

Volume II

REGIONAL ANALYSIS

I. FORESTLAND

In 1997, over 80% of the land in the Northeast Kingdom was covered by forest (USDA FS, 1997). Unlike many states, Vermont's forestland acreage has been expanding since the early part of the Twentieth Century. As farmland is abandoned, trees grow over what had once been pasture and crop fields. Today, local forests provide residents of the Northeast Kingdom with a variety of benefits. The largest revenue producers in the region come from the harvesting, processing, and manufacturing of forest products. In Vermont, these have existed as sources of income since the earliest European settlements. Water and air quality, and wildlife habitats are all dependent upon the vast forests. Residents enjoy a wide 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.

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).

Table 1.0 shows the total forested acreage for the region and counties. Also shown are the percentages of forestland that are northern hardwoods or spruce/fir, the two most prevalent forest types in the region. It should be noted that 113,125 acres, or about 9% of the region's total land, was considered as both forestland and agricultural land (USDA, 1997).

	Total Forest Acreage	Percent Northern Hardwood	Percent Spruce/ Fir
Caledonia	345,500	57%	31%
Essex	405,500	67%	21%
Orleans	332,200	52%	36%
Northeast Kingdom	1,083,200	59%	29%
(USDA FS, 1997)			

In 2002, over 35 % of the softwoods and 16 % of the hardwoods harvested in Vermont came from the Northeast Kingdom (www.vtlmi.info/profile2004.pdf). Much, if not most, of the harvested softwoods are used for pulpwood. Paper manufacturers, however, are continuing to look overseas and to Canada for this commodity, where more favorable growing conditions, subsidies, or lower wage rates mean lower prices. Consequences resulting from this trend include the loss of revenues generated by landowners and the loss of employment in logging, pulp, paper, and related industries. However, there still exists a potential for a shift in forest management practices away from pulpwood toward saw-timber, and an opportunity for value-added businesses in the region. Table 1.1 shows a breakdown of the 2002 harvest by county.

Table 1.1: 2002 Vermont Forest Harvest

	Total	Hardwood Board Feet (thousands)	%	Softwoods Board Feet (thousands)	%
Vermont	222,386	102,990	100%	119,396	100%
Northeast Kingdom	59,203	17,036	16.60%	42,167	35.30%
Caledonia	15,060	6,031	5.90%	9,029	7.60%
Essex	18,993	2,496	2.40%	16,497	13.80%
Orleans	25,150	8,509	8.30%	16,641	13.90%

(VT Department of Forest, Parks & Recreation, 2004)

Forest Products Industry

Local forests are an important source of lumber for large variety of wood-products manufacturers in the region. Some of these businesses originally located in the area for the ample supplies of materials. In 1998, wood-products manufacturing, using mainly hardwoods, accounted for 32% of all manufacturing employment in Northern Vermont (the Northeast Kingdom, plus Franklin and Lamoille Counties). The paper and pulpwood industry however, which uses softwoods, is currently threatened by lower costs for similar resources grown elsewhere. (*Northern VT Wood Bus. Resource Center Feasibility Study*, Flynn, 1998)

Many elements of an effective industry support program are already in place in Vermont. These include the Vermont Wood Products Association, the Vermont Technical College, the Vermont Community College System, the University of Vermont's Forestry Department, and the Small Business Development Center Program. The Robert Byrd Hardwood Center is a top national technical support program that may be underutilized in this region.

Sustainable Forestry

Many forestland owners and loggers point out that they have been practicing "sustainable" management for years, as is evidenced by the health of their woodlands. The argument is made that keeping forests healthy simply makes economic sense, and therefore certification is an unneeded expense. Often, from an ecological standpoint, they are correct. 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. Home Depot is one notably large retail company making certified wood available to consumers. At the moment however, producers of certified wood are not receiving premium prices.

There are a number of certification programs available to landowners and forest product manufacturers. The American Forest & Paper Association has created standards for sustainable practices, known as the Sustainable Forestry Initiative. This program does not currently allow for product labeling as sustainable, which is a potentially important aspect for marketing. At the time of this printing, the largest program in the United States that does allow for product labeling is the Forest Stewardship Council/ National Wildlife Federation's *SmartWood Program*. This program has two types of certification; a forest management

certification for forests, and a chain-of-custody certification for primary and secondary manufacturers and wholesalers. Because the cost of certification can be prohibitive for small operations, there is certification available for groups of landowners at lower costs. The Vermont Family Forests in Addison County has taken advantage of this option. Certification is also available to groups of manufacturers.

I. FORESTLAND GOALS

- Sustainable forestry should remain an economically viable tool to preserve woodlands, open space for recreation, and local character.
- Mixed-use forests should 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 should increase.

STRATEGIES

- Provide management, financial, and technical assistance to local forest product industries, including wood product manufacturers, sawmills, paper mills, and wood-powered electrical generators (cogeneration).
 - 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.
 - 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)
-

II. AGRICULTURE

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, the region's 1,100 farms accounted for more than 264,000 acres in the Northeast Kingdom in 1997, or about 20% of the total land area. It is the second largest land use in the region, and has provided a livelihood for generations of residents. However, the future of traditional farming in the region is tenuous at best. Competition from within the U.S. and abroad and low commodity prices



have contributed to a long-term decline in agriculture in the state. The state has lost over 10,000 farms in the past forty years, but statistics seem to suggest a potential stabilization in farm acreage in this region. Between 1992 and 1997 the net loss of farmland in the Northeast Kingdom was only 11 acres, and the region actually saw a gain in the number of farms.

Table 1.2 shows the breakdown of agricultural land for the three counties and the state of Vermont in 1997. Orleans County contained over half of all the agricultural land in the region, while Essex County accounted for less than one-tenth.

Table 1.2: Agricultural Land Use (acres) 1997, 1992

	Vermont 1997	Caledonia 1997	Essex 1997	Orleans 1997	Northeast Kingdom 1997	Northeast Kingdom 1992
Cropland including Pastured	617,263	43,209	9,438	74,331	126,978	133,565
Woodland including Pastured	487,346	42,431	14,575	56,119	113,125	112,110
Other Land	157,546	8,615	1,484	13,704	23,803	18,242
Total Land in Farms	1,262,155	94,255	25,497	144,154	263,906	263,917

(Center for Rural Studies, Vermont Indicators Online, 2004)

It should be noted that the USDA counted 113,125 acres, or about 43% of the region's total agricultural land, as both forestland and agricultural land in 1997. Although only 52,546 acres in the Kingdom were classified in the 1997 Agricultural Census as pastureland, much of the cropland is used for growing feed for livestock (USDA, 1997). 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.

Agricultural Trends

The total market value of all Northeast Kingdom agricultural products sold grew 12% between 1992 and 1997, from \$85,324,000 to \$95,648,000 (not adjusted for inflation). Dairy products accounted for \$79,358,000, or 83% of the 1997 total market value of all agricultural products. Significant farm enterprises other than dairy include other livestock, poultry, vegetables, fruit, Christmas trees, and nursery and greenhouse crops.

Table 1.3: Selected Regional Agricultural Sales 1997, 1992

	Vermont 1997	Caledonia 1997	Essex 1997	Orleans 1997	Northeast Kingdom 1997	Northeast Kingdom 1992
All Agricultural Products (\$1,000)	476,343	29,357	6,769	59,522	95,648	85,324
Cattle and calves (\$1,000)	35,859	2,640	275	4,383	7,298	6,989
Dairy Products (\$1,000)	352,556	23,407	5,183	50,768	79,358	73,883
Hogs and pigs (\$1,000)	543	17	1	90	108	85
Horses and ponies (\$1,000)	2,537	89	-	219	308	NA
Milk goats and their milk (\$1,000)	450	withheld	-	143	at least 143	NA
Nursery and Greenhouse Crops (including Christmas trees and floriculture) (\$1,000)	18,588	1,417	withheld	743	at least 2,160	at least 1,404
Christmas trees (\$1,000)	2,782	540	withheld	259	at least 799	NA
Floriculture Crops (\$1,000)	11,614	664	withheld	374	at least 1,038	at least 1,117
Poultry (\$1,000)	5,699	28	4	20	52	at least 15
Sheep, lambs, and wool sold (\$1,000)	1,003	45	withheld	22	at least 67	at least 55
					(USDA, 1997)	

Current trends in the state have been toward larger but fewer dairy farms, and an increase in small and part-time non-dairy farms. This trend is likely to continue with the growth of the specialty and organic food industry, agro-tourism, and part-time farming. There was a small decrease in the number of milk cows in the region between 1992 and 1997, despite the increase in both dairy sales (not adjusted for inflation) and total cattle and cows.

Farm diversification could potentially result in a weakening of the larger dairy infrastructure, including a loss of dairy processors, truck and transportation services, and farm-supply retail. Potential upsides to having more diverse farms include an agricultural industry that is less subject to price spikes in particular commodity markets, and increased opportunities for direct retail sales within the region. Greater diversity in agriculture reduces the risk of crop-specific pest infestations and the need for heavy pesticide applications. Agri-tourism, specialty agriculture, and part-time farms can also help to preserve farmland for use in growing feed, grazing, or rental to more traditional dairy operations).

Anecdotal evidence suggests that many agricultural producers in Vermont have been relatively resistant toward working together in marketing and distribution. Larger food retailers often do not contract with smaller farms, preferring to buy in bulk. Working with large suppliers, they receive clean, labeled, packaged, bulk merchandise ready for the shelf. Many farms in the region do not have the time or resources to compete in this manner. It is likely that more marketing and distribution partnerships will develop over time if local producers are to compete successfully.

Table 1.4: Selected Vermont Agricultural Sales 1997, 1992			
	Vermont 1992	Vermont 1997	% Change
All Agricultural Products	415,253	476,343	14.70%
Blueberries, tame (pounds)	312,888	170,637	-45.50%
Dairy Products	328,717	352,556	7.30%
Hogs and pigs (\$1,000)	641	543	-15.30%
Honey (\$1,000)	405	397	-2.00%
Horses and Ponies (\$1,000)	2,069	2,537	22.60%
Nursery and Greenhouse Crops (including Christmas trees and floriculture) (\$1,000)	9,461	18,588	96.50%
Christmas trees (\$1,000)	NA	2,782	NA
Floriculture Crops (\$1,000)	6,222	11,614	86.70%
Poultry (all) (\$1,000)	2,927	5,699	94.70%
Rasberries (pounds)	63,934	92,858	45.20%
Sheep, lambs, wool (\$1,000)	969	1,003	3.50%
Strawberries (pounds)	857,533	731,685	-14.70%
Trout, Farm-raised (\$1,000)	NA	580	NA
	(USDA, 1997)		

Beef

Although the most recent data on beef cattle is from the 1997 Census of Agriculture, a “window survey” of the region would suggest that the number of beef cattle in the region is growing, particularly Black Angus. Several Vermont beef producers believe that the industry has real potential for growth in the state. Vermont can sustain one of the nation’s highest rates of grazing animals per acre.

A move has begun to label beef as being from Vermont for consumer sales. Vermont has a reputation for clean, natural, quality foods which has helped other agricultural products.

Producers looking to market Vermont labeled beef have good reason to believe that it may bring a premium, particularly if consumer safety concerns grow relating to certain animal feed additives and unsanitary meat processing. Vermont beef producers could benefit if they maintain Vermont's image of healthy, quality foods.

The main barrier to expansion of the beef industry in the state has been the scarcity of slaughterhouses. Local slaughterhouses have difficulty keeping up with demand. Shipping cattle to feedlots and out of state slaughterhouses quickly becomes expensive. New slaughterhouses require a large investment, have fairly strict federal oversight, require good electric, water and sewer capacity, truck access, and must go through Act 250 hearings. Still, there is some interest in establishing local processing facilities, and Vermonters' have a long tradition of cattle-raising, expertise, farmland, and cattle-farming infrastructure.

Organic Agriculture

The organic foods industry is a growing market that easily fits many peoples image of Vermont. Consumers associate Vermont with clean, natural, quality foods, and the Vermont image has greatly benefited businesses in cheese and ice cream production. Many organic products can be sold for three or more times what can be charged for their non-organic counterparts. Organic certification and labeling is a logical step for many Vermont farms and food processors. The northeastern U.S. and eastern Canada serve as potential markets for a wide range of Vermont-grown organic products, as does the European Union, where markets are somewhat restricted for foods grown using certain conventional American farming practices.

Farmland Preservation

Despite large amounts of undeveloped land in the region, maintaining contiguous tracts of farmland for future agricultural use is becoming more of an issue. The same attributes which make land desirable for farming (well-drained and little slope) are the same for residential and commercial development. Agricultural fields must generally be within close proximity to other fields used by a farmer. Preserving contiguous parcels of primary and secondary agricultural soils that can used by a cluster of neighboring farms is more efficient than working scattered parcels of land.

The University of Vermont Agricultural Extension System has two regional offices (St. Johnsbury and Newport) to serve the local farming community. The University of Vermont Extension launched the Vermont Farm Labor Service, a cooperative with goals to recruit, train and match workers with farmers needing temporary help. Rural Vermont, a non-profit farm advocacy organization, has been organizing farmers in the northeast counties to explore opportunities for cooperative agricultural efforts. The Vermont Land Trust has been conserving prime farmland through the purchase of development rights.

II. AGRICULTURAL LAND USE GOALS

- Farming and agriculture should remain an important and viable sector of the regional economy.
- Contiguous tracts of prime agricultural soils should be preserved.

STRATEGIES

- 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.
-

III. 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 NVDA Region: Land Use Map (Map 1), located on the following page, illustrates the region's current development patterns.

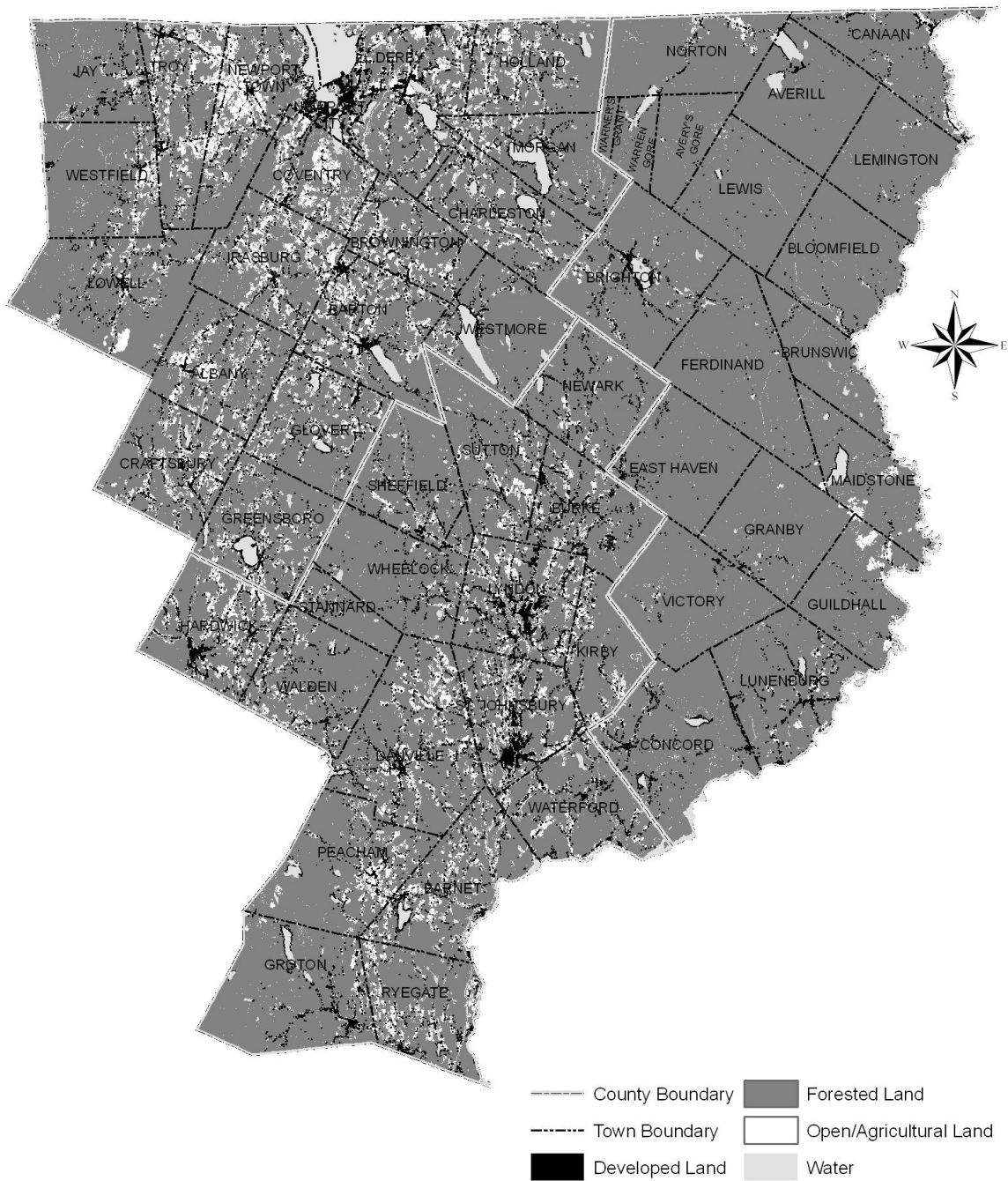
Most communities in the U.S. today have had to deal with some form of suburbanization, sprawl, loss of farmlands, and/or Brownfield issues influencing their development. To insure appropriate development for the Northeast Kingdom it is necessary to observe the development factors affecting other communities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

Suburbanization

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. Due to improved roads and automobiles, residents can now live further from work than was possible in the past, and access for tourism from outside of the state has improved. Improvements in the highway system, coupled with increases in population densities in other parts of the northeast and Quebec, have sharply increased the number of people who are within a day's drive of the region. Visitors, second-home owners, and increasingly mobile residents often desire homes and services in the region's scenic rural settings. Combined with a loss of agriculture and pulpwood profitability, the region has become increasingly suburbanized. According to the Vermont Forum on Sprawl, between 1982 and 1997 the

amount of developed land grew in the state by 30.8%, while population grew by only 13.6%. The Northeast Kingdom was not immune to these changes.

MAP 1:



NVDA Region: Land Use

Sprawl

Strip commercial development and large, low-density residential subdivisions have been growing across the state. This "sprawling", consumptive land use pattern increases development pressures on undeveloped land (farms, forests, and wildlife habitats), and frequently leads to disinvestment and under-utilization of existing town centers. Driving becomes a requirement for most trips, increases traffic congestion and causes greater demands on road infrastructure. In our region we see this in places such as Lyndonville and between Newport and Derby. Associated improvement of roads and services, and extending infrastructure are costs that 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. Strip development itself is often unsightly and monotonous, detracting from the local character and the region's general appeal.

Residential Development of Farmland

A common development pattern in the region has been the piecemeal residential development of farms. This pattern is common in farm communities across the country, with some unintended consequences resulting. In addition to the issues associated with overall loss of farms and farmland raised earlier, this development pattern encourages many of the worst aspects of suburbanization and sprawl. The development of land closest to the road suburbanizes the landscape almost immediately. If the new homes become poorly maintained, the property value of the area can fall. In some areas, this development pattern combined with a lack of upkeep, serves as a sort of rural blight.

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 pay property taxes and lower 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 are some of the tools commonly used to finance brownfield redevelopment. These are all financing methods that communities need to consider.

Shoreline Development

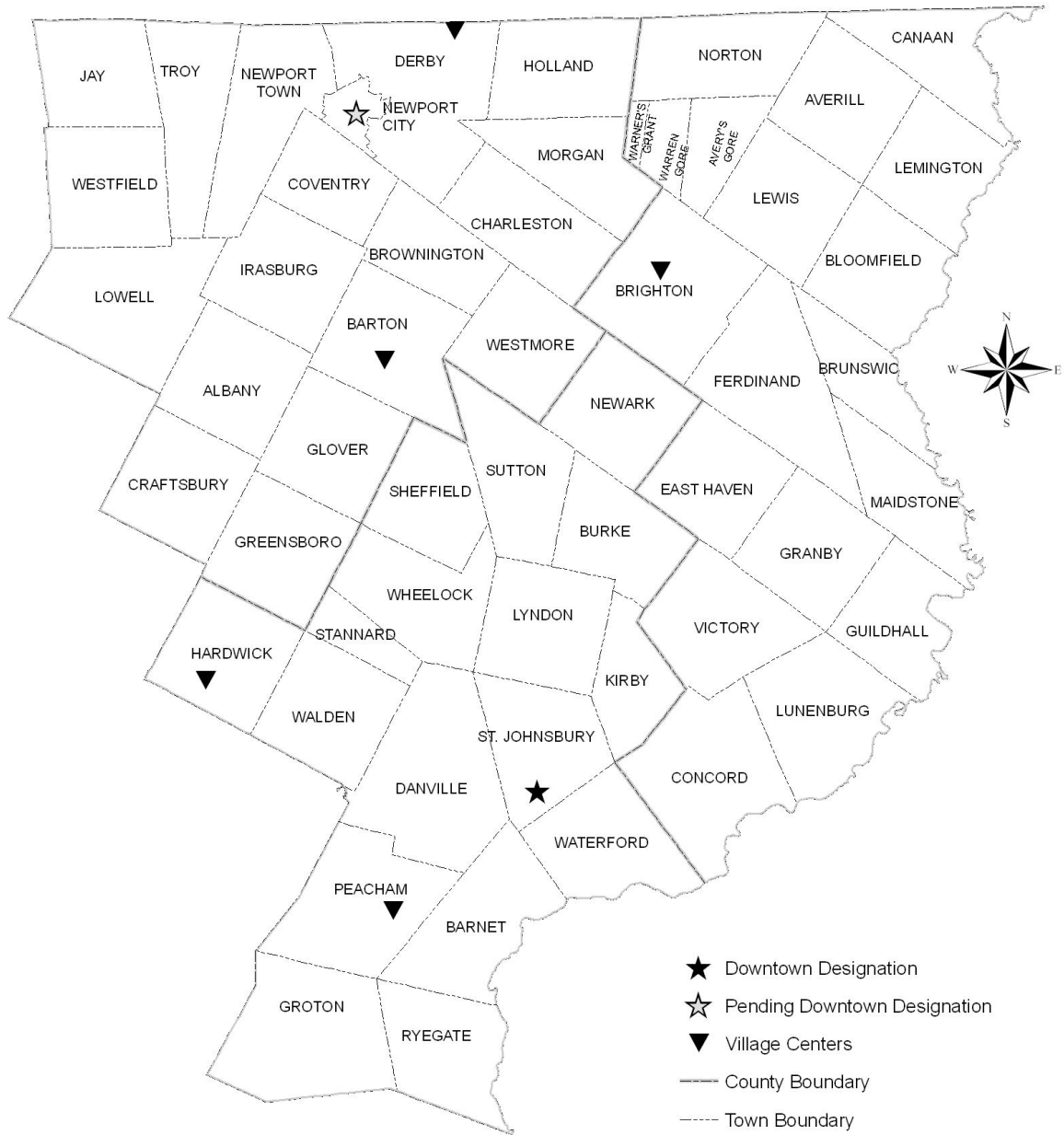
The Northeast Kingdom possesses a majority of the state's lake and ponds, and also the majority of undeveloped shorelines. Recent increases in the development of second homes, camps, and primary residences have decreased the amount of undeveloped shoreline.

Designated Downtowns and Village Centers

The State of Vermont's Downtown Program encourages communities to reinvest in their downtowns and village centers. Towns that receive Downtown Designation under this program can receive numerous benefits, including tax credits, loans, and grants from various state agencies. To qualify, a town must develop a comprehensive, long-term revitalization strategy for its downtown district. The Northeast Kingdom currently has only one designated downtown – St. Johnsbury – but Newport City is working hard to earn downtown designation.

In 2002, the Downtown Program created a second level of designation for Village Centers. These districts are generally smaller than the Downtowns but are still eligible for tax credits and priority consideration for grants from other state programs and agencies. The Designated Village Centers in the Northeast Kingdom are Hardwick, Barton, Island Pond, Derby Line, and Peacham Corners. These areas are depicted on the NVDA Region: Designated Downtowns & Village Centers Map (Map 2), located on the following page.

MAP 2:



0 5 10 Miles

NVDA Region Designated Downtowns & Village Centers

IV. FUTURE LAND USE & DEVELOPMENT

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. Rural Villages
4. Rural Areas
5. Industrial Parks

The Regional Urban Centers, Service Centers, Rural Villages, Rural Areas, and Industrial Parks (depicted in the NVDA Region: Future Land Use Map, Map 3) are categorized for growth based on the following development pattern descriptions. The development pattern descriptions are general in nature and can be used to guide growth in an appropriate manner, keeping in the character of the area.

1. Regional Urban Centers

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.

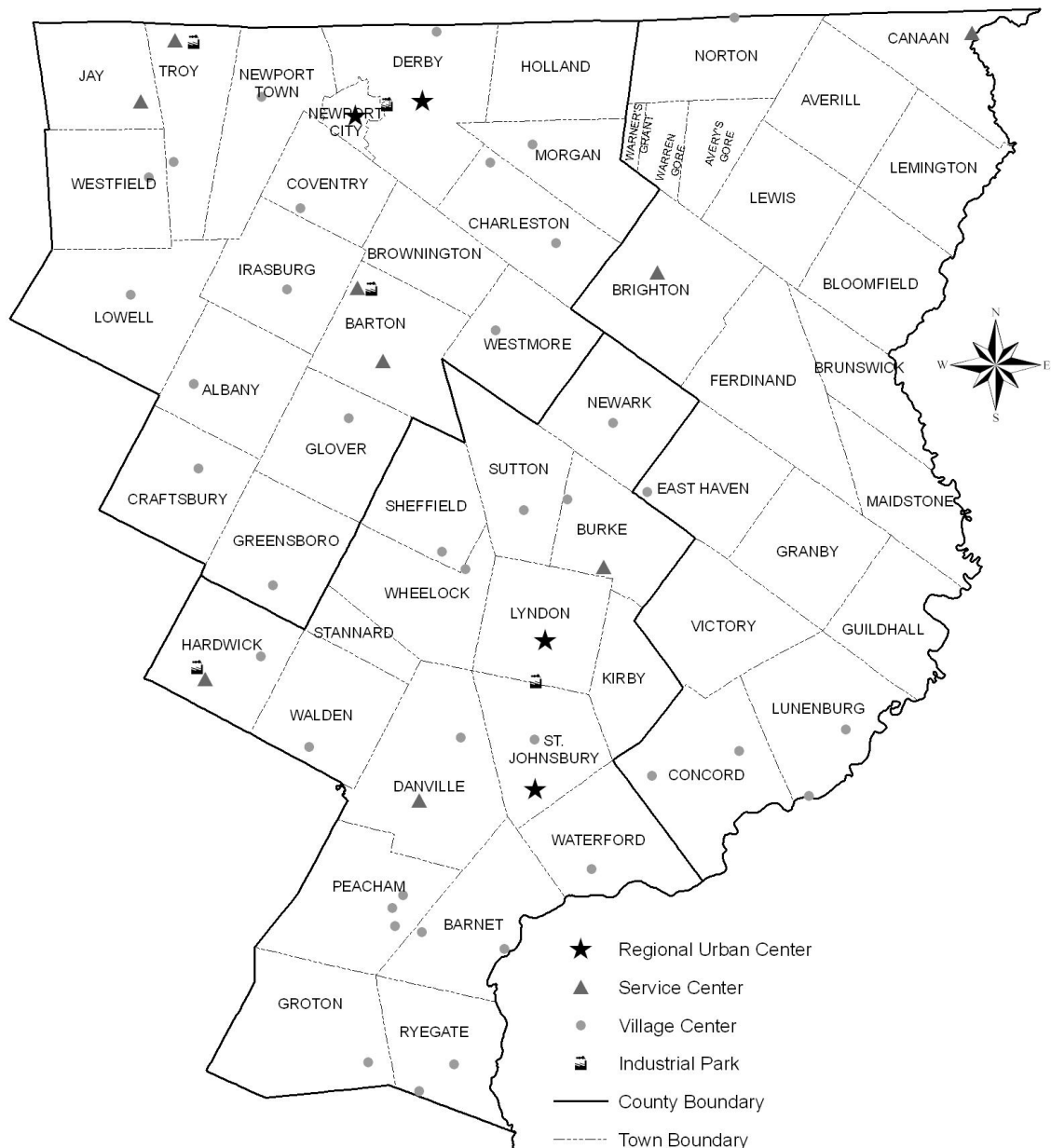
The Northeast Kingdom has two Regional Urban Centers. The St. Johnsbury/Lyndon area serves the southern section of the region, and Newport City/Derby serves the northern section. Transportation infrastructure plays an important role. St. Johnsbury/Lyndon is located at the intersections of Interstates 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 Newport State Airport is just outside of the Newport City limits in Coventry.

Over one-half of all employment in the Northeast Kingdom is located in one of the two urban centers. In 2002, the Northeast Kingdom had a combined 22,250 jobs, and 14,459 were in either St. Johnsbury/Lyndon or Newport City/Derby. Major industries include retail trade, manufacture of durable goods, education, and health services. (VT DET, 2002) Both urban centers have industrial parks, regional hospitals, various state offices, and dense commercial development. Lyndon State College, 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.

Housing density is greater in the 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. In 2000,

St. Johnsbury/Lyndon had a total of 5,672 housing units, about one sixth of the entire Northeast Kingdom's housing stock (which is 33,939). Newport City/Derby had a total of 4,600 housing units.

MAP 3:



NVDA Region: Future Land Use

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.

2. 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, Orleans, Hardwick, Island Pond, Canaan-Beecher Falls, North Troy, Jay, East Burke, and Danville belong in this group.

Their status as service centers is due to the fact that they are separated by distance from the two regional urban centers. At the same time, they do not provide enough employment to be completely self-contained. As a result, they also partly serve as bedroom communities for the larger urban centers. Declines in the farming and logging industry have contributed to this situation.

With some exceptions and individual variations, the service centers provide municipal water and sewer and employ municipal staffs. Limited other government functions may also be carried out in these communities. For example, the State Attorney's office and the U.S. Fish and Wildlife Service office are located in Island Pond. Vermont Agency of Transportation has maintenance garages in Canaan and Barton. All service centers are served by at least one state highway.

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. These plants have been instrumental in maintaining the social and economic vitality of the northern reaches of the region. However, a reliance on a few large industries



makes those communities very vulnerable to fluctuations in the national and regional economies. However, these service centers still have land set aside for future industrial development and would be happy to attract industry of any size. Orleans, North Troy and Hardwick all have industrial parks. Recent industrial 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 is presently going through a major expansion period, and along with Burke Mountain Resort has a goal of becoming a four-season resort. Expanded activities include mountain biking in both areas and a new golf course and residential development in Jay.

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. Recent conservation purchases by the State of Vermont and the US Fish and Wildlife Service, consisting of large portions of the former Champion lands, should also help to support the commercial businesses in Island Pond village.

3. 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 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.

4. 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 receive very little commercial or industrial development unless it occurs in an established industrial park, in an area specifically

designated in the local zoning bylaw, or occurs in an appropriate scale for its rural surroundings.

5. Industrial Parks

Some land uses, such as certain manufacturing processes, warehouses, or trucking-related businesses may be more appropriately located outside of any of the above 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. Industrial/business parks are encouraged to be densely developed while allowing enough space for business expansion. Infrastructure connections that serve industrial parks should not contribute to scattered development outside of the industrial parks.

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.

Adjacent Regions

The Northeast Kingdom does not exist or function separate 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 two states 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-Ottawquechee 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.

The Vermont planning regions abutting the Kingdom have a rural nature about them and they are very similar to the Northeast Kingdom. The regional plans that have been prepared for these regions are very similar to this plan for the Kingdom in wanting to maintain the rural nature of their areas.

IV. FUTURE LAND USE & DEVELOPMENT GOALS

- Traditional development patterns should be maintained and new development should be encouraged to follow these patterns.
- New development should be compatible with existing land uses, and agree with local plans.
- Historic structures, community facilities, and other buildings should be preserved and adapted for re-use.
- Brownfield sites should be reclaimed.
- Significant development proposals should consider the impact on adjacent regions.

STRATEGIES

TOWN CENTERS

- 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 adaptive reuse of historic structures through tax incentives, tax credits, grants, and loans, assistance in location of funding, etc.
- Assist communities applying for designation under the Vermont Downtown or Village Center Programs.
- Encourage mixed-use development (residential, commercial and appropriate light-industrial) in town centers.
- Direct public investment for new elderly and affordable housing towards town centers. Aside from promoting traditional settlement patterns, this will put seniors and low-moderate income residents closer to such amenities as transportation, shopping, and community activities.
- Encourage towns to plan for community recreational and social needs.
- Make reasonable accommodations for housing in town centers.

STRATEGIES

RURAL AREAS

- Support local conservation efforts.
- Encourage community open space plans and recreation infrastructure.

V. RECREATION LANDS

Recreation opportunities enhance the quality of life for residents and tourists alike, 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 take place on public and private lands. 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. Residential development and the subdivision of land over time have reduced the amount of private lands available for recreation. This increases the pressure on public lands and those private lands that are still accessible. According to the Vermont Department of Forests, Parks and Recreation, the posting of private land in the state more than doubled between 1988 and 1997 from about 100,000 acres to about 250,000 acres.

Other recreational land uses, such as sports fields, playgrounds, parks, and lake and river-access require more maintenance and usually some form of public investment. Municipalities should consider their residents' current and future needs for public spaces, water body access, and recreation facilities. This can be done in through the municipal plan or in a separate recreation plan or open space plan. Municipalities should work in conjunction with their neighbors in planning and development of recreation spaces so as to compliment each other's investments.

In 2003, NVDA assisted the Vermont Department of Forests, Parks, and Recreation with gathering information for the Statewide Comprehensive Outdoor Recreation Plan (SCORP). The SCORP is a ten year plan that identifies existing outdoor recreation opportunities and issues, and sets goals and objectives for the coming ten years. NVDA conducted a recreation issues survey of the region's towns to help the department in its efforts.

Issues that were identified as important by residents in the 1993 SCORP remain important for the region a decade later. These issues include: degraded water quality and an increase in aquatic nuisances, overdevelopment of shorelines around lakes and ponds, destruction of fish and wildlife habitat, loss of scenic resources and rural character, increasingly limited access to private lands (posting), and a lack of respect for private lands. All of these land use issues affect recreation.

Additionally, survey results indicated that there are an inadequate number of recreation facilities to meet public needs, as well as inadequate funding for public recreation. It still appears there is a lack of public education regarding recreation and a lack of information on recreation opportunities in the region. Lastly, respondents felt there is a need for greater numbers of trails, paths, and greenways in the region.

A number of new regional issues appeared in this recent survey. Hazardous and solid waste disposal, declining forest health, pollution (air, noise, and water), non-compliance with environmental laws, and loss of biodiversity were all identified as pressing issues for the region, and each is important for a high-quality environment.

Relating to the quantity of and access to natural and land resources in the region, issues that were identified as important include: the need to protect natural resources and ecosystems, the loss of wetlands, loss of agricultural land, need to preserve forest lands, loss of historic resources, loss of open space through inappropriate development, landowner liability concerns, and traditional land uses are no longer economically viable. Other new issues for the region are vandalism and littering in recreation areas, threats to existing trail resources, and the need to coordinate the development and maintenance of recreation areas and facilities.

V. RECREATION LAND USE GOALS

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

STRATEGIES

- Assist towns to plan for future recreation needs.
 - Assist with financing to develop additional facilities such as sports fields, playgrounds, trail systems, ice rinks, skateboard parks, and recreation/bike paths.
 - Identify and protect public access to water bodies.
 - Special attention should be given to providing recreation activities for youths and seniors.
 - Support local and regional recreation events (e.g. fairs, festivals, etc.).
 - Improve public information about existing recreational opportunities.
-

This material based upon work supported by the Dept. of Energy and Vermont's Clean Energy Development Fund under Award Number DE-EE0000859

INTRODUCTION

Northeastern Vermont Development Association (NVDA) originally prepared this plan as a supplement to the *Regional Plan for the Northeast Kingdom 2006*. The *2020 Energy Plan* is an update to the *2011 Energy Plan* (and a reflection of a statutory change that extended the life of regional plans to 8 years), which outlines a regional energy strategy for Northeastern Vermont, specifically the counties of Orleans, Essex, and Caledonia. 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 energy element, which may include an analysis of energy resources, needs, scarcities, costs and problems within the region, a statement of policy on the conservation of energy, and the development of renewable energy resources, and a statement of policy on patterns and densities of land use and control devices likely to result in conservation of energy.

In addition, NVDA is required to define what constitutes a 'substantial regional impact' with regards to development (24 V.S.A. Chp.117 §4345a (17)), because the definition is given due consideration in state regulatory proceedings. This definition is provided within Land Use section of the *Regional Plan for the Northeast Kingdom 2006* (Chp.1, pg. 16).

Background

Traditionally, NVDA approached energy planning from a strictly "supply-and-demand" perspective and this approach has generally supported the traditional systems that have continued to meet our regional energy needs. However, the energy trends of the last decade present NVDA with the challenge of addressing a much broader perspective, one that transcends current energy production and usage. At this time there are several factors that are creating a contentious climate for the future planning of our energy systems. Because of this, NVDA has expanded both its approach to energy planning and its role in regional energy policy.

This new role has stemmed from public response to rather swift changes now occurring in the energy industry. In the past several years, the region has had to contemplate the effect of utility-scale wind development on our mountains; how to ensure forest sustainability as wood-fuels grow in popularity; and whether or not an aging nuclear plant can be replaced with other generation resources. In addition, throughout these dynamic times affordability has become the primary concern of public and business communities. Because of our statutory responsibility, NVDA, through this document, is giving relevant information regarding various energy resources and setting our regional energy agenda for the next eight years.

NVDA Energy Committee

The 2020 update has been overseen by an Energy Committee whose members include Jim Greenwood, Marty Feltus, Robert Croteau, and John Morley. NVDA committee staff included Planning Manager, Dave Snedeker, and Senior Planner, Laurie Stillwell.

Strategy Outline

The Energy Strategy aims to guide the region's energy development for the next eight years. In order to accomplish this task, the Energy Committee has analyzed the current conditions of the region, calculated future growth, and evaluated the potential for resources to meet future needs. From the findings, the Energy Committee has developed regional portfolio recommendations, and overall energy goals and strategies. The basic components of the Energy Strategy are organized into four main sections:

REGIONAL OVERVIEW

This section provides an evaluation of local consumption, energy sectors, electricity infrastructure and demand, and anticipated future growth in energy usage.

RESOURCE ANALYSIS

In this section resources are analyzed for their current and future potential as part of the overall energy portfolio. Both traditional sources are addressed, including fossil fuels, hydro-power, and nuclear power, as well as the advancing renewable sources, such as solar, methane, wind, and biomass. Efficiency/conservation is also addressed as an important piece to meeting future needs.

NORTHEAST KINGDOM PORTFOLIO*

This section provides recommendations for each resource addressed within the Resource Analysis. It also addresses other important non-resource aspects of the portfolio, such as net-metering, and efficiency/conservation.

REGIONAL GOALS & STRATEGIES*

This section presents the main goals for the next eight years of energy planning and identifies clear strategies to meet those goals.

* Both the Northeast Kingdom Portfolio and the Regional Goals & Strategies include the guiding language for future energy development in the region.

REGIONAL OVERVIEW

Current Status of the Region

The Northeast Kingdom's energy trends have mimicked those of the state, and while the state has been subjected to the same energy issues occurring nationally, Vermont still remains a national role model for energy. 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. In 2010 Vermont ranked 51st out of the entire U.S. in total consumption of energy across all sectors and 42nd in per-capita consumption of total energy across all sectors¹.

In the past few years, the Northeast Kingdom has hosted electricity projects that have decreased transmission losses and improved reliability. The region is home to three major renewable generation facilities: the Ryegate Wood-Chip Plant, the Coventry Landfill methane-generator, and the Sheffield Wind Farm, which together produced 82% of the region's total electricity generation (2010). The Vermont State Legislature has made several changes with energy legislation as well, including policies pertaining to distributive generation (net-metering), renewable energy (portfolio goals and incentives), the creation of an efficiency utility, and alternative fuels/vehicles.

While Vermont continues to make changes in energy policy and infrastructure, there are some elements of the current energy system that negatively affect our region. The following overview proceeds to review all of the aspects of our energy system and pinpoint major elements that impact our region.

CONSUMPTION

Energy consumption has grown rather steadily since the 1950s. 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 traditionally ranked one of the lowest per capita energy consumption states in the nation. Table 2.1 represents the amount of energy consumed in the state in 2009. Regional figures for energy consumption are unavailable, but the Northeast Kingdom's consumption by source is similar to the state's breakdown. 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 2.2).

Table 2.1 Vermont Energy Consumption by Source 2009

Source	Trillion BTUs*
Coal	0
Natural Gas	8.7
Petroleum Products	82.2
Biomass (Wood & Ethanol)	14.3
Renewable Other**	0.3
Nuclear Electric Power	56.1
Hydro Electric Power	14.5
Net Interstate Flow of Electricity/Loses	-26.7
Net Imports of Electricity	8.7
Total	158.1

*A kilowatt hour is approximately 3,412 BTUs

**geothermal, wind, photovoltaic, and solar thermal energy.

(Source: Energy Information Association)

Table 2.2 Vermont Petroleum Product Consumption 2009

Type	Trillion BTUs
Motor gasoline	39.1
Heating oil and diesel fuel	30
Liqued petroleum gas	8.6
Jet Fuel	2.9
Other	1.7

Source: Energy Information Association

Table 2.3 Statewide Energy Use by Sector (Trillion BTUs)

Sector	1993	2001	2009
Transportation	50.7	51.9	53.5
Residential	34.6	47.8	48.3
Commercial	15.2	32.7	31.8
Industrial	14.2	31.2	24.4
Total	114.7	163.6	158.0

(Source: Energy Information Administration)

¹ U.S. Energy Information Administration: State Energy Consumption Estimates 1960-2010.
http://www.eia.gov/state/seds/sep_use/notes/use_print.pdf

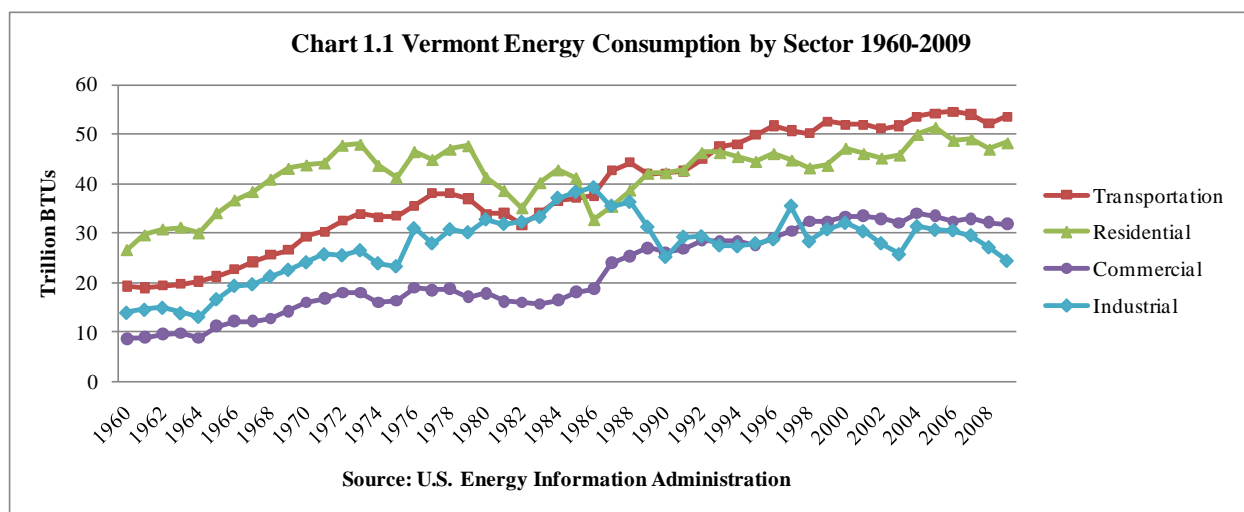
Table 2.3 outlines Vermont's energy usage by sector between 1993 and 2009. Over these years consumption has grown rather steadily, with major growth seen in particular sectors. Transportation energy usage has remained relatively steady over this period, most likely a result of an increase in fuel efficiency and conservation efforts. Residential sector consumption grew by 38.2% between 1993 and 2001. These 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 minuscule growth since 2001 corresponds with the recession, there is a general nation-wide "belt-tightening" initiated by rising energy prices, economic woes, conservation efforts and energy efficiency.

By far the largest growth occurred between 1993 and 2001 in the commercial and industrial sectors, which had more than doubled their energy consumption. Most of this growth can be attributed towards the advancement of computer technology and its widespread use in the workforce. The industrial sectors also saw a significant dip in consumption between 2001 and 2009; 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. Prior to 2008, energy consumption had continued to increase every year in each of these sectors. It is expected that the pre-2008 (pre-recession) consumptions figures will easily be met again once the economy turns around.

Energy Usage by Sector

TRANSPORTATION

According to the U.S. Energy Information Administration, approximately 34% of all energy used in the state is for transportation, almost entirely for cars and trucks. While the benefits of automobiles are obvious, they account for about 60% of all fossil fuels used in Vermont, 57% of carbon dioxide emissions and are the largest sources of several other pollutants. Since 1960, transportation energy use has grown at a faster pace than any other energy sector (Chart 1), especially in heavily auto dependent Vermont. However growth in transportation consumption has slowed considerably since 1993.



According to the Vermont Fuel Price Report, the average retail cost of gasoline was \$2.34 in January of 2006. In only 5 years the costs per gallon has risen 35% to \$3.17 (January, 2011). On average Americans spend 15.7 cents out of every dollar on transportation². Transportation costs now rank second only to housing costs for families throughout the country with food costs narrowing out a close third.

Energy usage 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. According to the *Vermont Energy Transportation Report*, the use of

Table 2.4 All Vehicles Registered in Vermont by Fuel Type

Fuel/Vehicle Type	2007	2008	2009	2010	Change
Hybrids	3,651	4,565	5,473	6,335	73%
Electric	106	101	94	77	-27%
Propane	93	75	69	40	-56%
Diesel	31,648	32,140	30,724	25,025	-21%
Gasoline	583,568	578,881	528,930	514,894	-11%

(Source: Vermont Energy Transportation Report)

high fuel-efficiency and alternative fuel vehicles is one way Vermonters can reduce transportation energy use. Table 2.4 depicts the use of alternative-fuel vehicles in Vermont over the last few years. Hybrids seem to be the most popular type of alternative fuel vehicle. Electric and electric-hybrid vehicles have the most potential to reduce Vermont's statewide

greenhouse gas emissions relative to conventional vehicles. This is because of their overall energy efficiency and relatively low greenhouse gas emissions associated with the electricity generation resources in the state (*Vermont Energy Transportation Report 2010*). Alternative fuel vehicles still require refueling infrastructure to support their use. According to the U.S. Department of Energy's Alternative Fuels Data Center, only 1 biodiesel, 3 compressed natural gas, 7 electric, 1 ethanol, and 1 propane refueling centers exist in Vermont (amounts include public and private facilities).

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 last 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.

As already noted, regional development patterns directly impact transportation energy usage, especially in regards to individual behaviors. For example, mixed-use, higher density neighborhoods encourage more pedestrian use. The following land use principles encourage reduced transportation energy consumption³:

² U.S. Dept. of Labor, Bureau of Labor Statistics: Consumer Expenditure Survey 2009-2010.

³ See the Transportation, Land-Use, and Housing Sections of the *Regional Plan for the Northeast Kingdom* for additional energy-related recommendations.

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.

RESIDENTIAL

Residential uses account for 30.5% of the energy used in Vermont (U.S. Energy Information Administration). Most of this energy is for residential heating. According to the 2005-2010 American Community Survey, heating oil is still the most common fuel source in the Northeast Kingdom, accounting for 62.5% of total home usage. Twenty-two percent of homes are heated by wood, 10.9% heated with propane gas, and 2.0% heated with electricity. All other fuels accounted for less than 1% each.

Table 2.5: Comparing the Cost of Heating Fuels, November 2008 & November 2011									
Type of Energy	November 2008				November 2011				% Change*
	BTU/Unit	Adj. Effic	\$/Unit	\$/MMBtu	BTU/Unit	Adj. Effic	\$/Unit	\$/MMBtu	
Fuel Oil (gallon)	138,200	80%	\$3.18	\$28.75	138,200	80%	\$3.82	\$34.58	15%
Kerosene (gallon)	136,600	80%	\$3.77	\$34.51	136,600	80%	\$4.17	\$38.16	6%
Propane (gallon)	91,600	80%	\$3.01	\$41.03	91,600	80%	\$3.16	\$43.16	1%
Natural Gas (therm)	100,000	80%	\$1.90	\$23.75	100,000	80%	\$1.67	\$20.83	-16%
Electricity (kWh)	3,412	100%	\$0.14	\$41.35	3,412	100%	\$0.15	\$43.46	1%
Wood (cord - green)	22,000,000	60%	\$190.00	\$14.39	22,000,000	60%	\$180.00	\$13.64	-9%
Pellets (ton)	16,400,000	80%	\$257.00	\$19.59	16,400,000	80%	\$247.00	\$18.83	-8%
* Adjusted for Inflation Source: Vermont Fuel Price Report, November 2008 & November 2011, Department of Public Service)									

Table 2.5 demonstrates the trend of instability in heating fuel prices in the last few years. Only the least used (and priciest) heating resources, such as Kerosene, Propane, and Electricity have remained relatively steady in price. Meanwhile fuel-oil, the number one household heating fuel in the region, has seen dramatic cost increases. Fuel oil prices may continue to rise as the U.S. economy turns around and demand for oil in growing economies, such as China and India, increases worldwide demand.

Natural gas prices show a continuation of the dramatic price reduction seen in the last several years. According to the U.S. Energy Information Administration (U.S. EIA), natural gas prices reached their lowest point in a decade this past January (2011). The dramatic drop is attributed to shale drilling (hydraulic fracturing) throughout Pennsylvania that has exploded in the last few years. Unfortunately, Northeast Kingdom residents are not able to utilize natural gas for home heating as the region lacks distribution infrastructure.

At present wood-heat is still the cheapest source of home heating in Vermont (See \$/MMBtu in Table 2.5 above). Both wood-pellets and cord wood saw decreases in price in the last few years, returning to 2007 figures. The decrease in wood-pellet pricing is attributed to an influx in pellets shipped in from British Columbia, which have kept prices down, but is not expected to last. While cord wood and wood-pellets have traditionally been used as supplemental heating fuels, the rising cost of fuel-oil has caused many home owners to swap the two, making fuel-oil a back-up to wood-pellet furnaces and out-door wood boilers. This switch was reflected in the 2005-2010 American

Community Survey, showing a 6% decline in homes heated with fuel oil and a 6% increase in homes heated with wood fuels, as compared to 2000 Census figures.⁴

Electric usage is the other major energy component in the residential sector. The majority of the electricity consumed in the region is for residential purposes (Table 2.6). Since 1990 the percentage of electric usage by the residential sector has declined, while total electric usage across all sectors has grown rather steadily.

Year	Residential	%	Commercial/Industrial	%	Total
2004	197,136	46%	235,882	54%	433,018
2005	201,916	44%	255,532	56%	457,448
2006	206,629	44%	259,722	56%	466,351
2007	203,137	44%	255,207	56%	458,344
2008	202,823	47%	233,170	53%	435,993
(U.S. EIA)					

Some of this shift is a result of improved efficiency and conservation measures provided to homeowners by the state's energy efficiency utility, Efficiency Vermont. For example, Efficiency Vermont assisted in saving roughly 3,425 megawatt-hours (MWhs) through the participation of 4,295 homeowners in the Northeast Kingdom in 2009 alone. In 2007, Efficiency Vermont's programs expanded into commercial and industrial sectors when a dramatic reduction in electric consumption was seen across all sectors. Unfortunately the continued reduction in 2008 is almost entirely in the commercial and industrial sectors, indicating this reduction is not due to savings measures alone but also the economic recession.

It has already been mentioned that residential usage accounts for a significant portion of the total amount of the total energy consumed in Vermont (30.5%). Residential usage consists primarily of heating for hot water and home heating, and fossil fuels remain the most common heating resources used within the region (fuel oil accounts for 62.5% of total residential usage and propane gas accounts for another 10.9%). Given the price volatility of these resources and the constant trend upward, it makes good sense to reduce the use of these resources whenever possible. The best opportunities to reduce consumption include conservation, weatherization, and efficiency. Other fuels, such as wood, can be used as a lower cost replacement or supplement for home heating.

COMMERCIAL/INDUSTRIAL

Combined, commercial and industrial activity account for the largest percentage of state-wide energy usage (35.5%). Most of the commercial/industrial energy usage can be attributed to space heating and process heating (Dept. of Public Service).

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 December 2011 the state's average electric retail price was 13.98 cents/kWh in the commercial sector and 10.05 cents/kWh in the industrial sector. Nationally, the December 2011 average electric retail prices for both the commercial and industrial sectors were 9.85 cents/kWh and 6.60 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.

⁴ The American Community Survey data differs from Census data in that it utilizes annual survey figures, from a smaller cross-section of the population, across a 5-year timeframe to provide data estimates for a given year.

To combat high electric and heating costs in the region a few industrial operations have resorted to generating their own energy. RadianTec, a radiant-floor heating manufacturing company in Lyndon, Vermont utilizes solar hot water panels and passive solar design to reduce their heat loads; the former Dirigo Paper Mill utilized on-site hydro and waste steam for electrical generation, which are still in operation under an independent power producer today; the Ethan Allen plant in Beecher Falls uses scrap wood to fuel an on-site generator, and is studying 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.

The opportunities for reduced energy consumption in the commercial/industrial sector are similar to those in the residential sector but typically differ in size and scale. These again include conservation and energy efficiency (including weatherization) and should not be underestimated. Other opportunities include: Investing in renewable energy systems such as solar, small wind, or biomass as some businesses and schools in the region have already done (including net-metered systems); and, altering hours of operation to take advantage better electric rates in off-peak hours/days.

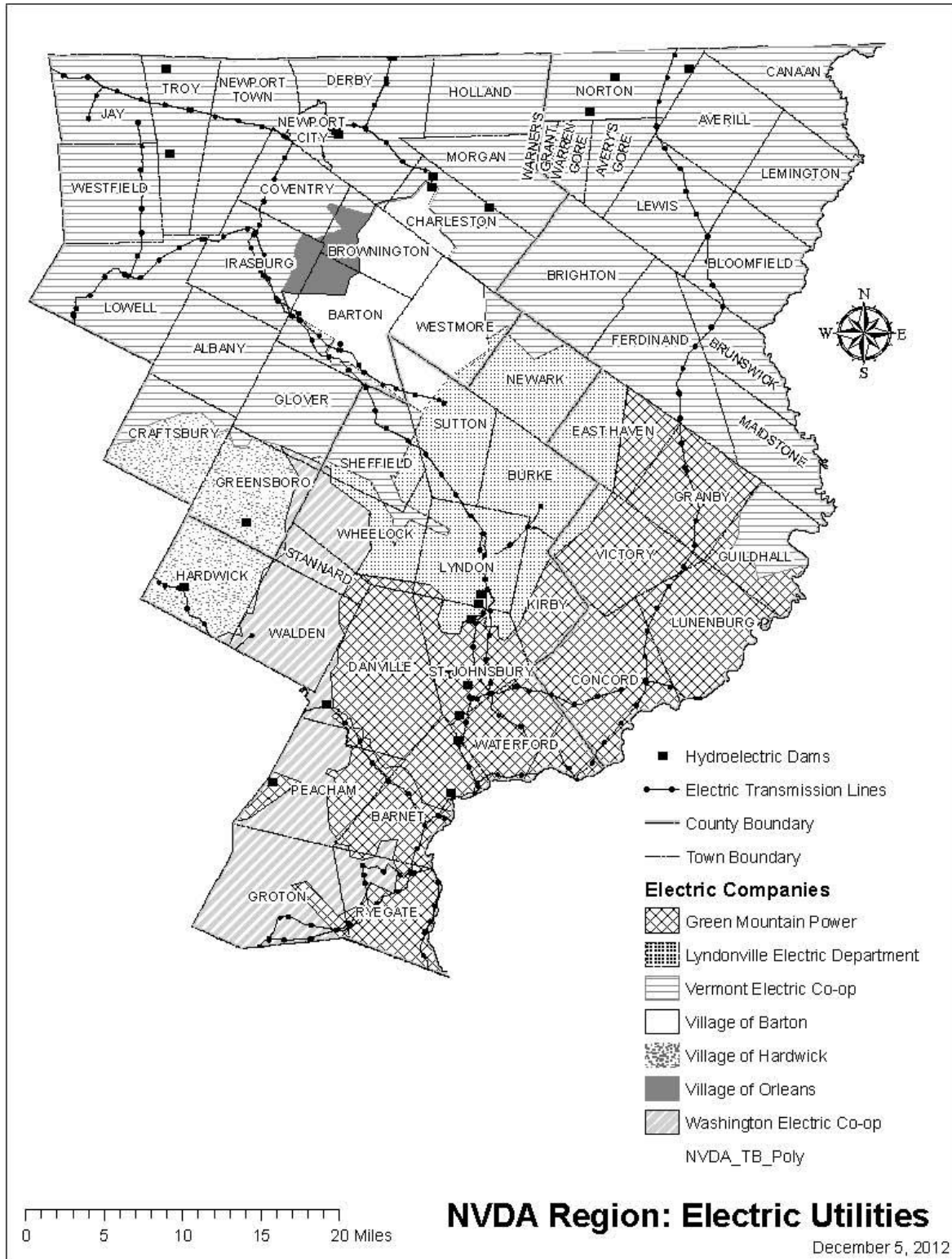
Electricity

Electric systems today 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 eight electric utilities. Map 4 depicts the coverage areas of the region's utilities and the major transmission 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, 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 over 19 different towns and

villages (see Regional Generation Facilities Map).



MAP 4: Regional Generation Facilities Map⁵

All of the smaller municipally owned utilities throughout the state are represented by the Vermont Public Power Supply Authority (VPPSA). VPPSA represents 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 explores new generation options. VPPSA has recently completed a 40MW peaking facility in Swanton, Vermont and is currently in the process of negotiating new power purchase agreements with Hydro Quebec and Vermont Yankee. The chart below documents the status of other generation resources VPPSA is presently pursuing:

Location	Project-Power Type	Ownership	Size	Status
Brockton, MA	Natural Gas Plant	Private	350 MW	Negotiating Power Purchase Agreements
Gilman, VT	Wood Biomass/Hydroelectric	Private	8-16 MW	Preliminary Negotiations
Kennebec, ME	Hydroelectric	Private	NA	Negotiating Power Purchase Agreements
Westminster, MA	Landfill Methane	Private	NA	Negotiating Power Purchase Agreements

Lyndonville Electric, Hardwick Electric, and Barton Electric's power supply portfolios are made up of a mixture of generation resources, long-term contracts, and short-term contracts. Orleans Electric's portfolio also includes long-term and short-term contracts; however it is without generation resources of its own. According to the 2011 Resource Reports provided by VPPSA, the municipal utilities receive power from hydro, wood, fuel-oil, natural gas, and nuclear generation facilities located throughout New England. Table 2.7 below outlines the actual power loads of the municipal utilities from 2006 through 2010 and their forecasted loads for 2011 through 2015.

Table 2.7 Municipal Utility Load Obligation 2006-2010 (actual) & 2011-2015 (forecasted) Load Obligation in Megawatt Hours										
Utility	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Orleans Electric	14,327	14,194	14,147	12,185	13,768	12,926	13,247	14,328	14,693	14,662
Barton Electric	17,197	17,353	17,371	17,370	17,080	17,194	17,253	17,173	17,167	17,168
Lyndonville Electric	78,246	79,050	78,017	75,957	76,462	75,520	75,890	77,342	77,817	77,776
Hardwick Electric	37,637	38,130	37,897	33,113	34,706	34,896	34,896	34,896	34,896	34,896
Total	147,407	148,727	147,432	138,625	142,016	140,536	141,285	143,739	144,573	144,501
Source: VPPSA 2011 Resource Reports										

According to the chart above all of the region's municipal utilities except Barton Electric saw a significant drop in load obligations that corresponds with the economic recession. These same utilities have forecasted that they will just begin to return to pre-recession load obligations between 2013 and 2015. This is not surprising since much of the consumption lost were from commercial/industrial operations that are hard to replace.

REGIONAL GENERATION FACILITIES

The Northeast Kingdom has a very large share of generation resources compared to other regions of the state. Table 2.8 provides a list of the region's generation sources. 2005 saw the first major jump in regional generation growth with the development of the Coventry Landfill methane generator, which provided another 25,000 MWWhs. In 2009, regional generation made another major jump when Coventry Landfill's generation output was doubled. Altogether, the Northeast Kingdom's 2009 electric generation capacity grew to 284,614 MWWhs.

⁵ Latest version of mapped Utility Service Territories (VCGI ArcGIS) data available.

Table 2.8 Generation Facilities in Caledonia, Essex, and Orleans Counties

Owner/Operator - Facility Name	Facility Type	2005 MWH Produced	2009 MWH Produced*	Location
Great Bay Hydro Corp. (IPP) - Newport Units 1,2,3	Hydro	15,678.22	undisclosed	Newport
Great Bay Hydro Corp. (IPP) - Newport 4-10	Diesel	0	-	Newport
Great Bay Hydro Corp. (IPP) - West Charleston	Hydro	undisclosed	2,070.00	Charleston
CVPS - Emerson Falls	Hydro	undisclosed	700.00	St. Johnsbury
CVPS - Arnold Falls	Hydro	1,510.70	1,965.00	St. Johnsbury
CVPS - Gage	Hydro	2,968.00	3,582.00	St. Johnsbury
CVPS - Passumpsic	Hydro	2,158.70	2,060.00	Barnet
CVPS - East Barnet	Hydro	9,855.70	7,320.00	Barnet
Barnet (IPP)	Hydro	1,767.38	1,814.00	Barnet
Village of Barton - Diesels	Diesel	3.83	4.00	Barton
Village of Barton	Hydro	3,678.92	5,101.00	Barton
Great Bay Hydro Corp. (IPP) - North Troy	Hydro	0	-	Troy
Chaput Family Farms	Methane	0	2,490.00	Troy
Maplehurst Farm	Methane	0	723.00	Greensboro
Norton Hydro	Hydro	0	-	Norton
Lyndonville Electric - Vail & Great Falls	Hydro	4,455.91	6,205.00	Lyndonville
CVPS - Pierce Mills	Hydro	1,411.40	1,464.00	St. Johnsbury
Ampersand Gilman Hydro (IPP)	Hydro	undisclosed	undisclosed	Lunenburg
GMP – Joe's Pond	Hydro	11,122.50	2,759.00	Danville
Dodge Falls (IPP)	Hydro	23,500.00	21,734.00	Ryegate
Ryegate Power Station (IPP)	Wood Chip	167,627.41	172,367.00	Ryegate
Maxwell's Neighborhood Energy, LLC (IPP)	Methane	0	1,750.00	Coventry
WEC - Coventry Landfill	Methane	25,000.00	50,506.00	Coventry
Total		224,509.00	284,614.00	
*figures are a mixture of actual & projected		(Source: VT Dept. of Public Service & IPPs)		

While not reflected in this chart, the region saw more generation growth in 2010 with the addition of the largest utility-scale wind farm in Vermont, by First Wind, Inc. The First Wind facility, located in Sheffield, Vermont came online in September 2010 and contributed another 25,948 MWhs to regional generation. The wind-farm was only operating for a portion of 2010, but was expected to contribute a total 112,000 MWhs annually. Another utility-scale wind farm in the region, Kingdom Community Wind (Lowell, Vermont), was also recently approved with a Certificate of Public Good. Once built, the Kingdom Community Wind Project is expected to contribute another 185,570 MWhs annually. If producing at expected capacity⁶, both wind farms will bring the region's electric generation capacity to approximately 580,000 MWhs.

⁶ Expected production capacity figures are provided by the Public Service Department and include discounts from actual total production capacity based on the frequency of wind generation (i.e. intermittency).

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 2.9 presents 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 2.9 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	

ELECTRICITY CONSUMPTION

With respect to simply how much electricity is generated here relative to what is consumed, the Northeast Kingdom will soon be a net exporter of electricity once the Kingdom Community Wind Project is up and running. This is a major shift from just a few years ago, when the region relied heavily on Canada, New Hampshire and the rest of Vermont to meet its electricity demand. In 2004, the total electric usage for the region was 433,019 MWhs (Table 2.10). Between 2004 and 2005 the region saw a significant increase in consumption (5.34%), even 2006 saw another 1.93% in growth, but by 2008 consumption had returned closer to 2004 levels. Again this reduction in electric consumption is associated with the start of the recession, increasing fuel costs and improved efficiency measures. If more recent consumption figures (2009-2011) were available on the county level it is expected they would follow the trend reflected in the municipal utilities' load obligation data (Table 2.7), essentially showing a continued decline in 2009-2010 with a recovery to pre-recession consumption levels by 2015. From this assumption, current regional electric consumption should be close to the 2004 figures, around 433,000 MWhs. With the recent addition of significant generation assets, plus the soon-to-be built Kingdom Community Wind Farm, the Northeast Kingdom will produce approximately 580,000 MWhs of electricity, which is 150,000 MWhs more than it consumes.

Table 2.10 2004-2008 Annual Electric Usage by County (MWh, All Sectors)

County	2004	2005	2006	2007	2008
Caledonia	213,437	223,313	216,580	219,845	211,269
Essex	41,312	53,333	60,552	51,447	41,173
Orleans	178,270	180,802	189,221	187,054	183,553
Total	433,019	457,448	466,353	458,346	435,995

(VT Dept. of Public Service & Renewable Energy Atlas of Vermont)

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.

At this time 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 (Table 2.11). 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 30-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.

Table 2.11 January 2012 Average Electric Retail Price (all sectors)	
State	Cents/kWh
Connecticut	15.91
Maine	12.68
Massachusetts	14.05
New Hampshire	14.48
Rhode Island	13.57
Vermont	14.21
National Average	9.65

(Source: Electric Power Monthly, EIA)

TRANSMISSION

A majority of Vermont’s electric transmission system is operated by the Vermont Electric Power Company (VELCO). VELCO is responsible for bulk transmission lines with a voltage rating of 115kV and above. Lines with a rating of 34.5kV, 44kV, and 69kV are considered sub-transmission lines. The Northeast Kingdom has roughly 325 miles of transmission and sub-transmission lines (Map 4) and serves as an important gateway for electricity coming from both Canada and New Hampshire.

At this time, Vermont is considered a constrained zone due to transmission grid congestion. Constrained states have a limited transmission network and transport electricity over long distances, creating congestion on the lines and restricting the ability to receive additional electricity from outside the state during increasing demand. The majority of the constraint has been caused by the considerable growth in the Northwest region of the state. The increasing demand has congested the Northeast Kingdom’s transmission network – limiting the capacity to receive additional electricity from out of state when needed. Constraint issues usually result in increased electricity costs. Because of transmission line congestion in-state facilities must be brought online (started up) in order to meet the new demand, even though less expensive generation facilities might be available out of state.

VELCO’s recently completed Northern Loop Project has alleviated much of the congestion of the Northern transmission grid. In our region, the project installed new lines between Irasburg and Newport; upgraded the St. Johnsbury substation; upgraded the Irasburg substation; and reconfigured the Hydro Quebec interconnection at Highgate – resulting in a significant amount of new transmission capacity on existing lines. The Northern Loop Project increased the reliability throughout Northern Vermont and should provide the transmission capacity needed to meet the Northeast Kingdom’s electrical growth for the next several years. An upgrade of the Hill Street substation in Lyndonville is also underway to provide a secondary connection between Lyndonville Electric’s grid and the larger VELCO transmission lines. The project is expected to ensure adequate future demand is met and improve overall reliability in Caledonia and Essex Counties. Other similar upgrades are being made throughout the region.

VELCO's implementation of Smart Grid technology is also expected to improve transmission reliability. With the help of a \$69M grant from the American Recovery and Reinvestment Act, the technology will be installed throughout the state in the next several years. A "Smart Grid" is named for the improvements made to existing transmission networks that convert existing one-way transmission system into a two-way system. The new fiber-optic system will be able to relay real-time data on electric usage, voltage, existing or potential outages, and generation facility performance allowing utilities to resolve problems quickly and assess customers' electric usage patterns. The Smart Grid technology also improves the incorporation of more and more distributed generation systems into the current electrical grid. According to VELCO the Smart Grid, "has the potential to increase energy efficiency and thereby reduce environmental impacts and energy consumption, and empower customers to manage their energy choices".

NET-METERING

Another means of alleviating transmission congestion is to reduce the need for transmission altogether, which is something that net-metering can help provide. 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's of renewable electricity that they create. In 1998 the Vermont State legislature passed a bill allowing the practice of net-metering. Approved net-metering systems include photovoltaic, small wind, fuel cell, farm methane, and bio-gasification facilities. Several revisions to the net-metering law over the last several years, including expanding production limits, simplifying permitting, and increasing peak load capacity, have made it easier to establish individual and group run net-metered systems.

The current law allows for net-metered systems of up to 500 kW with a capacity limit of 4% of a utility's 1996 system peak or previous year's peak, whichever is higher. Farm methane systems are now exempt from the capacity limit and solar net-metered systems have an added financial incentive called the "Solar Adder", which increases the average value of solar net-metered payback to \$0.20/kWh. According to Vermont's *2011 Comprehensive Energy Plan*, there are currently 1,319 permitted systems that have a peak production capacity of 10,923 kW, the majority of which are residential. Net-metered renewable systems have multiple benefits. Besides producing green power and providing monthly electric bill credits, the systems reduce the capacity pressure on local transmission systems during peak demand times.

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.

Anticipated Future Growth

According to the *2005 Vermont Electric Plan*, energy consumption will increase in coordination with economic growth and population growth. According to the 2000 and 2010 Census, the region has grown by roughly 3.7% in the last decade, down from a 4.2% population growth between 1990 and 2000. If the region continues this slower than average growth rate, as it is expected, the Kingdom will see 0.3 – 0.4% population increase each year for the next decade.

Economically, Vermont is expected to return to its pre-recession levels by 2015, and grow mildly through 2020 as compared to the rest of New England. According to the *New England Economic Partnership* (NEEP), New England's economic base will grow by just under 1% per year up to 2013. Unfortunately, this figure is said to be barely strong enough to overcome unemployment growth as the overall employment base is expected to grow as well, creating a rather stagnant economy. Vermont, however seems to be faring slightly better than the rest of New England, with lower unemployment, limited housing value decline, and growth in real personal income in 2011; pre-recession growth levels of 1% per year are predicted to be reached for Vermont prior to 2015, putting the state at a slight advantage. Although this figure represents the State's growth, the Northeast Kingdom should plan to incorporate a small percentage of this growth into the region approximately 0.2 - 0.3% between 2013 and 2020.

We project the future growth in energy demand for the Northeast Kingdom to be between 0.5 – 0.7% a year for the next eight years. This is very similar to the compound annual growth rate of between 0.4 - 0.7% (forecast to 2030) predicted for the Vermont as a whole by the Department of Public Service.

Using the conservative projection (0.5% per year), the Northeast Kingdom's electricity consumption will reach approximately 462,886 MWH by 2020, which is still below the regional consumption peak of 466,353 in 2006 (Table 2.10). This is certainly a possibility, since 2006 peak demand was reached prior to the implementation of extensive conservation and efficiency programs. The more realistic projection is 0.7% per year in electric consumption growth, as it reflects the 2015 rebound amount of 457,812 MWH, nearly matching the pre-recession consumption figures of 2007 that account for conservation and efficiency measures. Following the more realistic figure, we project that the Northeast Kingdom will consume an additional 40,000 MWH of power by 2020.

Transportation sector energy consumption is projected to have a much more conservative growth rate, which is most often tied to Vehicle Miles Traveled (VMT) data. According to the *Vermont Transportation Energy Report*, the amount of VMT has been decreasing statewide between 2006 and 2009 (reduced by 1.75% annually). This decline is attributed to the economic recession and growing fuel costs over this period, but it is unclear as to whether higher fuel prices will have a more lasting effect on the amount people are driving even after the economy turns around. Because of this, we project that the number of Vehicle Miles Traveled to grow rather conservatively for the Northeast

Kingdom following the projected 2015 economic turnaround, translating to an additional 3,800,000 VMT from 2015 and 2020.

According to *Vermont's 2011 Comprehensive Energy Plan*, thermal energy consumption has changed little in the last 20 years. Petroleum fuel consumption for heating purposes only grew at an average annual rate of 0.8% between 1990 and 2009. Increases in costs for heating fuels mostly result in fuel substitutions and investments in efficiency and weatherization. At the same time, new residential development and population growth has balanced out any decline in consumption that might be seen in the region so far. Therefore, we project thermal energy consumption in the NEK to remain relatively stable to 2020, with decline only expected if efficiency and weatherization activities increase.

RESOURCE ANALYSIS

Traditional Resources

FOSSIL FUELS

Fossil fuels account for over 60% of Vermont's energy consumption. Transportation and household heating are the two leading uses of fossil fuels. Fossil fuels include: natural gas, propane, heating oil/diesel fuel, gasoline, coal, and kerosene. As mentioned previously, the Northeast Kingdom is not served by natural gas; instead heating oil and propane are major resources. There are also no crude oil processing facilities in the state, the nearest facility is located in Quebec and is served by the Portland Pipeline, which runs through the region. Coal and kerosene are also used, though minimally.

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 (utilize 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. According to *Vermont Transportation Energy Report*, a total of 2.6 million cubic feet of CNG was sold at the two compressed natural gas filling stations in Vermont, the equivalent of over 20,000 gallons of gasoline or 19,500 gallons of diesel.

In the past, the abundance of cheap fossil fuels has influenced the development of our energy systems. Their current price volatility has dramatically affected the economy and the cost of living. In order to stabilize the country's energy structure, many states are encouraging diversification of energy portfolios through renewable resources. In the last few years, fossil fuel costs have risen to the point where renewable and alternative fuels are becoming more attractive within the energy market.

NUCLEAR

In 2009, nuclear power constituted roughly 38% of Vermont's electric needs. Vermont only has one nuclear facility located in Vernon, Vermont and owned by Entergy. Nuclear energy is produced using an atomic reaction and the process needed for this type of generation produces a lot of radioactive waste and environment temperature increases. Because of these outputs, there is a lot of

apprehension towards this type of energy production. Public concern over facility safety has been another major concern for nuclear, particularly with the Vernon facility and the recent natural disasters in Japan (earthquake and flooding).

Green Mountain Power and Central Vermont Public Service held the largest share of power purchase agreements with Vermont Yankee, which expired in 2012 as the plant faces relicensing. Entergy is in the process of renewing its Vermont license to continue operation for another 20 years, but there is significant public sentiment against the continued operation of Vermont Yankee. At this time it is unclear as to whether or not the plant will receive license renewal or shut down and begin decommissioning. Because of this uncertainty many Vermont utilities have already begun seeking replacements for power previously provided by Vermont Yankee in their portfolios. A large share of this replacement power is expected to come from Hydro Quebec and other facilities in the regional market. According to Vermont's *2011 Comprehensive Energy Plan*, "even with new Hydro Quebec and other contracts being offered to replace power previously supplied by Vermont Yankee, a gap between contracted supply and expected demand still exists". Presently, Vermont utilities retain the ability to purchase nuclear power from Vermont Yankee and other nuclear facilities.

Renewable Resources

In response to issues with conventional energy sources, Vermont is exploring newly emerging technologies and renewable energy sources, in particular, to meet future needs. Renewable resources generally include solar, wind, methane, hydro, and biomass energy. In June 2005, Vermont enacted the Sustainably Priced Energy Enterprise Development (SPEED) Program and Renewable Portfolio Goal. The SPEED Program provides 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 (Table 2.12) and a total cap of 50 MW was established for the program. To date the 50 MW cap has been met, with 15 projects in operation (7.58 MW) and another 43 projects (42.37 MW) in various stages of development (*Public Service Department*). In the 2012 latest legislative session, the cap was increased to a total of 127.5MW that will be rolled out in set allotments each year to limit the impact on rate payers. The first allotment will be 5MW/year for the first three years, then it will increase to 7.5MW/year for the next three years, after which it will increase to 10MW/year for each remaining years until the 127.5MW capacity is met by 2022. Changes to the program also address how tariff rates are established, with the legislature promoting a reverse auction process to ensure competitive rates. Northeast Kingdom renewable energy development projects enrolled in the SPEED Program include First Wind, Coventry Landfill, Maxwell's Neighborhood Energy, Chaput Family Farms, Great Bay Hydro - West Charleston, and Kingdom Community Wind.

Table 2.12 SPEED Program Renewable Energy Rates (\$/kWh)

Renewable Energy Technology	Current Tariff Rates*
Landfill Methane	\$ 0.09
Farm Methane	\$ 0.141
Wind (small)	\$ 0.214
Wind (large)	\$ 0.118
Solar PV	\$ 0.24
Hydroelectric	\$ 0.12
Biomass	\$ 0.13
*As amended in 2010	

(Source: Public Service Department)

Vermont's Renewable Portfolio Goal calls for utilities to meet growth in electricity demand by using energy efficiency and new renewable generation sources. This law encourages each retail electricity

provider to supply an amount of new renewable energy equal to its total incremental energy growth between 2005 and 2012, with a minimum requirement of 5% (2008 amendment). If this goal is not achieved by 2012 the policy will become a mandatory Renewable Portfolio Standard in 2013. According to the *2011 Comprehensive Energy Plan* the 5% minimum was met in 2011, and there is a new goal established by the Legislature of 75% minimum by 2032. Presently, Vermont utilities are on track to provide 17% of the state's total electric portfolio from new renewable resources by 2013.

HYDRO

Hydro-power is second leading generation resource in the Northeast Kingdom. Fifteen of the 22 generation facilities in the region are hydro. The largest electric producers include Green Mountain Power's facility on Joe's Pond, Lyndonville Electric's Vail & Great Falls facilities, Central Vermont Power Service's East Barnet Dam, and Great Bay Hydro's facilities in Newport (Table 2.8). 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 roughly 638,000 MWH of electricity annually (double what the region consumes). Altogether, the Northeast Kingdom can produce roughly 78,000 MWhs of hydro-electric power. A hydro-power resource map developed by NVDA (provided on the following page) identifies where the potential for new hydro facility siting may exist in the region.

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 wildlife⁷. 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 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. To alleviate some of the permitting costs new legislation was recently passed to help expedite permitting for new small-scale hydro projects in the state.

SOLAR

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

⁷ Foundation for Water and Energy Education.

(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.

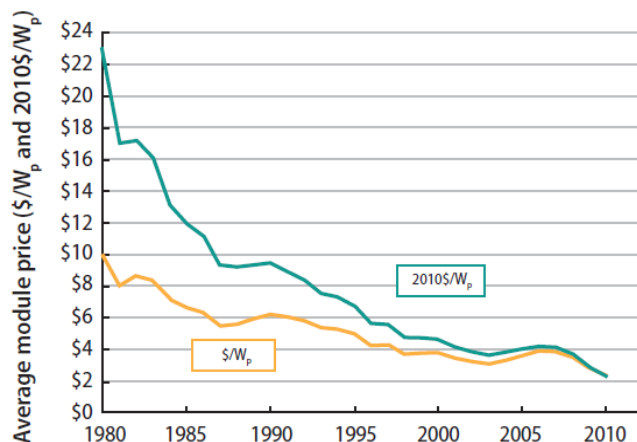
Solar water heating systems typically utilize collectors to capture the sun's energy, a pump to circulate a solution through the collectors to extract heat energy, and a well-insulated storage tank to hold the heated water for use as needed (this can be integrated with an existing water-heating system). 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, possibly blocked by other development or trees. This is common for more urbanized areas. 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. 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.

Improving technology, in cost and output, also suggests that Vermont's solar energy potential will continue to grow. Vermont is already one of the top 10 states for PV on a per capita basis (Vermont's *2011 Comprehensive Energy Plan*). Today, smaller net-metered (or “grid-tied”) PV systems tend to produce power with a long-term levelized cost of about \$.20/kWh (with the 30% Federal Tax Credit included). The following chart shows the dropping price of photovoltaic modules from the Department of Energy's Solar Technologies Market Report⁸. There is also a wide range of photovoltaic technologies now

Chart 1.2 Global Average PV Module Prices, all PV technologies 1984-2010 (Mints 2011)



⁸ <http://www.nrel.gov/docs/fy12osti/51847.pdf>

under development, including various thin film technologies, which may further advance the use of solar systems in Vermont.

METHANE

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. 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, and the dry solids can be used for animal bedding.

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 Bridgeport, Vermont was the first farm in the state to develop a manure-methane generation system. The farm began producing in January of 2005 and estimates production at 1.7 million kWh annually. The project is supported through the Central Vermont Public Service's (CVPS) Cow Power Program, which grants financial assistance for the development of methane generation systems. Through this program, farmers receive 95 percent of the market price for the electricity produced plus the additional fees (4 cents/kWh) from participating rate payers. In the Northeast Kingdom the Maplehurst Farm, Maxwell Farm, and Chaput Family Farms have installed anaerobic digester systems and collectively produce approximately 4.9MW of electricity. According to the *Renewable Energy Atlas of Vermont*, there are another 31 dairy farms in the Northeast Kingdom that have the potential to support anaerobic digesters.

With landfills, facilities are capped and have special extraction systems to remove the methane for generation. If not utilized, methane - which is 20 times more potent as a greenhouse gas than carbon dioxide - escapes into the atmosphere. In late 2005, the Coventry Landfill began producing electricity from the facility. According to the Washington Electric Cooperative, this facility currently provides two-thirds of the Co-op's power demand. There are a number of smaller landfills in the region that may have the potential to produce electricity depending upon the content of the landfills and their age.

WIND

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.

At this time, our region harnesses wind energy through small-scale individual systems and one utility-scale wind farm (First Wind) located in Sheffield, VT. The First Wind facility, which consists of 16 turbines over 400' tall, was the first large utility-scale wind farm permitted in Vermont following the experimental and much smaller Searsburg facility. Already permitted and currently under construction is the Kingdom Community Wind project, located in Lowell. Kingdom Community Wind will be the NEK's second and Vermont's largest utility-scale wind farm, utilizing 3 miles of ridgeline, and 21 turbines over 400' tall, and is predicted to produce approximately 185,570 MWhs annually. There are several more utility-scale wind projects in the works at various

stages of planning and development in the state, as outlined in Table 2.13, some of which are within the Northeast Kingdom.

Table 2.13 Proposed Commercial Wind Projects in Vermont			
Project Name	Size (MW)	Location	Status
Deerfield Wind	30 (15 towers)	Reedsboro (Searsburg Expansion)	Certificate of Public Good Permitted (Lawsuit pending)
Georgia Mountain	7.5-12 (3-5 towers)	Milton	Certificate of Public Good Permitted (operational Nov. 2012)
Grandpa's Knob	50 (20 towers)	W. Rutland, Castleton, Hubbardton, Pittsford	Permit Application expected in 2012
Seneca Mountain Wind	91.5* (12-25 towers)	Ferdinand, Newark, Brighton	Planning stage (measurement towers application submitted Apr. 2012)
Grandview Farm	2-2.3 (1 tower)	Derby	Certificate of Public Good Permit Application submitted Dec. 2011
Smugglers Hill Farm	2-2.3 (1 tower)	Holland	Certificate of Public Good Permit Application submitted Dec. 2011
*based on NEEPOOL Interconnection application		(Source: VT. Department of Public Service, www.aweo.org)	

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. A wind resource map is provided at the end of this chapter that outlines potential siting locations that are suitable for small-scale wind towers. Larger (utility-scale) ridgeline generation facilities may contain as few as 1 to as many as 40 or more turbines. All grid-connected wind turbines are subjected to review and approval by the Public Service Board (30 VSA Section 248). 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.

GEOHERMAL

Geothermal, or "ground source heat pump systems", 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. While geothermal systems do require electricity to operate the pumps, the systems generally deliver between 3 to 5 times more heat than the electrical energy they consume (depending on the type of system). Geothermal systems are also more efficient than heat pumps that just utilize outside air

because the ground/well source systems can take advantage of relatively constant temperatures below the frost line (45-60 Fahrenheit).⁹

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 transfers 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.

BIOMASS

Biomass is organic material that is burned to generate energy. The most common forms of biomass are wood, solid waste (biogas), and biofuels such as ethanol and biodiesel. Wood is already an abundant renewable resource in the region and commonly comes in the form of cordwood, wood chips, and wood pellets. Appropriate biomass applications include use as fuels for heating, electric generation, combined heat-and-power (CHP), and transportation.

Wood chips and wood-pellets have become increasingly popular as a heating resource in the region. 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. While wood-pellets can be used in these same applications, they have proven to be most popular in residential applications due to the increased efficiency and ease of existing operating systems. According to the Pellet Fuels Institute, sales of pellet-burning stoves and furnaces grew from 55,000 in 2007 to 141,208 in 2008.

For institutional applications the Vermont Fuels for Schools Program has been extremely successful, installing 43 schools with heating systems that burn small-diameter waste wood. Several Vermont colleges now also have campus-wide district heating systems supported by wood-waste. Middlebury College, for example utilizes a 21,000 ton/year wood-chip fueled combined heat-and-power (CHP) system.

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, Ethan Allen Plant (Canaan), and Lyndon Furniture utilize wood-chip CHP systems to meet partial heat and power needs. The Vermont Department of Buildings and General Services operate a large number of facilities on wood-chips including the Montpelier Capital Complex, the Middlebury State Office Complex, the Emory Hebard State Office Building, and several state prisons. According to

⁹ Source: *Heating Your Home or Business in Vermont with a Geothermal System* (a NVDA Publication).

the Vermont State Agency Energy Plan (July 2005) wood resources account for only 2% of energy expenditures for state buildings, but yields 20% of the energy required.

The region already supports a large scale wood-chip fueled electric generation facility. The Ryegate Power Station will be the second largest electric generation facility in the region once Kingdom Community Wind is built in Lowell. 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. The plant remained shut down for a while because its retail price/kWh cannot compete on the electric spot market. Plant modifications underway will enable it to receive Renewable Energy Credits, effectively subsidizing its production costs to make its retail price more competitive. 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 power¹⁰. 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 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 wood-generation and co-generation facilities are not always easy either. Noise, emissions, truck traffic, and unsightly smoke stacks are concerns when siting facilities near residential neighborhoods and since these facilities use a renewable fuel that grows at a specific rate, overharvesting of the regional woodshed is also a concern.

By diversifying transportation fuels with ethanol or biodiesel, the region would be able to reduce a significant portion of our fossil fuel consumption and stabilize transportation costs. Ethanol based fuels such as E85 are a combination of ethanol and 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. Biomass fuels are also vulnerable to natural disasters, such as drought and wildfires.

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).

Biodiesel is a better fit as a biofuel in the state of Vermont, as it can easily be supported in the existing infrastructure of the region. Existing diesel engines and heating oil furnaces do not need to be altered in any way to use biodiesel. Both systems can use pure biodiesel, but combination fuels have been developed for maximum output, such as B10 and B20. Biodiesel is commonly made from soybeans, rapeseed (canola), and sunflowers; all of which can be grown in Vermont. Currently the Vermont Biodiesel Project is working to expand the usage of biofuels for heating and transportation in the state.

Energy Generation Facility Permitting Process

As with the development of any energy generation facility, a Certificate of Public Good must first be issued by the Public Service Board. Prior to issuance, the Board takes into account the environmental, economic, and social impacts of a proposed facility (see Appendix A at the end of the chapter for specifics). Municipalities and other groups are allowed to participate in the Section 248 review process, but many find doing so to be difficult and expensive. At this time towns may only regulate the development of individual owner-consumption electric generation facilities that are not connected to the transmission grid. Moreover, under Section 248 the Public Service Board must consider, but is not bound by, environmental criteria and may approve a project simply on the basis that they deem the project to be in the “public good”.

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. The extension of some subsidies by the Federal government is now currently in question, and as a result, the industry is presently unstable. 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
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
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

Business Investment Tax Credits are a major contributor to the renewable energy market at this time. Investors receive deductions from 10-30% of the cost of investing, purchasing, or construction depending on the type of renewable technology. Vermont provides a corporate state-tax credit that

investors can claim in addition to the federal credit. The federal Production Tax Credit (PTC) provides residential and business generators of renewable power a tax credit of up to 2.2 cents/kWh for 10 years depending on the type of renewable technology. In order to claim the Production Tax Credit eligible facilities must be in-service before a set date. Wind technologies will be the first to expire from the Production Tax Credit, unless the in-service deadline of December 31, 2012 is extended. All other eligible PTC technologies have an in-service deadline of December 31, 2013. At this time it is unclear if the Production Tax Credit will be extended by Congress for wind facilities. Modified Accelerated Cost Recovery System (MACRS) is another extremely important subsidy, especially to wind farms at this time, due to the short life-span of wind turbines. The system provides specific tax depreciation deductions for a variety of technologies based on pre-determined life-spans.

Renewable Energy Credits (RECs) are also a major supporting factor in the development of renewable energy. RECs are derived from the Renewable Portfolio Standards (RPS) laws mandatory in Massachusetts, Connecticut, Rhode Island, Maine, and New York. Although similar to Vermont's Renewable Portfolio Goals, the standards require utilities to have a certain percentage of renewable power in their mix. Commonly the RPS starts at 1-5% in the first year and increases to as much as 20% in ten years. Most RPS policies involve a credit trading mechanism, so that companies with extra renewable power can sell the extra "renewable-credits" to utilities who haven't met their RPS requirement. Vermont currently allows the sale of renewable credits in other New England states, since Vermont's goals are not mandatory. Essentially as Vermont utilities build additional renewable generation, the RECs can be sold separately from the electricity to other states' utilities, where they have a higher value, thereby subsidizing the development of the new renewable generation in Vermont. Unfortunately, the separate sale of RECs also has provided for a kind of a 'double counting' of renewable generation. For example, a Vermont utility can currently claim to provide renewable power to its ratepayers (possibly as part of the Vermont SPEED Program), while at the same time sell the RECs from the same power to Massachusetts ratepayers. Overall, this is clearly an issue which deserves further consideration and refinement by the Legislature.

Property-Assessed Clean Energy (PACE) Districts are a relatively new method to encourage property owners to install renewable energy systems and make energy efficiency improvements. PACE programs 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 local towns are considering implementing PACE Districts.

Efficiency & Conservation

Energy efficiency is a very significant part of any long-term energy strategy, yet it is often overlooked when adopting an energy plan. 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. Efficiency can be improved in any number of ways (e.g. switching to efficient fluorescent light bulbs, insulating an attic, driving a more fuel efficient vehicle, or replacing older equipment with new technologies that consume less energy). The net result is that less energy is used, while the overall costs needed for energy are reduced. 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.

Weatherization improvements are energy efficiency measures and include such things as insulating walls and ceilings, installing programmable thermostats, and replacing inefficient machinery. There are energy efficiency and weatherization programs in Vermont available to businesses and homeowners and these do change over time. Efficiency Vermont is a good starting place to find out what is available.

EFFICIENCY VERMONT

In 1999, the Vermont Public Service Board created an energy efficiency utility for the state, called Efficiency Vermont. 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.

Over the last ten years, Efficiency Vermont has had a strong impact on reducing energy consumption. According to *Efficiency Vermont's 2011 Annual Report*, the savings from their programs have met 11% of Vermont's 2011 total electrical energy needs. In 2011 alone, they were responsible for saving 108,000 MWhs of electricity, 66,762 MMBTUs, and 790,000 tons of cumulative CO2 emissions state-wide. In the Northeast Kingdom, their programs accounted for 5,609 MW hours of electricity savings, a net -462 MMBTU of fuel savings, and 27,300 CCF of water savings in 2011 (*Efficiency Vermont Year 2011 Annual Report*).

In 2009, Vermont Energy Investment Corporation signed a new three-year contract with the Public Service Board to provide services through Efficiency Vermont that will raise the annual energy savings goal to 360,000 MWhs from 204,000 MWhs (2005-2008) and provided a \$100 million dollar budget to do so. The economic benefit goal for the current contract term aims to provide \$85 million in total resource (lifetime) benefits to the Vermont economy. This translates to a benefit cost ratio of 1.2 (Highlights of Efficiency Vermont's Plans for 2009-2011). As of Efficiency Vermont's 2009 Annual Report, 95% of the Caledonia County and 85% of Orleans/Essex Counties total resource benefit goals had been met, accounting for a total of \$6.4 Million in savings.

NEK PORTFOLIO

Portfolio Recommendations

As we look at meeting the energy needs for the Northeast Kingdom it is important to remember that there are several distribution companies that supply the region with power and each will need to focus on their individual future needs. All distribution companies are planning for greater diversity in their resources as well as evaluating fuel sources, contract lengths, and contract terms.

The following recommendations express how each resource should fit into the regional energy portfolio for the next eight years:

FOSSIL FUELS

Base-load Power, Standard Heating & Transportation Fuel Resource

Determining the future extent to which fossil fuels can remain a part of the region's energy mix is difficult. For years, experts have been trying to determine the time frame in which world oil production will peak and just how long worldwide supplies will be able to keep up with demand. At the time of this writing, world oil production is growing more slowly than demand, causing a major increase in fuel prices. The trend of rising fossil fuel prices over the long-term is expected to continue although downward fluctuations do occur. Natural gas has been a relatively recent exception to this trend for fossil fuels. Expanding production capacity can be developed, but this only translates into a short-term fix. For the next eight years fossil fuels, with the exception of natural gas, should play a reduced role in the region's energy mix.

HYDRO

Base-load & Intermittent Power Resource

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 point the focus for hydro-power should be focused on maintaining facilities with renewed permits, upgrades to aging infrastructure, and improved safety standards. The development of new facilities should be pursued where practical, and may now be easier under new state law.

NUCLEAR

Base-load Power Resource

Nuclear power is a reasonable priced base-load resource. The Vermont Yankee plant provided a significant portion of the state's electricity and its power has been replaced by utilities with other base-load resources, primarily from Hydro Quebec. Nuclear energy should remain an option for the region's energy portfolio, either through Vermont Yankee (if it's relicensed), or through other nuclear facilities in New England.

SOLAR

Intermittent Power & Supplemental Heating Resource

Solar power (photovoltaic) has an ability to meet some of our future energy needs, by successful implementation as a supplemental resource. The recent decrease in cost of PV and technology advances suggests that prospects for this resource will continue to improve. A gradual, sustainable increase in the use of solar power should be encouraged, especially in residential applications. Solar hot water heating is already a proven cost reducer and/or stabilizer. This technology should be considered where applicable. Green Building Design principles, including passive solar design, are also a very cost-effective way to help reduce energy consumption and should be encouraged in renovations or new buildings.

METHANE

Base-load Power Resource

Methane proves to be a significant resource to meet our short-term energy growth and also support agricultural practices in the region. The only large-scale landfill in the region is already being utilized for methane generation, but there are at least 31 dairy farms with enough capacity to sustain a manure-methane generation facility (Renewable Energy Atlas of Vermont). Farms with over 200 cows can produce a favorable amount of generation, potentially over 1,000 MWhs/year. The development of such systems can be costly however. If state and federal grants, tax credits, and

incentives remain in place to combat the high start-up costs, manure-methane generation should be expanded in the region's energy mix.

WIND

Intermittent Power Resource

Two large utility-scale wind farms have already been permitted in the Northeast Kingdom and at least four other projects are in development stages. Given the recent increase in development pressure the NVDA region is experiencing in regards to utility-scale wind; the NVDA Board of Directors passed the following resolution¹¹,

“The Executive Committee recommends a suspension of new construction of industrial size wind turbines in excess of two hundred feet for a three-year period. This will allow time for a thorough evaluation of the impact of wind towers on the Northeast Kingdom. Such an evaluation will be conducted by NVDA and include the following criteria (additional criteria may be added as determined by the Executive and Energy Committees:

- The cost versus the benefit of industrial size wind turbines in the Northeast Kingdom;
- what does objective data and science show concerning measurable health impacts, what does national and international research shows;
- are transmission requirements being adequately addressed with these projects;
- do statutes, regulations and the review process (Section 248) provide ample environmental protections for the development of higher elevation ridgelines;
- what is the impact of utility-scale wind turbines on property values and tourism in the Northeast Kingdom;
- and, what impact do utility-scale wind turbines have on greenhouse gas emissions in the Northeast Kingdom.”

Upon completion of the Wind Study, the NVDA Energy Committee shall revise this version of the Energy Strategy to incorporate the findings from the study.

While NVDA is recommending suspending utility-scale wind development, there is still very strong support for small-scale non-utility wind development as a resource for the region. For purposes of this plan, smaller non-utility scale wind systems are defined as turbines under 200 feet in height, including the blades length. Small-scale wind should remain a viable resource option for farms, communities, and landowners in the region.

GEOTHERMAL

Supplemental Heating Resource

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.

¹¹ Area towns may take differing positions on wind energy facilities which may be at significant variance with NVDA's resolution. Town plans will be deemed compatible with this regional plan and with other town plans so long as the plans demonstrate that wind energy was taken into consideration in the development of the town's energy component.

BIOMASS

Base-load Power, Standard/Supplemental Heating & Transportation Fuel Resource

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.

ENERGY EFFICIENCY & CONSERVATION

The Northeast Kingdom expects energy efficiency improvements and weatherization could meet a significant portion of growth in energy demand. Through efficiency programs and weatherization, such as the ones offered by Efficiency Vermont, energy efficiency and weatherization efforts should be promoted and utilized as much as possible at the local and regional level. All municipalities should lead by example and conduct energy efficiency audits of public buildings and make efficiency and weatherization improvements to reduce energy consumption and save local taxpayer dollars.

REGIONAL GOALS & STRATEGIES

Policy Statement

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 Service Board shall 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.

Regional Energy Goals & Strategies

- 1. An adequate, reliable, diverse, and secure energy supply will benefit 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.
 - Promote a diversified energy portfolio for the region.
 - Encourage local responders to plan for emergency energy resources (VEM Emergency Generator Grant Program generators).
- 2. Affordable energy alternatives will be available for the region's users.**
- Assist in the development of businesses that support alternative energy use.
 - 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.
- 3. 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.
- 4. 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).
- 5. Environmental and aesthetic impacts of energy generation and usage will be considered.**
- 6. Energy efficiency and weatherization will be an integral part of the energy portfolio.**
- Encourage municipalities to reduce their energy costs through conservation and efficiency, and weatherization programs
 - 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 (Green Building Design & LEED certification).
- 7. 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.

- Encourage the PSB to examine the long-term sustainability of proposed facilities.
- Ensure that developments subject to Act 250 consider new energy requirements.
- Support the NVDA Board of Directors resolution for a three-year suspension of utility-scale wind development in the Northeast Kingdom until a study is completed.

8. 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.

APPENDIX A - Title 30: Public Service Board, Chapter 5, Section 248(b): Before the public service board issues a certificate of public good as required under subsection (a) of this section, it shall find that the purchase, investment or construction:

(1) with respect to an in-state facility, will not unduly interfere with the orderly development of the region with due consideration having been given to the recommendations of the municipal and regional planning commissions, the recommendations of the municipal legislative bodies, and the land conservation measures contained in the plan of any affected municipality. However, with respect to a natural gas transmission line subject to board review, the line shall be in conformance with any applicable provisions concerning such lines contained in the duly adopted regional plan; and, in addition, upon application of any party, the board shall condition any certificate of public good for a natural gas transmission line issued under this section so as to prohibit service connections that would not be in conformance with the adopted municipal plan in any municipality in which the line is located;

(2) is required to meet the need for present and future demand for service which could not otherwise be provided in a more cost effective manner through energy conservation programs and measures and energy-efficiency and load management measures, including but not limited to those developed pursuant to the provisions of subsection 209(d), section 218c, and subsection 218(b) of this title. In determining whether this criterion is met, the board shall assess the environmental and economic costs of the purchase, investment, or construction in the manner set out under subdivision 218c(a)(1)(least cost integrated plan) of this title and, as to a generation facility, shall consider whether the facility will avoid, reduce, or defer transmission or distribution system investments;

(3) will not adversely affect system stability and reliability;

(4) will result in an economic benefit to the state and its residents;

(5) with respect to an in-state facility, will not have an undue adverse effect on esthetics, historic sites, air and water purity, the natural environment, the use of natural resources, and the public health and safety, with due consideration having been given to the criteria specified in 10 V.S.A. §§ 1424a(d) and 6086(a)(1) through (8) and (9)(K) and greenhouse gas impacts;

(6) with respect to purchases, investments, or construction by a company, is consistent with the principles for resource selection expressed in that company's approved least cost integrated plan;

(7) except as to a natural gas facility that is not part of or incidental to an electric generating facility, is in compliance with the electric energy plan approved by the department under section 202 of this title, or that there exists good cause to permit the proposed action;

(8) does not involve a facility affecting or located on any segment of the waters of the state that has been designated as outstanding resource waters by the secretary of natural resources, except that with respect to a natural gas or electric transmission facility, the facility does not have an undue adverse effect on those outstanding resource waters;

(9) with respect to a waste to energy facility, is included in a solid waste management plan adopted pursuant to 24 V.S.A. § 2202a, which is consistent with the state solid waste management plan;

(10) except as to a natural gas facility that is not part of or incidental to an electric generating facility, can be served economically by existing or planned transmission facilities without undue adverse effect on Vermont utilities or customers;

(11) with respect to an in-state generation facility that produces electric energy using woody biomass, will:

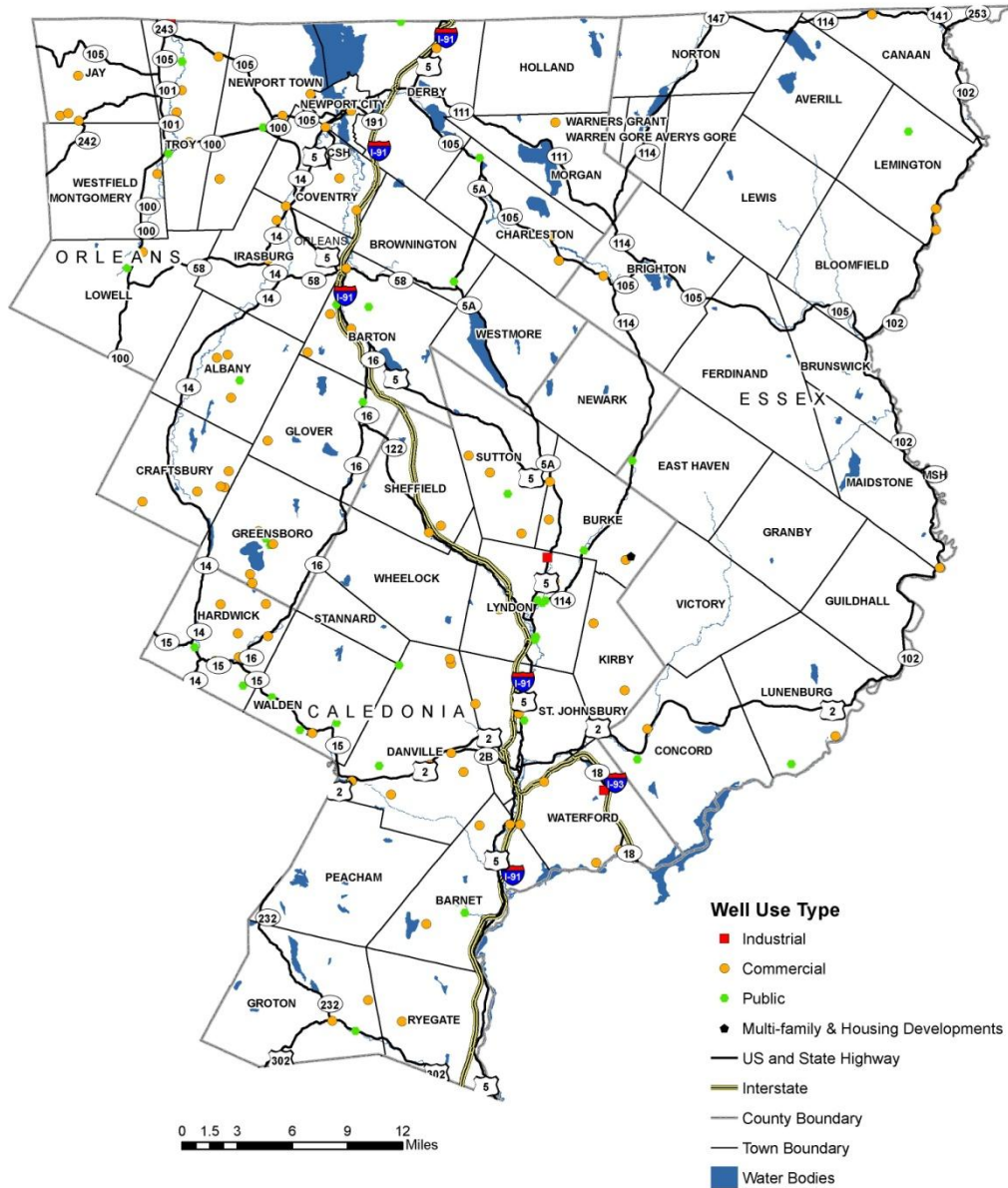
(A) comply with the applicable air pollution control requirements under the federal Clean Air Act, 42 U.S.C. § 7401 et seq.;

(B) incorporate commercially available and feasible designs to achieve a reasonable design system efficiency for the type and design of the proposed facility; and

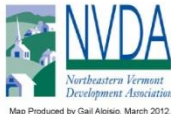
(C) comply with harvesting guidelines and procurement standards that are consistent with the guidelines and standards developed by the secretary of natural resources pursuant to 10 V.S.A. § 2750 (harvesting guidelines and procurement standards).

Geothermal Heating & Cooling High Potential Wells in the Northeast Kingdom

DRAFT



Wells depicted on this map have been determined to have a high yield and significant depth, such that they may support larger size geothermal heating or cooling systems. Actual well suitability for geothermal use must be evaluated by a geothermal systems installation professional.



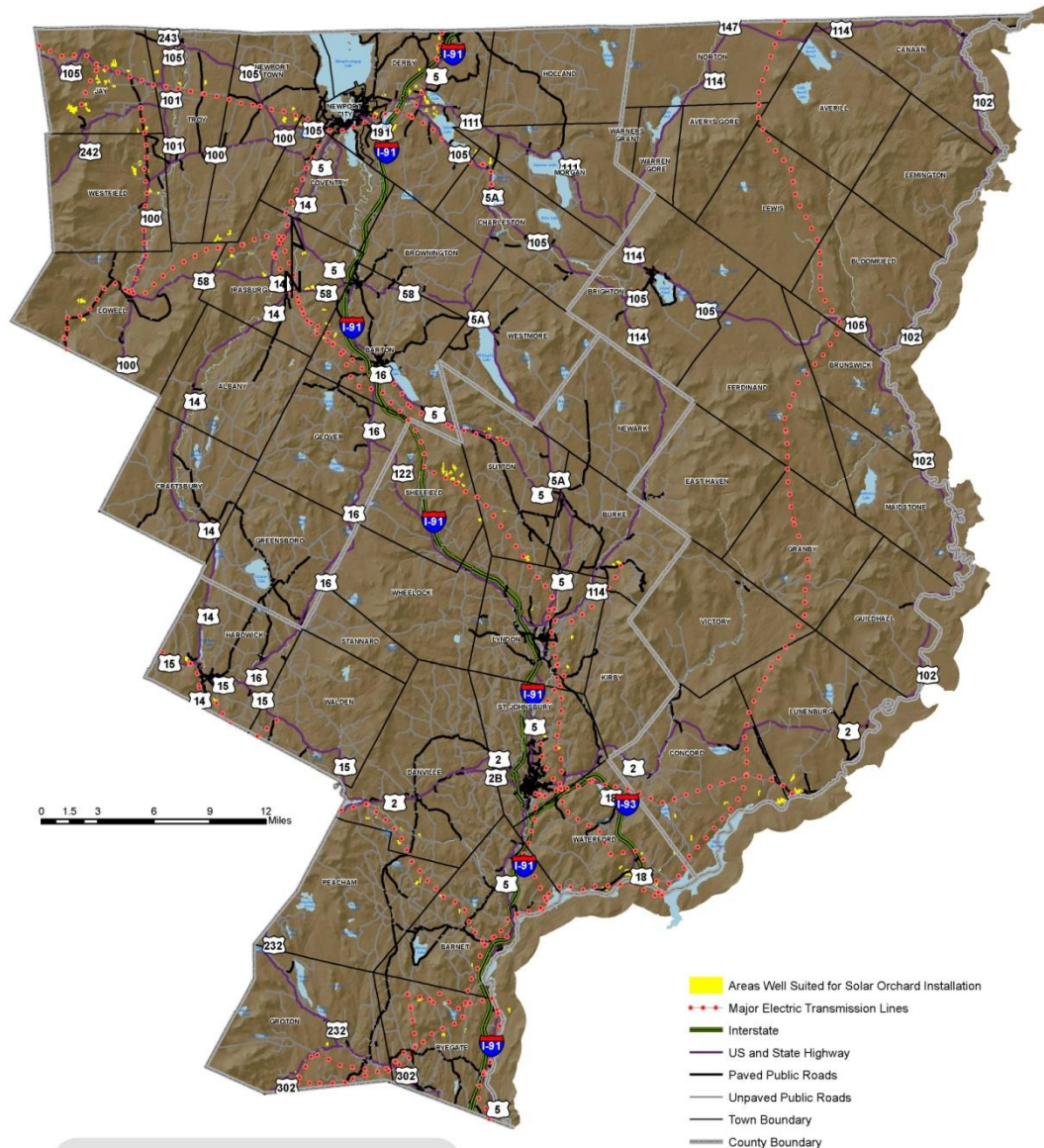
Please Note: This Data is for planning purposes only and does not replace a survey and/or engineering study. Because this map is developed from various scale sources, there may be some discrepancies between data layers.

Data Sources: Vermont Center for Geographic Information, The Renewable Energy Atlas of Vermont, Vermont Hydrography Dataset

Map Produced by Gail Atlesio, March 2012.

Solar Orchard Site Suitability in the NEK

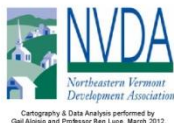
Where are sites that are well suited for commercial or community sized solar installations in the Northeast Kingdom?



Based on an analysis of digital map information, the yellow areas depicting possible solar orchard sites meet the following criteria:

- within 1 mile of a Major Electric Transmission Line
- south facing
- larger than 10 acres
- below 2,500 feet in elevation
- on flat or gentle slopes
- outside of conserved land
- outside of publicly mapped wetlands and wildlife habitat

Actual feasibility of a solar orchard installation at the sites depicted must be verified on the ground by a solar installation professional.



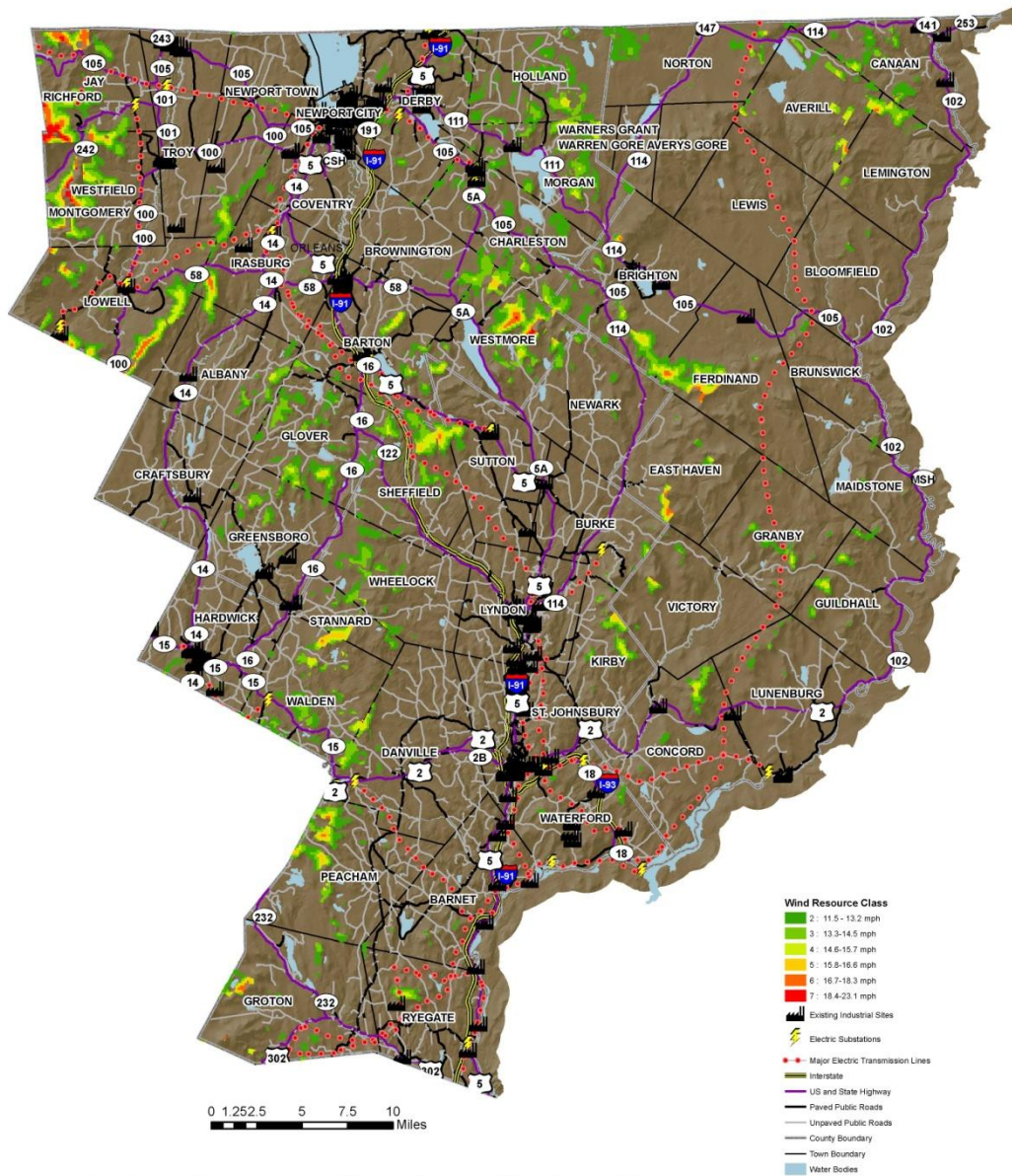
This effort was funded by an Energy Efficiency and Conservation Block Grant (EECBG) - DOE Award Number: DE-EE0000859 provided to NVDA by the VT Clean Energy Development Fund #02240-AEECBG-MUN-010.

Please Note: This Data is for planning purposes only and does not replace a survey and/or engineering study. Because this map is developed from various scale sources, there may be some discrepancies between data layers.

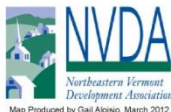
Data Sources: Vermont Center for Geographic Information, United States Geological Survey National Elevation Dataset, Vermont Dept. of Fish & Wildlife, Vermont Significant Wetlands Inventory, Vermont Hydrography Dataset, Vermont Conserved Lands Database

Northeast Kingdom Small Scale Commercial Wind Resources

DRAFT



The Vermont Renewable Energy Atlas classifies a Small Scale Commercial wind turbine as a turbine with a hub 50 meters (164 feet) above the ground.

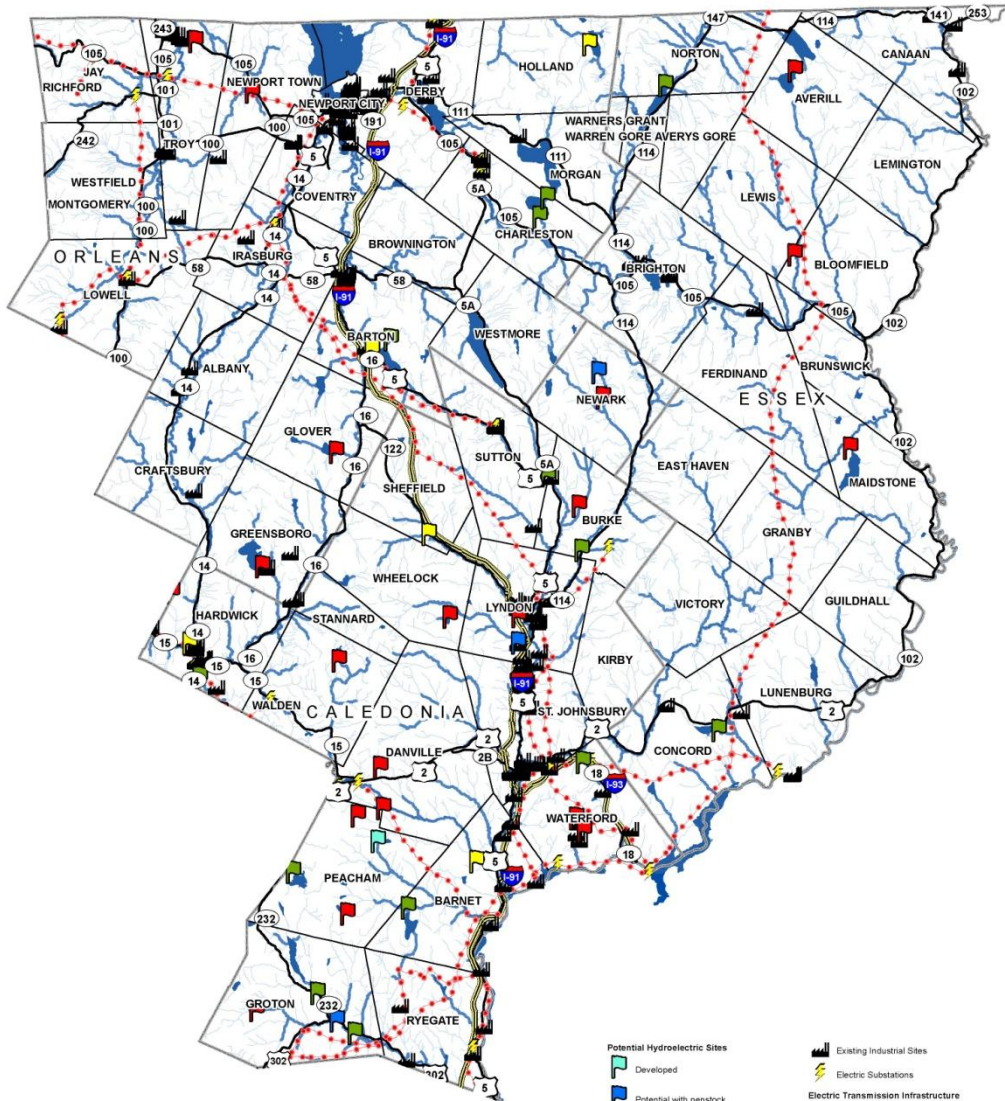


Please Note: This Data is for planning purposes only and does not replace a survey and/or engineering study. Because this map is developed from various scale sources, there may be some discrepancies between data layers.

Data Sources: Vermont Center for Geographic Information, The Renewable Energy Atlas of Vermont, United States Geological Survey National Elevation Dataset, Vermont Hydrography Dataset

Hydroelectric Potential in the Northeast Kingdom

DRAFT



0 1.5 3 6 9 12 Miles

- Potential Hydroelectric Sites**
 - Developed
 - Potential with penstock
 - Undeveloped Potential 10-49 KW
 - Undeveloped Potential greater than 50 KW
 - Undeveloped Potential less than 10KW
- Existing Industrial Sites**
- Electric Substations**
- Electric Transmission Infrastructure**
 - Major Electric Transmission Lines
- Major Roads**
 - US and State Highway
 - Interstate
- County Boundary**
- Town Boundary**
- Lakes, Ponds & Rivers**
- Major Streams**
- Minor Streams**
- NVDA_Countries**



Please Note: This Data is for planning purposes only and does not replace a survey and/or engineering study. Because this map is developed from various scale sources, there may be some discrepancies between data layers.

Data Sources: Vermont Center for Geographic Information, The Renewable Energy Atlas of Vermont, Idaho National Laboratory, United States Geological Survey National Elevation Dataset, Vermont Dept. of Fish & Wildlife, Vermont Significant Wetlands Inventory, Vermont Hydrography Dataset, Vermont Conserved Lands Database

CHAPTER THREE

Utilities & Facilities

I. EDUCATIONAL FACILITIES

Public Primary Education

All of the region's towns operate their own elementary schools with the exceptions of Bloomfield, Brunswick, Kirby, Lemington, Maidstone, Victory, Westmore, and the Unorganized Towns and Gores. Towns without their own schools arrange for students to attend other public or independent schools locally or elsewhere (via payment) in the state. Other towns combine educational facilities. Jay and Westfield share the operation of an elementary school. Wheelock and Sheffield operate the Miller's Run School (a K-8 union school) jointly. Stannard and Greensboro operate a K-6 union school together. A trend over recent years has been to consolidate schools in some areas to reduce costs. In addition to town school districts, the region's public education is also organized into nine supervisory unions depicted on the following page, in the NVDA Region: Supervisory Unions & Educational Facilities Map (Map 5).

Private Primary Education

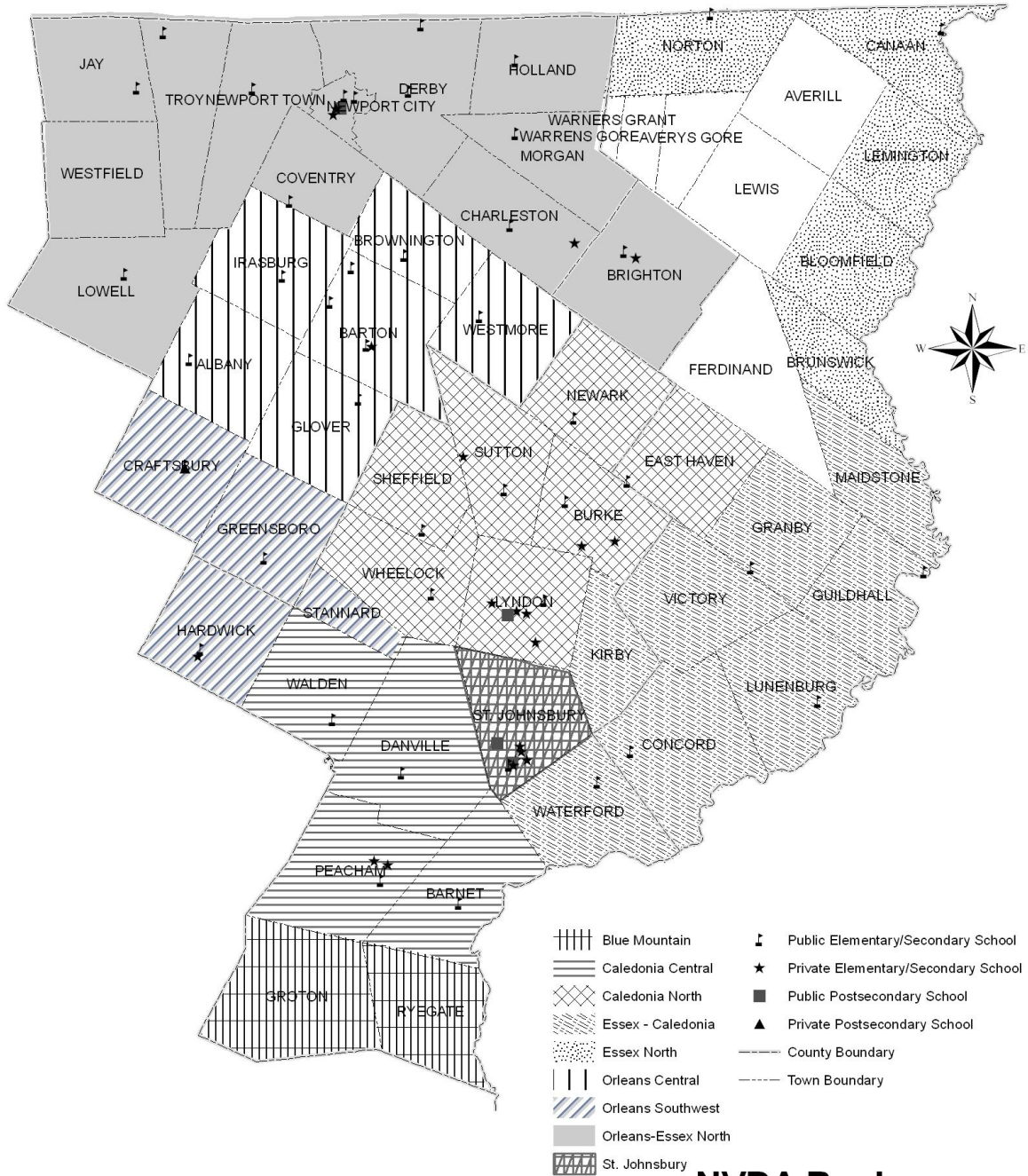
There are many independent schools in the region to supplement the number of public schools. Independent schools (Table 4.0) must be approved by the State of Vermont and are required by state statute to provide a minimum level of curriculum and instruction. Occasionally, independent schools exceed the number of services and opportunities provided by traditional public schools, in part because they may receive both public and private funds, in addition to their independent nature. 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.

Table 4.0: Vermont Dept. of Education "Approved" independent schools

Town	School	Enrollment 2000-2001	Grades / ages	Other
Barton	St. Paul's Elementary School	52	K-8	Roman Catholic Day School
Burke	Burke Mountain Academy	65	8-12	Boarding, college prep. competitive skiing
Lyndon	Lyndon Institute	650	9-12	Day school, some special education
Lyndonville	Riverside Day School	58	4-8	Day School
Newport	Sacred Heart School	102	K-8	Day School
Peacham	The Stevens School of Peacham	16	7-8	Day School
St. Johnsbury	Cornerstone School	30	4-12	Special Education
St. Johnsbury	Good Shepherd Catholic School	127	K-8	Roman Catholic Day school
St. Johnsbury	Intermountain High School	12	9-12	Day school
St. Johnsbury	St. Johnsbury Academy	958	9-12	Day school with some special education
St. Johnsbury	St. Johnsbury Elementary 7 th Day Adventist School	6	1-8	Day School

(VT Dept of Education, 2002)

MAP 5:



NVDA Region Supervisory Unions & Educational Facilities

Other educational institutions in the region are "recognized" by the State (Table 4.1). For the most part, these are private, religious-based institutions that are not eligible to receive public funds.

Table 4.1: Vermont Department of Education "Recognized" schools

Town	School	Enrollment 2000-2001	Grades / ages
Island Pond	Community in Island Pond	12	Ages 6-16
Lyndonville	Cornerstone Christian School (The Fold, Inc.)	11	6-12
Newport	United Christian Academy	112	K-12
Sutton	King George School	48	9-12
Waterford	Union Baptist Christian School	99	K-12

(VT Department of Education, 2002)

Home Study & Home School

Today, 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. In the 2002 - 2003 school year, approximately 170 students within the region covered by the nine Northeast Kingdom supervisory unions were receiving school instruction in the home (Table 4.2). Actual numbers tend to vary throughout the school year.

Table 4.2: 2002-2003 NEK Home-School Students (by supervisory union):	
Supervisory Union	# of Students
Blue Mountain #21	14
Caledonia Central #9	19
Caledonia North #08	25
Essex– Caledonia #18	13
Essex - North #19	5
Orleans Central #34	17
Orleans EssexNorth #31	47
Orleans Southwest #35	21
St. Johnsbury #11	7
Total	168

(VT Department of Education, 2002)

Secondary Education

The following table (4.3) shows education comparisons among the three counties of the Northeast Kingdom. Most notable is the fact that five high schools in the region had dropout rates greater than the state average. 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 4.3: FY2003 Regional Education Comparison:				
County	Public School Name	Enrollment Grades	Drop Rate 3yr avg.	Student Teacher Ratio
	High Schools	12-Sep		
Caledonia	Lyndon Institute	627	3.00%	11.1
Caledonia	St. Johnsbury Academy	972	0.10%	12.6
Caledonia	Danville School	165	4.00%	11.3
Caledonia	Hazen UHSD #26	288	4.70%	10.5
Essex	Canaan	122	3.50%	11.3
Essex	Concord	78	9.90%	10.3
Orleans	Craftsbury School	59	4.80%	9.1
Orleans	Lake Region UHSD #24	396	4.20%	11.6
Orleans	North Country Sr UHSD #22	1,063	5.70%	12.9
Vermont		31,586	4.00%	11.7

(Adapted from VT Department of Education, 2004)

Table 4.4 demonstrates that a significant number of the region's population is enrolled in an educational institution at some level at any fixed point in time. While early education is required, life-long or adult education is just as important to many.

Table 4.4:

2000 U.S. Census Education Figures				
County:	School Enrollment: *	% of County Population:	% H.S. Diploma or higher:	% Bachelor's Degree or higher:
Caledonia	7,986	26.9	82.6	22.5
Essex	1,543	23.9	75.0	10.8
Orleans	6,344	24.1	78.2	16.1

(U.S. Census, 2000)

* Population aged 3 years and over enrolled in school.

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 (extension campus), and Lyndon State College in Lyndon. Colleges and educational facilities are often viewed as "clean industries" and communities vie to have them. Expanding education institutions within the region is encouraged.

Adult Basic Education Services, with offices in Newport, St. Johnsbury and Derby provides general education and employment skills to many Northeast Kingdom residents. Adult Basic Education has three primary sites located in Newport, St. Johnsbury, and Hardwick. Vermont's Adult Basic Education Program supports persons with the lowest levels of literacy to develop basic reading, writing, and math skills. Instruction is tailored to help adults achieve their own personal goals and function more effectively as parents, workers, and citizens. Their mission is to provide adults with a comprehensive skill foundation equivalent to secondary school completion (GED) and be responsive to the unique needs of individual learners, families and their communities. (<http://www.state.vt.us/educ/abe/index.html>)

Technical and Alternative Education

Technical education providers in the Northeast Kingdom include; Lyndon Institute Technical Center, St. Johnsbury Academy Applied Technologies Center, and the North Country Career Center (NCCC). The NCCC in Newport serves over 300 high school students and adults annually with 15 different program areas. NCCC also provides a smaller selection of satellite programs and technical training at Lake Region High School. Technical education has become an important and viable part of our educational system, allowing individuals to specialize in work areas typically not addressed by the more traditional public institutions. Specific technical training courses are available at Canaan High School as well.

The Northeast Kingdom Workforce Investment Board (WIB) seeks to identify training needs for the region's industries and businesses, and recommends training opportunities for those industries. The WIB supports and assists other workforce development efforts as well. The Vermont Department of Employment and Training (DET), the Agency of Human Services Department of Economic Services (formerly PATH and the Department of Social Welfare),

the Department of Vocational Rehabilitation, and Employee Assistance Services are members of the Workforce Investment Board.

The Charles E. Carter Business Resource Center, located in the St. Johnsbury – Lyndon Industrial Park, was designed and funded with workforce training in mind. Along with office and warehouse space for new and small businesses, quality conference and training space is also available. The facility has been in operation since February 2003 and use of the facility has been steadily improving.

Along with a need for workforce development and training, there is a need for more vocational/technical education programs and a need for more adult literacy programs. This was identified by 85% of the respondents in the still valid 2001 survey. Additionally, the ongoing need for computer and information technology training was cited by 85% of the respondents in the survey.

Issues and Concerns

The relative burden for providing quality educational opportunities is on the region's supervisory unions, local school districts, and teachers. Educational quality is always important to towns and residents, yet there is often disagreement as to what makes a quality education. This is evidenced by the number of local bond votes that come about and often fail.

Residential growth (or lack thereof) in a community should always be balanced with the capability of the municipality to adequately fund quality education. The capacity of local schools can be overwhelmed. Additionally, questions of where to site new schools, how to incorporate handicap accessibility features, and whether or not to retain local schools adds to the funding dilemma. Matters are sometimes further complicated by the changing standards, entitlements, and incentives offered by the Department of Education.

Increased school spending is a hot issue for most towns. Schools in all three Northeast Kingdom counties averaged a lower spending level (\$8,302) per equalized student than the State of Vermont average of \$9,087 for FY2005. For individual towns, 13 of 50 towns exceeded the state average. The purpose of Act 60 was to address funding inequities between school districts. Act 60 changed the basic funding mechanisms for local schools, but a number of inequities in the system were apparent (i.e. ties to property wealth). Act 68 is the most recent attempt to improve the school funding situation, and the results of this new legislation are still unclear.

EDUCATIONAL FACILITY GOALS

- Schools should be closely integrated with the local communities they serve, including the business community.
- Educational facilities should have the capacity to benefit both students and local residents.
- Affordable educational and training opportunities should exist for all persons within the region.

STRATEGIES

- Promote cooperation between institutions of higher learning and local businesses to create quality training and employment opportunities for local residents.
 - Encourage public involvement in school board decisions.
 - Increase involvement of school officials in the local planning processes. Investigate how towns and educational institutions can coordinate projects that would benefit the greatest number of persons.
 - Investigate opportunities for shared facilities between municipalities and institutions.
 - 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.
 - Promote combined public/private educational programs and shared resources. Eliminate boundaries that impede knowledge and resource sharing.
-

II. RECREATION FACILITIES & PROGRAMS

Many towns in the region offer public recreation facilities in some form, they include town parks or commons, town forests, tennis or basketball courts, ball fields or ice rinks, or public beaches. There are also community centers, school recreation facilities, and municipal buildings hosting local recreation programs. Communities should plan for adequate facilities to meet residents growing and ever-changing needs. A new, multi-purpose, state of the art indoor recreation facility (IROC) was recently completed in Derby. The community facility project is unique in many respects, most importantly in that it combines recreation and education.

Newport and St. Johnsbury are the only communities having year-round, staffed, municipal recreation programs. The St. Johnsbury Recreation Department owns a community center, and rents or is donated the use of other facilities for conducting their year-round recreation programs. They also have some small "ornamental parks" located in various parts of the city. Newport has a municipal ice rink, community building, town beach, and a multi-use park facility. Each city's recreation department offers a variety of programs on a year-round basis. Here, it is important to adequately serve all populations - it is likely that some needs are going unmet.

Other communities in the region offer programs and activities on a seasonal basis (as do a sizable number of private recreation providers, churches, and schools), but many of these are often short in-duration, and under-funded. There seems to be a real programming need for youth and low-income residents, and the elderly throughout the region. Along with providing and funding recreational facilities, this is a challenge that communities must address. 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.

(Note: For a complete list of goals related to Recreation Facilities & Programs please see the Chapter One: Land Use Section under V. Recreation Land Use Goals.)

III. CHILD CARE

Since 2003 a thirteenth planning goal is addressed in many local and regional plans. Regional planning commissions are now required to review how municipal plans address child care issues as part of the confirmation process. It is also appropriate that child care issues be examined at the regional level and included as part of this plan.

Child care in the Northeast Kingdom region is seemingly in a constant state of crisis. Many of the region's residents continue to lack accessible, affordable, high-quality child care services. There are not enough child care centers in the region to meet demand. There also exists a very high annual turnover in state-approved child care providers (44% turnover in 2000). Apparently, one reason for the exceptionally high turnover is that many providers lack basic business skills, thus becoming financially unsustainable. For established child care programs, tight budgets and funding cuts are the norm.

The regional child care system is diverse, and includes independent day care homes, relative care, and center based group care. A professional family child care system would go a long way in meeting regional childcare needs. State agencies that offer child care assistance programs in the Northeast Kingdom include:

- Childcare Services Division (AHS)
- Vermont Child Care Apprenticeship Program (VT DET)
- Department of Economic Services
- Department of Health
- Department of Education

Regional agencies and organizations that offer child care programs include:

- Northeast Kingdom Community Action, Inc. NEKCA
- Umbrella, Inc.
- Success By Six

III. 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.
- The efficiency and effectiveness of existing child care, early education, and family service programs should be improved.

STRATEGIES

- Support efforts to improve the child care system in the Northeast Kingdom.
- Provide assistance to towns, villages, and non-profits seeking to develop child care facilities and/or programs.
- Assist eligible individuals to become licensed child care providers.

IV. TELECOMMUNICATIONS

Telecommunications are a dynamic medium for community networking, information dissemination, feedback, discourse, collaboration, and discussion. The region can gain many economic, social, safety and cultural benefits with a strong telecommunication infrastructure. Our regional economy can only be enhanced if it is served by a robust telecommunications infrastructure. The current Northeast Kingdom telecommunications infrastructure is depicted in the NVDA Region: Telecommunications Map (Map 6).

Current trends in the development of telecommunication infrastructure suggest that several media will converge into a standardized digital format with high-speed broadband access. With digital high speed access, customers will be able to send and receive voice, video, and data through the telecommunications network with many types of devices such as telephone, cable TV, mobile and desktop computers, and portable and household devices. A redefinition of "basic" service that is accessible and affordable for a converged telecommunications network will require reexamination.

The Statutory goals and principles from the Vermont Legislature (30 V.S.A. § 202c and § 202d) for the telecommunication network are:

- Affordable basic service
- Stable and predictable local exchange rates and toll rates
- Superior quality of service, including consumer protection and privacy rights
- A technologically advanced telecommunications network serving all local service areas in the state
- Benefits including enhanced 9-1-1 and continuous emergency access, improved electronic community, public access, government information and services delivered on-line, associated training and technical support

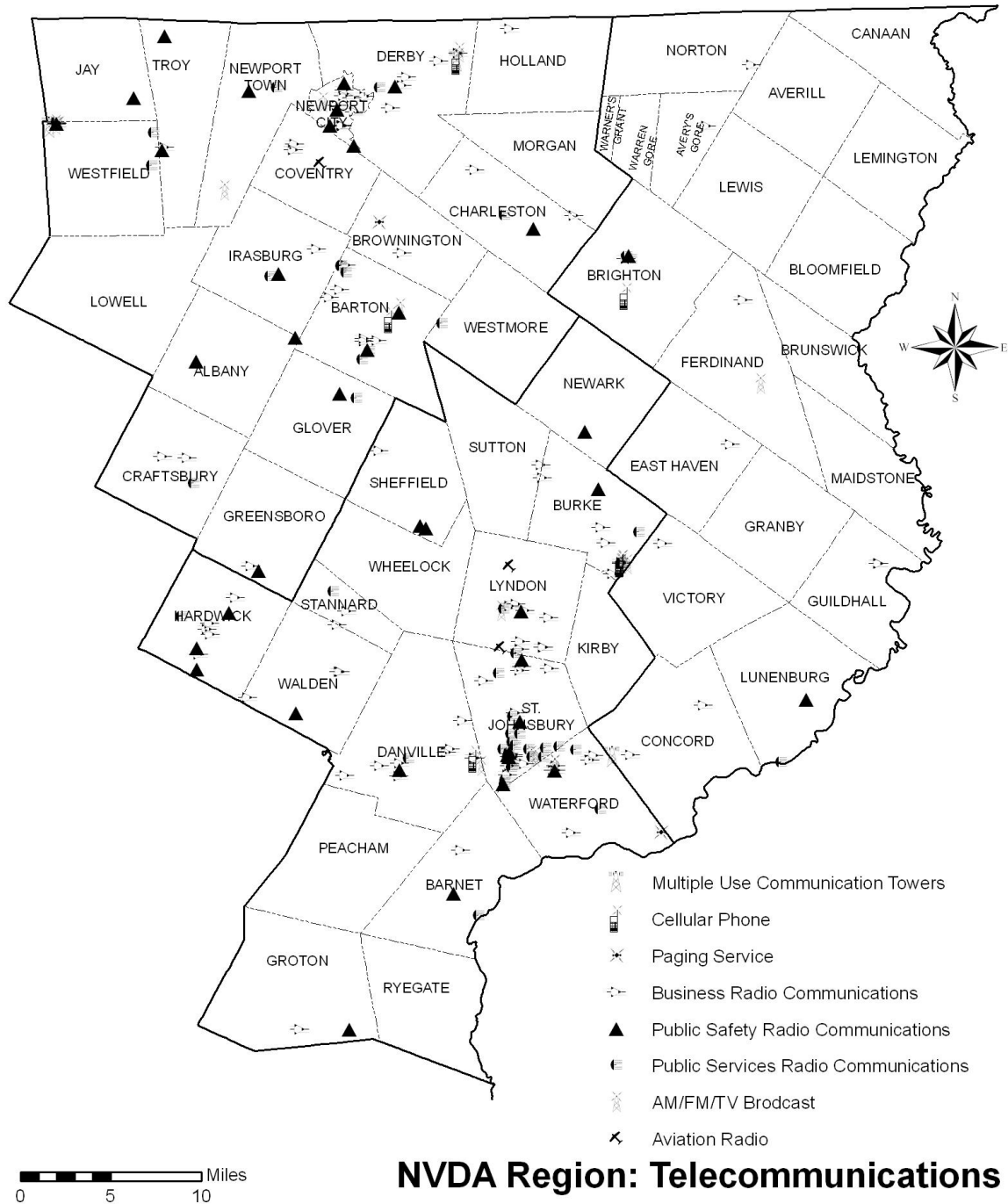
The Vermont Telecommunications Plan issued by the State of Vermont Department of Public Service represents a serious effort to address the important issues that will affect availability and use of telecommunications in Vermont. The current Telecommunications Plan specifically calls upon the regional planning commissions to undertake a coordinated process of planning for wireless development in their respective regions.

Barring unforeseen changes in circumstances, the current Telecommunications Plan (adopted September 2004) sets forth some ambitious goals that will have a significant impact on life in the Northeast Kingdom. Among these goals:

- Consumer-grade and small-business-grade broadband services to 90% of all homes and businesses that have access to telephone by 2007;
- 100% handheld phone coverage along all interstates, plus Routes 2, 4, 7, and 9 on both the GSM/GPRS and CDMA digital standards by 2007;
- 100% handheld phone coverage on all numbered state highways routes on both the GSM/GPRS and CDMA digital standards (or their successors) by 2010;
- Reasonably priced mobile walkabout WiFi in all designated downtowns, all highway rest areas, welcome centers, and in significant resort locales.

For an in-depth description of Vermont's telecommunication goals refer to the Vermont Telecommunications Plan, Version 4 (<http://www.state.vt.us/psd>).

MAP 6:



NVDA Region: Telecommunications

Although the technology industry is constantly evolving, the Vermont Telecommunications Service Availability Project conducted by the Vermont Department of Economic Development

(<http://www.thinkvermont.com>) keeps an updated list of telecom providers for each town and the services offered (ATM, Cable, DSL, Wireless, Frame, ISDN, and T-1).

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 will be available to customers anywhere at anytime 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.

In the coming years, telecommuting may become more popular and possibly lessen road traffic at peak commuter driving times. Settlement patterns may change as more people work in "cyber-jobs" or further away from their employment locations. Video conferencing and teleconferencing will 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. However, until the overall state of the region's telecommunication system is brought up to date, telecommuting options will be limited.

Vermont Interactive Television (VIT) is an innovative service that uses T-1 lines to provide videoconferencing capabilities to many Vermont communities. By linking to the University of Vermont, VIT also provides national and international videoconferencing. VIT has two primary locations in the region, one at Lyndon State College and another at North Country Union High School in Newport.

Wireless Telecommunication Facilities

Wireless telecommunication facilities are currently regulated at the Federal, State, and local levels. The Federal Communication Commission authorizes the licensing of telecommunication companies in addition to creating legislation for town governments. The Federal Telecommunications Act of 1996 preserves local zoning authority. However, it states that local governments shall abide by the following measures:

- (a) Not prohibit or have the effect of prohibiting the service;
- (b) Not unreasonably discriminate among providers of functionally equivalent services;
- (c) Not regulate Personal Wireless Service Facilities on the basis of radio frequency emission safety if in compliance with FCC's regulations;
- (d) Act on all requests within a reasonable time period;
- (e) Base any denial on substantial evidence and put that decision in writing.

At the State level, the Vermont Act 250 District Environmental Commissions oversee all telecommunication applications for towers over 20 feet tall. Although the Federal Telecommunications Act of 1996 limits the authority of municipalities to regulate communications towers, towns can still establish appropriate guidelines and regulations related to aesthetics, integrity of residential zones, ridgeline protection, preferred locations (general and specific), and collocation or clustering of tower facilities. In 1997, the Vermont Legislature enacted legislation [24 V.S.A. §§ 2291 (19)] municipalities to regulate telecommunication facilities through either zoning or stand alone ordinances. Chapter 117, the statute that regulates planning and zoning in Vermont, also authorizes municipalities to

adopt bylaw to “regulate wireless telecommunication facilities and ancillary improvements in a manner consistent with federal law.” Bylaws can require the decommissioning or dismantling of telecommunication facilities, as well posting of bonds to finance their decommissioning or dismantling. [24 V.S.A. §4414(12)] Towns were previously able to issue a moratorium on development, but that option expired on July 1, 1999.

Municipalities may also describe their visions for telecommunication planning within their town plans. NVDA encourages towns to prepare the most appropriate plans and regulation for their individual needs.

IV. TELECOMMUNICATIONS GOALS

- Northeast Kingdom residents, business, organizations and public entities should be served by an up-to-date telecommunications infrastructure.
- Affordable fixed and wireless communications systems, as well as high-speed Internet broadband, should be available throughout the region.

STRATEGIES

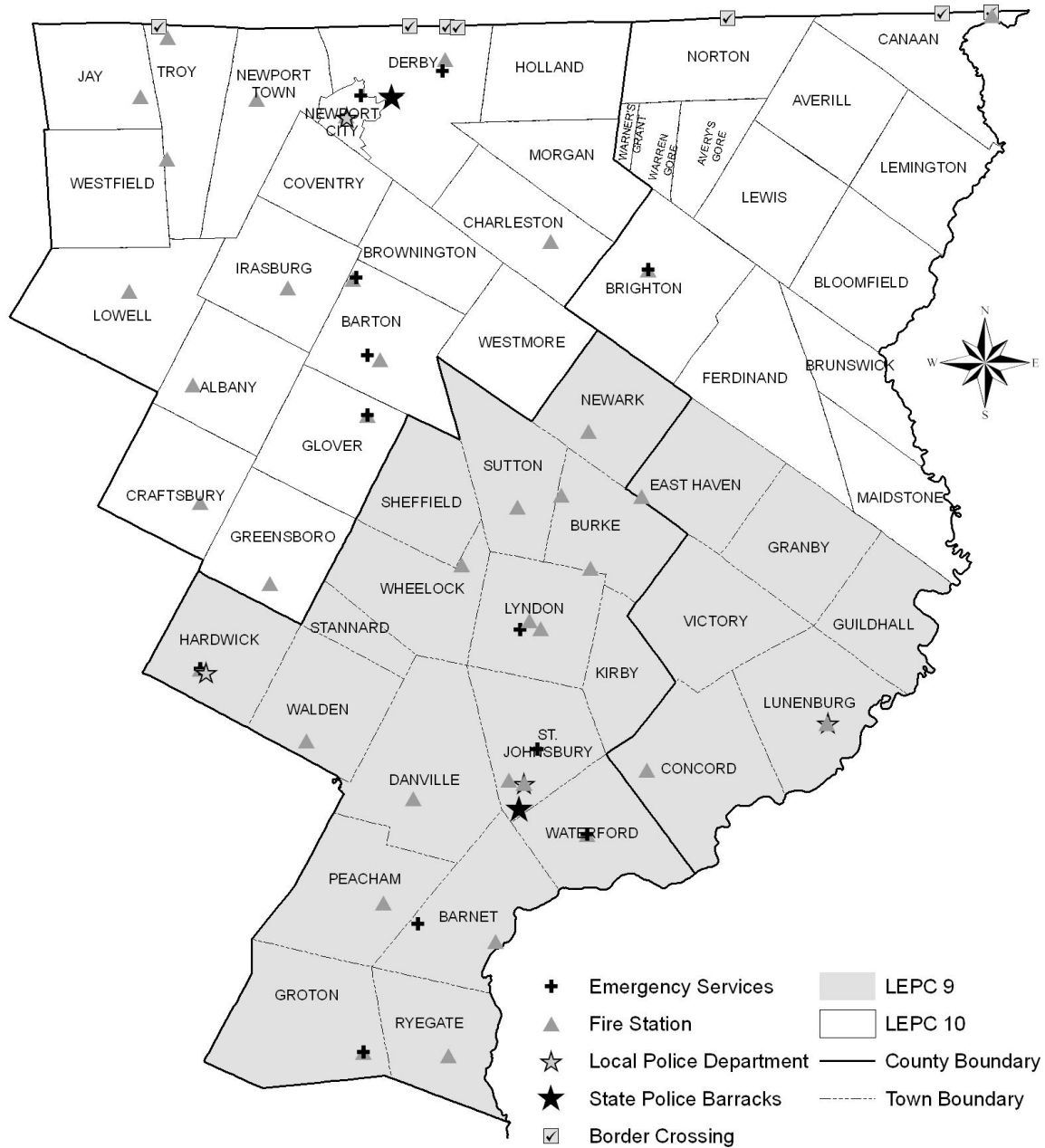
- Create incentives for appropriate telecommunication technologies, infrastructure and services to be implemented.
- Support development efforts that reduce the cost of high-speed telecommunications throughout Vermont and the Northeast Kingdom.
- Actively support the development of a wireless backbone along the region's interstate highway system corridors. This infrastructure should allow for co-location of carriers and platforms whenever possible, as well as virtual information technology for first responders, and wireless broadband.
- 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 is the regional PSAP. The PSAP call taker will have the caller's phone number, locatable address (from a Geographic Information System (GIS), (coverage does not yet cover cell phone callers), and contact information for the nearest emergency services (police, fire, ambulance, EMS). This enhanced service shortens response time in the dispatch of appropriate local emergency services and finding the location of the caller without having the caller provide that information.

MAP 7:



NVDA Region: Public Safety

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. 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 fire departments made up of a large number of dedicated individuals who are called upon frequently to perform in emergencies. Increased funding for equipment and training would assist our fire departments with keeping up with the demand for their services.

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 4.5 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 4.5: 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		(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 Hospital, 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, St. Johnsbury and Newport City. 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.

LEPC's have completed Rapid Response Plans for all towns in the region. 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.

V. 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 rapid response and 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.

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 wells, 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.

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 systems are required by the state to have Source Protection Plans. The NVDA Region: Sewer & Water Map (Map 8), included on page 53, shows the municipalities with public water supply facilities.

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. Owners and operators of public water systems must restrict the land use within 200 feet of the public water supply source to uses that pose no threat of contamination.

Non-Public water systems are divided into those requiring permits and those not requiring permits. Subdivisions of nine lots-or-fewer, and public buildings serving less than 25 people, are examples of Non-Public systems requiring a permit. Single family homes are Non-Public systems not requiring permits, but they are still subject to regulation (i.e. permits are required for well construction).



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). Non-Public, NTNC, and TNC water systems are generally administered for construction permit purposes by the regional offices of the Wastewater Management Division of the DEC. Jurisdiction over the protection of public water supplies rests with the Water Supply Division of the DEC.

The NTNC, TNC, and Non-Public systems requiring permits are considered Small-Scale water systems, and serve public buildings, mobile home parks, campgrounds, and subdivisions. Permits for operating requirements, fees, and other non-construction requirements are administered by the Water Supply Division of the DEC. The active public water systems in the Northeast Kingdom are:

Table 4.6: Public Community Water Systems – Caledonia, Essex, & Orleans Counties

Public Community Water Systems - Caledonia County		
System Name:	Primary Water Source Type:	Est. Population Served:
Barnet Water System, Inc.	Ground Water	205
Burke FD 1	Ground Water	60
Burke Mountain Water System	Ground Water	1622
Danville Fire District 1	Surface Water	450
East Hardwick Fire District 1	Ground Water	300
Green Lantern Mobile Home Park	Surface Water*	150
Hardwick Town Water System	Ground Water	1500
Karme Choling	Ground Water	100
King George School I, Boys Dorms – <i>Private</i>	Ground Water	50
King George School II, Girls Dorms – <i>Private</i>	Ground Water	50
Lyn Haven Fire District 1	Ground Water	114
Lyndonville Water System	Ground Water	3200
McIndoe Falls Fire District 3	Surface Water	200
Passumpsic Fire District 1	Surface Water*	170
Peacham Fire District 1	Ground Water	150
Ryegate Fire District 2	Ground Water	260
Sheffield Village Water	Ground Water	70
South Ryegate Water Co-op	Ground Water	36
St. Johnsbury Fire District 1	Ground Water	370
St. Johnsbury Water System	Surface Water	4500
Sutton Water System	Ground Water	54
West Burke Housing – <i>Private</i>	Ground Water	32
Wheelock Fire District 1	Ground Water	60
<i>Private = Privately Operated</i>	<i>* Purchased</i>	

Public Community Water Systems - Essex County		
System Name:	Primary Water Source Type:	Est. Population Served:
Aqua Haven – <i>Private</i>	Ground Water	150
Bloomfield Water System	Surface Water	40
Brighton Water System	Surface Water	2200
Canaan Water System	Ground Water	970
Guildhall Water System	Ground Water	120
Lunenburg Fire District 1	Ground Water	320
Lunenburg Fire District 2	Ground Water	700
Riverside Water Works Co.	Ground Water	336
Sorrell Mobile Home Park – <i>Private</i>	Ground Water	90

Public Community Water Systems - Orleans County		
System Name:	Primary Water Source Type:	Est. Population Served:
Albany Water System	Ground Water	200
Alpine Haven – <i>Private</i>	Ground Water	600
Barton Water System	Surface Water	1500
Beebe Plain Water System	Ground Water	1030
Campbells Water System – <i>Private</i>	Ground Water	45
Coventry Fire District 1	Ground Water	110
Craftsbury Fire District 2	Ground Water	420
Derby Center (<i>Connected to Newport System</i>)		1100
Derby Line Village Water District	Surface Water	900
Derby Mobile Home Park – <i>Private</i>	Ground Water*	150
Greensboro Bend Water Co-op	Ground Water	55

Greensboro Fire District 1	Surface Water	650
Holbrook Bay Commons – <i>Private</i>	Ground Water	138
Irasburg Water Department Co-op	Ground Water	200
Jay Peak Basin Complex – <i>Private</i>	Ground Water	32
Jay Peak Subdivision II – <i>Private</i>	Ground Water	30
Jay Peak Village Phase I – <i>Private</i>	Ground Water	116
Maple Lane Nursing Home – <i>Private</i>	Ground Water	68
Newport Center Water System	Ground Water	246
Newport City Water System	Ground Water	5500
North Troy Water System	Surface Water	750
Orleans Water System	Ground Water	825
Shattuck Hill Mobile Home Park – <i>Private</i>	Surface Water*	90
Slopeslide Condominium – <i>Private</i>	Ground Water	256
Trillium Woods Water System – <i>Private</i>	Ground Water	40
Troy Water System	Ground Water	300
Union House Nursing Home – <i>Private</i>	Ground Water	40
Westfield Fire District 1	Ground Water	120
<i>Private = Privately Operated</i>	<i>* Purchased</i>	

(ANR Water Supply Division, 2002)

In Vermont, 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. Jurisdiction over protection of public water supply sources rests with the Department of Health and the District Environmental Commission.

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.

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)]

Source Protection Plans

The *Safe Drinking Water Act* was passed in 1974 to protect the quality of drinking water in the U. S., and was amended in 1996. The *Source Water Assessment Program (SWAP)* is the federal

program for Public Water Systems that states are required to implement under the *Drinking Water Amendments* of 1996. In Vermont, Source Protection Plans are used to cover the three basic requirements of the SWAP, which are to:

1. Delineate the water source protection area;
2. Inventory potential sources of contamination (such as waste generating sites, underground storage tanks, septic systems, etc.); and
3. Assess the susceptibility of the water system to contamination from these sources and have management and contingency plans ready in case of water system failure or contamination.

Vermont's Source Water Assessment Program includes different requirements for the three types of public water systems:

1. Public Community water systems (serving at least 25 year-round residents, or 15 service connections) are required to have Source Protection Plans. The system is responsible for developing the plan. The Water Supply Division is available to provide technical assistance in preparing the plan.
2. Non-Transient, Non-Community public water systems (serving at least 25 of the same people, more than six months of the year) are also required to have Source Protection Plans. Each system is responsible for developing the plan, with the Water Supply Division available for technical assistance.
3. Transient, Non-Community public water systems (serving at least 25 people per day more than 60 days a year) are required to have a Source Water Assessment for the system (rather than a Source Protection Plan). The management and contingency plans are not prepared as part of the assessment. The system assessment is done by the Water Supply Division of the DEC.

Table 4.9: NEK Community Water Systems by Type.

Public Water System Type:	Number:	% of Total:
Community Water Systems	60	38.7
Non-Transient, Non-Community Water Systems	25	16.1
Transient, Non-Community Water Systems	70	45.2
Total	155	100.0

(ANR Water Supply Meeting, 2002)

Public community water systems in Vermont are required to develop Source Protection Plans (SPP). As of 2000, 84% of Vermont's Public Community Water Systems had source protection plans. It is expected that this number will reach 98% by June 30, 2005. The Water Supply Division of the DEC is available to provide specific technical advice for completing or updating these plans.

Public Water Issues

Source Protection: The Vermont Department of Environmental Conservation's goal is to increase the number of public water systems having Source Protection Plans (or Source Water Assessment) to 100 percent. The Water Supply Division of the DEC is available to assist

communities with preparing Source Protection Plans. The Water Supply Division will conduct Source Water Assessments for each Transient, Non-Community public water system in lieu of a Source Protection Plan.

Training: 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. Therefore, training and development programs are encouraged to assure water system capacity. Capacity, in this instance, means that a public water system can demonstrate the technical, financial, and managerial capabilities to consistently comply with current performance standards, including the requirements of the Safe Drinking Water Act, as amended.

Capacity and Conservation: In years past, it seemed there was an endless supply of fresh water available for use. Recently, prolonged droughts have occurred in some areas. Public water systems may also have experienced an increase in the number of users, thus reducing the available supply. 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. These strategies, along with individual conservation efforts, have worked in many communities.

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. This is also the case for the Northeast Kingdom. 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. Also noteworthy is that 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.

VI. WATER SUPPLY GOALS

- Water supplies and water systems should not be contaminated, depleted, or degraded
- There should be sufficient quantities of water to meet existing and future residential, agricultural, commercial, industrial and recreational needs.
- Public investments should 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.
- Effective, efficient, and accessible public services should be promoted.

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.

VII. WASTEWATER, SEWAGE & STORMWATER MANAGEMENT

The treatment of wastewater is necessary to remove solids, destroy pathogens, and remove pollutants. Municipal sewage, domestic septage, 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.

Public Wastewater Facilities

Public sewage disposal systems that collect and treat wastewater before discharge help to protect public water supplies are the preferred types of systems. Wastewater treatment facilities are categorized as primary, secondary, or tertiary. Primary treatment physically removes suspended particles by screens, sediment chambers, and/or skimmers. Secondary treatment involves the digestion of organic wastes by bacteria in a controlled setting, in addition to the removal of suspended particles. Tertiary treatment takes additional steps to remove solids and other difficult to extract compounds, beyond the steps involved in primary and secondary treatments. All municipal wastewater systems in the Northeast Kingdom region have secondary treatment systems or better.

Wastewater treatment facilities may be industrial, municipal, or private in nature. Some of these facilities are required to have state-certified operators due to their size, and require permits. Table 4.10 below shows the permitted municipal wastewater facilities in the Northeast Kingdom region. Permits are typically re-issued when applications are submitted in a timely manner (e.g. before the expiration date), allowing the facility to continue operating until the application is approved.

Table 4.10: Permitted Wastewater Treatment Facilities:

	----- Gallons Per Day (7-9/2002)-----		
Municipal Wastewater Facilities:	Avg. Annual Flow:	Committed Flow:	Uncommitted Reserve Capacity:
Caledonia County			
Danville	38,051	5,050	16,899
Hardwick	164,083	15,186	191,731
Windsor	227,833	3,570	518,597
Windsor (Town)	1,687	0	4,313
Windsor Fire District #2	3,264	0	7,036
Johnsbury	1,197,417	80,412	322,171
Essex County			
Brighton (Island Pond)	77,500	3,033	69,467
Canaan	137,750	3,388	43,862

Lunenburg Fire District #2	48,167	0	27,833
Orleans County			
Barton	134,833	4,432	125,735
Glover (West Glover)	2,286	450	4,264
Newport (City)	597,750	172,358	429,892
Newport Town	6,195	27,803	7,502
North Troy	87,875	3,395	18,730
Orleans	73,417	335	116,248
Troy / Jay	30,583	6,600	162,817

(ANR Wastewater Division, 2002)

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. Therefore, the majority of the region's wastewater continues to be handled by on-site systems. Current on-site septic design options offer less expensive alternatives to central facilities, making development possible at locations where it has been historically difficult to install effective systems.

Alternative Wastewater Systems

Conventional wastewater systems (both on-site and centralized systems) tend to be large-diameter (pipes), gravity-fed systems. Alternative wastewater systems are often smaller-diameter systems that may, or may not, be gravity fed. They differ from conventional systems in their pre-treatment, collection, treatment, and dispersal methods.

Prior to 1996, on-site septic system designs in Vermont were limited to a few choices that, if properly installed and maintained, were known to be effective in treating wastewater. With the passage of the *Small Scale Wastewater Treatment and Disposal Rules* of 1996, and later the *Wastewater System and Potable Water Supply Rules* (effective January 1, 2005), the numbers and types of acceptable alternative systems have increased. The decision of whether or not an on-site system is permitted remains limited by site constraints such as soil type and depth, degree of slope, proximity to surface water, or lot location (proximity to property lines).

On-Site Wastewater Systems

For our region, on-site systems (i.e. traditional septic systems) are by far the most common for wastewater treatment. Limiting the number of on-site system designs occurs with good reason. Approximately one-third of the on-site septic systems installed each year in Vermont are replacements of failed systems (*Small Flows Quarterly*, Winter 2000, Vol. 1, p.12). 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.

In years past, many wastewater and water supply systems in Vermont were designed and constructed with little or no oversight, sometimes leading to problems for homeowners when systems failed. In 2000, only one-half of Vermont towns had some form of review or permitting process for on-site system design. The slow pace of regulation and oversight could have potentially contaminated a large number of local water supplies due to poor design or failed systems, thus leading to significant public health risks.

The Agency of Natural Resources, Department of Conservation *Wastewater System and Potable Water Supply Rules* are in effect as of January 1, 2005. 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 new rules regulate soil-based disposal systems with design flows of less than 6,500 gallons per day, and sewerage connections of any size.

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.

The rules also allow the use of alternative and experimental treatment and disposal systems in the appropriate circumstances and offer investment protection to homeowners through a remediation process for failed systems; and ensure that system designs are reliable, cost effective, and sustainable.

In 2002, the only Northeast Kingdom towns with zoning-based sewage regulations (i.e. through municipal ordinances) were Barnet, Barton, Danville, Hardwick, Kirby, Lyndon, Newport City, Peacham, St. Johnsbury, Stannard, and Waterford. After June 30, 2007, all municipal ordinances and zoning bylaws that establish technical standards and criteria for the design, construction, operation, and maintenance of potable water supplies and wastewater systems will no longer be in effect. Local regulations will later be superseded by the technical standards and criteria of the *2004 Wastewater Systems and Potable Supply Rules* and the *Vermont Water Supply Rules*.

It is likely that the *Wastewater System and Potable Water Supply Rules* will increase the flexibility of siting conditions for on-site wastewater systems. Briefly, the new rules allow:

1. Consider use of advanced treatment technologies.
2. Revisions to required site conditions, such as increasing the maximum allowable slope of a site from 20% to 30%, and decreasing the minimum depth of native soil to groundwater from 24" to as little as 12" if certain approved treatment systems are used.
3. In the repair of failed systems, allow cost as one factor in deciding what the "best fix" system must be.

It has been estimated that the combined effect of the 1996 and these new rules could potentially open an additional 30% of the state's land area up for development, under Vermont Act 249 (ANR Environmental Protection and Subdivision Rules). (*Alternative Wastewater Treatment/Environmental and Land Use Impact Study Committee Report*, Vermont Department of Housing and Community Affairs, January 2001, p.2). There are concerns that this could lead to an increase in 'sprawl-like' conditions in some areas. Municipalities that encourage and plan for denser development would benefit, however, by being able to share the costs of providing centralized wastewater facilities due to a higher number of residents being served by the system.

Act 249 created the state subdivision permitting process, where lots larger than ten acres in size were not required to have a state subdivision permit, nor any review of wastewater treatment systems. With the new rules, subdivisions of any size now require permitting for wastewater and water supply systems. The provisions of any local subdivision regulations less stringent than the state regulations will be superseded by the new state rules.

The new rules also provide minimum site conditions that must be met before a wastewater system can be constructed. These conditions must meet one of three sets of requirements (related to a site's soil, slope, and drainage) outlined in the new rules. There are minimum site conditions (outlined in the new rules) that can be used by towns that have adopted a variety of zoning and land use regulations designed to manage development.

The new rules reflect the state permitting authority's belief that Vermonters are better served by a standardized subdivision permitting process conducted at the state level than by piecemeal regulation conducted at the town level. ANR does not plan to cut towns entirely out of the process, however, as it hopes that towns will sometimes be able to implement the state's permitting scheme on ANR's behalf.

Sludge and Effluent Disposal

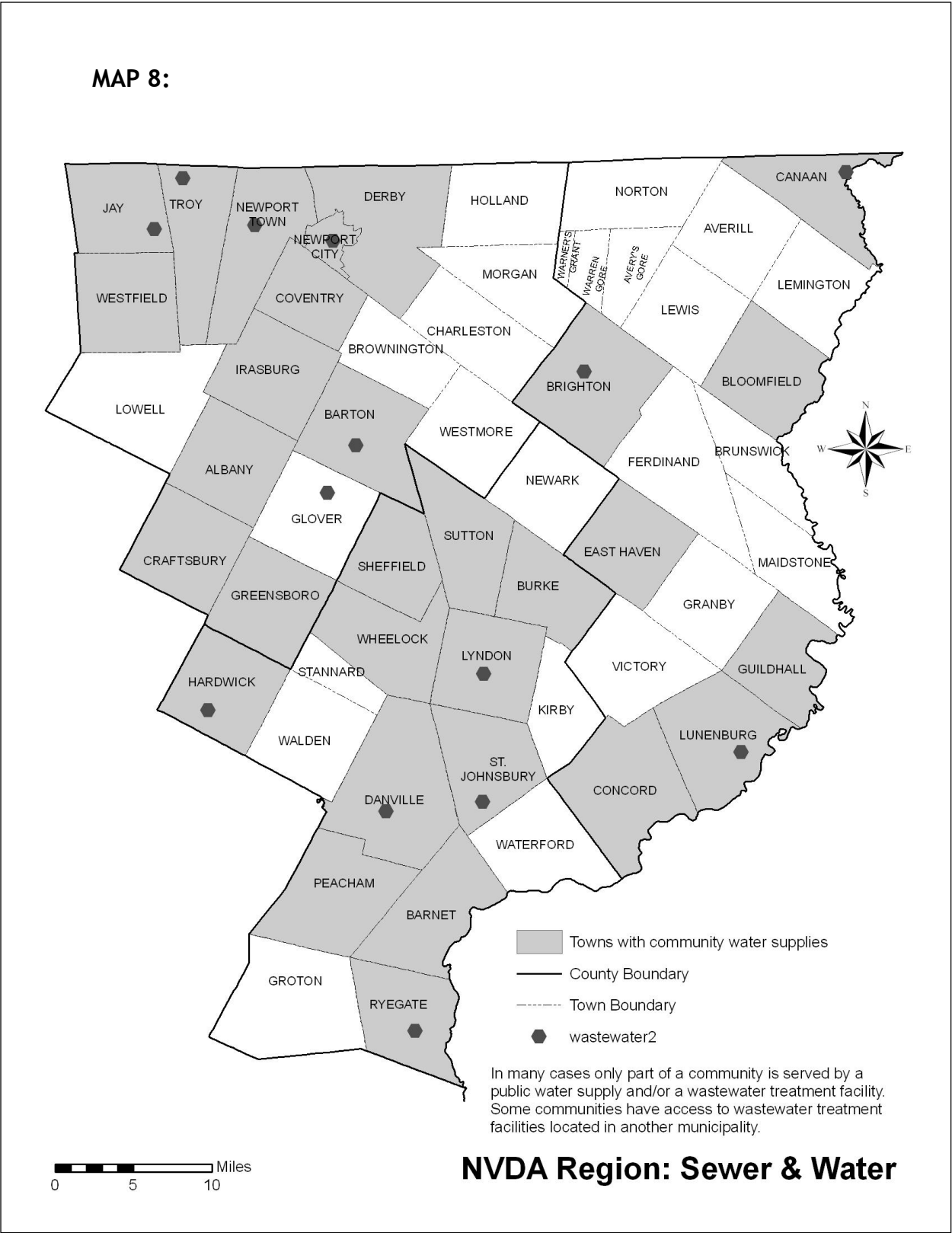
After wastewater is treated, there is the issue of sludge and effluent disposal. Sludge in the Northeast Kingdom is typically disposed of by land application, or it is de-watered and sent to a landfill. Shipping sludge to a landfill takes up valuable space. Incineration is not permitted in Vermont, but 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. Management options to dispose of septage are: treatment at municipal

wastewater facilities, land application, de-watering and landfilling of bio-solids (sludge and septage), composting, and management at suitable out of region or state facilities.

MAP 8:



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 (e.g., hydrocarbons, nutrients, or bacteria) into our surface waters, improperly managed stormwater runoff can result in soil erosion and flooding. Stormwater does recharge the groundwater supply, and helps to reduce flooding and surface water contamination. Some municipalities have designated "groundwater recharge areas", for storm water collection.

The Vermont Agency of Natural Resources, Water Quality Division requires a Multi-Sector General Permit (MSGP) for stormwater discharges associated with industrial activities. The goals are to eliminate contaminants from entering receiving waters or municipal sewer systems through storm runoff, and to keep contaminants from being exposed to rain or snow and subsequent runoff. The MSGP is an Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) permit, thus the permit is required for compliance with federal regulations. This permit covers new and existing discharges associated with certain types of industrial activity. Typically, municipal industries that will require the permit include wastewater treatment facilities and public works garages. Private industry usually includes auto salvage facilities, paper mills, manufacturing plants, food processing facilities, landfills, and auto repair and maintenance facilities.

VII. WASTEWATER, SEWAGE & STORMWATER MANAGEMENT GOALS

- The region's towns should have adequate wastewater treatment facilities with sufficient capacity to meet current needs and projected future development.
- Public investments in utility facilities and services should be in agreement with local plans and be directed toward town centers, villages, or other designated and planned growth areas.

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.
- Assist communities with advanced planning activities for future upgrades and financing of local systems.

VIII. SOLID WASTE MANAGEMENT

Municipal Solid Waste Plans

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) that conforms with the State Solid Waste Management Plan (2001 Plan Update). The Waste Management Division of the Agency of Natural Resources offers a Guidance Document/Template that is intended to help towns, districts, and associations to assemble a plan. The Guidance Document may be requested from the Waste Management Division by calling (802) 241-3888, or may be downloaded from the Agency's website: <http://www.anr.state.vt.us/dec/wmd.htm>.

Although mandated solid waste plans mean that municipalities still have the primary statutory responsibilities for solid waste management, the private sector has increasingly taken on a majority of collection, transport, processing, and disposal services required in the state. The State Solid Waste Management Plan holds the Agency of Natural Resources, municipalities, and the private sector responsible for maintaining environmental protection and economic competitiveness. Each should also initiate and play a role in educating the public about waste reduction.

Solid waste services are provided for 34 towns 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 District. Seventeen towns have approved their own individual plans for solid waste, and are not members of a Waste Management District (See Map 9, page 56).

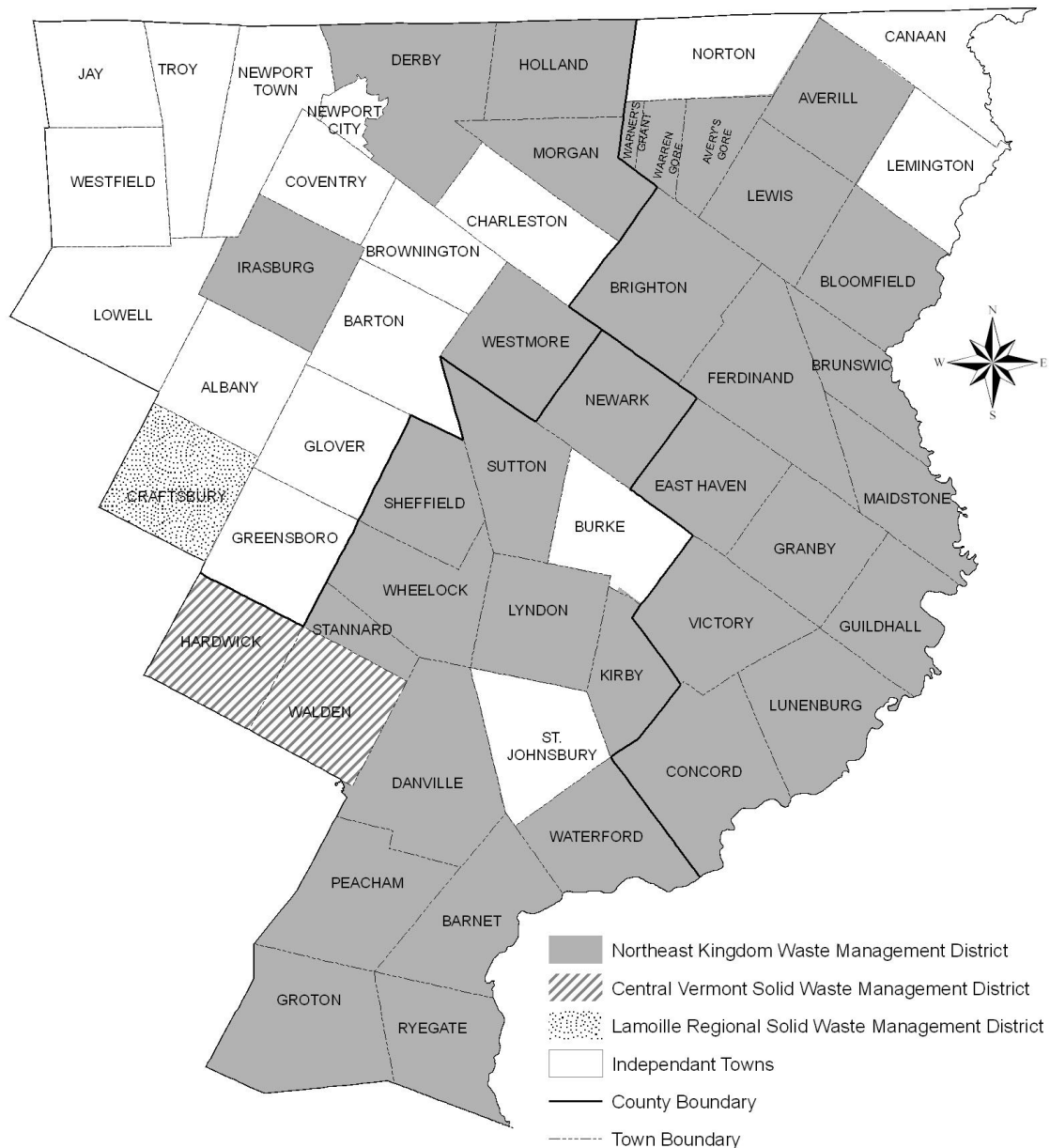
Landfills

As of 2004, the only permitted landfill within the region is located in Coventry. This is a lined facility, privately owned and operated by Waste USA, a subsidiary of New England Waste Services of Vermont. Waste USA estimates that approximately one-half of the solid waste generated in Vermont goes to the landfill in Coventry. This makes the region a net importer of municipal solid waste. The useful life of the Coventry landfill (in its present configuration) at its current rate of fill (240,000 tons per year) is approximately five to seven years. Waste USA is presently in the process of permitting for another cell. They also expect the Coventry landfill to remain in operation for another 20 years. In addition to the landfill services that Waste USA provides, they also provide recycling services (including tires and metals), composting, and have plans for a generating facility that will convert methane gas into electricity.

Act 78, sometimes referred to as the Solid Waste Act, challenged Vermont communities to develop management plans to increase source and waste reduction, reuse, recycling, and decrease the disposal of solid wastes. The highest priority was placed on source and waste reduction, something that has not been successful. The Act did result in the closure of a number of older, unlined landfills and requires greater planning by local officials when siting new facilities. Landfills in Lyndon, Concord, Waterford, and Brighton were closed prior to

1989 and are exempt from post closure monitoring requirements. Landfills in Barnet, Morgan, and Westmore were closed after 1989 and are subject to the post closure monitoring requirements.

MAP 9:



NVDA Region: Waste Management

Some former waste disposal sites within the region also remain on the federal EPA's list of Superfund sites. These include: Darling Hill Dump (Lyndonville), Derby Line Dump, Fairbanks Morse Foundry (St. Johnsbury), Nadeau Landfill (Coventry), Parker Sanitary Landfill (Lyndon), and St. Johnsbury Dump. These sites require continued monitoring as existing or potential sources of groundwater pollution.

Transfer Stations and Recycling

There are several waste transfer stations and recycling collection centers within the region. Waste transfer stations allow municipal wastes to be collected locally for transport to the regional landfills. Local transfer stations that collect recyclables help to reduce the amount of waste going to the regional landfill, thus lengthening its useful life. This is important because the siting of new landfills can certainly be quite controversial. Recycling has become more important to many communities and lets individuals play a direct role in protecting the environment.

To a large degree, waste collection (and handling) services within the region are carried out by private sector companies. This is in line with a nationwide trend and aids in reducing the amount of municipal funds required for solid waste management. The Northeast Kingdom Waste Management District requires that all waste haulers conducting business in the District first register, and then report to the district on a monthly basis.

The Northeast Kingdom Waste Management District has a variety of recycling and composting programs, to carry on the function of the former NEK Recycling Cooperative. Recyclables within the NEK Waste Management District are collected at the various transfer stations and transferred to the Lyndonville facility for processing and bundling. They are then sold to brokers who ship the recyclables to their end destinations for final processing (usually in ME, CT, or Canada).

Hazardous and Radioactive Wastes

The sub-categories of hazardous wastes include Household Hazardous Wastes, Industrial Wastes, and Radioactive Wastes (low-level and high-level). 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. The Northeast Kingdom Waste Management District periodically collects HHW for shipping and disposal. Some towns also have oil and battery collection facilities.

Low-level radioactive wastes are generated within the region. Typically, low-level wastes come from hospitals, medical, and research institutions. Low-level radioactive wastes generated in Vermont are disposed of in Texas under a radioactive waste disposal compact. High-level radioactive wastes are not directly generated in the Northeast Kingdom. As consumers of nuclear power, the region is partially responsible for wastes generated through the Vermont

Yankee nuclear plant in southern Vermont. However, until a decision is made regarding a future long-term storage facility in Nevada, the high-level wastes will remain on-site.

Solid Waste Management Initiatives

- Unit based pricing (for non-recyclables). The pay per bag (or, pay as you throw) system is an effective way to reduce the amount of waste generated and increase the amount of waste recycled. The built-in economic incentive allows customers to pay less as they dispose of less.
 - Reuse/Recycling Programs. These have proven to be economically successful and popular in most communities. Establishing re-use zones at local transfer stations (residents drop off unwanted usable items and others can take them for reuse) has worked in some areas. Some communities continue to charge fees for residents to recycle. Recycling fees may actually be a disincentive for getting residents to recycle.
 - Grants for education. Education grants are available to establish curriculum guides for waste management and recycling education, and to promote in-school recycling and composting.
-

VIII. SOLID WASTE MANAGEMENT GOALS

- Municipal and regional solid waste disposal systems should be cost-effective, environmentally sound, and promote reduction, reuse, and recycling.
- Hazardous wastes should be disposed of at secure, environmentally sound disposal sites.

STRATEGIES

- Promote recycling, re-use, and waste reduction efforts throughout the region.
 - Support public education to promote proper waste disposal efforts.
 - Assist municipalities to adopt illegal dumping and burning ordinances.
 - Encourage communities to meet the waste management and recycling goals established by the Northeast Kingdom Waste Management District and municipal waste management plans.
 - Encourage communities to create or expand local recycling facilities.
 - Encourage communities to eliminate or clean up illegal dump sites and Brownfields in the region.
-

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 which will be mentioned later. Tourism has been increasingly beneficial for much of the New England region, and particularly for Vermont due to its abundance of scenic resources. Thus, 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 5.0 gives some representation of the existing historic and cultural resources within the region.

Table 5.0:

Northeast Kingdom Historic Districts <i>(Listed on the National Register of Historic Places)</i>	Date
Caledonia County:	
Railroad Avenue Historic District, St. Johnsbury	06-25-1974
St. Johnsbury Main Street Historic District	05-28-1975
Hardwick Street Historic District, Hardwick	06-22-1979
St. Johnsbury Historic District	04-28-1980
Downtown Hardwick Village Historic District	09-30-1982
Barnet Center Historic District	07-12-1984
William & Agnes Gilkerson Farm, Barnet	1992
Maple St./Clarks Ave. Historic District, St. Johnsbury	04-05-1994
Summer Street Historic District, St. Johnsbury	1994
West View Farm, Waterford	1995
Thresher Mill, Barnet	1996
Essex County:	
Island Pond Historic District, Brighton	01-31-1979
Guildhall Village Historic District	09-27-1980
Judge David Hibbard Homestead, Concord	1995
Orleans County:	
Brownington Village Historic District	05-09-1973
Crystal Lake Falls Historic District, Barton	07-07-1994

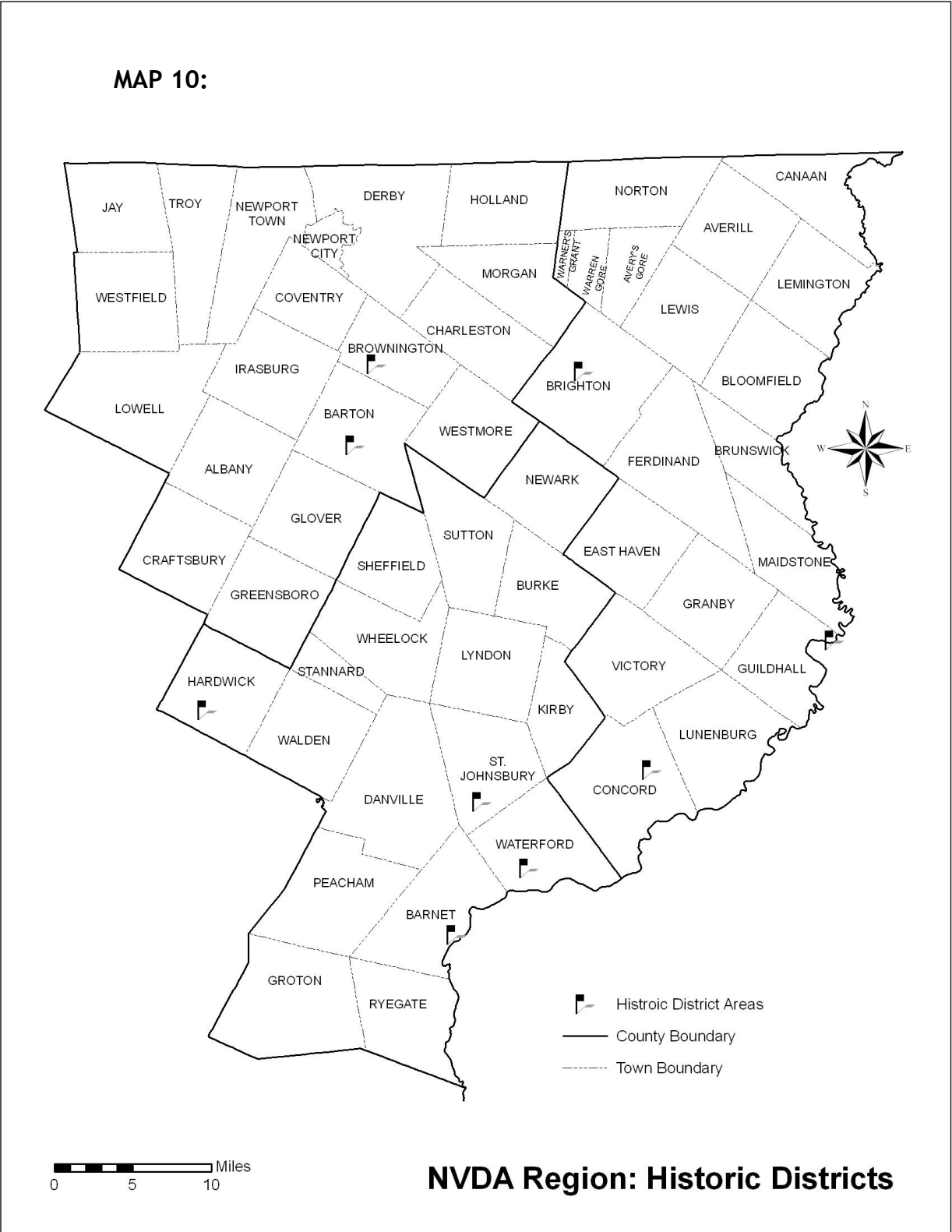
(Vt. Division for Historic Preservation, 2002)

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

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 University of Vermont puts out a guide to the *Division for Historic Preservation Services* (www.uvm.edu/~vhnet/hpres/org) that explains the programs available for historic and cultural preservation efforts, information, and technical assistance. 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 5.5, below, is included as a resource for additional information.

Table 5.5: Local Chambers of Commerce	
Barton Area Chamber of Commerce, Barton	www.bartonareachamber.com
Burke Area Chamber of Commerce, East Burke	www.burkevermont.com
Danville Chamber of Commerce, Danville	www.vtliving.com/chambers (contact info)
Hardwick Area Chamber of Commerce, Hardwick	www.hardwickvtarea.com
Island Pond Chamber of Commerce, Island Pond	www.islandpond.com/chamber-of-commerce.html
Jay Peak Area Association	www.jaypeakvermont.org
Lyndon Area Chamber of Commerce, Lyndonville	www.lyndonvermont.com
Northeast Kingdom Chamber of Commerce, St. Johnsbury	www.vermontnekchamber.org
Vermont's North Country Chamber of Commerce, Newport	www.vtnorthcountry.com

Northeast Kingdom Travel and Tourism Association (NEKTTA), the regional marketing organization for the Northeast Kingdom is an active partner with NVDA on many projects, including regional transportation projects, planning, and marketing efforts. The NVDA and NEKTTA organizations annually submit a joint work program plan to the State of Vermont. NEKTTA is also involved in assisting individual businesses and the local chambers of commerce shown in Table 6 with their marketing efforts. More about the NEKTTA organization can be found at their web address listed above.

II. CULTURAL RESOURCES

Public Libraries

Table 5.1 Public Libraries in the Northeast Kingdom:
St. Johnsbury Athenaeum, St. Johnsbury
Northeast Regional Library, St. Johnsbury
Cobleigh Public Library, Lyndonville
Pope Memorial Library, Danville Green, Danville
Samuel Read Hall Library, Lyndon State College, Lyndonville
Alice M. Ward Memorial Library, Canaan
Island Pond Public Library, Island Pond
Craftsbury Public Library, Craftsbury Common
Derby Free Library, Derby Center
Goodrich Memorial Library, Newport
Haskell Free Library and Opera House, Derby Line

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. Table 5.1 depicts some of the private and public libraries in the region.

In addition to public library resources in the region, Table 5.2 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 5.2:

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	
King George School	Sutton	www.kinggeorgeschool.com
Burke Mountain Academy	East Burke	www.burkemtnacademy.org
Northwoods Stewardship Center	East Charleston	www.northwoodscenter.org
St. Johnsbury Academy	St. Johnsbury	www.stjohnsburyacademy.org

(NVDA, 2002)

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 5.3 lists the region's resources for historic information and museum collections.

Table 5.3:

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
Craftsbury Public Library	Craftsbury
Derby Historical Society	Derby
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
Fairbanks Museum and Planetarium	St. Johnsbury
Stannard Historical Society	Stannard
Hitchcock Memorial Library and Museum	Westfield

(NVDA, 2002)

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.

STRATEGIES

- Promote local and regional tourism, since it 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.
-

I. OVERVIEW

According to the U.S. Census Bureau, the Northeast Kingdom's population was 62,438 persons in the year 2000. There were 33,939 total housing units, of which 7,428 (21.9% were for seasonal or occasional use. 18,306 householders owned their homes, while 6,405 households rented homes. In each of the three counties, the rate of housing growth exceeded the rate of population growth for the period 1990-2000. Vermont experienced an 8.5% increase in total housing units during the decade. For the same period, Orleans County experienced a 12.9% growth in housing units (1,676 housing units); Caledonia County had a 7.8% increase (1,055 housing units); and Essex County experienced an 8.2% increase (359 housing units).

A large percentage of housing units in the region are seasonal/vacation homes. For the region, approximately one of every five homes (20%) is a vacation home. Statewide the average is 16%. In Orleans County vacation homes make up 24% of the total number of housing units. In some communities, such as Greensboro, Jay, Morgan, and Westmore, more than one-half of the units are vacation homes. In Essex County, nearly 37% of the total housing units are vacation homes. In towns such as Averill, Lewis, Ferdinand, Maidstone, Avery's Gore, and Warren's Gore, 80% or more of the units are vacation homes. In sharp contrast to this, only fifteen percent of the housing units in Caledonia County are vacation homes.

The median value of owner-occupied housing units ranged from \$70,700 in Essex County to \$85,900 in Caledonia, compared with \$111,200 for Vermont as a whole. The median gross rent (rent plus estimated average monthly costs including utilities) was about \$125 less in the region than the state as a whole. About 22% of homeowners and 36% of renters paid more than 30% of their income for housing. While these statistics account for a regional view of housing costs at the end of the 20th century, recent interest in the Northeast Kingdom for inexpensive second-home properties from the rest of New England has driven up the price of real estate across the region. Because of this, many middle income families can no longer find affordable housing.

Between the years of 1990 and 2000 the population of the region grew by 7.1% (4,134 people), mainly in Orleans and Caledonia Counties (Table 7.0). The state as a whole grew slightly faster, with 8.2% population growth.

Table 7.0: Population Changes, 1990-2000				
	1990	2000	Change 90-00	% Change 90-00
Caledonia	27,846	29,702	1,856	6.70%
Essex	6,405	6,459	54	0.80%
Orleans	24,053	26,277	2,224	9.20%
Region	58,304	62,438	4,134	7.10%
Vermont	562,758	608,827	46,069	8.20%
(US Census Bureau, 2000)				

Table 7.1: Housing Unit Changes, 1990-2000

	1990 Units	2000 Units	Change 90-00	% Change 90-00
Caledonia	13,449	14,504	1,055	7.80%
Essex	4,403	4,762	359	8.20%
Orleans	12,997	14,673	1,676	12.90%
Region	30,849	33,939	3,090	10.00%
Vermont	271,214	294,382	23,168	8.50%
(US Census Bureau, 2000)				

In all three Northeast Kingdom counties, the housing growth rate exceeded the rate of the population growth. Region-wide, housing experienced a 10% growth while population experienced a 7.1% growth (Table 7.1). Orleans County grew the most percentage-wise in both population and housing units. Essex County housing alone grew by 8.2%, while its

population grew by less than 1%.

Surprisingly, only a small proportion of the housing unit growth was in seasonal or occasional-use housing. As Table 7.2 shows, only 254 of the region's 3,090 new housing units built between 1990 and 2000 were for seasonal use.

Table 7.2: Seasonal Use Housing Unit Changes, 1990-2000

	1990 Seasonal Use	2000 Seasonal Use	Change 90-00
Caledonia	1,923	2,096	173
Essex	1,833	1,839	6
Orleans	3,418	3,493	75
Region	7,174	7,428	254
(US Census Bureau, 2000)			

The region has a higher rate of owner occupancy than the state (Table 7.3). It is assumed that this is partially due to the lower cost of home ownership in the region (Table 7.7).

Table 7.3: Housing Tenure, 2000

	Occupied Units	Owner Occupied Units	Percent Owner Occupied	Renter Occupied Units	Percent Renter Occupied
Caledonia	11,663	8,499	72.9%	3,164	27.1%
Essex	2,602	2,069	79.5%	533	20.5%
Orleans	10,446	7,738	74.1%	2,708	25.9%
Region	24,711	18,306	74.1%	6,405	25.9%
Vermont	240,634	169,784	70.6%	70,850	29.4%

(US Census Bureau, 2000)

Age of Population

Between 1990 and 2000, the Northeast Kingdom experienced a 62% increase in the number of residents between the age of 45 and 54, as well as growth in the number of residents aged 55 and over (Table 7.4). The region actually saw a decrease in people under the age of 44 between 1990 and 2000. This age group may continue to shrink if more employment opportunities do not become available, particularly opportunities that are attractive to young people.

Table 7.4: Age of Population, 1980, 1990, and 2000					
Age	1980	1990	2000	% Change 80-00	% Change 90-00
Under 25	23,141	21,376	20,644	-10.80%	-3.40%
25 to 44	14,806	17,899	16,673	12.60%	-6.80%
45 to 54	5,318	6,003	9,729	82.90%	62.10%
55 to 64	5,375	5,199	6,209	15.50%	19.40%
65 and over	6,921	7,827	9,183	32.70%	17.30%
Total	55,561	58,304	62,438	12.40%	7.10%
(US Census Bureau, 2000)					

The largest age group of householders (Table 7.5), those from age 25 to 44, own 34.4% of the units. This age group shrank between 1990 and 2000. The second largest class of householders is comprised of residents aged 65 and over, who make up 14.7% of the population, but account for 23.9% of the householders. This group grew by 17.3% between 1990 and 2000. As the baby boomer generation continues to age, this age group is likely to continue growing. Population projections by Woods and Poole Economics estimate an 89% growth in residents age 65 and over by 2020 (Woods and Pole Economics, 2002).

According to the 2000 Census, householders age 65 and over account for more than a third of all households with incomes of less than \$20,000. Available senior housing stock seems close

to meeting demand for subsidized units, but seniors who do not qualify for subsidies or require affordable assisted living facilities are having difficulty finding quality living situations within their means. In some cases, empty nesters and single seniors would like to move from their large homes to smaller apartments that require less maintenance. Finding quality, affordable senior housing situations is a nationwide issue that will likely intensify as baby boomers enter their golden years.

Household Type

The size of the average household in the region continued to decrease, from 2.8 in 1980, to 2.6 in 1990, to 2.5 in 2000. The smaller average household size is due in part to a decrease in married with children households, and an increase in households that are married without children, single parent, non-family, or single person (Table 7.6). Family households still account for most households in the region, at 68% of the total.

Table 7.6: Household Types

	1990	2000	Change	% Change
Family households	15,575	16,861	1,286	8.3%
Married with children	6,236	5,628	-608	-9.7%
Married without children	6,549	7,761	1,212	18.5%
Female with children	1,449	1,667	218	15.0%
Male with children	404	766	362	89.6%
Other family	937	1,039	102	10.9%
Non-family households	6,010	7,850	1,840	30.6%
Single person	4,799	6,248	1,449	30.2%
Total households	21,585	24,711	3,126	14.5%

(US Census Bureau, 2000)

Affordable Housing

In 1999, the median household income in Caledonia County was \$34,800. Essex County was at \$30,490 and Orleans County at \$31,084 (US Census). When a household's housing costs are 30% or less of the household income, its housing is considered affordable. While the 30% rule applies to housing costs for all income brackets, the term "affordable housing" is as a rule reserved for housing that is affordable to those households that have an income below 80% of their county median household income. Conversely then, when households belonging to this segment of the population pay more than 30% of their incomes for housing costs, their housing is not considered affordable. Recent changes to Vermont's planning and development law, VSA 24 §117, has identified affordable housing as a top priority for Vermont communities.

As Table 7.7 shows, residents in this region are generally more likely to find affordable housing than statewide. The exception to this is renters in Orleans County, who have a slightly higher (.2%) proportion that pays more than 30% of their income. Renters are more likely than owners to be paying more than 30% of their income to housing. However, in all counties the median monthly costs for houses with mortgages are higher than median rents.

Table 7.7: Housing Affordability

	Owner Occupied Units	Owner Occupied Households Paying 30% of Income or More on Monthly Owner Costs Including Mortgage	Median Value of Owner Occupied Units	Renter Occupied Units	Renter Occupied Households Paying 30% of Income or More on Gross Rent	Median gross rent
Caledonia	72.9%	22.7%	\$85,900	27.1%	35.8%	\$428
Essex	79.5%	19.6%	\$70,700	20.5%	30.2%	\$420
Orleans	74.1%	21.3%	\$82,400	25.9%	37.7%	\$420
Region	74.1%	21.8%		25.9%	36.1%	
Vermont	70.6%	23.1%	\$111,200	29.4%	37.5%	\$553

(US Census Bureau, 2000)

Not surprisingly, the majority of residents paying more than 30% of their income for housing are lower income residents. Affordable monthly gross rent for a household with a \$20,000 income would be \$500 (gross rent = rent + utilities). As Table 7.8 shows, there are nearly twice as many households with incomes of less than \$20,000 than units with gross rents less than \$500. In all three counties, householders age 65 and over account for more than one-third of all households with incomes of less than \$20,000. As more residents with reduced incomes enter this age group, the issues of quality, affordable senior housing will grow in importance, as well as assistance to seniors wishing to continue living in their current homes.

Table 7.8: Households with Income Less than \$20,000

	Households with income less than \$20,000	Units with gross rent less than \$500	Householders age 65 and over with income less than \$20,000
Caledonia	3,169	1,726	1,307
Essex	836	308	393
Orleans	3,259	1,616	1,286
Region	7,264	3,650	2,986

(US Census, 2000)

Table 7.9 shows the number of subsidized housing units in the region that are assisted by the state and federal governments. Also listed are the numbers of units designated for the elderly and designated handicap accessible.

Table 7.9: Subsidized Housing Units			
	Units	Designated for Elderly	Designated Accessible
Caledonia	706	170	61
Essex	88	44	8
Orleans	616	203	65
Region	1410	417	134

(Directory of Affordable Housing in Vermont, 2000)

counseling to families with a variety of housing issues.

Gilman Housing Trust is the primary affordable housing provider in the Northeast Kingdom. In addition to developing, holding, renting, and managing subsidized housing, Gilman runs a popular homebuyer assistance program, a housing rehab loan program, rehabilitates housing for resale to private owners, and provides housing

There are both real and perceived problems associated with large concentrations of subsidized and affordable housing. An effective remedy for this can be mixing various income groups in neighborhoods and housing complexes rather than isolating low-income groups. One approach to creating mixed-income housing is for municipalities to require a certain percentage of affordable units in large, new housing developments. Other approaches are to create accessory apartments or smaller two to four unit buildings interspersed throughout the

community. This avoids isolated concentrations of low-income housing and the stigma that is often attached to large scale subsidized housing.

Gilman Housing Trust purchases and rehabilitates existing sub-standard multi-family and elderly housing that probably would not be acquired by the private sector. They try to improve the “worst on the block”. Apartments are redesigned to provide safe, decent and affordable rental housing. Recently, Gilman Housing Trust has also constructed new elderly housing. Typically the Trust’s rental housing is located in downtowns and village centers, where residents have pedestrian access to basic services.

Mobile Homes

Due to their low cost, mobile homes are seen as an inexpensive alternative to renting or owning a traditional housing unit. Table 7.10 shows the number of mobile homes in the region, and their median value in each county. While the initial investment in a mobile home is usually significantly less than purchasing a traditional unit, resale values of mobile homes decline much faster than traditional units.

Table 7.10: Mobile Homes		
	Mobile homes	Median Value
Caledonia	1,458	\$38,700
Essex	511	\$36,000
Orleans	1,518	\$34,800
Region	3,487	
(US Census Bureau, 2000)		

Homelessness

An issue often overlooked in the Northeast Kingdom is homelessness. Homeless persons in the region often do not match the common perception of the single adult sleeping in alleys or parks. Some are families that have recently lost their homes or apartments and are temporarily living with friends or family. Finding quarters for homeless families is particularly difficult in this region. The few shelters that exist typically do not have enough space, and breaking up the family is undesirable.

The Veteran's Administration provides transportation for disabled, homeless, and other veterans and their families to access services in White River Junction. Many towns are unaware of this service. It may be effective to combine this service with others provided by mental health and human service programs in the region.

Vacancy

As Table 7.11 shows, the Northeast Kingdom had a vacancy rate 2% higher than the state for year-round use units in 2000. Rental vacancy rates are much higher in the region than homeowner rates. However, due to differences in how the Census reports county and state figures, comparisons could not be made for rental and homeowner vacancy rates between county and state.

Table 7.11: Vacancy Statistics, 2000

	2000 Units	Vacant	Vacant Seasonal Use	Vacant Year-Round Use	Percent Vacant Year-Round Use	Rental Vacancy Rate	Homeowner Vacancy Rate
Caledonia	14,504	2,841	2,096	745	5.1%	7.2%	1.8%
Essex	4,762	2,160	1,839	321	6.7%	10.0%	5.4%
Orleans	14,673	4,227	3,493	734	5.0%	9.4%	2.4%
Region	33,939	9,228	7,428	1,800	5.3%		
Vermont	294,382	53,748	44,006	9,742	3.3%		

(US Census Bureau, 2000)

Housing Quality

Compared to other Vermont regions, the Northeast Kingdom has a good supply of available and affordable housing. However, the housing stock is aged and with the relatively low incomes in the area, maintenance becomes an issue. A lack of quality housing can be a drawback for attracting new employers and employees to the area.

The relatively low cost of homeownership in the Northeast Kingdom has however helped the region to have one of the highest levels of homeownership in the state. It has also lessened the demand for middle and higher priced rental units. This situation makes it difficult for a landlord to justify improvements on properties when rents do not cover renovation expenses and resale values are low. A lack of improvements will hasten the deterioration of aging units, and contributes to fire and safety issues. Combined with the loss of population in some regional hubs and the current market for single-family homes in rural areas, the potential for decay of some town centers and a declined in the appearance of the region could become significant issues.

Housing Safety

According to the Federal Emergency Management Agency (now under the Dept. of Homeland Security), Vermont consistently ranks high on the list of annual per capita fire fatalities. Many older houses still use kerosene heating, propane space heaters, and wood stoves. Wiring is often sub-standard, smoke detectors may not work, and emergency exits may be inadequate, obstructed, or non-existent. In this region, multi-family homes often pose more of a problem than single-family homes regarding safety issues.

In the experience of one local fire chief who inspects homes for fire safety, tenants and landlords share the blame for problems equally. Tenants inadvertently create fire hazards by storing fuels improperly, unplugging smoke detectors, blocking fire exits with personal property, etc. Landlords often do not invest enough in the property to keep it safe. Smoke detectors stop working, old wiring becomes unsafe, etc.

Municipalities can work with the Department of Labor and Industry to address code violations. The Department can be contacted for a more thorough explanation of ways that they can help. They are more focused on code management (rather than using the court system), and have been working to train fire chiefs to do home inspections for fire safety. This approach is effective in addressing serious safety problems and does not make the town liable.

A survey of rental housing stock can help towns to objectively address housing problems and avoid singling out individual property owners. The town then decides who will be responsible for enforcement of findings. The Department of Labor and Industry can be invited if the town does not want the liability of enforcement. However, some entities involved in housing issues feel that towns can deal more effectively with enforcement than the state. Enforcement is clearly easier for municipalities who have adopted their own housing codes, although the Department of Labor and Industry continues to have jurisdiction over rental housing.

In some instances banks, towns, and state agencies are aware of violations on properties but potential buyers are not. Serious violations could be put on deeds so that potential buyers are aware of the risks. One mechanism that follows a deed is a legally binding written order from the Commissioner of Labor and Industry.

Housing and Social Services

Social service providers may often be the first people to notice deteriorating housing conditions. These people might serve as a better first contact for tenants who need housing issues addressed.

Social service groups could potentially assist landlords in addressing problem tenant issues. Northeast Kingdom Community Action has developed a tenant self-sufficiency program that includes education on how to be a good tenant, provides basic living skills, meets with clients almost once a week either on-site or in the office, and develops agreements with landlords.

For landlords, having problem tenants who damage real property, miss rent payments, steal, etc. can be devastating financially, and may discourage the landlord from making necessary investments in real estate. It can also be counter-productive to efforts to help low and moderate-income people to find quality, affordable multi-family homes for owner occupancy.

In some instances it may be difficult for private landlords to compete in the area of affordable housing with nonprofit housing developers, which can offer multi-tenant housing that has been rehabilitated with public funds and rented to eligible tenants at below-market rents.

HOUSING GOALS

- An adequate supply of affordable housing should be available to the region's residents.
- The safety and quality of the existing housing stock in the region should improve.
- Partnerships with regional housing and human service providers should be strengthened, allowing for more effective service provision.

STRATEGIES

- Work with regional housing and human service providers, including Gilman Housing, NEK Enterprise Collaborative, and NEK Community Action to identify housing needs.

- Assist towns to create housing policies that address the affordable housing needs of low-income residents.
 - Assist communities interested in adopting local building codes.
 - Provide incentives for developers to create more rental and ownership housing that is affordable to middle income people.
-

I. OVERVIEW

Employment Characteristics

The Vermont Department of Employment & Training recently changed their employment classification system from the SIC (Standard Industrial Classification) system to the NAICS (North American Industrial Classification System). This change makes it challenging to examine historical employment trends, but may provide a more accurate picture of what is happening in Vermont. Under the SIC system, industry was divided into private and public (Government) ownership, with private ownership subdivided into the primary industrial sectors - e.g. agriculture, manufacturing, trade, and services, etc. Under the NAICS, there is still a division between private and public ownership, but the public sector is further subdivided into federal, state, and local government, while private sector industries are divided into "goods-producing" or "service-providing" before being subdivided into the more-detailed, primary industrial sectors.

Table 8.0: Employment by Industry, 2003 (figures based on NAICS data)

	Caledonia County	Essex County	Orleans County	State
Industry				
<i>Private Ownership</i>	9,448	1,052	7,682	247,200
<i>Goods Producing:</i>	2,546	675	2,323	53,800
Nat. Resource, Ag. & Mining	145	*	135	950**
Construction	729	60	563	15,350
Manufacturing	1,672	*	1,624	37,500
<i>Service Providing:</i>	6,902	377	5,359	245,400
Trade, Transport, & Utilities	2,287	139	1,736	58,250
Wholesale Trade	291	*	256	10,250
Retail Trade	1,618	81	1,229	39,500
Information service	272	*	99	6,500
Financial Activities	412	*	274	13,250
Professional/Business service	452	27	288	20,350
Education/Health service	2,106	67	1,846	52,100
Leisure & Hospitality	1,000	106	852	32,800
Other services	375	24	263	10,150
<i>Government Ownership</i>	1,918	366	1,897	52,000
Federal Government	114	82	235	6,250
State Government	599	0	332	16,800
Local Government	1,205	284	1,330	28,950
TOTAL:	11,366	1,418	9,579	299,200

(VT Dept. of Employment & Training, Labor Market Information, 2001)

* Separate industry figures were not available for Essex County, but employment numbers were included in the subtotals. ** Agriculture was not included in the State figure.

According to the Vermont Department of Employment & Training statistics for 2003, the three counties of the Northeast Kingdom (Caledonia, Essex, and Orleans) had an estimated combined labor force exceeding 30,000 persons. The average annual employment (covered*) for 2003 was 22,363. Within the region, Caledonia County had the highest average annual employment at 11,366 persons, followed by Orleans at 9,579 and Essex at 1,418. **Covered employment includes all private and public ownership types, but doesn't count all farm employment or self-employment.*

Interestingly within the region, the number of men employed (10,995) was slightly less than the number of women (11,369). In Caledonia County, 5,730 women accounted for 50.4% of the average annual employment total. For Essex and Orleans Counties, the figures were 607 (42.8%) and 5,032 (52.5%), respectively.

For the state in 2003, employment was the highest in the service-providing industries, followed by goods-producing industries and government employment (Table 8.0). This was also true for the Northeast Kingdom region with the exception of Essex County, where goods-producing employment (manufacturing, construction, and resource industries) outpaced the service-providing industries (wholesale/retail trade, education/health services, and leisure/hospitality employment - tourism). This essentially follows the pattern of the most recent decade 1990-99. (NAICS data, Table 8.0)

Table 8.1: Employment by Industry, 1990 and 1999 (figures based on SIC system)

Industry	Caledonia County		Essex County		Orleans County	
	1990	1999	1990	1999	1990	1999
Manufacturing	1,873	2,254	871	1,000	1,980	1,804
Services	2,152	2,736	75	158	1,825	2,202
Trade - Retail	1,974	2,198	139*	146*	1,486	1,581
Trade - Wholesale	335	336	*	*	251	281
Construction	652	626	47	51	452	472
Transport./Utilities	540	509	44	37	302	373
Finance/Ins./ R.E.	472	403	16	14	245	241
Agriculture/ Forestry/Fishing	61	N	22	16	N	157
Mining	10	N	0	0	N	N
Government	1,618	1,881	308	361	1,481	1,747
TOTALS	9,876	11,059	1,600	1,784	6,691	7,111

(VT Dept. of Employment & Training, Labor Market Information, 2000)

N = Not published, but figures included in the totals.

* Separate retail and wholesale trade figures for Essex County were not available.

In the previous decade, Essex County saw a majority of its workforce employed in manufacturing with a heavy concentration in durable goods. The county experienced the most growth in services and government employment. Government employment includes education professionals and in 2003 accounted for approximately 25 percent of all employment in Essex County.

In the same period (1990 to 1999), Orleans County lost jobs in manufacturing, but gained jobs in most other sectors, especially services and government. Agriculture and forestry, while no longer major employers, remained prominent in the local economy.

In Caledonia County, manufacturing still provides an estimated 15% of employment. Employment in the education and health services grew faster than other industries in the 1990s. St. Johnsbury and Lyndon are the primary economic centers and provide about 75% of the jobs within the county. Of the three counties, Caledonia has the most diversified industry base.

Unemployment

Regional unemployment rates improved steadily throughout the 1990s (Table 8.2), but an economic downturn in 2000 and a stagnant economy that ensued caused unemployment numbers to rise. In December 2004, Caledonia County's unemployment rate was 4.6%. In Essex and Orleans Counties, the numbers were 5.4% and 6.2%, respectively. The state unemployment rate for the same period was 3.2%. The county averages conceal the fact that a few communities in the region still have double-digit unemployment rates.

Table 8.2: Average Unemployment Rates as Percentages of Labor Force, 1992 – 2001				
Year	Caledonia County	Essex County	Orleans County	Vermont
1992	7.5	9.3	10.8	6.7
1993	7.3	8.4	9.2	5.5
1994	6.5	6.5	8.7	4.7
1995	6	7.3	8.5	4.2
1996	6.6	8.4	9.2	4.6
1997	5.4	6.9	8	4
1998	4.7	6	7.1	3.4
1999	4.1	5.9	6.3	3
2000	4.1	5.8	5.9	2.9
2001	5.2	6.6	7.1	3.6

(Vermont Department of Employment & Training, 2002)

Leading Northeast Kingdom Employers

In 2003, there were 702 privately-owned companies in Vermont employing 50 or more employees - 237 were in Chittenden County. Only 43 of these were located in the Northeast Kingdom (25 in Caledonia County, 18 in Orleans County, and no exact figures for Essex County, but Dirigo Paper and Ethan Allen certainly employ 50 or more individuals). These companies employed approximately 5,764 persons. However, the largest percent of businesses in the Northeast Kingdom are small in size, often employing four workers or fewer. Table 8.3 below, depicts the number of private businesses by county, classified by number of employees, for the region in 2003.

For Caledonia County, nearly 78% of the businesses employed 10 or fewer employees. These businesses employed a total of 2,608 employees. Businesses having 10 - 49 employees made up about 20% of the County total, and employed 3,647 persons. In Essex County, 88% of the businesses employed fewer than 10 persons (336 workers), and 11% employed 10 - 49 persons (222 workers). In Orleans County companies with fewer than 10 employees made up 82% of the total (2,215 workers), while businesses having 10 - 49 employees comprised 16% of the total (2,645 workers).

Table 8.3: Private-Ownership Business Size Class by County, 2003.

County	Total	Businesses classed by number of employees						
		0-4	5-9	10-19	20-49	50-99	100-249	250+
Vermont	22,279	12,991	4,310	2,687	1,589	388	242	72
Caledonia	917	492	218	108	74	11	11	3
Essex	131	95	21	10	5	--	--	--
Orleans	821	515	155	79	53	13	N	5
N = Data reported as confidential.					(Vt Labor Market Information, July 2004)			
Dash (--) = Zero reporting units.								

II. LEADING ECONOMIC SECTORS

Manufacturing

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 Weidman Industries, Caledonia County
- Columbia Forest Products, Orleans County
- NSA Industries, Caledonia County
- Kennametal (Greenfield) Industries, Caledonia County
- Fairbanks Scales, Caledonia County

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 Vermont Tap and Die and NSA in Lyndonville, Vermont Aerospace in St. Johnsbury, and Trivoly USA and North Country Engineering in Derby. EHV Weidmann, in St. Johnsbury, manufactures industrial insulators. Dirigo Paper Company, in Gilman, prints specialty papers for a number of customers.

Recent manufacturing industry growth for the region includes:

- In North Troy, Newport Panel, the sister company of Newport Furniture Parts, continues as steady growth.
- In Newport, Vermont Teddy Bear has continued to grow and recently expanded into an additional 10,000 square feet.
- MSA Gallet, a safety-helmet company with headquarters in France, continues with large contracts from the U.S. military for helmets and has expanded its workforce to 80, working two shifts.
- Green Mountain Custom Finishing and its sister company recently moved to a new location, combining both plants under the same roof.
- Vermont Beef Jerky, located in Orleans, purchased the Comstock building where they are smoking cheeses for Cabot. Also in the building are Le Gavotte, a gourmet pate manufacturer, and Chebe, producer of gluten free breads.

Agriculture

Although agriculture accounts for only a small percentage of the region's employment base, approximately 20% of Vermont's farmland is located within the Northeast Kingdom (Agriculture comprises the greatest number of jobs in the Natural Resources category in Table 1.0.). Orleans County produces about 13% of agricultural products sold in the state, ranking third for all counties. Caledonia County ranks fourth, producing about one-half as much as Orleans County. Dairy farming is the main agricultural practice in Orleans and Caledonia Counties. Dairy products accounted for \$79,358,000 or 83% of the 1997 market value of all agricultural products in the Northeast Kingdom. Farming is also an important component of the Northeast Kingdom's traditional landscape, as it preserves open spaces and enhances the region's tourist draw. However, the number of small family farms in the region continues to decline.

Silviculture

The forest industry is an intricate part of the region's economic and social identity. Columbia Forest Products, Ethan Allen, Island Pond Woodworkers, and now Dirigo Paper are key manufacturers using the region's abundant forest resources.

In 1997, close to 59,000,000 board feet or two-thirds of the wood harvested in the Northeast Kingdom was softwood. Much, if not most, was used for pulpwood. Paper manufacturers are increasingly looking for this commodity overseas, where lower wages, and therefore lower prices, prevail. The immediate consequence of this change is the potential loss of pulp related employment. Nevertheless, forest products industries are still very prominent in the regional manufacturing economy. Essex County's large percentage of goods-producing industries (58%) is largely due to the presence of the Ethan Allen Furniture manufacturing plant in Beecher Falls, Island Pond Woodworkers (an employee-owned company) in Island Pond, and Dirigo Paper (operating in the former Gilman Paper mill) in Gilman. Ethan Allen has an additional production facility in the village of Orleans. The company has expanded over the past five years and contracts with other smaller manufacturers to take on some tasks, supported by technical assistance from Ethan Allen.

Lyndon Woodworking and Newport Furniture Parts are other wood manufacturers located in the Northeast Kingdom. In addition, Columbia Forest Products manufactures plywood in the City of Newport. 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. Recently, however, large tracts of commercially forested lands have been converted into conservation uses. Nevertheless, logging continues to be a locally important economic activity.

Health Care & Education

The healthcare and education service industries have become significant employers for the region. The Northeastern Vermont Regional Hospital in St. Johnsbury and the North Country Hospital in Newport are among the largest employers the Northeast Kingdom. In 2003, healthcare and education services accounted for 4,019 of the region's jobs. In many of the

region's towns, it is likely that the local school is one of the largest employers in the town (*note: some education professionals are employed within the government sector).

Retail

Retail trade remains a challenge for many Northeast Kingdom communities. Taking into account the region's low population densities, it has proven difficult to attract large retailers, although some have opened in neighboring New Hampshire where there is a smaller tax burden and a less stringent permitting process. 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. The closing of the St. Johnsbury and Derby Ames Department Stores created an obvious void for discount merchandise shoppers. Local merchants have been able to fill some retail needs, but local officials continue to seek large retailers for area residents.

The Town of St. Johnsbury continues working to revitalize its Railroad Street retail district. The recent rebuilding of the Daniel's Block, destroyed by fire in the late 1990s, should help their efforts. 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. The town is investing in streetscape enhancements in the downtown commercial area, and has recently constructed a downtown parking facility to alleviate congestion and parking shortages along Railroad Street and Eastern Avenue. St. Johnsbury's many cultural and historic assets provide 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 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.

Leisure & Hospitality

The leisure and hospitality services (e.g. hotel, restaurant, and tourism related businesses) industries account for about 1,958 jobs (NAICS data, 2003), and continues to grow. Tourism has been an important factor in keeping the retail trade and leisure and hospitality industries strong in the Northeast Kingdom. A number of high-quality, commercial recreation facilities and tourist attractions have been the reason for much of the increased tourism. In 2003, the region's taxable rooms and meals receipts totaled \$5,173,568, while sales and use taxes were \$12,071,812.

Among the leading leisure and hospitality industries in the area, the Jay Peak Ski Area continues its expansion with the addition of new equipment and new ski runs. They now employ over 200 full-time equivalent employees. From the continuing development of seasonal homes, condominiums, and a future 18-hole golf course, Jay Peak Ski Area plans to expand to a four season vacation resort. Burke Mountain Ski Resort has expansion plans underway, as well, including additional condominium development.

Tourism

The regional tourism industry also incorporates activities such as: snowmobiling, hunting, cross-country skiing, and hiking to attract numerous visitors to the Northeast Kingdom. Along with the Jay Peak Ski Area and Burke Mountain, the alpine ski areas mentioned above, there are numerous cross-country ski centers in the region. Kingdom Trails, the Craftsbury Outdoor Center, the Northwoods Stewardship Center, Highland Lodge, Lyndon Outing Club, Sterling Ridge Inn, and Jay Peak include a thorough network of cross-country ski trails. The Vermont Association of Snow Travelers (VAST) has an extensive system of trails throughout the region for snowmobiles.

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.

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 and cross-country skiers. Other bicycle path projects are still in the planning stages including paths in St. Johnsbury and Newport.

"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". In Essex County, eco-tourism has especially good growth potential with the recent conservation acquisition of the former Champion lands by the U.S. Fish & Wildlife Service and Vermont Agency of Natural Resources; and permanent conservation easements on the Essex Timber Company holdings on the remainder of the Champion lands. The Northeast Kingdom Travel and Tourism Association and the local chambers of commerce are focusing efforts on cultural heritage, local history, and nature-based tourism.

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. For 2003, approximately 19% (4,181 persons) of the active Northeast Kingdom workforce was employed by local, state, or federal government.

III. WAGES

Wages in the Northeast Kingdom increased steadily from 1992-2001 during a nationwide period of economic growth. However, the gains made by the region's wage earners substantially lagged behind the statewide average for the same period (Table 8.4). In 2002, the average annual wage for Vermont was \$31,041. In Caledonia County the average wage was \$25,536. In Essex County, the figure was \$25,976. Orleans County had the lowest average annual wage at \$24,539.

Table 8.4: Average Annual Wages* 1992 - 2001.				
Year	Caledonia County	Essex County	Orleans County	Vermont
1992	19,750	20,925	17,860	22,364
1993	19,671	21,255	17,946	22,702
1994	19,587	21,873	18,328	22,963
1995	20,027	22,364	19,187	23,574
1996	20,491	23,208	20,034	24,479
1997	21,230	24,480	20,748	25,506
1998	22,039	24,905	21,336	26,624
1999	22,631	24,815	21,956	27,589
2000	23,617	24,694	23,177	28,924
2001	24,379	25,508	23,971	30,239
(VT Dept. of Employment & Training, Labor Market Information, 2002)				

*Average annual wage is based on the geography of the job and not the residents in the area. It is also important to note that a high concentration of seasonal or part-time jobs significantly lowers the average wage.

IV. OTHER ECONOMIC INDICATORS

Housing

The federal government typically uses new housing starts as an indicator of economic activity. These numbers are not presented in this report. Communities can track local building permits to estimate activity in their areas. Additional housing information can be found in Chapter 7 of this document.

Population

The Northeast Kingdom is the most sparsely populated region in Vermont. Population growth over the decade from 1990-2000 would seem to indicate that increased economic activity is occurring. The region accounts for 21% of the land area in Vermont, with each county having roughly the same total land area. However the region contains only 10% of the state's population. As Table 8.6 shows, the population of Essex County is relatively small, and now ranks last among Vermont counties in population (Caledonia County ranks ninth and Orleans County ranks eleventh).

Table 8.6: Population		
County	2000 Population	% Change 1990-2000
Caledonia	29,702	6.70%
Essex	6,459	0.80%
Orleans	26,277	9.20%
Total	62,438	7.00%
(U.S. Census, 2000)		

More than 30% of Northeast Kingdom residents are between 35 to 54 years of age - an increase of 5% since 1990. Each of the three counties in the region has slightly higher concentrations of residents aged 65 or older than the state rate of 13% (Essex County is the highest at 16%). In contrast, all three counties are below the state rate of 20% for people aged 20 to 24. A perceived lack of attractive employment opportunities likely contributes to the out-migration of younger workers from the area.

Rural Poverty

The lack of adequate personal income is a critical issue in the Region and was identified by 92% of the population in a 2001 survey of Northeast Kingdom residents conducted by the Northeast Kingdom Collaborative as part of the process for the Rural Economic Area Partnership (REAP). The Peace and Justice Center conducted a groundbreaking study on the livable wage issue in Vermont and Justice. The study's findings include:

- The federal poverty measure severely underestimates the cost of meeting a family's basic needs.
- Depending on family size, a livable wage is between 52% and 197% greater than the minimum wage.
- A significant percentage of working families do not earn enough to meet their basic needs.
- The inflation-adjusted median wage has not grown in ten years; while aggregate income has increased, the top 40 % of families experienced all of the growth.

The counties of the Northeast Kingdom continue to have the highest poverty levels in the state. In 1999, Orleans County's poverty rate was 14.1%, Essex County was at 13.7%, and Caledonia County was at 12.3%.

External Trends and Forces

People may be concerned about future 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 development. Everyone agrees that efforts to revitalize downtowns can have economic and cultural benefits, but many people oppose limiting growth to existing growth centers and downtowns. Also, attempts to create a "livable wage" continue to raise concerns over retaining and attracting new businesses, but it is extremely difficult for someone earning minimum wage to improve their standard of living.

Adequate, 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. Education in Vermont is primarily funded by property taxes. Towns determine how funds are allocated for education based, in part, on how

much revenue they generate from property taxes. The Vermont Legislature first passed Act 60, and more recently Act 68, to address the disparities between rich and poor communities and the ability of the latter communities to fund elementary and secondary education by the development of an equalized statewide property tax. The full impact of Acts 60 and 68 on economic development and the business climate is unknown, but property taxes have increased significantly and reforms are still being discussed.

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.

Due to the rural character of the Northeast Kingdom, telecommunications companies have been slow developing high-speed telecommunications systems throughout much of the region, thereby frustrating the growth of e-commerce and those wishing to "telecommute" from home. Slow systems development can be attributed in part to a widely scattered population base and environmental sensitivities regarding the location of new of telecommunication facilities.

V. 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:

1. *Economic Development Council of Northern Vermont* (EDCNV) provides technical assistance for its clients to develop business plans and quarterly financial reports, and provides comprehensive assistance in marketing, advertising, management, and inventory control. EDCNV writes grant proposals to the Economic Development Administration for funds to be used for economic development projects and feasibility studies. EDCNV manages "The FUND", a program which provides loans up to \$100,000 and two micro-business programs providing loans under \$25,000.
2. *Northern Community Investment Corporation* (NCIC) 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.
3. *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 the province of Quebec. NVDA provides technical assistance for reviewing business plans, and connects with the appropriate state agencies for marketing assistance. NVDA submits grant proposals for community and economic development projects to a number of funding agencies. NVDA has a Rural Development Intermediary Relending Program, which provides loans ranging from \$20,000 to \$50,000.

4. *St. Johnsbury Area Economic Development Office* writes planning and implementation grant proposals for specific economic development projects. The St. Johnsbury Area Economic Development Office also manages the St. Johnsbury/Lyndon Revolving Loan Fund.
5. *Small Business Development Center* (SBDC), a program of the U.S. Small Business Administration, maintains 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.
6. *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 trouble shooting for micro-businesses.
7. *Vermont Economic Development Authority* (VEDA) serves the entire state and offers a variety of business incentive programs.

Local Revolving Loan Funds

The towns of St. Johnsbury, Lyndon, Barton, Hardwick, Brighton, Newport, Albany, Jay, and Canaan all have revolving loan funds 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.

Workforce Education and Training

Workforce development has been identified as one of the keys to economic development in the region. The need for more vocational/technical education programs and a need for more adult literacy programs were identified by 85 % of the respondents in the Northeast Kingdom survey. A need for training with computers and information technology was cited by 85 percent of the respondents in the Northeast Kingdom survey conducted by the Collaborative as part of the Rural Economic Area Partnership.

Importantly, the region's Workforce Investment Board, 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.

VI. CONCLUSION

Workforce training for new and existing workers will be one of the region's priorities in order to meet the needs of area businesses and increase workers' salaries. New and innovative infrastructure improvements must occur for information technology to grow and thrive. Quality employment opportunities will be identified and promoted to allow residents, especially young adults, to find jobs closer to home. Business and industry clusters can be developed to increase productivity, broaden the access to markets, and reduce the waste of time and resources. The growth in the small business sectors, e.g. telecommuting, specialty foods, value-added businesses, arts and crafts and e-commerce, will flourish. It is expected that manufacturing will strengthen, become more flexible, and make important gains, particularly in the forest products and industrial machinery sectors. It is hoped there will be increased research and start-up funds to aid value-added processing and to

diversify the economy, especially for the region's farmers. Tourism will continue to grow in the Northeast Kingdom. Eco-based businesses will become a part of the region's landscape, and steps will be taken to mitigate the negative effects that some older businesses have had on the environment.

ECONOMIC DEVELOPMENT GOALS

- The region's unemployment rate should be reduced.
- The training/skills of the workforce should be improved.
- Higher-wage jobs should be created.
- Coordinate economic development functions in the Northeast Kingdom.
- Towns should receive assistance in their economic development efforts.
- The region's agricultural output should increase and diversify. Value should be added to local staple products and raw materials.
- The economic infrastructure capacity in the Northeast Kingdom should be improved to meet current and future needs.
- The region's telecommunications infrastructure should modernize and expand.
- Downtowns and village centers in the Northeast Kingdom should be maintained and revitalized.
- Quality, affordable child care should be available to workers with children in the Northeast Kingdom.

STRATEGIES

- Provide technical assistance for new and expanding businesses, and recruit new businesses.
- Market the resources of NVDA.
- Assist existing manufacturing companies to grow by identifying new markets, products, and technology.
- Assess opportunities for coordination of economic development organizations.
- Provide greater access to revolving loan funds.
- Develop an annual forum for regional partners to participate in the economic development strategy for the Northeast Kingdom.
- Implement a comprehensive workforce development strategy for the region.
- Develop and implement strategies to revitalize distressed areas and specific 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.
- Host economic development planning seminars in cooperation with SBDC and USDA Rural Development and other partners.
- Support and promote the specialty food industry.
- Research new methods of promoting sustainability in the agricultural field.
- Index and promote the traditional foods products of Vermont's small family farmers.
- Develop, maintain, and support local physical infrastructure projects such as water, sewer, industrial sites, and transportation projects.

- Continue to administer public works grants for towns in the region.
 - Conduct a study to identify the region's Brownfield sites.
 - Encourage and identify new startups with business strategies and tools.
 - Identify, prioritize and implement Brownfield mitigation projects within the region.
 - Develop a region-wide plan for water and sewer facilities.
 - Support telecommunications infrastructure and knowledge capabilities by creating effective partnerships, and by advocating for increased infrastructure.
 - Create a region-wide telecommunications strategy that will address wireless voice communication and high-speed Internet access, in order to halt the growing digital divide between rural and urban areas.
 - Promote and advocate for economic development projects in downtown areas.
 - Support Micro-enterprize programs for new business identification.
 - Work through regional and community partnerships to expand training assistance and other support for childcare providers, and develop additional site-based child care centers.
 - Work with local businesses, the Workforce Investment Board, schools, and community partnerships to assess childcare needs throughout the region.
-

I. OVERVIEW

The Northeast Kingdom is recognized for its diverse wildlife, large undeveloped areas, and vast woodlands. The region's natural resources (depicted in Map 11 on the following page) provide residents and others a variety of benefits. The largest source of revenue in the region is from the harvesting, processing, and manufacturing of forest products; a wide variety of recreational activities are available in the forests and on lakes; 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:

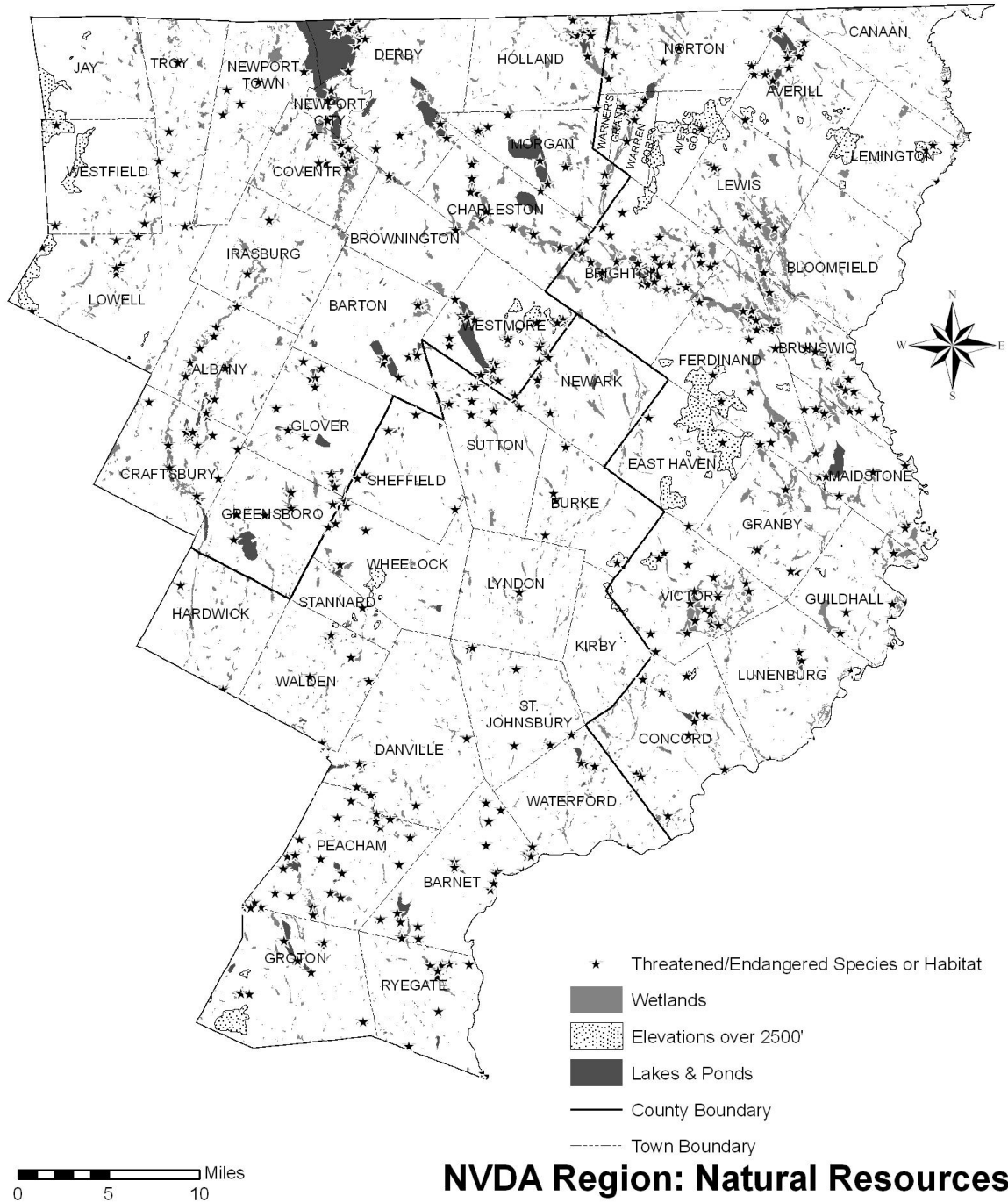
- *The Northeast Highlands*, an extension of New Hampshire's White Mountains, make up most of Essex County and northern Caledonia County. On average, this area is cooler than the rest of the state. The growing season here averages less than 90 days and snowfall accumulation frequently exceeds 36 inches.
- 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 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 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 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 to the Northeast Kingdom.

MAP 11:



II. WATER RESOURCES

Water Quality

According to the Water Quality Division of the Department of Environmental Conservation, the water quality of all rivers, streams, lakes, and ponds in Vermont is considered good. When mercury contamination in fish is added to the equation, the rating is fair. 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 July 2, 2000 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 9.0 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 9.0: State Targeted-Impaired Surface Waters.	
Water Body	Threat or Impairment
Levi Pond – Groton	Extremely sensitive to acidification; episodic
Stearns Brook & Tributary – Holland	Undefined: Agricultural runoff
Lake Salem – Derby	Elevated levels of mercury in Walleye
Crystal Brook – Derby	Sediment & nutrients: Agricultural runoff
Ticklenaked Pond – Ryegate	Phosphorus: Algae blooms, high pH, low D.O.
Lake Memphremagog – Newport	Phosphorus: Excessive algae growth, nutrient enrichment
South Bay – Newport	Phosphorus: Nutrient enrichment, nuisance algal
Comerford Reservoir – Barnet	Elevated levels of mercury in all fish
Moore Reservoir – Waterford	Elevated levels of mercury in all fish
Lower Sleepers River – St. Johnsbury	E. Coli: St. Johnsbury WWTF Collection System passes combined sewer
Passumpsic River from Pierce Mills to below Passumpsic Dam	E. Coli: St. Johnsbury WWTF Collection System passes combined sewer overflows
Source: VT DEC-WQD,303(d) List of Impaired Surface Waters in need of TMDL, 2004	

Watersheds

A watershed is a geographic area in which all water flows into a single river. Boundaries of watersheds are therefore the highest points of elevation surrounding the water body. Watersheds can be small and localized, or large enough to incorporate many drainage areas flowing into a vast water body. Vermont is divided into 17 major watersheds. The three counties of our region contain waters that flow within the St. Francois or Lake Memphremagog; Passumpsic; Upper Connecticut; Lamoille; Missisquoi; Stevens, Wells, Waits, Ompompanoosuc or “Basin 14”; and Winooski watersheds.

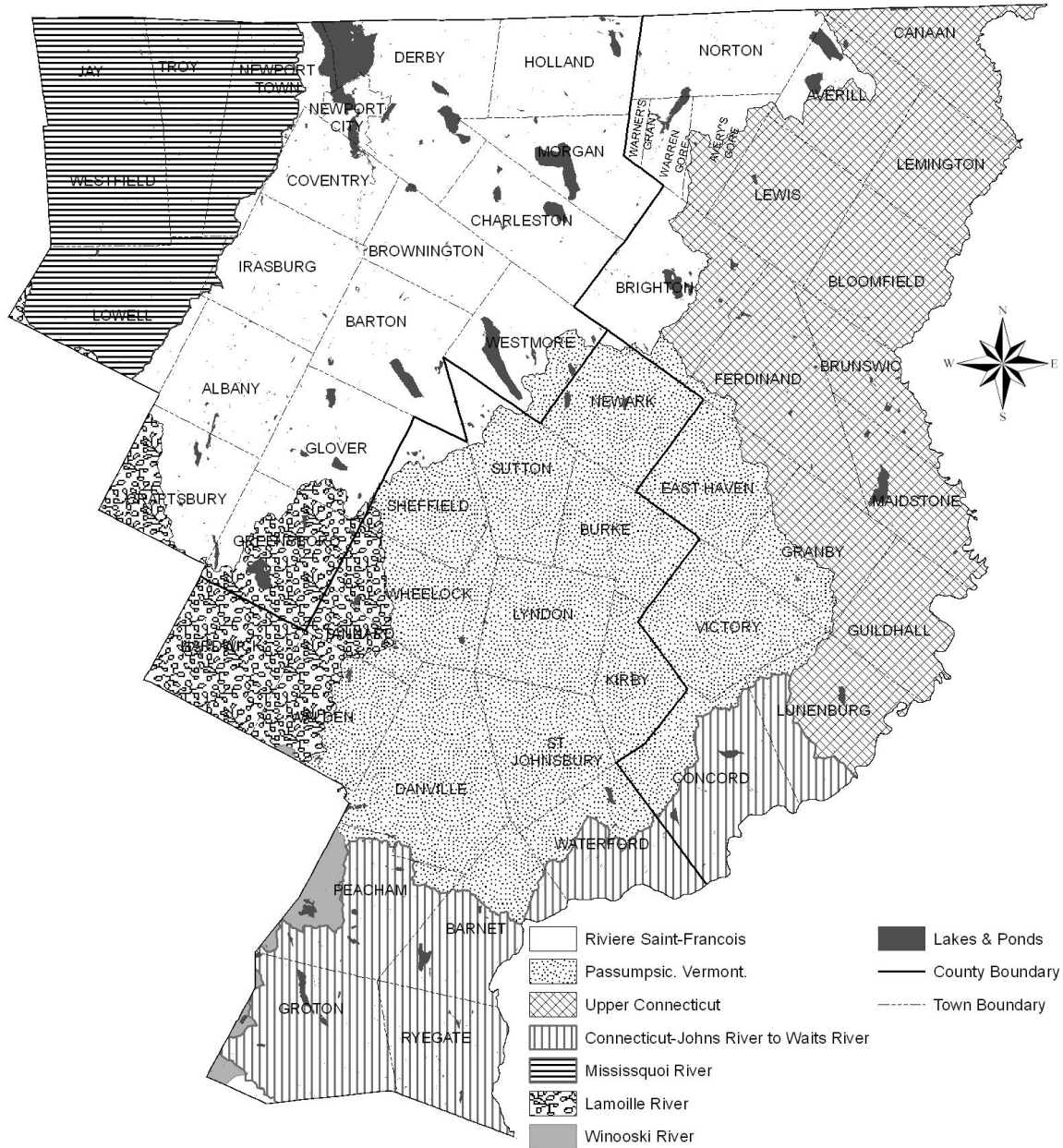
The Agency of Natural Resources should complete a watershed basin planning process for all 17 major watersheds by the year 2006. Each basin will have a watershed council comprised of area residents and technical advisors to create a comprehensive watershed plan. Plans should contain present water quality conditions, problems of local concern, management goals and implementation strategies. The Lamoille River Watershed Council has already been established and is expected to complete its plan by 2005. The Basin 14 Council has been established which includes the subgroups of the Stevens River Watershed Council and the Wells River Watershed Council. This plan is not expected to be complete until 2006.

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 Watershed Council is another citizen-based advocate for the environmental well-being of the Connecticut River. This Council, 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. One 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.

MAP 12:



0 5 10 Miles

NVDA Region: Watersheds

Table 9.1: 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)	⇒ Bacteria Monitoring
Crystal Lake Reservation Assoc.	⇒ Exotic Species Spread Prevention
Daniel's Pond Assoc.	⇒ Lake Assessment
Echo Lake Assoc.	⇒ Lake Protection Through Town
	Zoning
Elligo Lake Assoc.	⇒ Land Conservation
Friends of Little Hosmer	⇒ Landowner Education
Island Pond Assoc.	⇒ Lay Monitoring Program
Lake Parker Assoc.	⇒ Local Advocacy
Memphremagog Conservation, Inc.	⇒ Road Erosion Control
Salem Lake Assoc.	⇒ Runoff Diversion
Seymour Lake Assoc.	⇒ Shoreland Vegetation Enhancement
Shadow Lake Assoc.	⇒ Testing of Shoreline Septic Systems
Westmore Assoc. (Lake Willoughby, Long Pond, Bald Hill Pond)	⇒ Watershed Assessment
Lamoille River Watershed	⇒ Watershed Management Committee
Greensboro Assoc. (Caspian Lake)	
Passumpsic River Watershed	
Cole's Pond Assoc.	Basin 14: SEWER Save Everyone's Wells River
Joe's Pond Assoc.	Passumpsic River Network
Lyford Pond Assoc.	Passumpsic Valley Land Trust
South End Newark Pond Assoc.	CT River Watershed Advisory Commission
Stevens River Watershed	Barton River CPP Program
Harvey's Lake Assoc.	Lamoille River Anglers Association
Upper Connecticut River Watershed	Missisquoi River Basin Association
Maidstone Lake Assoc.	
Miles Pond Assoc.	
Neal Pond Assoc.	

(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. Lakes such as 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 and landlocked Atlantic salmon that migrate upstream from the big lake. Efforts to restore Atlantic salmon are taking place in the upper Connecticut River basin waters, such as the Passumpsic, Moose, Stevens and Wells Rivers. 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 (see Table 4). 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.

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 networks of dirt roads are a major cause of erosion and sedimentation when improperly built and maintained. It is important that the state, towns, and landowners cooperate in efforts to maintain these roads with better practices to protect water quality and save funds over the long term. The Better Backroads Program, established by the Agency of Natural Resources, is a popular program for education on appropriate road maintenance.

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.

Water Quality

As development around the region's lakes has increased, so has the use of these lakes and the amount of pollution entering the water. A lake can naturally treat a certain amount of pollution but if the amount surpasses the lake's natural ability to treat the waste, it starts to accumulate in the sediments and water column. The Northeast Kingdom's lakes are cold water lakes which have a much harder time breaking down pollutants. Once a particular concentration of nutrient pollution is reached, there may be a decrease in the amount of oxygen available for fish along with an increase in lake temperatures. Sediment build-up and algae growth are natural processes in the life cycle of a lake. However, when phosphorous and sediments enter a lake through erosion, agricultural run-off, or failed septic systems, this process is accelerated dramatically, hastening the lake's decline.

A decline in water quality may affect the real estate value of lakefront properties. Vermont has no statewide shoreline zoning laws, and much of the shoreline development currently taking place receives little or no review. Water quality protection is dependent on municipalities enacting and enforcing good resource protection measures.

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 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 Sheffield, Ryegate and South Ryegate.

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.

Deer Wintering Areas

One of the most prized game species; the Northern 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 needle-leaf 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 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.

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 endangered or threatened plants and animals. 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. Much of the river's natural riparian forest in Vermont is gone, removed for farming, development, or 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 river jumps its channel and cuts a new one into the cropland.

Travel Corridors and Contiguous Forestland

Many species, such as bobcat and black bear, use different areas dependent upon the season and they need ways to travel between habitats. Wildlife corridors enable their movement and hence their survival. Black bear require contiguous remote forestlands to survive. Black bear and bobcat are also considered "umbrella" species. This means that if migration corridors are effectively maintained to support these species, many other species with smaller home ranges will also benefit.

The division of habitat into smaller and smaller areas due to human settlement is termed "fragmentation." The transformation results in the direct loss of important habitat by the creation of gaps or barriers between isolated habitat blocks, rendering the habitat unusable for some animal species. The smaller the habitat block, the fewer the number of species can survive there and the less species diversity. Many species of wildlife rely on natural connections (corridors) between habitats to allow safe access within their habitat range.

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 of lakes 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.

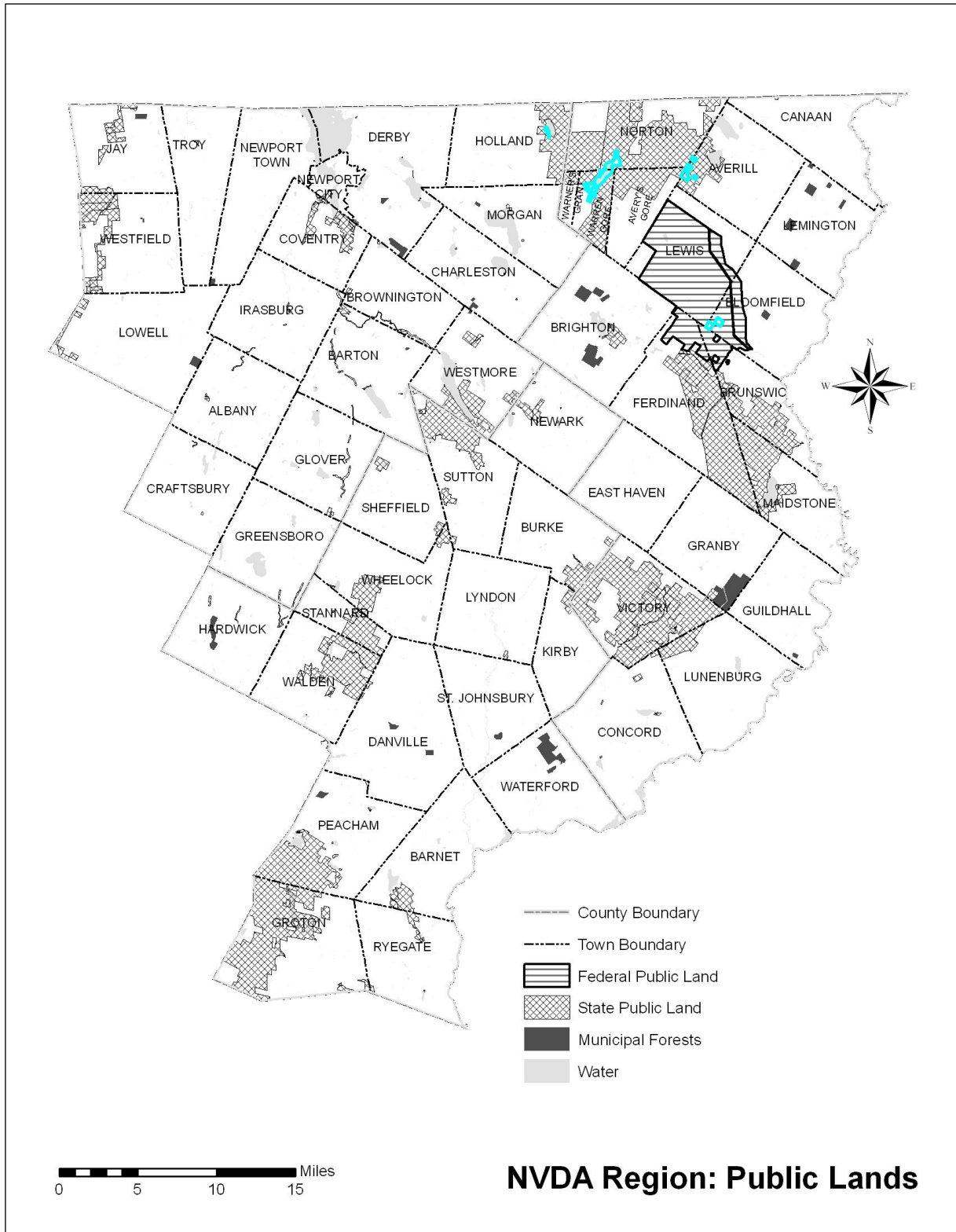
Open Space

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.

MAP 13:



Prior to this extensive investment, in 1997 the State of Vermont purchased easements on 31,450 acres in another major land deal with the former John Hancock Insurance properties creating Legacy Forests. While the easements limit future subdivision, they protect public

access and recreation opportunities. These new lands and previously state owned lands provide the Northeast Kingdom with some of the finest, most remote, and diverse outdoor recreation opportunities in New England.

Table 9.2: 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
Ryegate, 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

(NVDA, 2002)

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.

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.
- Support the efforts of watershed organizations working in the region.
- 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.
- Support the protection and the acquisition of unique and irreplaceable recreational spaces open for the public to enjoy.
- Encourage the growth of businesses focused on recreational activities. Support ecotourism in the region that will increase visits to the region and minimize the disturbance of important habitats.