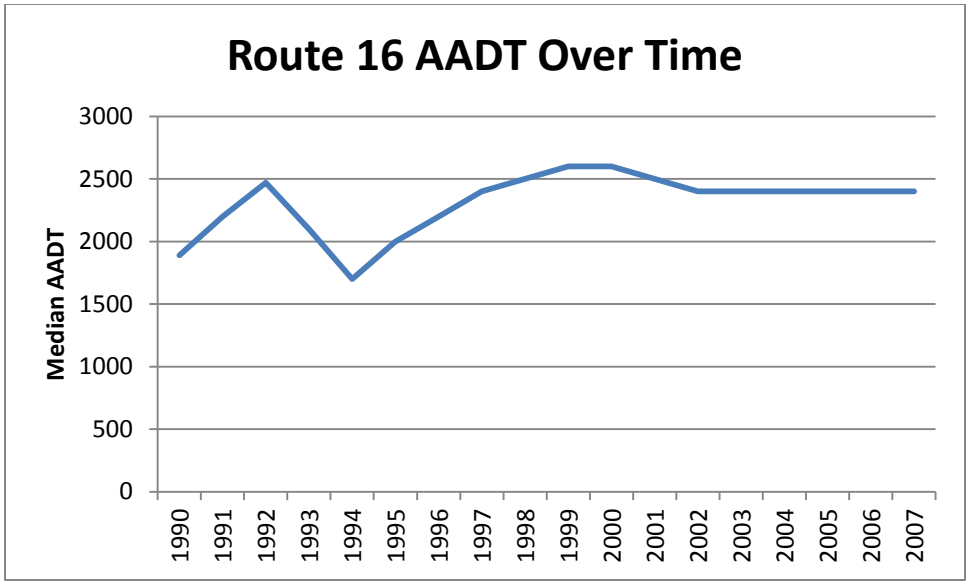
## High Crash Locations

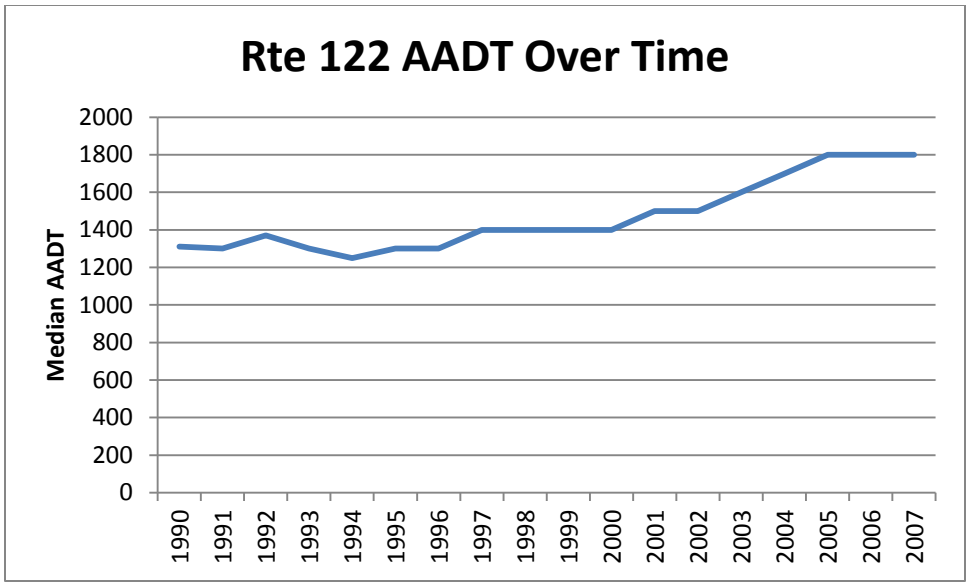
High Crash Locations (HCL) are intersections and discrete sections of highway that have a critical number of accidents over time. This report utilizes accident data between the years 2006-2010 and is focused exclusively on roads that fall under the Federal Aid Highway System. There are two HCL intersections on VT Route 15; one at the intersection of VT Routes 15 and 16 and one at the intersection of VT Routes 15 and 14. There are 6 HCL sections on VT Route 15, One HCL Section on VT Route 16, One HCL Section on VT Route 14, and one HCL section on VT Route 122.

## Traffic Volumes

VT Routes 14, 16 and 122 has seen a significant increase while much of the regions roads have either remained flat or decreased in volume.



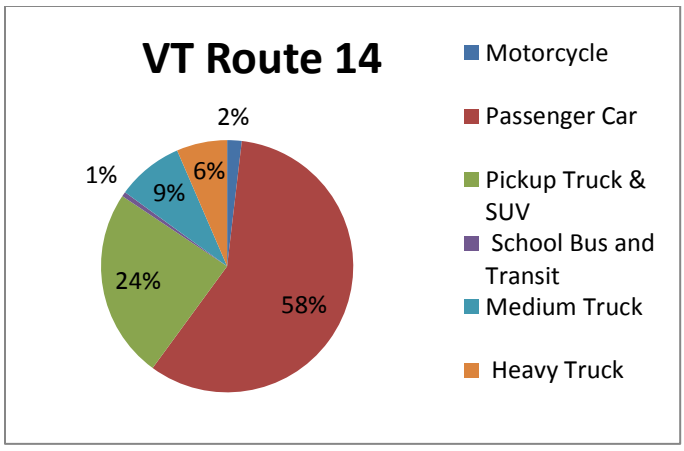


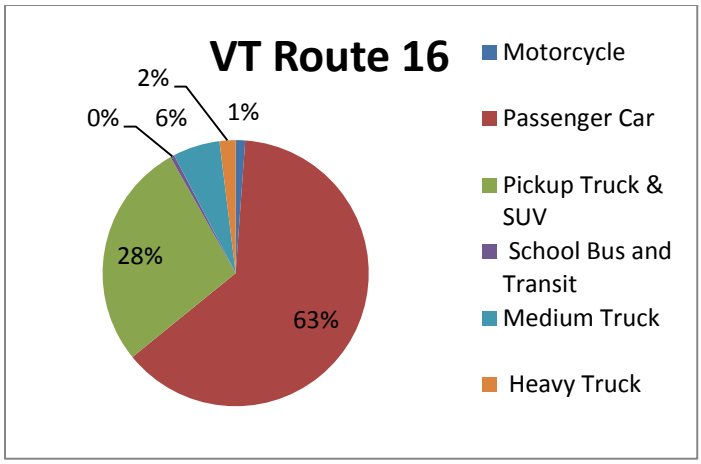

## Border Crossing

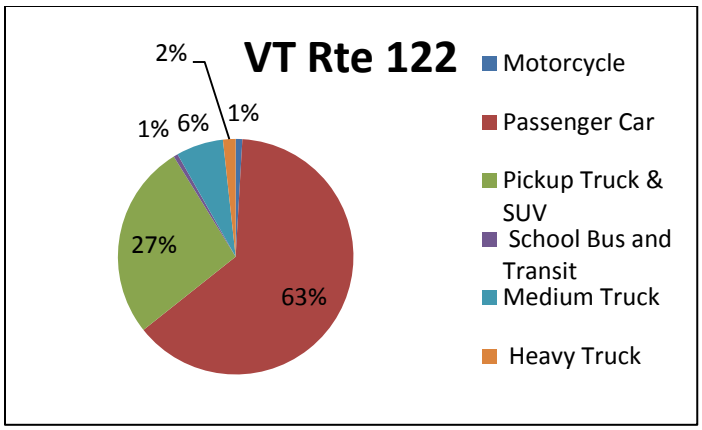
There are no international crossings on VT Routes 14, 16, or 122 in the NEK.

## Goods Movement

Significant truck traffic on VT Route 14 ranging from 19.01% in Coventry, and 9.26% in Albany are significantly higher than the state averages for this Class of State Highway at 7.34%.






### Local Public Transit
There are no deviated fixed routes on these state highways.

## Airports
VT Route 14 joins US Route 5 in Coventry and passes near the Newport State Airport.

## Bike & Ped
The Lamoille Valley Rail Trail crosses VT Route 16 in Hardwick between the villages of Greensboro Bend and East Hardwick.

## Railroad
There are no active Railroads along these state highways.

## Intermodal
There is an informal Park and Ride at the intersection of VT Routes 15 and 16.

## VT Route 14/16/122 Corridor Goals and Objectives

**Goal A: Maintain Adequate Road and Bridge Capacity and Mobility**

1. Support the rehabilitation/reconstruction of VT Route 122.

**Goal B: Guarantee a Regional Transportation System that Facilitates Economic Development**

1. Work to facilitate greater efficiency in agricultural freight movements to include shipping and distribution nodal development.

**Goal C: Ensure Good Quality of Life**

1. Support the widening of shoulders on all paving projects where feasible.

**Goal D: Ensure Availability of Alternative Transportation Modes to Address Residents' Needs**

1. Support the formalization of park and ride at VT Route 15/14 intersection.
2. Identify new locations for Park and Rides.
3. Work to identify locations for electric vehicle charging stations.

# *VT Route 100*

## *Narrative*

VT Route 100 serves as a Minor Arterial highway in the region and functions as an inter-regional connection between Newport City and Central Vermont. VT Route 100 runs in its full extent from the Massachusetts and Canadian Borders. In the Northeast Kingdom VT route 100 serves commuters as well as conveys skiers from Chittenden County to Jay Peak. It also supports numerous agricultural enterprises.

VT Route 58 is a Major Collector that serves mainly to provide land access to local residents and farms.

There are two studies looking at VT Route 100 and one looking at VT Route 58.

VT Rte 14 & 100 Corridor Study 1997

Study looks at both VT Rte 100 & 14, and VT Rte 58 from Irasburg to Lowell and makes recommendations for improvements. Includes an addendum with all technical data used to derive study findings. Study completed by Resource Systems Group.

VT Rte 100 Lowell and Westfield Village Pedestrian Safety Study 2012

This study evaluates existing conditions on VT Rte 100 within the villages of Lowell and Westfield to identify the safety of pedestrian and bicyclist movements and to recommend improvements for those modes.

VT Rte 58 Access Management Plan Barton to Irasburg 1998
Study looks at existing conditions as well as municipal planning and zoning documents to attempt to maintain roadway mobility as well as address specific problem issues. Study completed by North Woods Engineering.

## Roadway Sufficiency Ratings

VT Route 100 is overwhelmingly in Fair condition (85.7%) with the remainder (14.3%) in Poor condition.

Completed in 2008, this sufficiency rating is based on the structural condition of the road (including pavement surface, foundation and ditches), safety (including road bed width, shoulder width and stopping sight distances) and service (including safe operating speed and passing sight distances).

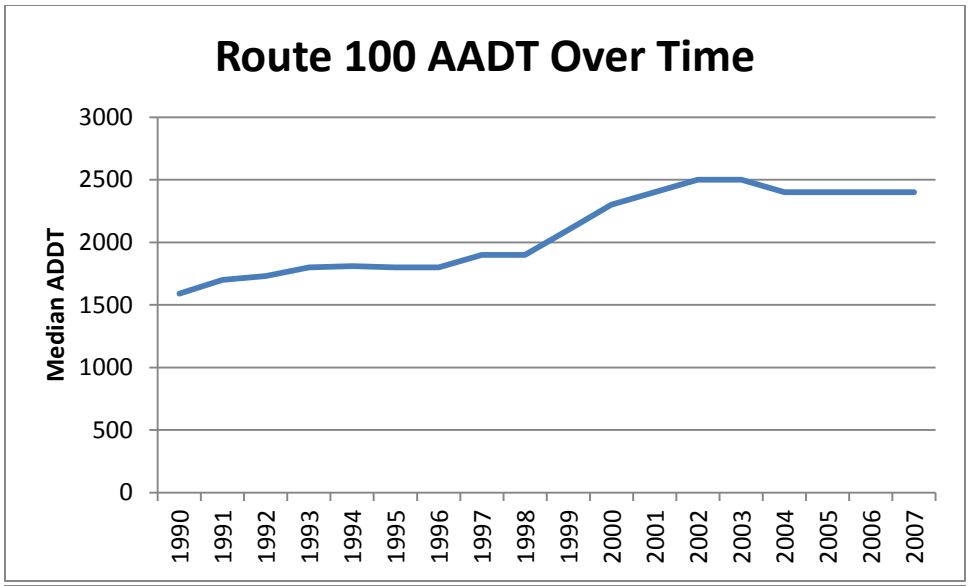
## Bridge Sufficiency Ratings

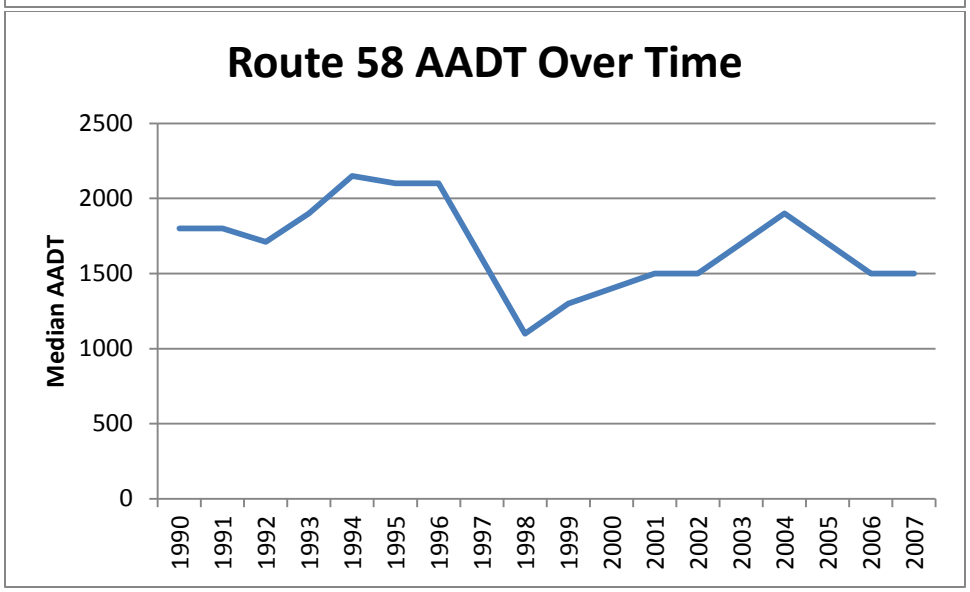
The majority of sufficiency ratings for structures on VT Route 100 are unknown. There are seven structures over 20 ft. in length. Four are in Good Condition, two are in Fair condition and one is in Poor condition.

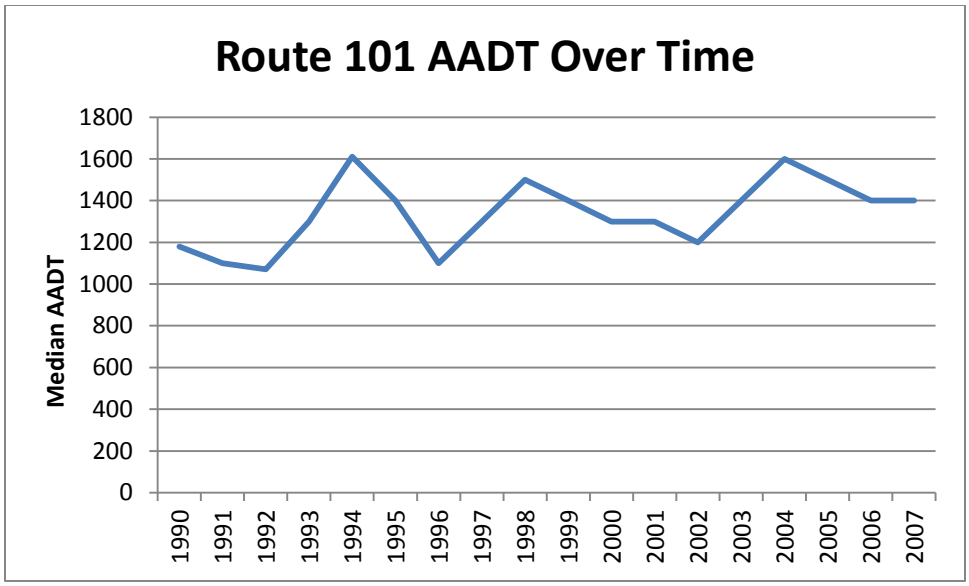
## High Crash Locations

High Crash Locations (HCL) are intersections and discrete sections of highway that have a critical number of accidents over time. This report utilizes accident data between the years 2006-2010 and is focused exclusively on roads that fall under the Federal Aid Highway System. There are four HCL sections on VT Route 100 - two in Lowell and two in Troy.

## Traffic Volumes



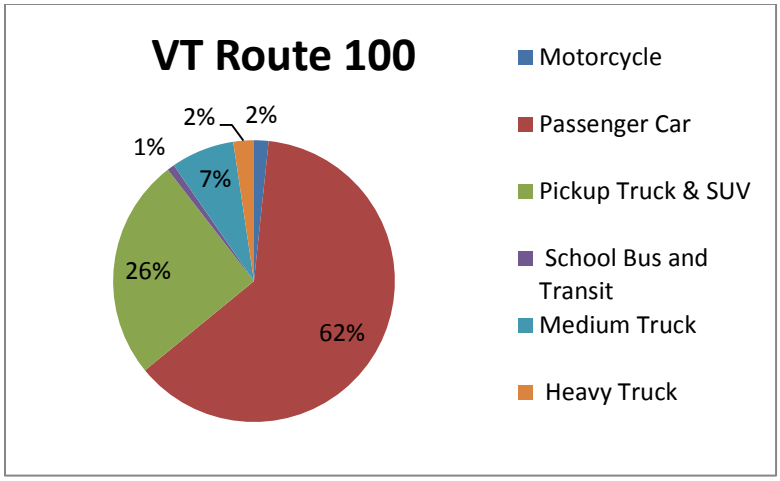


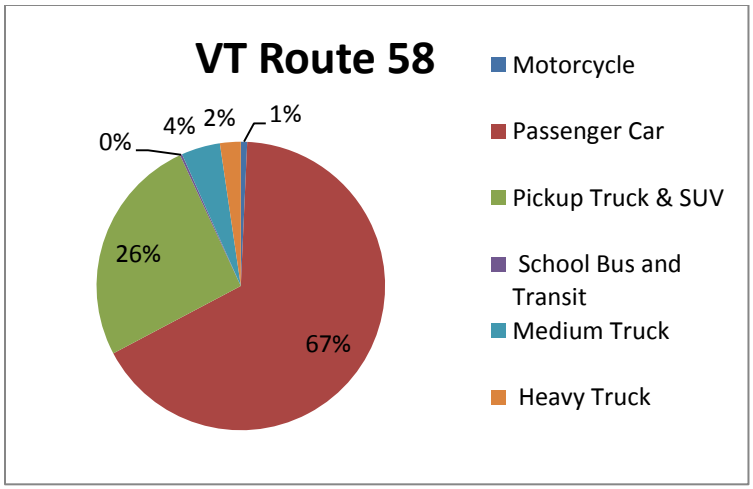

## Border Crossing

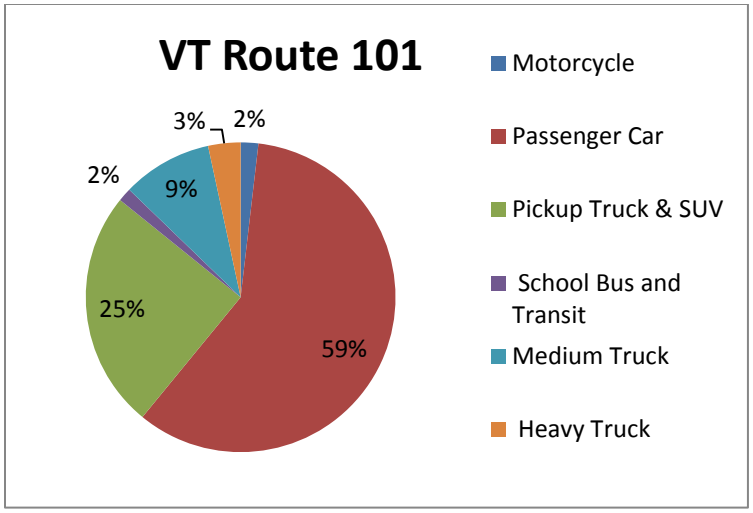
There are no international crossings on VT Route 100 in the NEK.

## Goods Movement

All freight movements in the VT Route 100 corridor are made with trucks. The vast majority of traffic on the three highways in this corridor is made up of Passenger Cars, Pickup Trucks and SUV's( Route 100 (88%), Route 58 (93%), and Route 101(84%)).






## Local Public Transit

There are no deviated fixed route transit lines on the VT Route 100 Corridor.

## Airports

There are no airports on the VT Route 100 Corridor.

## Bike & Ped

There are no dedicated Bike and Pedestrian facilities on VT Route 100.

## Railroad

There are no active Railroads on the VT Route 100 Corridor.

## Intermodal

There are no Intermodal Facilities on the VT Route 100 Corridor.

## VT Route 100 Corridor Goals and Objectives

**Goal A: Maintain Adequate Road and Bridge Capacity and Mobility**

1. Support the rehabilitation of VT Route 100.
2. Work to address safety issues around HCL sections.

**Goal B: Guarantee a Regional Transportation System that Facilitates Economic Development**

1. Work to facilitate greater efficiency in agricultural freight movements to include shipping a distribution nodal development.

**Goal C: Ensure Good Quality of Life**

1. Support the implementation of recommendations of Pedestrian Safety Study for Villages of Lowell and Westfield.
2. Support the widening of shoulders on all paving projects where feasible.

**Goal D: Ensure Availability of Alternative Transportation Modes to Address Residents' Needs**

1. Identify new Park and Ride locations.

# *VT Route 114*

## *Narrative*

VT Route 114 is a Major Collector that serves as the major corridor to Northern Essex County form the south through access to Interstate 91 in Lyndon. It runs from Lyndon to the New Hampshire Border in Canaan. This route traverses some of the most rural areas of the Northeast Kingdom. VT Route 114 intersects with the St Lawrence and Atlantic Railroad in Island Pond which has an active multi modal transfer facility and generates a significant amount of truck traffic. There is also a significant amount of through truck traffic to and from Quebec. Included in this overall corridor are VT Routes 147, 141, 253, and 102. These are all Major Collectors. VT Routes 147 in Norton and 141 in Canaan are border roads and continue as those route numbers in Quebec.

There is a dated Corridor study for VT Route 114 that was commissioned by NVDA in 1998.

VT Rte 114 Corridor Analysis Study Lyndon to Canaan1998
Study provides a detailed look at the corridor and provides a series of improvements. Study completed by North Woods Engineering.

## Roadway Sufficiency Ratings

VT Route 114 is overwhelmingly in Fair (61%) and Poor (33%) condition with the remainder (6%) in Bad Condition. The Bad section is essentially in the village of East Burke starting just south of the village and running all the through the village to approximately the access for the village park.

VT 102 is overwhelmingly in Fair Condition, with 13.3% in Poor Condition, and 6.7% in Good Condition.

VT Route 253 is 100% in Fair Condition.

VT Route141 is 100% 1n Good Condition.

VT Route 147 is 100% in Fair Condition.

Completed in 2008, this sufficiency rating is based on the structural condition of the road (including pavement surface, foundation and ditches), safety (including road bed width, shoulder width and stopping sight distances) and service (including safe operating speed and passing sight distances).

## Bridge Sufficiency Ratings

There are 13 structures with known sufficiency ratings on VT Route 114. Of those 9* are in Good condition, 4 are in Fair condition and 1 is in Poor condition. There is one functionally deficient structure, Bridge 13 in the Village of East Burke.

VT 102 - 9 structures, 8 in Good Condition, and 1 in Poor Condition. The structure in Poor condition, Bridge #6 is located in Brunswick over Paul Stream.

VT 253 - no structures with Sufficiency Data.

VT 141- no structures with Sufficiency Data.

VT 147 - no structures with Sufficiency Data.

*(at the updating of this plan, a full rehabilitation of Bridge 18 on VT Route 114 was being completed. It is anticipated that this will push Bridge 18 into the good category).

## High Crash Locations

There are no High Crash Locations on VT Route 114 or the associated corridors.

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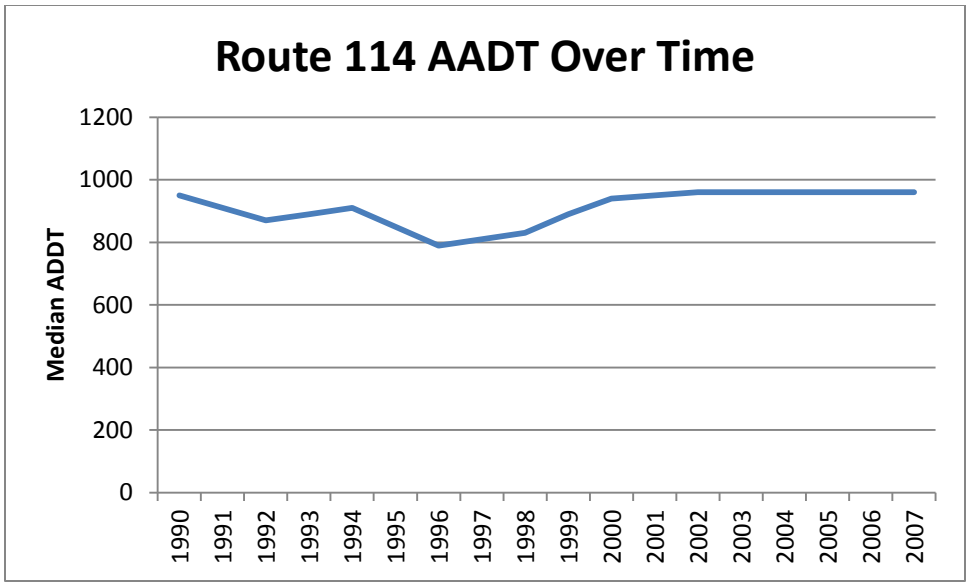
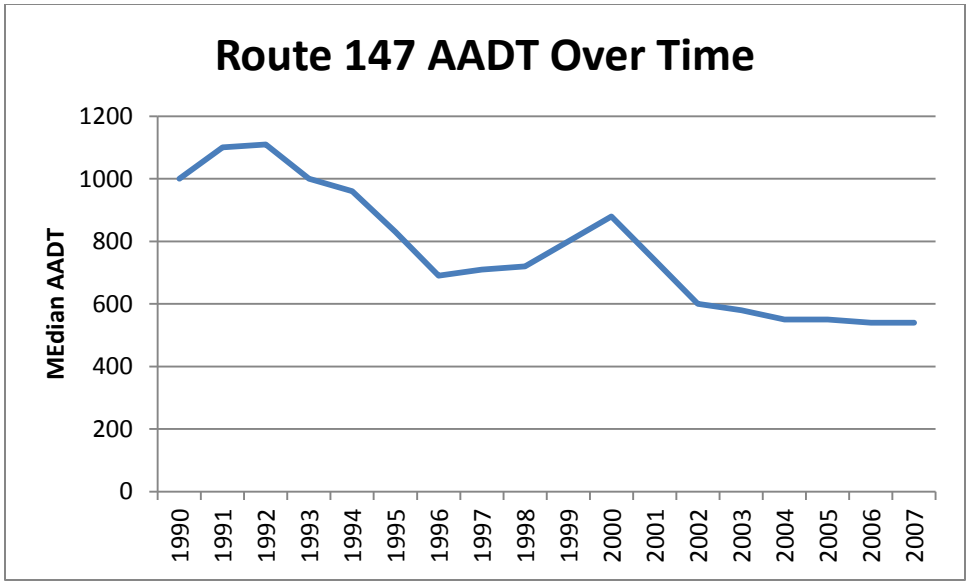
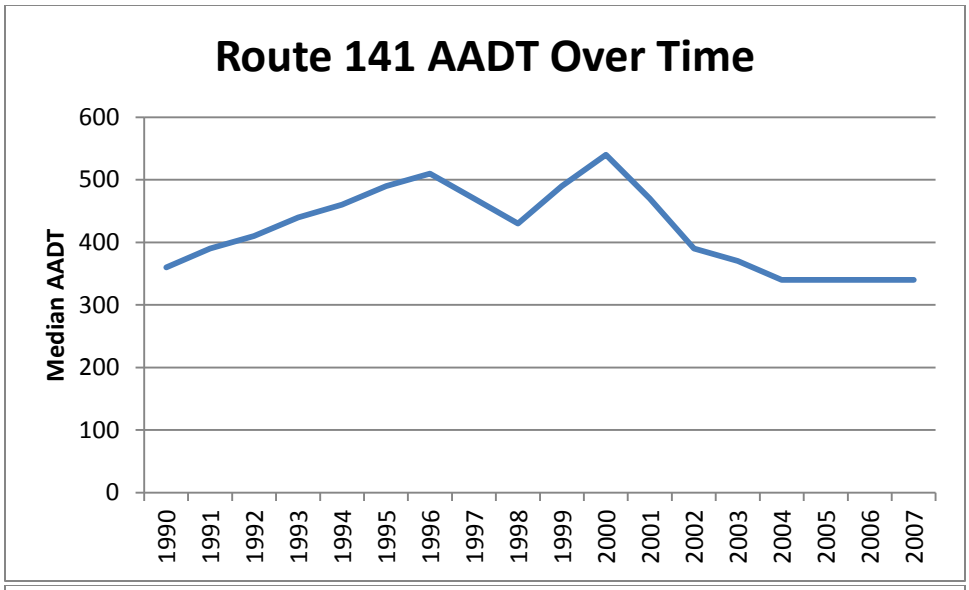
## Traffic Volumes

Traffic Volumes on VT Route 114 have remained relatively flat over the period between 1990 and 2007. There are significantly higher Traffic Volumes on the ends of the corridor in Lyndon.




On VT Routes 102 and 147 there has been a significant decline in Traffic Volume between 1990 and 2007. On VT Route 102 traffic volume was recorded as 890 AADT in 1990 and 470 AADT in 2007. On VT Route 147 traffic volume was recorded as 1000 AADT in 1990 and 540 AADT in 2007.




Route 141 AADT Over Time
Median AADT
600
500
400
300
200
100
0
1990
1991
1992
1993
1994
1995
1996
1997
1998
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2000
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2002
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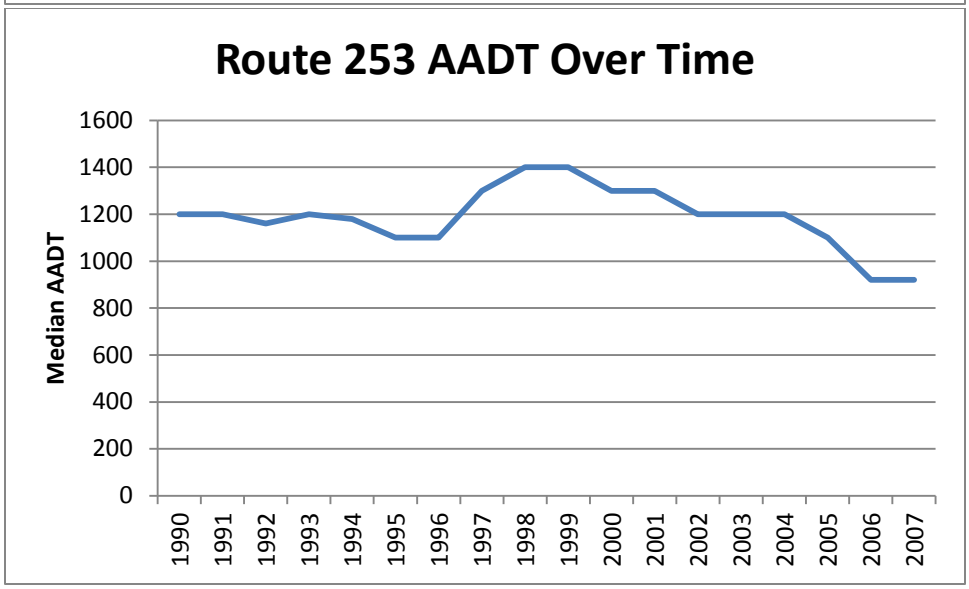
2004
2005
2006
2007


Route 253 AADT Over Time
Median AADT
1600
1400
1200
1000
800
600
400
200
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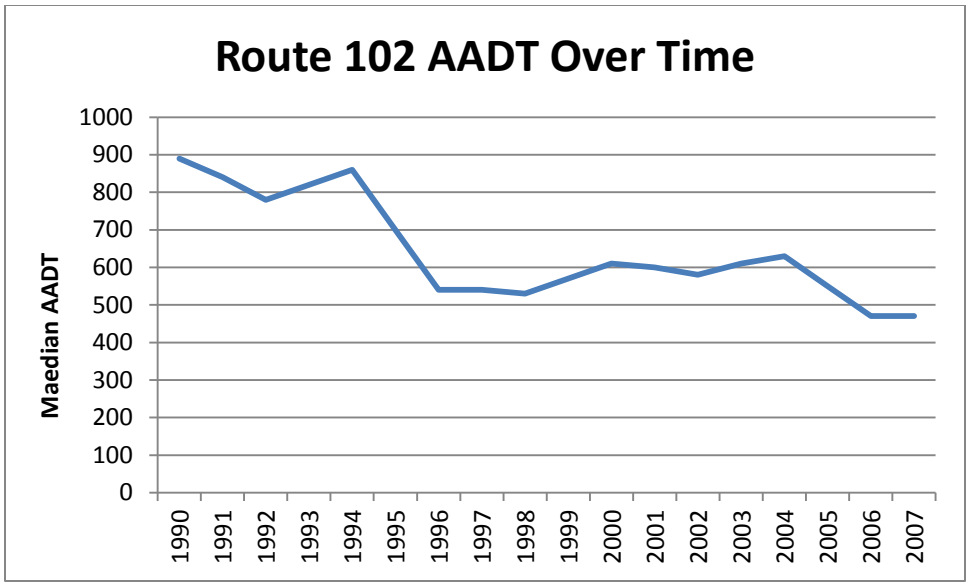
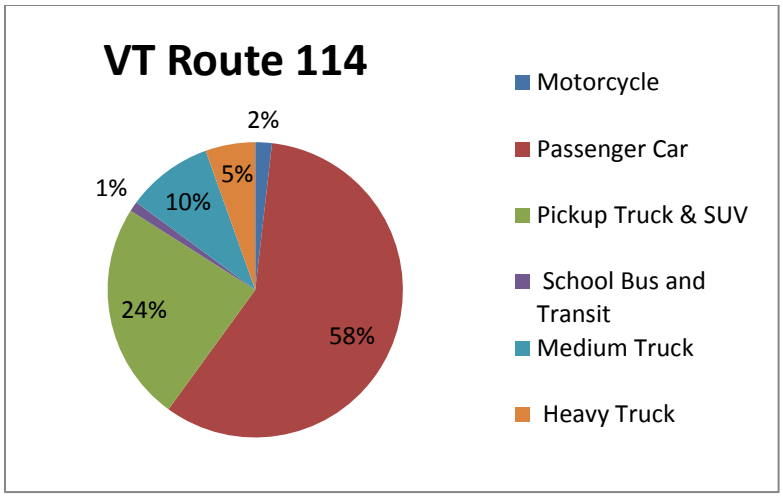


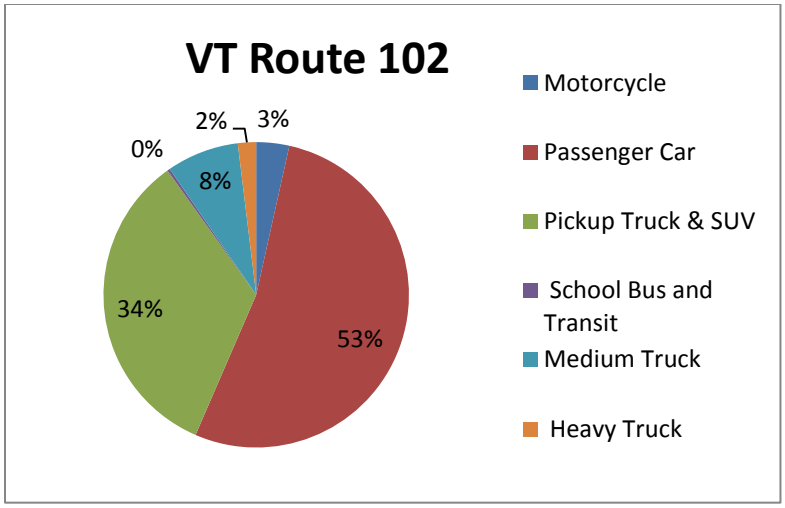

## Border Crossing

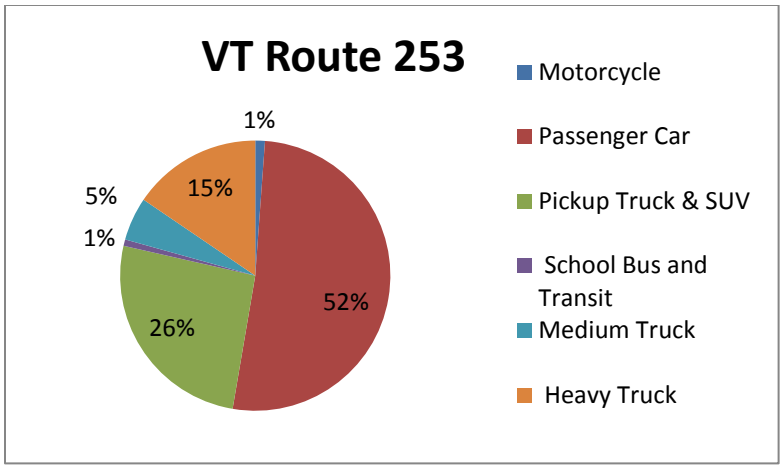
There are international Border Crossings on VT Routes 147, 141, and 253. Both VT Routes 147 and 253 have seen significant declines in Volume between 1990 and 2007; from 1000 to 540, and 1200 to 920 respectively. The number of crossings at VT Route 141 has remained relatively flat.

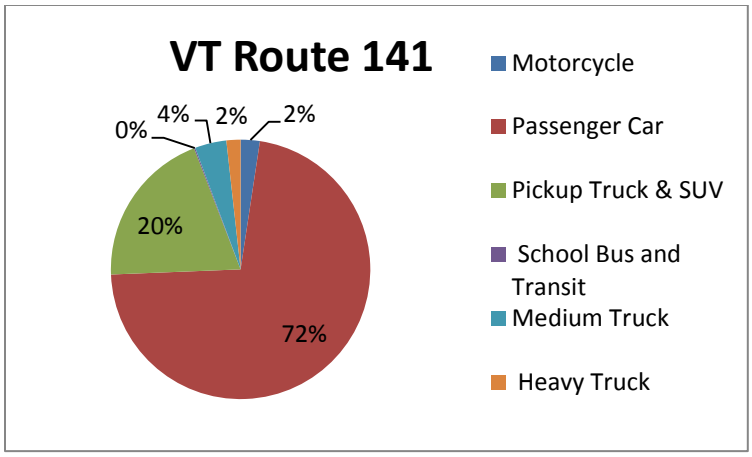
## Goods Movement

Trucking is the dominant means of supplying businesses or shipping goods to market. VT Route 114 has a high proportion of trucks (15%) for this class of state highway. VT Rte 253 has a higher percentage (20%) of trucks and a much higher percentage of Heavy Trucks (Tractor Trailers) than VT Route 114 (15% vs. 5%). The highest percentage of traffic volume on all corridors is dominated by the passenger cars, pickups, and SUVs.


VT Route 114
2%
5%
1%
10%
24%
58%
Motorcycle
Passenger Car
Pickup Truck & SUV
School Bus and Transit
Medium Truck
Heavy Truck


VT Route 102
2%
3%
0%
8%
34%
53%
Motorcycle
Passenger Car
Pickup Truck & SUV
School Bus and Transit
Medium Truck
Heavy Truck


VT Route 253
1%
5%
15%
1%
52%
26%
Motorcycle
Passenger Car
Pickup Truck & SUV
School Bus and Transit
Medium Truck
Heavy Truck




VT Route 147 has no classification data.

## Local Public Transit

There is no regular deviated fixed route line along any of these corridors.

## Airports

Caledonia County Airport is located at the southern end of VT Route 114 in Lyndon.

John H Boylan Airport is located on Route 105 in Brighton near VT Route 114.

## Bike & Ped

There are no dedicated Bike and Pedestrian facilities on VT Routes 114, 147, 141, 253, or 102. There is a rail-banked ROW in Canaan owned by the state of New Hampshire that the town has expressed a desire to convert into a multi-use path. The town has completed a feasibility study looking this possibility.

## Railroad

The Saint Lawrence and Atlantic Railroad parallels VT Route 114 from Island Pond to the Canadian Border. There is a transfer yard in Island Pond that is the source of a significant number of truck trips on VT Route 114, mostly just going through to destinations outside of the region and the state.

## Intermodal

There is a municipal Park and Ride located at the Norton Town Office adjacent to VT Route 114. There is also a Municipal Park and Ride located at the southern terminus of VT Route 112 actually located on VT Route 122 at the intersection of Center St and VT Route 122.

## VT Route 114 Corridor Goals and Objectives

**Goal A: Maintain Adequate Road and Bridge Capacity and Mobility**

1. Update Corridor Management Plan.

**Goal B: Guarantee a Regional Transportation System that Facilitates Economic Development**

1. Continue to support the maintenance and upgrade of rail infrastructure to facilitate the increased use of rail for freight shipping.

**Goal C: Ensure Good Quality of Life**

1. Continue to support the Town of Canaan in their efforts towards the creation of safe multi-modal alternatives between the Village of Canaan and Beecher Falls.
2. Support the widening of shoulders on all paving projects where feasible.

**Goal D: Ensure Availability of Alternative Transportation Modes to Address Residents' Needs**

1. Identify new Park and Ride locations.
2. Work to identify locations for electric vehicle charging stations.

# *VT Route 105*

## *Narrative*

VT Route 105 is the most northern east west highway in Vermont. It goes from Bloomfield at the New Hampshire border to Jay in the western end of the region, and on to St Albans on Lake Champlain. Because of this, Route 105 is of significant importance in both economic and quality of life terms. It is a Minor Arterial Highway and should be managed for higher mobility than land access. It serves as an inter-regional and intra-regional corridor, conveying commuters as well as commerce.

This corridor also contains VT Routes 111, 243, and 242.

VT Route 111 is Major Collector that roughly parallels VT Route 105 between Island Pond and Derby Center. It functions mainly as a local access highway.

VT Route 243 is a Major Collector essentially functioning as an international gateway with a border crossing to Quebec in North Troy.

VT Route 242 is a Major Collector that allows inter-regional connectivity between northern Orleans and Franklin Counties. This State Highway also serves as the access road for Jay Peak Resort.

There are three studies that look at VT Route 105. The first was a full corridor study completed jointly between NVDA and Northwest Regional Planning Commission. It is dated but safety recommendations for the entire corridor were completed as part of the 2010 study in Newport City. The two other studies focus primarily on infrastructure in Newport City.

There is one study that looked at the impact of development at Jay Peak on the regional transportation infrastructure.

Newport City Thoroughfare Study 2010
This report first reviews and evaluates many of the different functions and users of Newport's thoroughfare network, and then considers each corridor separately with more detailed review and recommendations. This study was completed by Smart Mobility.

Newport City Main Street, Causeway, and Railroad Sq Intersection Study 2008
This study focuses on the intersection of Main St, Causeway, Railroad Square and looks at alternative alignments that address safety and capacity concerns. This study was completed by Lameroux and Dickenson.

VT Route 105 Corridor Study St Albans Bloomfield 1998
Study looks at current and projected transportation deficiencies. Recommends improvements and provides a schedule for the improvements. Study was completed by Louis Berger & Associates.

Jay Area Transportation Infrastructure 2006
The goal of this planning study is to quantify the scope of development impacts and then work with key stakeholders and residents to develop a set of recommendations to best maintain efficient traffic flows, accommodate growth pressures, and maintain a strong quality of life throughout the region. This study was completed by RSG.

## Roadway Sufficiency Ratings

VT Route 105 has its largest percentage of road sections in Poor (46.1%) or Fair (34.6%) condition, followed by 11.5% in Bad condition, and 7.7% in good condition.

VT Route 111 has 42.9% in Fair condition, 42.9 Poor condition, and 14.2% in Bad condition.

VT Route 243 is 100% in Good condition.

VT Route 242 is 75 % in Poor condition and 25% in Fair condition.

Completed in 2008, this sufficiency rating is based on the structural condition of the road (including pavement surface, foundation and ditches), safety (including road bed width, shoulder width and stopping sight distances) and service (including safe operating speed and passing sight distances).

## Bridge Sufficiency Ratings

VT Route 105 has 12 structures for which Sufficiency ratings could be determined. Of those 10 are in Good condition, 1 is in Fair condition, and one was a temporary structure at the time of the release of the 2010 VTrans Sufficiency data used for this plan.

VT Route 111 has two structures with sufficiency data available; one in Good condition and one in Fair condition.

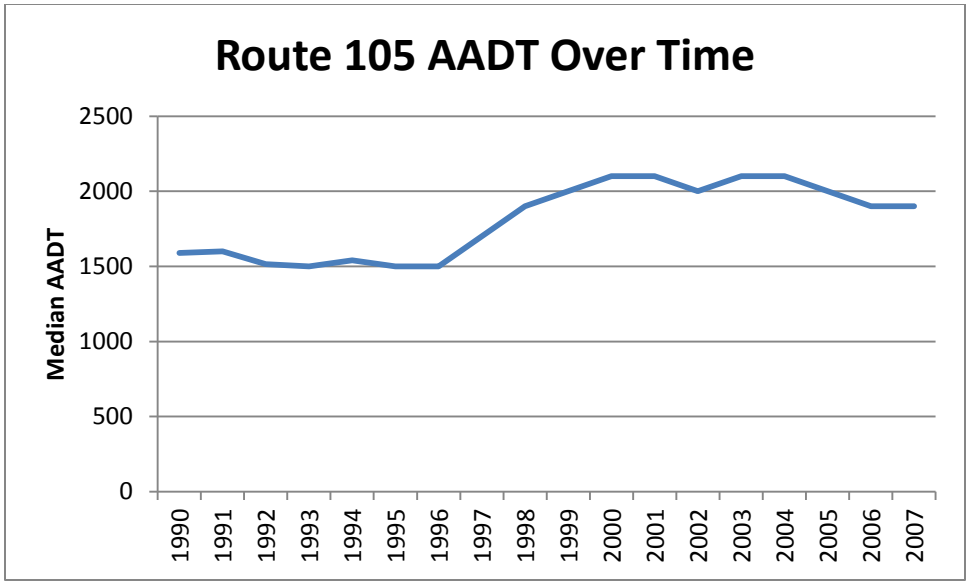
VT Route 243 has no structures with sufficiency data available.

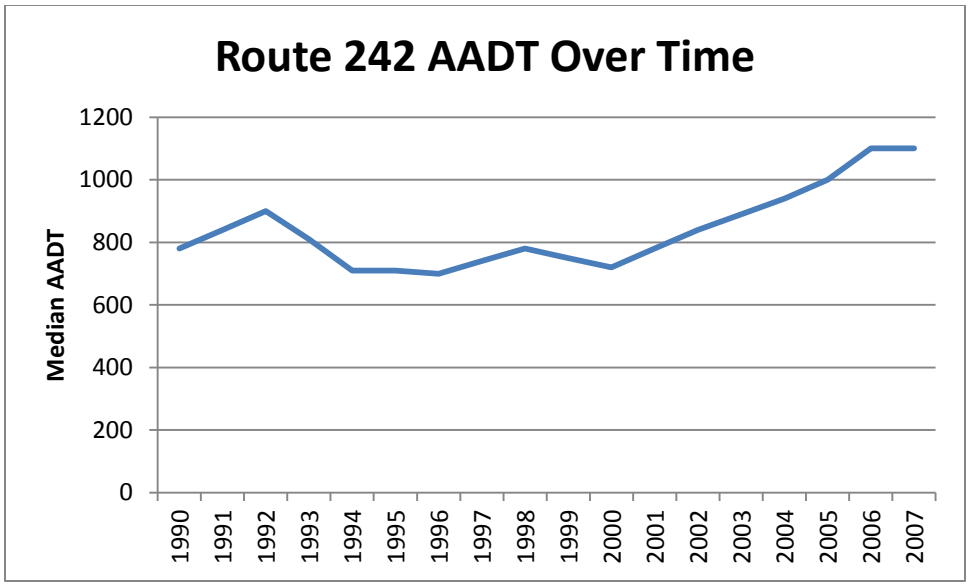
VT Route 242 has two structures with sufficiency data available; one in Good condition and one in Fair condition.

## High Crash Locations

High Crash Locations (HCL) are intersections and discrete sections of highway that have a critical number of accidents over time. This report utilizes accident data between the years 2006-2010 and is focused exclusively on roads that fall under the Federal Aid Highway System. VT route 105 has two High Crash Locations; one in Derby and one in Troy. VT Route 242 has two High Crash Locations located in the town of Jay.

## Traffic Volumes




Route 242 AADT Over Time
Median AADT
1200
1000
800
600
400
200
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1990
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1992
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1994
1995
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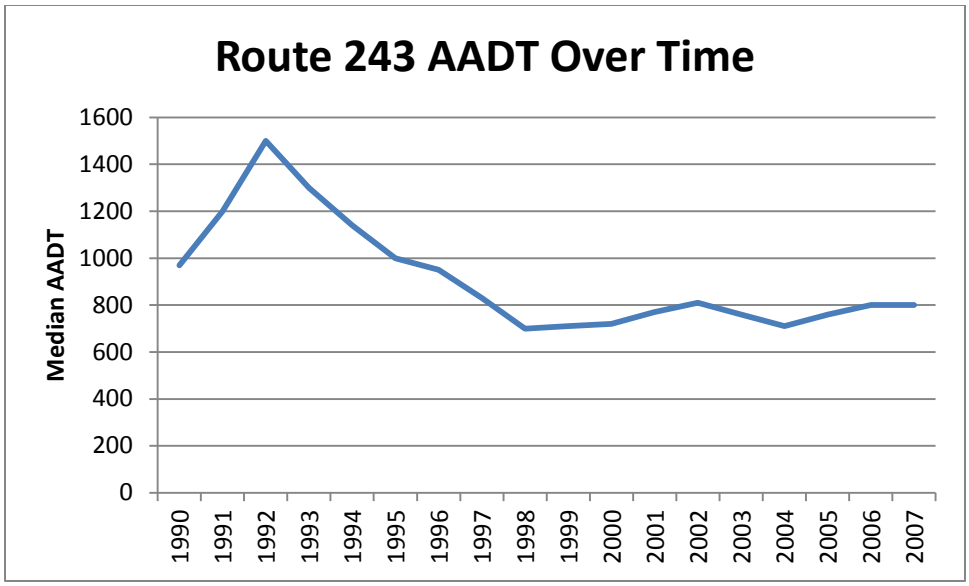
2002
2003
2004
2005
2006
2007


Route 243 AADT Over Time
Median AADT
1600
1400
1200
1000
800
600
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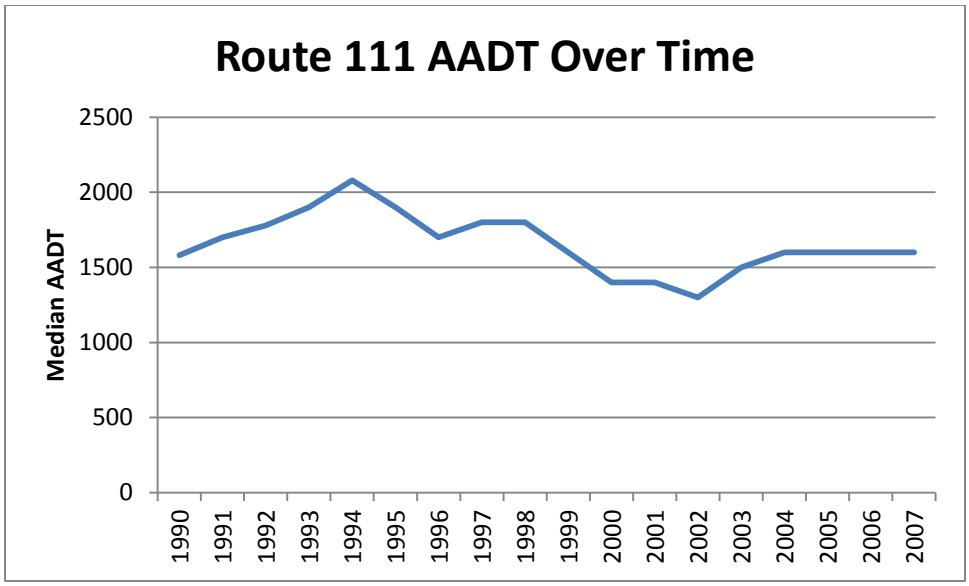
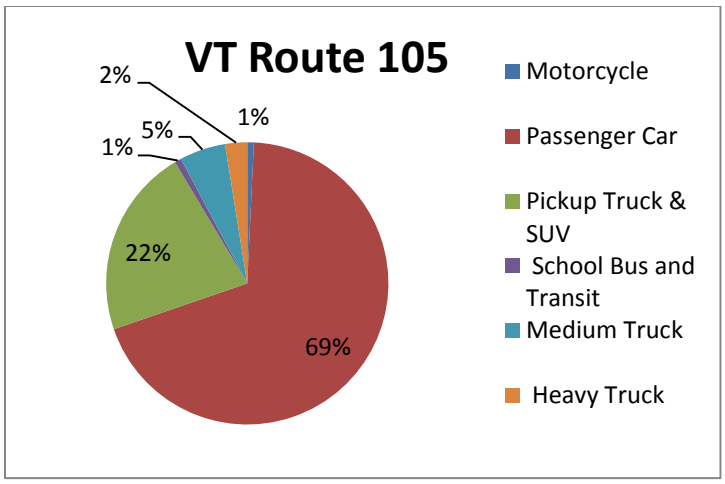
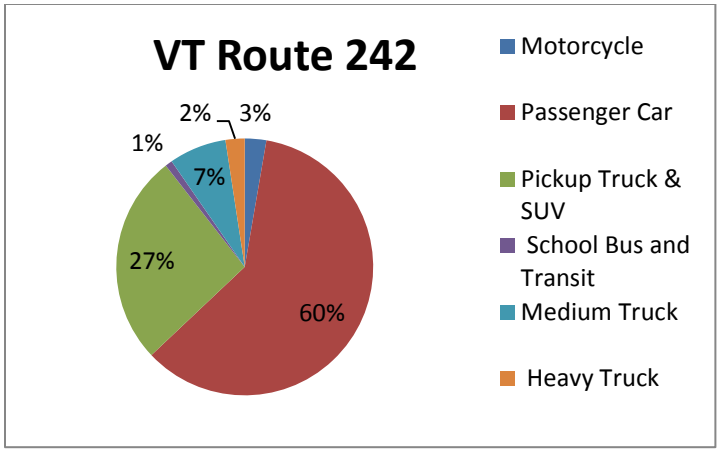


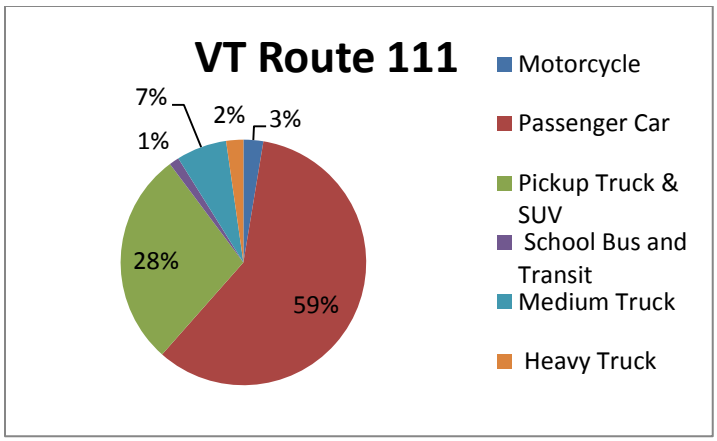

## Border Crossing

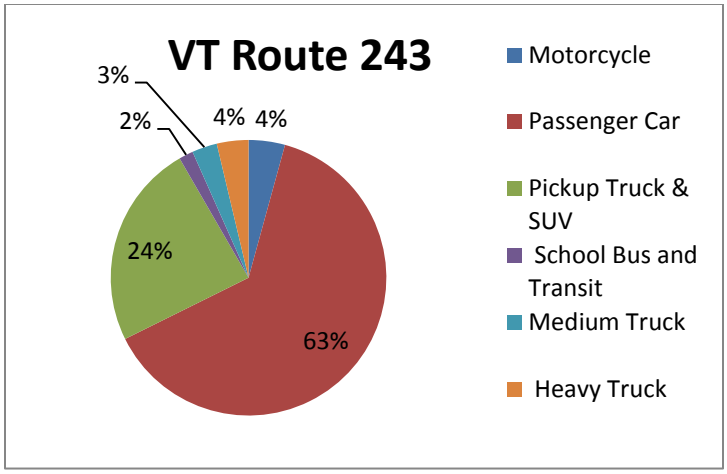
There is an international crossing on VT Route 243 in North Troy.

## Goods Movement






## Local Public Transit

There is no regular deviated fixed route line along any of these corridors. There have been discussions between Jay Peak Resort and RCT to establish a transit shuttle.

## Airports
VT Route 105 runs close to the Newport State Airport in Coventry.

## Bike & Ped
The Beebee Spur Bike Path is a 4-mile rail-trail running from Newport City towards the Canadian border. It follows Lake Memphremagog for most of the way, offering outstanding views of the water, as well as the Green Mountains. Although fairly level, mountain bikes are recommended due to the trail's packed gravel surface.

## Railroad
The Montreal Maine & Atlantic meets the Conn River subdivision of the Washington County Railroad in Newport City and runs west to cross into Quebec in North Troy.

## Intermodal
There are no formal Park and Rides or other intermodal facilities on these corridors.

## VT Route 105 Corridor Goals and Objectives

**Goal A: Maintain Adequate Road and Bridge Capacity and Mobility**

1. Promote the improvement of Pavement conditions on VT Route 105, 111, and 242.

**Goal B: Guarantee a Regional Transportation System that Facilitates Economic Development**

1. Continue to support the maintenance and upgrade of rail infrastructure to facilitate the increased use of rail for freight shipping.
2. Work to facilitate greater efficiency in agricultural freight movements to include shipping a distribution nodal development.

**Goal C: Ensure Good Quality of Life**

1. Support the widening of shoulders on all paving projects where feasible.

**Goal D: Ensure Availability of Alternative Transportation Modes to Address Residents' Needs**

1. Identify new Park and Ride locations.
2. Work to identify locations for electric vehicle charging stations.

## US Route 302/ VT Route 232

### *Narrative*

US Route 302 is a Minor Arterial Highway and should be managed to preserve mobility over land access. It serves as part of an inter-regional route between US Route 2 in Montpelier and ultimately Portland Maine. In the region US Route 302 traverses Groton and Ryegate. It serves as an inter-regional and intra-regional corridor, conveying commuters as well as commerce. US Route 302 also serves to bring visitors to Groton State Forest via VT Route 232.

There is one intersection study that addresses VT Route 232. It does have some corridor wide information but it focus is on one intersection.

Groton VT Route 232 Boulder Beach Rd Intersection Study 2009
This study evaluates the existing conditions at the intersection of VT232 and Boulder Beach Road in Groton, Vermont, and identifies preliminary recommendations for consideration at this intersection.

## Roadway Sufficiency Ratings

US Route 302 is roughly evenly split between 57% Good condition, 43% Fair condition.

VT Route 232 is overwhelmingly (60%) in Poor condition, with 20% in Fair condition, and 20% in Bad condition.

Completed in 2008, this sufficiency rating is based on the structural condition of the road (including pavement surface, foundation and ditches), safety (including road bed width, shoulder width and stopping sight distances) and service (including safe operating speed and passing sight distances).

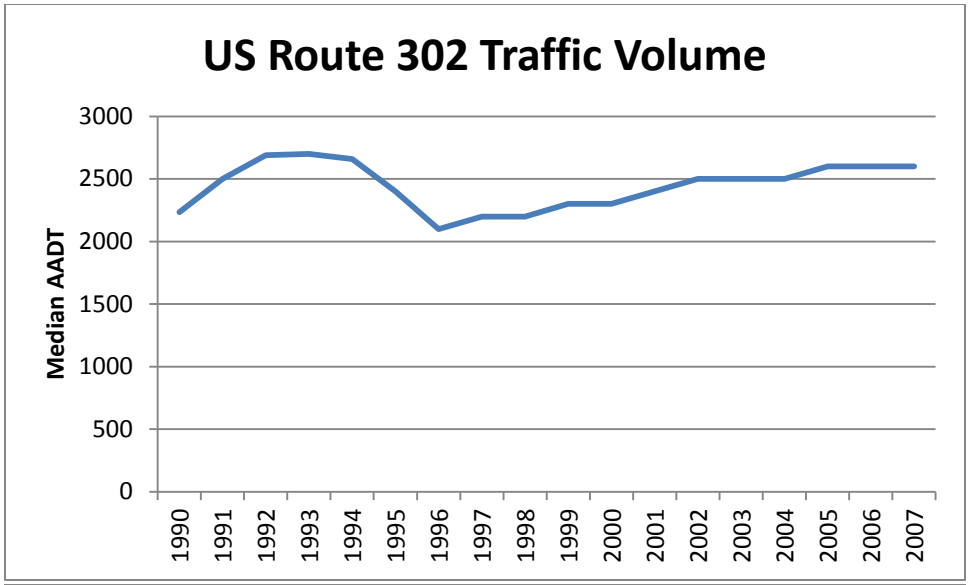
## Bridge Sufficiency Ratings

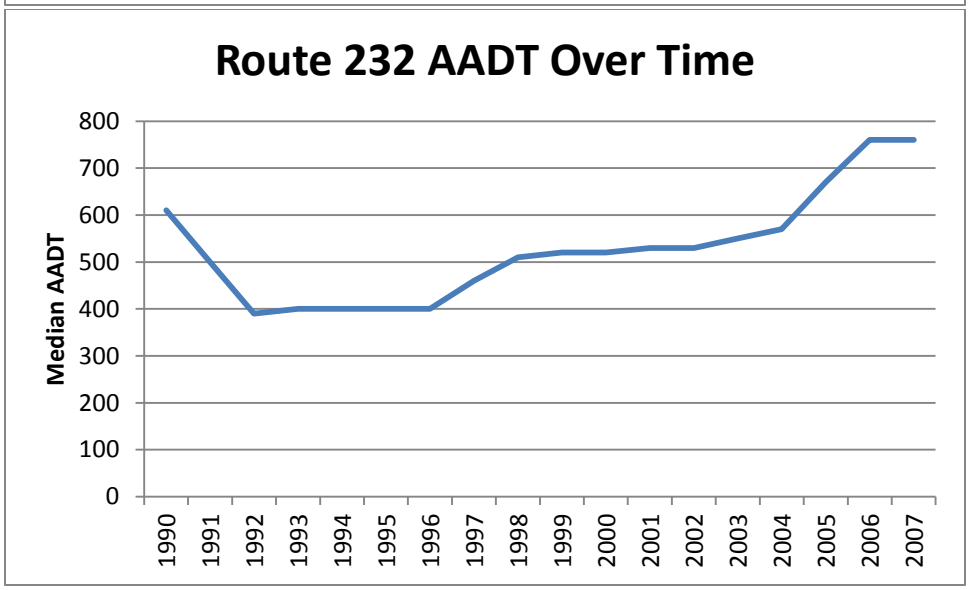
US Route 302 has 5 structures with sufficiency ratings; 4 in Good condition and one in Fair condition. VT route 232 has 2 structures with sufficiency data available. Both are in Good condition.

## High Crash Locations

High Crash Locations (HCL) are intersections and discrete sections of highway that have a critical number of accidents over time. This report utilizes accident data between the years 2006-2010 and is focused exclusively on roads that fall under the Federal Aid Highway System. There are 3 HCL on US Route 302; two in Groton (near Daniels and Welch Rd and one near the intersection of VT Route 232 ) and one in Ryegate ( in The village of South Ryegate).

## Traffic Volume



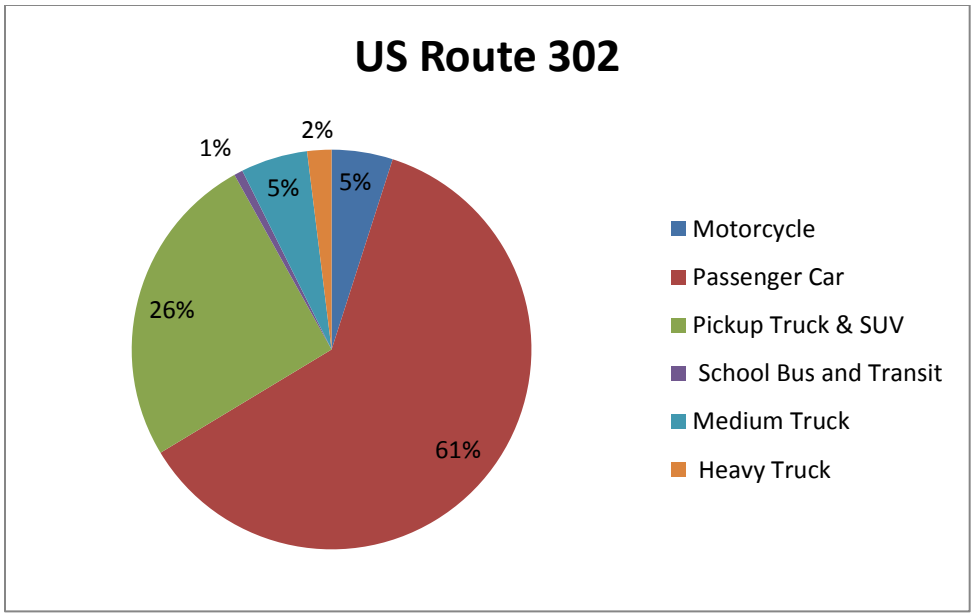



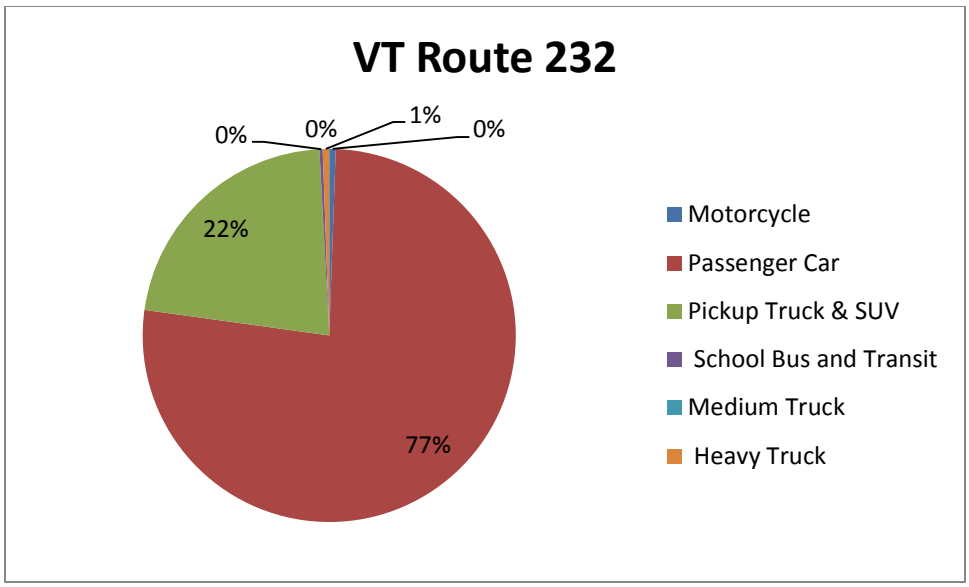

## Border Crossing

There are no international border crossings on either corridor.

## Goods Movement

US Route 302 mostly serves rural residential and agricultural land uses. It has a lower than average number of truck traffic for its class of highway; 8% vs. 9.6 %. VT Route 232 also has a lower than average number of trucks for its class of highway.




## Local Public Transit

There are no scheduled deviated fixed route transit lines on these corridors.

## Airports

There are no airports on these corridors.

## Bike & Ped

The Cross Vermont Trail consists of roughly 14 miles of shared use access between Ryegate and Groton. This trail continues beyond the regions borders in either direction.

## Railroad

There is no active Rail service along either corridor.

## Intermodal

There is a municipal Park and Ride (awarded in 2012) located at the Ryegate Fire station in South Ryegate.

## US Route 302/232 Corridor Goals and Objectives

**Goal A: Maintain Adequate Road and Bridge Capacity and Mobility**

1. Work to address safety issues related to HCL's on US Route 302.
2. Support rehabilitation of VT Route 232.

**Goal C: Ensure Good Quality of Life**

1. Support the efforts of the Cross Vermont Trail Association to maintain and upgrade the CVT.
2. Support the widening of shoulders on all paving projects where feasible.

Goal D: **Ensure Availability of Alternative Transportation Modes to Address Residents' Needs**

1. Identify new Park and Ride locations.
2. Work to identify locations for electric vehicle charging stations.