PHYSICAL REGION

Transportation

Natural and Cultural Resources

Land Use

Disaster Resilience

Infrastructure: Water, Wastewater & Solid Waste

TRANSPORTATION

GOALS

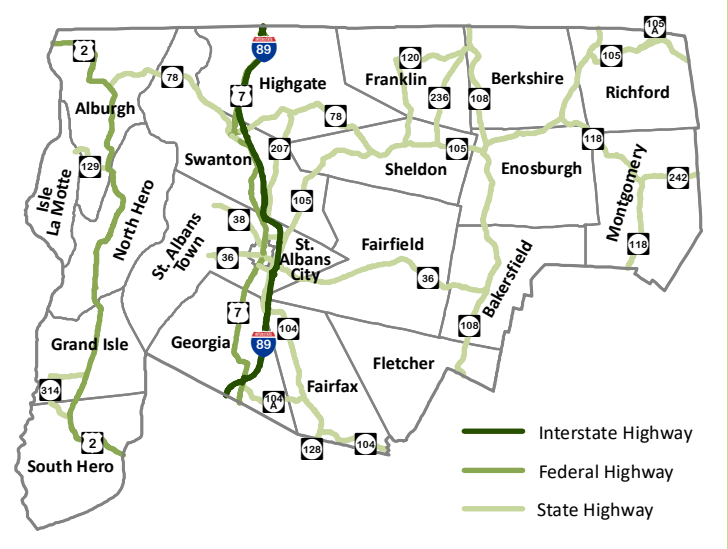
1. **Ensure all of the region's residents have access to safe and affordable transportation options regardless of age, physical ability, economic status, or other factors.**
2. **Use creative approaches to maintain, improve, and expand the region's transportation network, and ensure it is resilient to the impacts of climate change.**
3. **Ensure the transportation network enhances residents' overall quality of life, supports regional land use goals, and expands economic opportunities.**

TRANSPORTATION ASSETS AND TRENDS

Roadway

Of all the transportation modes in the region, the roadway is the most widely used means of transportation. There are approximately 1,300 miles of public roadway located in the Northwest region—ranging from town highways to state routes to components of the National Highway System and Interstate 89. The location of state, federal, and interstate highways is shown in Map 1. Privately maintained roads are not shown and there is no data on road conditions or cost of maintenance for private roads.

MAP 1: Northwest Region Highways

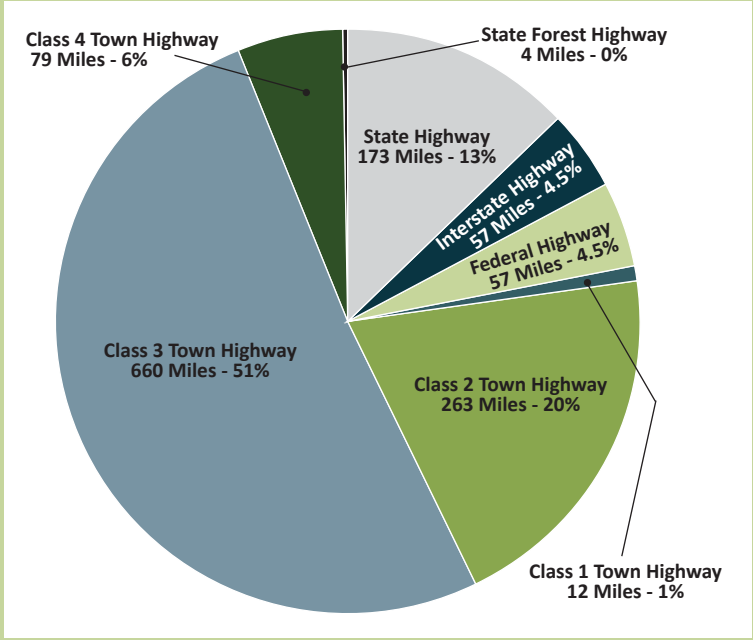


SOURCE: *Vermont Open Geodata Portal*

Interstate Highways: There are 57 miles of interstate highway (I-89) located in the region (just over 25 miles in each direction). This roadway provides limited access via exits 18 through 22. It allows travelers and goods to move at higher speed and capacity, and it is a vital link to Quebec at the Highgate Springs border crossing.

State Highways and Federal Highways: State highways and federal highways make up only 18% of the region's total public roadway mileage, but they are the backbone of the region's transportation system. U.S. 2 and U.S. 7 are the two segments of federal highway in the region. State highways include VT 36, VT 38, VT 78,

FIGURE 1: Northwest Region Public Road Miles



SOURCE: *VTrans Road Centerline Data*

At a Glance: Town Highways

- **Class 1:** Extension of a state highway, maintained by a town
- **Class 2:** Primary local roads
- **Class 3:** Minor local roads maintained year-round
- **Class 4:** Minor local roads not maintained year-round

TABLE 1: Pavement Condition Ratings of Interstate and State Highways in the Region

Category	Franklin & Grand Isle Counties % of Total Miles	Vermont % of Total Miles
Good	23%	30%
Fair	31%	31%
Poor	26%	22%
Very Poor	19%	16%
Invalid	1%	1%

SOURCE: *VTrans November 2022 Pavement Condition (0.1-mile segments). Road segments missing data for one or more pavement criteria are classified as "Invalid."*

VT 104, VT 104A, VT 105, VT 105A, VT 108, VT 118, VT 120, VT 128, VT 129, VT 207, VT 236, VT 242, and VT 314. Although these roadways are owned and maintained by the Vermont Agency of Transportation (VTrans), many portions of state highways go through our village centers and serve as our "Main Streets." The sections of state and federal highways in Enosburg Falls, Richford Village, Swanton Village, and St. Albans City are designated as class 1 town highways. This means the state and the municipalities have joint jurisdiction over the roadways. While VTrans will complete periodic paving, the communities are responsible for regular maintenance and generally have more control over the roadways.

National Highway System: The National Highway System (NHS) was designated in the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991. The roads that make up the NHS are typically major roads that connect important regional destinations. In the Northwest region, VT 78 from Alburgh to Swanton and U.S. 2 from Alburgh to the New York line are part of the NHS, and these roads serve as a critical link between Interstate 87 in New York and Interstate 89 in Vermont.

Town Roads: The remaining public roads not classified previously are town roads that are owned by the municipalities. Of the 1,305 miles of public road in the Northwest region, 1,015 miles (78%) are local roads. Just over half of town roads are paved.

Regional Road Network Condition

Pavement Condition: VTrans evaluates pavement condition on state-maintained highways on a regular basis. Small segments of roadway (0.1 miles) are rated based on roughness, depth of wheelpath deformation/ruts, and the severity and extent of pavement cracking. An overall pavement condition is then derived from these factors. As seen in Table 1, the region's percentage of state roadway miles with an overall "Good" pavement is lower than the statewide average. and both the region's percentage of state roadway miles in the "Poor" and "Very Poor" category is higher than the statewide average.

The VTrans overall policy on roadway pavement condition is designed to ensure that good roads remain in good condition. This policy is based on the understanding that proactive

measures are more cost-effective than reactive measures when it comes to maintaining pavement conditions. While this approach makes fiscal sense, there are cases where poor and very poor pavement conditions create safety concerns. NRPC advocates to VTrans for new construction or paving projects to address these concerns.

At a Glance: Bridges in the Region

- There are 168 bridges (and culverts) with spans 20 feet or greater in the region:
  - 30 bridges on interstate
  - 57 bridges on state highways
  - 74 bridges on town highways
  - 6 railroad bridges
  - 3 pedestrian bridges
- In 2020, the average age of bridges in the region was 59 years old.

Bridge Conditions: VTrans inspects all state highway bridges and town highway bridges that are 20 feet in length or longer every two years unless the bridge condition warrants more frequent inspection. The bridge components of deck, superstructure, substructure, and channel conditions are evaluated and each bridge component is ranked on a scale of zero to nine, with nine indicating an excellent condition and zero a failed condition. A bridge with a rating of four or lower in any of the bridge components is reported as being structurally deficient. Of the 161 interstate, state highway, and town highway bridges in the region greater than 20 feet, 5.6% (9 bridges) were reported structurally deficient. This is slightly lower than the state's 2014 average of 8.3%, but it is still an issue of concern.

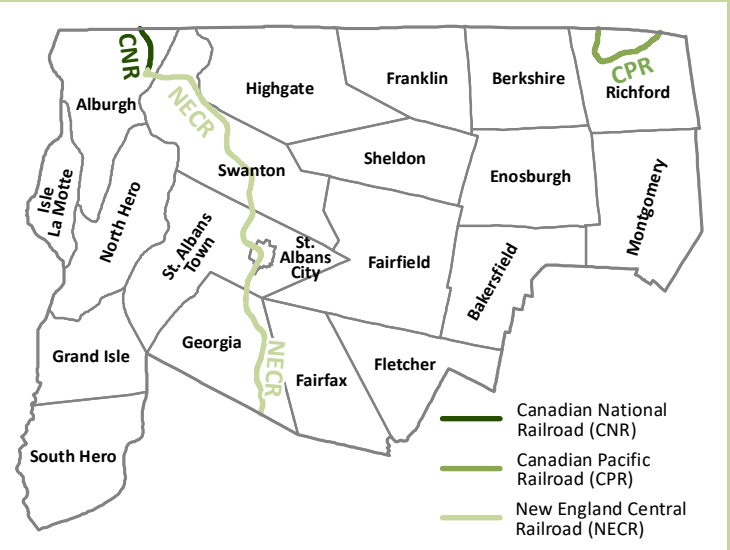
Rail

With three active rail lines, the Northwest region is home to a substantial amount of rail infrastructure (Map 2). This includes the state's largest private railroad owner/operator, New England Central Railroad (NECR).

The Canadian National Railway (CNR) operates freight traffic from Alburgh Springs to Canada. This three-mile segment is the only Class 1 railroad in Vermont. Class 1 railroads are the largest rail operators, and they are categorized by their annual operating revenue. There are eight Class 1 railroads currently operating in the United States.

The New England Central Railroad, a subsidiary of Genesee & Wyoming, operates 394 miles of railroad between the Vermont/Quebec border and New London, Connecticut. NECR has several interchanges with Class 1 railroads, including its connection with CNR in Alburgh Springs. NECR serves as a major shipper of goods from Canada to markets in southern New England because it is the only link between Montreal and Boston via rail. NECR's offices and headquarters are located in St. Albans City, as are the company's dispatch operations. NECR also operates the Italy Rail Yard in St. Albans Town, which is the busiest rail yard in Vermont. While the NECR rail in Vermont can accommodate 286,000-pound railcars, weight limits in Massachusetts and Connecticut effectively limit freight to 263,000-pound cars.

MAP 2: Northwest Region Railroads



SOURCE: *Vermont Open Geodata Portal*

Amtrak's Vermonter route—one of the two Amtrak passenger trains operating in Vermont—operates two trains per day on the NECR tracks: one from St. Albans south to Washington, DC, and one north to St. Albans from Washington, DC. The State of Vermont is committed to restoring passenger rail service to Montreal.

Current challenges to this effort include establishing international preclearance procedures, building a preclearance facility in the Montreal station, and restoring track in Quebec.

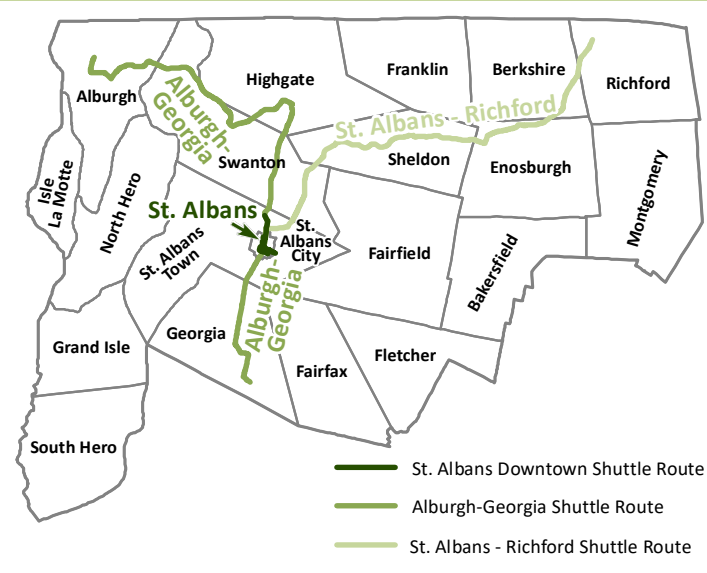
A 24-mile segment of line operated by Canadian Pacific enters Vermont in Richford to serve the Blue Seal Feeds, re-enters near Troy, VT, and terminates in Newport, VT, where it connects with the Connecticut River Subdivision.

Freight

In Franklin and Grand Isle Counties, as in all of Vermont, trucks are the primary means of freight transportation, but rail is also a critical component of the freight network. Approximately 46.7 million tons of freight moved into, out from, through, or within Vermont in 2018. Trucks carried approximately 84% of that freight and rail carried 15%. By 2045, the volume of freight (when measured by weight) is expected to increase 68% to 78.7 million tons. By 2045, rail is expected to move a larger share of freight (21%) in Vermont. (Vermont Freight Plan 2022). Freight rail transport is most competitive for long-distance hauls of bulky commodities such as coal, grain, paper, wood, and minerals. Freight- generating industries in the region include forest and logging (Franklin County), paper manufacturing (Franklin County), and animal production (Franklin and Grand Isle Counties).

The Interstate I-89 and VT Route 78 corridors in the region have the most freight truck traffic, representing 17% and 13% of total traffic respectively. I-89, VT 78 (from the I-89 intersection in Swanton to the U.S. 2 intersection in Alburgh) and U.S. 2 (from the VT 78 intersection in Alburgh to I-87 in New York State) are designated portions of the National Highway System. The high number of trucks traveling on VT Route 78 in Swanton Village has been of particular concern to the community. Many other communities in the region—such as Alburgh, St. Albans City, Georgia, Enosburg Falls, and Richford—are wrestling with how to accommodate trucks when their Main Streets are also major trucking routes. Periodic closures of VT 78, through Swanton, have proven to redirect significant traffic through the Champlain Island communities along U.S. 2, posing concerns of traffic, safety, and capacity.

MAP 3: GMT Shuttle Routes



SOURCE: *NRPC*

Public Transit

Green Mountain Transit (GMT) is the public transportation provider for Franklin and Grand Isle Counties (Map 3). GMT operates the following five main routes in the region; all are currently fare-free as a result of COVID-19 era policies:

- **St. Albans Downtown Shuttle:** This route provides service through St. Albans City and St. Albans Town from 5:45 a.m. to 6:34 p.m. on weekdays, and from 10:00 a.m. to 3:30 p.m. on Saturdays. Its route includes stops at the Highgate Commons, the State Office Building, the Champlain Valley Office of Economic Opportunity (CVOEO), Price Chopper, Walmart, Rite Aid, Community College of Vermont, and Northwestern Medical Center, and by request, the Franklin County Senior Center, Hawk's Nest Housing, and Northwestern Counseling & Support Services (NCSS).

- **Alburgh/Georgia Commuter:** This route provides one morning and one evening weekday commuter trip between Alburgh and the Georgia industrial parks. The Alburgh Commuter serves Swanton, Highgate, St. Albans, and Georgia.
- **Richford/St. Albans Commuter:** This route provides one morning and one evening commuter trip between Richford and the St. Albans Town Industrial Park, Monday through Friday. It travels through Berkshire, Enosburgh, and Sheldon.
- **St. Albans Link Express:** This commuter route to Chittenden County picks up passengers at Highgate Commons and the Collins Perley Sports & Fitness Center and takes them to Burlington. The LINK operates two morning and afternoon roundtrips Monday through Friday.
- **Price Chopper Shopping Shuttle:** This shuttle offers a free ride to the St. Albans Price Chopper for easy grocery shopping. This shuttle only operates on Tuesdays and only within the St. Albans and Swanton areas.

GMT currently operates numerous buses varying in size from 18 to 28 passengers. All buses are lift equipped. All regular routes operate on a fixed deviated schedule, which means that drivers may deviate up to three-quarters of a mile on the St. Albans Downtown Shuttle and up to one-quarter of a mile on the Richford and Alburgh Commuters with at least 24 hours' notice to pick up or drop off passengers.

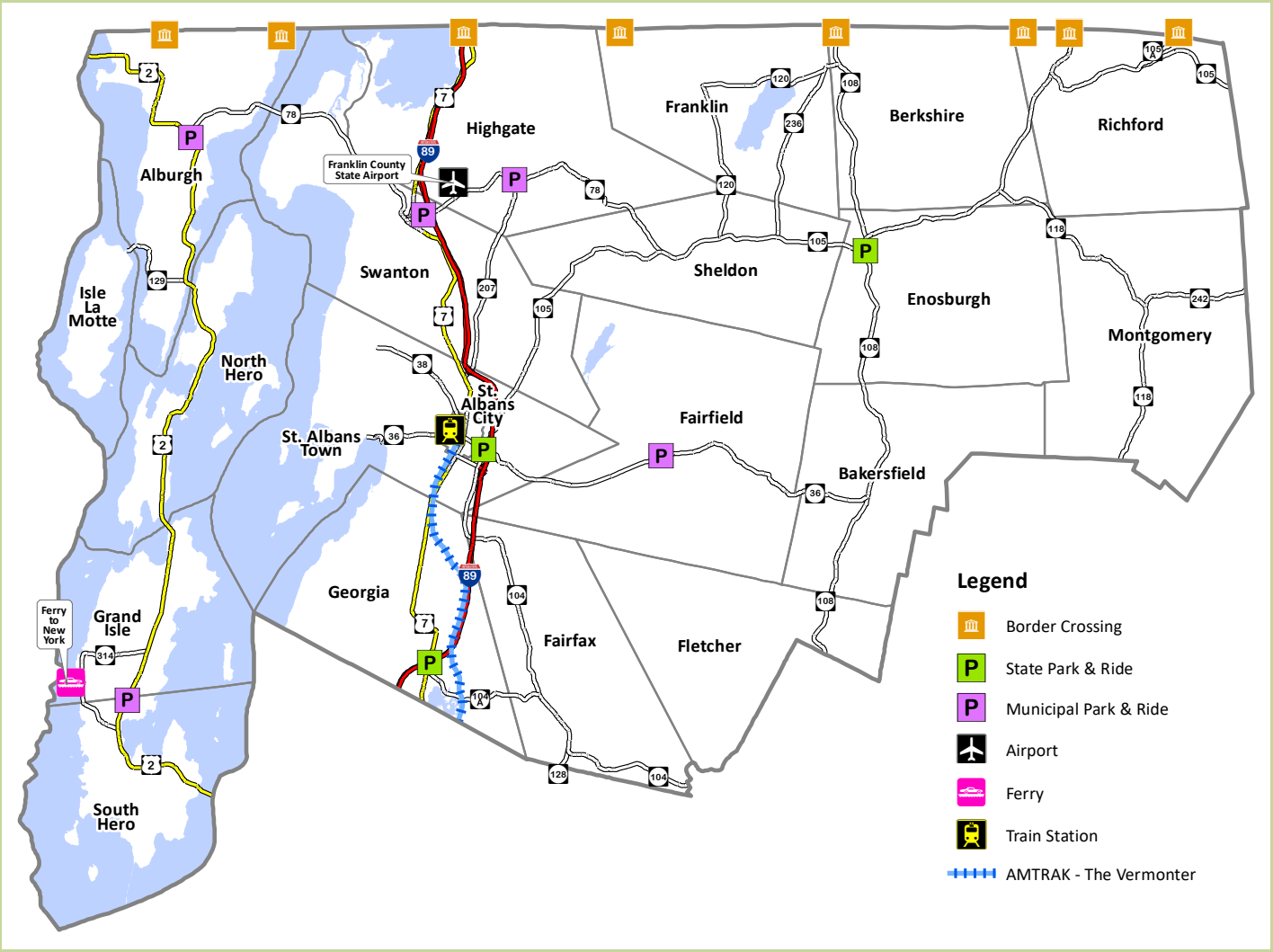
GMT provides special transportation services to the elderly, residents who are disabled, Medicaid recipients, and people undergoing radiation and chemotherapy treatments or kidney dialysis who do not have a car or cannot drive for medical reasons. GMT Elderly and Disabled services include transportation to senior meal sites, shopping, and medical services to permit elders to live independently. Services are provided through volunteer drivers, bus service, van service, or taxi cabs. GMT operates four shuttles per day to CarePartners Adult Day Center, providing respite time to caregivers and allowing them to work without concern for the safety of their loved ones. GMT also serves as the fiscal agent for its partner agency, CIDER (Champlain Islanders Developing Essential Resources). CIDER provides transportation to elderly and disabled residents of Grand Isle County.

Much of the region is currently unserved by regular transit routes. Barriers include cost and the low-density population of rural areas. Micro-transit, which is a nimbler on-demand system open to all users, is being investigated for Franklin and Grand Isle Counties and may hold promise for serving unserved or underserved areas. Current GMT funding formulas require municipalities to pay a non-federal match for new fixed routes based on mileage, without account for tax base or other factors. A more equitable approach to providing the non-federal match, or a source other than the local property tax, will help to ensure a more equitable approach to transit funding.

Air

The Franklin County State Airport is one of ten airports owned by the State of Vermont. The airport has one primary paved runway and two grass runways. The primary runway is equipped with medium-intensity runway lights (MIRLs). Recently, a precision approach path indicator (PAPI) was installed at the airport, and it is available for approaches to the primary runway. Runway end identifier lights (REILs) are available for all runways. The airport facilities include a weather reporting system, a communications relay device that allows the pilots to communicate directly with air-traffic controllers, a 3000' x 60' asphalt runway, hangers, and outdoor aircraft tie downs. The Franklin County State Airport is home base for about 65 aircraft and sees roughly 26,000 operations (takeoffs and landings) per year. Improvements are planned for the airport, with construction expected to begin in 2024. Plans are to rebuild the existing 3,000-foot-long runway and widen it from 60 to 75 feet, the size required under current federal guidelines. Additionally, a 1,001-foot runway extension will allow larger planes to use the airport, including single-engine cargo and passenger planes.

MAP 4: Transportation Facilities



SOURCE: *NRPC*

Commercial passenger air travel is available via the Burlington International Airport in Chittenden County, Vermont; the Plattsburgh International Airport in New York State; the Montréal-Pierre Elliott Trudeau International Airport in Quebec; and limited service from Rutland-Southern Vermont Regional Airport. The Montréal-Mirabel International Airport is also located in Quebec, but it primarily transports cargo.

Ferry

The Lake Champlain Transportation Company provides year-round ferry service between the town of Grand Isle and Plattsburgh, New York. The "Cumberland Head" ferry route runs 24 hours per day, seven days per week. The ferry dock is located on VT 314, which is an important link for the ferry traffic traveling to U.S. 2 and I-89. This ferry port is popular with cyclists, as it sits as a prime and convenient location on the popular Champlain Islands Bikeway, which follows portions of VT 314. A seasonal bike ferry also operates from the Colchester causeway to South Hero.

Border Crossings

The region has eight border crossings managed by the U.S. Border Patrol under the Highgate Springs Area and the Richford Area. The Highgate Springs Area contains four facilities located in Highgate Springs, Alburgh

Springs, Alburgh, and Morses Line. The Highgate Springs Port is one of three U.S. Customs high-volume centers for clearing cross-border commercial traffic in Vermont, with the other two located in Derby Line and Norton. U.S. Customs and Border Patrol has begun the early planning phases for an expansion and improvement project for this facility. The Highgate Springs complex oversees the Highgate and Richford Areas as well as the Burlington International Airport. The remaining three crossings in the Highgate Area are "permit" ports that primarily handle local traffic.

The Richford Area has four ports handling primarily local traffic at three crossings in Richford and one in West Berkshire. Distinct from the border crossings, the customs facility in St. Albans serves as a "service" port that processes information related to cargo classification and passenger information for the entire state (personal communication: Craig Jehle, area port director, U.S. Customs Service, Highgate Springs; Mike D'Ambrosio, U.S. Customs Service, St. Albans).

Intermodal Facilities

Intermodal facilities are locations where commuters, tourists, travelers, and/or freight are transferred from one mode of transportation to another. Consequently, the modal linkages provided by intermodal facilities are key components of effective multimodal transportation systems. Park and ride lots, train stations, bus stations, airports, and ferry stations are examples of intermodal facilities found in the Northwest region.

The automobile is by far the dominant mode of transportation in the region. Consequently, most intermodal facilities have automobile parking to accommodate people who drive to an intermodal facility and switch to another mode of transportation (carpool, vanpool, transit, bus, etc.). There are seven state and municipal park and ride lots in the region (Map 4).

Active Transportation

Active transportation facilities in the region include on-road shoulders, shared-use paths, and sidewalks. The major facilities are shown on Map 3 in the Social Region, Infrastructure section and include:

- **Missisquoi Valley Rail Trail:** This 26.4-mile crushed stone trail is situated on a railbanked corridor parallel to VT Route 105. The rail trail extends from St. Albans to Richford through the towns of Swanton, Sheldon, Enosburgh, and Berkshire, and it provides an alternative to VT Route 105.
- **Lamoille Valley Rail Trail:** This 96-mile railbanked corridor extends from Swanton to St. Johnsbury. The VT Agency of Transportation completed the majority of construction in summer of 2022 and will manage the trail with the support of local advisory councils. The trail passes through the towns of Swanton, Highgate, Sheldon, Fairfield, Bakersfield, and Fletcher in the region and intersects with the Missisquoi Valley Rail Trail.
- **Alburgh Recreational Rail Trail:** This 3.5-mile cinder and gravel trail is located on a railbed running east–west through Alburgh and is currently used for walking, mountain biking, and cross-country skiing. The rail trail crosses farmland and the Mud Creek Wildlife Management Area to Lake Champlain. It also serves as an alternative to U.S. Route 2 and VT Route 78 for non-motorized modes of transportation.
- **Local Trails:** Many municipalities within the region host a variety of local and recreational trails. Some well-known examples are the Swanton Fit & Healthy Recreation Path (1 mile), Fairfax Recreation Path (0.8 miles), and South Hero Recreation and Marsh Trails (4 miles out-and-back).
- **Sidewalks:** 14 of the 23 municipalities in the region have public sidewalks. A list of these is shown in Table 2. Several municipalities (notably, Enosburg Falls, Fairfax, Swanton, and St. Albans City) have added sidewalks since the last plan update through a combination of developer construction and municipal projects. Sidewalk projects are currently in planning phases in Montgomery, St. Albans Town, Fairfax, Highgate, Enosburg Falls, and Swanton Town.

TABLE 2: Sidewalk Locations in the Region

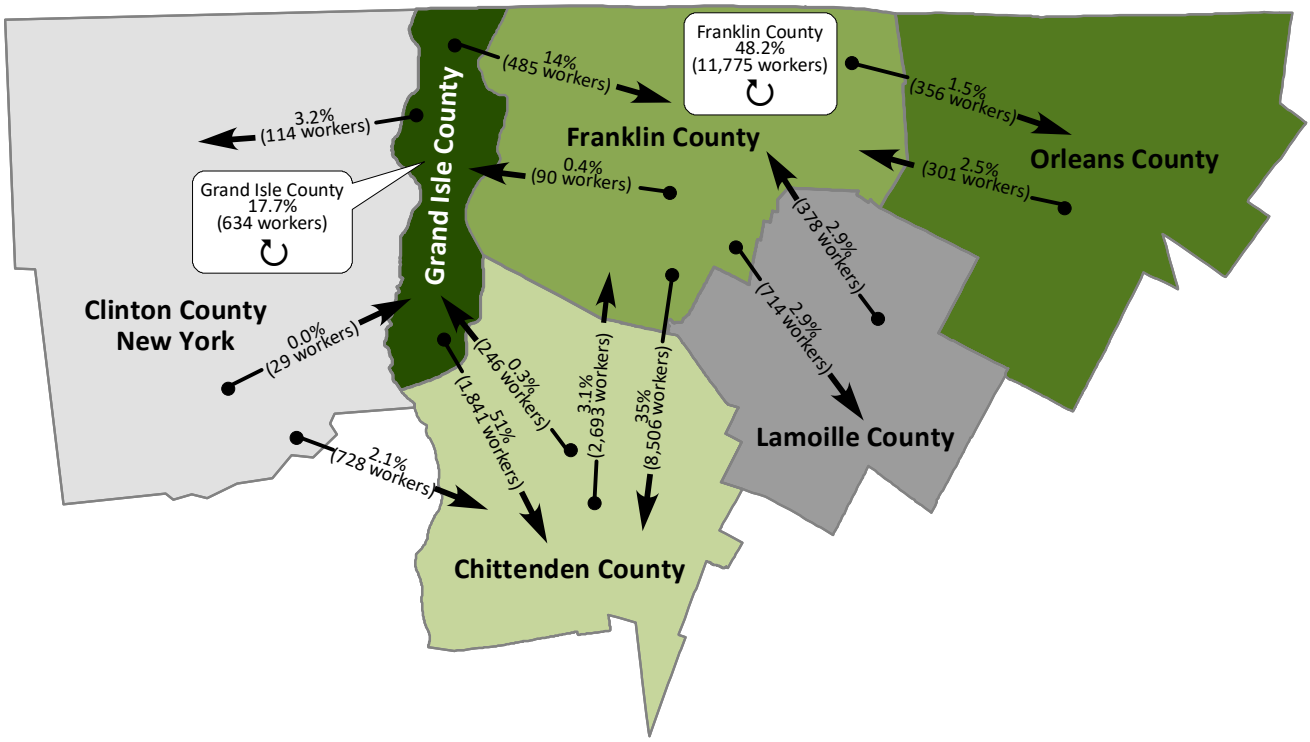
MUNICIPALITY	LINEAR FT.	DESCRIPTION
St. Albans City	144,006	Sidewalks are evenly distributed throughout most of the city on both sides of the streets. They are located along the major north–south (US Route 7) and east–west (VT Route 36) streets. 3,269 linear feet were added since 2017.
Swanton	48,009	Sidewalks are evenly distributed throughout Swanton Village, usually on both sides of the streets. 7,105 linear feet of were added since 2017.
Enosburg Falls	34,298	Sidewalks are concentrated in Enosburg Falls along major roads such as VT Route 108 and VT Route 105. They are also located on many minor roads that are perpendicular to those major roads. 10,622 linear feet were added since 2017.
Richford	27,424	Sidewalks are located along north–south streets in Richford Village, with a gap along VT Route 105 south of River Street.
Fairfax	8,472	Sidewalks are located along VT Route 104 between Tuttle and School Streets as well as along Hunt and School Streets. 3,741 linear feet were added since 2017.
Franklin	4,788	Sidewalks are located along Hanna Road near VT Route 120, along VT Route 120 between Lake and Hanna Roads, and along Square Road. These sidewalks were constructed in 2010. 63 linear feet were added since 2017.
South Hero	4,398	Sidewalks are located on the northern and southern sides of US Route 2 near South Street. 1,604 linear feet were added since 2017.
Montgomery	3,806	Sidewalks are located along VT Route 118 (Main Street) near the intersection of VT Route 242 and VT Route 118. 81 linear feet were added since 2017.
St. Albans Town	2,478	A segment of sidewalk is located south of the US Route 7/VT Route 207 intersection, extending into Price Chopper from US Route 7. There are also some sidewalks located on Fairfield Street around the hospital, that is in the Town. 2,178 linear feet were added since 2017.
Georgia	2,454	Sidewalks are located around the Georgia Elementary & Middle School. There are also small sections of sidewalks located at the Georgia Town Office, Georgia Fire Station, next to Maplefields on the northwestern side of US Route 7 and on Sumner Lane.
Alburgh	2,007	Sidewalks are located in Alburgh Village on the eastern side of US Route 2, from Champlain Street to Horican Avenue.
Fairfield	1,572	Sidewalks are located on one side of VT Route 36 in Fairfield Center. There is also a small section of sidewalk around the school library.
Bakersfield	1,101	Sidewalks are located along VT Route 108 (North end of Main Street) and were constructed in 2010. 237 linear feet were added since 2017.
Highgate	626	Sidewalks are located on VT Route 78 in Highgate Center.

SOURCE: *NRPC*

Commuting

As shown in Map 5, a large percentage of the region's residents work outside of their home communities. This creates a demand for transportation services and infrastructure to get residents to their places of work and home again. As this demand increases, efforts to combine infrastructure capacity improvements with increased public transportation services should be examined at every possible opportunity. Carshare, carpooling, and ridematch services can serve a useful role in rural areas where extensive public transit may not be feasible. The impacts of this daily mass commuter migration extend beyond the "wear and tear" to regional transportation infrastructure. It also impacts other facets of regional life, such as where commuters purchase goods and services. Although 48.2% of Franklin County residents who are employed work within the county, a significant portion (35%) commuted to Chittenden County for work in 2019. With the increase in telework, this number may be lower in 2023.

MAP 5: Northwest Region Workers



SOURCE: *Longitudinal Employer-Household Dynamics (2019)*

Complete Streets in Northwest Vermont

Complete Streets is an approach to planning, design, construction, and maintenance of our roadway network to consider all users, including pedestrians, bicyclists, and transit riders. Vermont's Complete Streets Law, Act 34, went into effect on July 1, 2011. The purpose of the law "is to ensure that the needs of all users of Vermont's transportation system—including motorists, bicyclists, public transportation users, and pedestrians of all ages and abilities—are considered in all . . . transportation projects and project phases, including planning, development, construction, and maintenance." There are many reasons to support Complete Streets techniques:

- Improve the safety of all users, including bicyclists, pedestrians, drivers, and passengers.
- Provide greater mobility and accessibility to individuals without cars.
- Offer less costly choices for transportation.
- Provide a physically active option for transportation.

The role of Complete Streets in this plan is to:

- Provide additional clarity to municipalities on how to implement Complete Streets.
- Guide NRPC Act 250 comments/project mitigation recommendations.
- Support regional projects seeking grant funding.
- Allow for stronger regional input in state transportation projects.

Table 3 outlines the implementation policies for Complete Streets for the different land-use categories included in the future land-use map in this plan.

TABLE 3: Implementation Policies for Complete Streets - Part 1
(*Part 2 is on the next page*)

	Downtowns	Village & Hamlet Areas (designated and undesignated)	Regional & Sub-Regional Growth Centers
Sidewalks	• Gaps in the sidewalk network shall have high priority for new sidewalk construction. • New sidewalks shall be constructed and existing sidewalks upgraded to comply with the Americans with Disabilities Act (ADA).	• Gaps in the sidewalk network shall have high priority for new sidewalk construction. • New sidewalks shall be constructed and existing sidewalks upgraded to comply with the Americans with Disabilities Act (ADA).	• Sidewalks shall be constructed in conjunction with new development or redevelopment projects. • The construction of sidewalks along existing roadways shall be required to mitigate traffic impacts from development or redevelopment projects.
Shoulders/Bike Lanes	• Bike lanes should be installed along streets with both high bicycle and vehicle traffic volumes.	• More narrow travel lanes and wider shoulders shall be encouraged, especially in areas without sidewalks.	• Bike lanes shall be recommended along streets with existing and anticipated future high bicycle and vehicle traffic volumes.
Shared-Use Paths/Rail Trails	• Shared-use paths/rail trails on the outskirts of downtowns should be extended into downtown areas.	• Shared-use paths/rail trails on the outskirts of downtowns should be extended into downtown areas.	• Shared-use paths/rail trails crossings within regional growth centers shall have crosswalks or pedestrian beacons when there is high vehicle volumes and high bike/pedestrian use.
Intersections and Crosswalks	• Curb extensions and pedestrian refuges shall be installed at very wide intersections.	• New crosswalks shall be supported when there is moderate pedestrian activity and moderate traffic, and when the crosswalk can be located in an area with proper sight and stopping distances.	• Intersection upgrades shall accommodate existing and future anticipated bicycle and pedestrian use.
Transit	• Transit stops shall be clearly marked and located in accessible areas for users.	• Transit stops shall be clearly marked and located in accessible areas for users.	• New development within regional growth centers shall work with local transit providers to increase routes within the area.
Maintenance	• Snow/ice shall be removed from sidewalks to allow for year-round pedestrian use. • Crosswalk and bike lane markings should be regularly maintained. • Recessed crosswalk striping should be considered in areas of high traffic to reduce annual maintenance.	• Snow/ice shall be removed from sidewalks to allow for year-round pedestrian use. • Crosswalk and bike lane markings should be regularly maintained.	• Snow/ice shall be removed from sidewalks to allow for year-round pedestrian use.
Other Considerations	• Amenities (e.g., pedestrian-scale lighting, bike racks, street furniture and trees) should be encouraged. • On-street parallel parking shall be encouraged.	• Amenities (e.g., pedestrian-scale lighting, bike racks, street furniture and trees) should be encouraged. • On-street parallel parking shall be encouraged.	• Accesses to the roadway shall be minimized. • Entrances to existing parking lots should be made narrower.

TABLE 3: Implementation Policies for Complete Streets - Part 2
(*Part 1 is on the previous page*)

	Transitional Areas	High Density Residential Clusters (Including Senior Housing) Located within Transitional & Rural Areas	Rural Areas
Sidewalks	• New sidewalks shall be encouraged in transitional areas and shall be recommended when the sidewalk can connect to services in a downtown or village area. • The right-of-way for future sidewalks shall be set aside as part of new development or redevelopment projects.	• Sidewalks or paths should be constructed within the development to allow for bike and pedestrian circulation within the development. • Sidewalks or paths should be constructed to connect the development to the adjacent public roadways.	• While not discouraged, sidewalks in rural areas shall not be encouraged unless the area is targeted for future growth.
Shoulders/Bike Lanes	• Wider shoulders should be constructed, especially in areas without sidewalks.	• Sidewalks or paths should be constructed within the development to allow for bike and pedestrian circulation within the development. • Sidewalks or paths should be constructed to connect the development to the adjacent public roadways and shall be constructed to adjacent public facilities or community amenities.	• Areas with higher bicycle and pedestrian usage shall be prioritized for shoulder widening as part of planned paving projects.
Shared-Use Paths/Rail Trails	• Crossings should have crosswalks or pedestrian beacons when there is higher vehicle use. • New roads crossing existing trails shall have stop sign–controlled accesses.	• New roads crossing existing trails shall have stop sign–controlled accesses.	• New roads crossing existing trails shall have stop sign–controlled accesses.
Intersections and Crosswalks	• Intersection upgrades shall accommodate existing and future bicycle and pedestrian use.	• Not applicable.	• Not applicable.
Transit	• Transit stops shall be clearly marked and located in accessible areas for users.	• Expanded transit services shall be encouraged for new developments. • Parking lots shall accommodate transit parking and the loading/unloading of users.	• Not applicable.
Maintenance	• Municipalities should adopt a winter maintenance policy for existing bike and pedestrian facilities.	• Property managers should adopt a winter maintenance policy for existing bike and pedestrian facilities.	• Not applicable.
Other Considerations	• Entrances to existing parking lots should be made narrower.	• Not applicable.	• Not applicable.

Transportation Planning in Northwest Vermont

Transportation Planning Initiative: The Transportation Planning Initiative (TPI) provides the main framework and funding source for transportation planning in the region. It was created by the State of Vermont in 1991 in response to the federal Intermodal Surface Transportation Efficiency Act (ISTEA)—legislation with broad goals toward the development of a transportation system that is efficient, economical, respectful of local needs, and integrated with land-use planning.

The TPI intends to achieve the following goals:

- Improve linkages between transportation planning and planning for land use, economic development,
- emergency preparedness, and natural resources at the state, regional, and local levels.
- Increase participation by municipalities and members of the public in making transportation decisions.
- Facilitate implementation of transportation projects through greater understanding of transportation issues and opportunities.

Long-Range Transportation Plan: The TPI requires NRPC to develop and periodically update a Long-Range Transportation Plan that outlines a vision for the region's current and future transportation system, outlines specific action strategies, aids in the selection and prioritization of future transportation investments, and guides NRPC's comments throughout the Act 250 project review process. In past editions, the Long-Range Transportation Plan was a stand-alone document that was part of the regional plan by reference. It is now fully integrated into the regional plan, primarily in this transportation section.

Transportation Advisory Committee: The Northwest Transportation Advisory Committee (TAC) is critical in ensuring the public is engaged in the transportation planning process. TAC membership includes a representative from each municipality in Franklin and Grand Isle Counties and one representative from the following organizations or interests: air, rail, bike, pedestrian, and public transportation.

The TAC plays a vital role in identifying regionally important needs and projects through Vermont Project Selection and Prioritization (VPSP2). The team is also annually apprised of, and able to collaborate with, area-specific developments that are related to transportation: i.e., Green Mountain Transit plans, Road Safety Audit Reviews, Traffic Counts, etc.

In addition to ensuring legislative and regional compliance, TAC meetings support greater community growth, municipally focused development, and best practices. Regular meetings provide the working group a chance to learn from and with one another. The natural synergy fostered by TAC meetings provides advantages beyond planning and often encourages conversation around new or updated procedures, project management, and strategic initiatives.

Village Master Planning: NRPC supports village master planning efforts alongside municipalities. Many of these plans contain and incorporate transportation aspects, including pedestrian and bike facilities, streetscape design, and traffic calming. Recent master plans include:

Georgia South Village Transportation Master Plan (2019)
A collaborative effort between the Town of Georgia, NRPC, and VTrans to articulate and prioritize transportation and land-use strategies that will help foster the development of a dense, mixed-use, walkable village setting in Georgia's South Village district.

Alburgh Village Master Plan: Town and Village of Alburgh (2019)
An illustrative plan of the "public space" in Alburgh Village that identifies how that space can be improved to further the goals of the Alburgh Municipal Plan. This part of the plan contains proposals for traffic calming, sidewalks, bike lanes, street trees, and aesthetic improvements.

Enosburg Falls Vital Village Master Plan (2019)
A collaborative vision for a vibrant and healthy village center. Intended outcomes include improved and safer transportation alternatives, including wayfinding and Complete Streets improvements; improved pedestrian experience along Main Street through streetscape enhancements; and enhanced tourism and commerce in the village center through marketing and branding.

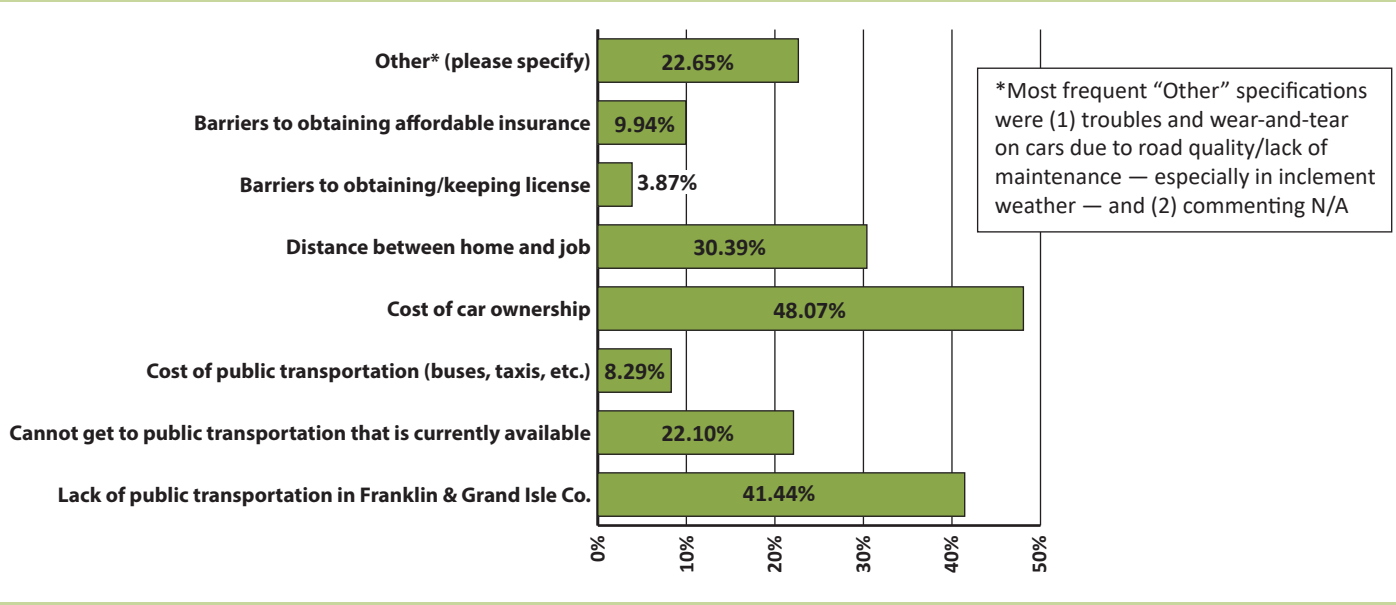
Connecting Sheldon: The Heart of Franklin County Strategic Bike and Pedestrian Plan (2020)
Identification of projects that would make walking and biking in village centers safer and to capitalize on the recreational and economic opportunities of the intersecting Lamoille and Missisquoi Valley Rail Trails.

FUTURE TRANSPORTATION NEEDS

Cost and Access

The Northwest Region has high transportation costs. Lack of transportation is frequently noted as an impediment to employment, education, and health care. The Working Community Challenge general public survey identified the most common impediments to accessing transportation (Figure 2). Three related factors topped the list: cost of car ownership, distance from home to work, and the lack of public transportation. As noted in the introduction, all but one small area of the region is considered cost-burdened for transportation. This data shows the importance of making progress on the regional plan goals—for example, increasing public transit routes and sidewalks and building more housing units near our employment centers will help to ease the transportation cost burden. Additionally, roadway access to Grand Isle County is limited, making improvement to Exit 17 in Chittenden County an important project for the region.

FIGURE 2: Working Communities Challenge Survey
What Aspects of Transportation Do You Find the Most Challenging in Franklin and/or Grand Isle Counties? (please pick 1 to 3 options)



SOURCE: *Working Community Challenge General Public Survey*

Climate Change: Greenhouse Gas Mitigation, Adaptation, and Resilience

Due to the rural nature of the state, transportation makes up 38% of the total energy consumed in Vermont and produces more greenhouse gas emissions—around 40% of the state's total—than any other sector. The 2022 State Comprehensive Energy Plan calls for 10% of energy needs in the transportation sector to come from renewable energy by 2025, and 70% by 2040. To achieve these goals and help mitigate the effects of climate change, NRPC supports efforts to adapt and become more resilient.

As one of the more rural areas in the state, the region's residents rely heavily on their personal vehicles for commuting and daily needs. Transportation infrastructure that increases the quality and types of

transportation choices available—like public transit, rideshares, bicycling, and walking—provides alternatives to single-occupancy vehicles. These choices make the transportation system more accessible and equitable while also helping to make communities more livable and vibrant and reducing energy use and emissions.

At a Glance: TAC Identified Roadway, Safety & Traffic, and Project Needs Not in the Capital Program

- VT 120- address drainage issues to mitigate on-going poor pavement conditions.
- VT 120/VT 236/Middle Road Intersection upgrades in Franklin.
- US RT 2/South St. Traffic and safety concerns at a busy intersection in South Hero.
- US RT 2/Hyde Rd. Traffic and safety concerns at a busy intersection in Grand Isle.

At a Glance: High Priority Paving, Safety & Traffic, Bridge and Roadway Projects in Capital Program

- VT Route 78 reconstruction from Swanton Village to the Missisquoi Bay Bridge- NH 036-1(9)
- I-89 Exit 19/VT 104/SASH intersection upgrade-ST. ALBANS 044-1(2)
- VT 104/VT 128 intersection upgrade-FAIRFAX STP 023-1 (8)- FAIRFAX STP 023-1 (8)
- I-89 Exit 21 address congestion on northbound exit ramp- SWANTON IM 089-3 (82)-
- US 7/VT 104A and I-89 Exit 18- Intersection and park and ride upgrades in Georgia South Village-GEORGIA STP 0285 (18)
- St Albans City Federal Street Corridor- ST. ALBANS CITY RAIZ(3)
- Swanton Village bridge B6 on VT 78 rehabilitation- SWANTON BF 036-1 (16)

Increasing transportation choices and promoting land-use patterns that support compact and mixed-use settlement are mutually reinforcing strategies that can drastically improve outcomes for the transportation system. Making roads that are suitable for multiple types of transportation can help create a foundation of more efficient and low-carbon infrastructure. Creating a smart transportation plan and foundation is key to having the infrastructure that can evolve and change with the needs of the community and environment in the future. To help reduce emissions, residents must continue to expand the market share of electric cars and trucks. This strategy can move the transportation sector toward energy and emissions goals faster than any other single measure. Although EVs are becoming more accessible, it is crucial to have a wide range of equitable options for transportation.

Climate offers a unique challenge to our transportation system. As severe weather becomes more common, it is important that the transportation system and infrastructure can handle these changes. NRPC's work in hazard mitigation and climate resiliency is explained more in the resilience chapter.

Project Priorities

The VTrans Capital Program outlines the state's capital transportation investments over the next five years. The program is updated annually and covers a range of transportation infrastructure projects, including highways, bridges, rail, aviation, and public transportation. The purpose of the program is to ensure that VTrans' capital investments align with the state's transportation goals and priorities, as well as meeting federal and state regulations. Many—but not all—of the region's priority transportation projects are in the Capital Program.

The TAC has a long-standing role helping prioritize projects for the Capital Program. In 2021, VTrans implemented a new methodology for identifying, selecting, and prioritizing projects for the Capital Program called Vermont Project Selection and Prioritization (VPSP2). The VPSP2 framework relies on data to maximize the "transportation value" delivered to Vermont taxpayers. This helps to maximize the way transportation funding is used in Vermont.

VPSP2 utilizes two main sources for understanding transportation needs: Vermont Agency of Transportation asset management systems and regional planning commissions' regionally driven transportation needs. In combination, these two sources evaluate each need across eight criteria: safety, asset condition, mobility

and connectivity, economic access, resiliency, environment, community, and health access. VPSP2 prioritizes projects on a two-year alternating cycle. Phase 1 includes addressing roadway, traffic and safety, and paving needs; phase 2 mainly includes bridges.

The TAC and the transportation planner are generally responsible for this planning activity. The transportation planner utilizes tools provided by VTrans to assign each project or area of concern with a score. The TAC then considers these scores and makes a final determination to be submitted to VTrans.

GOALS AND POLICIES

1 GOAL

Ensure all of the region's residents have equitable access to safe and affordable transportation options regardless of age, physical ability, or economic status or other factors.

a. Ensure that the region's transportation network will safely accommodate all users, including pedestrians, bicyclists, motorists, freight, and public transit users.
b. Seek out engineering, enforcement, and behavior change solutions to address safety issues on the transportation network.
c. Support new and expand existing public transportation services to serve both transit-dependent and transit-by-choice riders.
d. Support new revenue sources or equitable approaches to providing non-federal match for transit services.
e. Support changes to match requirements for multi-modal transportation grants to ensure a municipality's ability to pay is considered.
f. Prioritize transportation investment in communities or neighborhoods of historic underinvestment or disinvestment.

2 GOAL

Use creative approaches to maintain, improve, and expand the region's transportation network, and ensure it is resilient to the impacts of climate change.

a. Use innovative planning, design, construction, and contracting techniques to reduce cost and improve project delivery while still allowing for transparency and public oversight.
b. Facilitate public-private partnerships that implement the recommendations of local, regional, and state planning efforts.
c. Ensure that new commercial, multi-use, and multi-unit (4+) housing developments provide electric vehicle charging stations and provisions for public transit.
d. Ensure that new transportation facilities are designed with consideration for the people using the facilities and incorporate context-sensitive design features.
e. Incorporate climate resilience and greenhouse gas mitigation considerations in new and upgraded transportation facility designs and in project prioritization.
f. Implement the goals of the Vermont Climate Action Plan when developing new transportation projects and programs. This can include planning for appropriately sized culverts and stormwater mitigation, which better meet the challenges of current increased rainfall totals.
g. Use transportation as a tool to reduce greenhouse gas emissions, through planning for smart traveling (e.g., carpool, rideshare, public transit), EV charging infrastructure and walkable/bikeable infrastructure.

3 GOAL

Ensure the transportation network enhances residents' overall quality of life, supports regional land-use goals, and expands economic opportunities.

a. Ensure that construction and maintenance of the transportation network minimizes negative impactson natural, cultural, and scenic resources.
b. Use appropriate Complete Streets techniques depending on the land-use context, including as described in Table 4.
c. Develop and maintain rail, truck freight, and air facilities in a manner that supports efficient operation of the system, ensures compatibility with the host community, and increases economic opportunities for the region.
d. Implement the land-use and transportation recommendations from regionally endorsed (i.e., TAC or NRPC board) corridor plans.
e. Implement the goals of the Vermont Comprehensive Energy Plan when developing new transportation projects and programs.
f. Ensure that new land development does not negatively impact the safety of any mode within the transportation network.
g. New public and private transportation infrastructure shall be designed and built to interconnect with adjacent land development(s).

NATURAL AND CULTURAL RESOURCES

GOALS

1. **Protect significant natural resources, including air, wetlands, wildlife, lakes, ponds, woodlands, earth resources, open spaces, groundwater resources and wildlife habitat.**
2. **Protect and conserve historically significant buildings and locations, archaeological resources, and important scenic and aesthetic resources, starting with those identified in local and regional plans.**
3. **Maintain and wherever possible improve the quality of lakes, ponds, rivers, streams and groundwater.**

ASSETS AND VALUES

The region is a reflection of its people and its land. With a traditionally agrarian, working landscape framed by the Green Mountains and Lake Champlain, Franklin and Grand Isle Counties are still heavily dependent on the natural resource base. With a built environment largely defined by compact villages surrounded by open countryside, the region retains much of its rural character.

The region is home to an abundance of archaeological, historic, and cultural resources. The archaeological resources provide clear evidence of the region's extensive and longstanding indigenous habitation, while many of the historic resources are tangible reminders of the communities built following the arrival of Europeans in North America. Cultural value is attached to events and physical items from prehistory through to the present day.

Archaeological resources include the villages, hunting camps, trade networks and burial grounds associated with indigenous people. Significant indigenous archaeological resources are known to be located in the vicinity of Route 78 in Swanton and Monument Road in Highgate. The location of many other such sites in the region remain private to protect their integrity. The Vermont Division for Historic Preservation maintains a listing of the 522 known archaeological sites within the region, of which 410 have detailed data. This figure likely represents a small fraction of significant sites in the region given that indigenous peoples lived in many places and intensive investigation of site locations has not been undertaken. The Abenaki of Missisquoi continue to maintain a deep connection to the area in many ways, including via their tribal headquarters in Swanton.

Similarly, several historic settlements, sites and structures in the region (most reflecting post-colonial settlement) have been identified and entered into the State Register of Historic Places. In addition, over 75 properties within the region are included in the National Register of Historic Places. These include historic

districts, as well as bridges, border stations, places of worship, and farmsteads. They also include two historic sites: the Hyde Log Cabin in Grand Isle (managed by the Grand Isle Historical Society) and the Chester A. Arthur Birthplace in Fairfield (managed by the Vermont Division for Historic Preservation). The region also hosts 10 museums, including St. Albans's Museum in St. Albans and the Hyde Log Cabin in Grand Isle, and a growing roster of art-focused venues, such as the Cold Hollow Sculpture Park. The region's 18 community-based historical societies work ever more diligently to document the diverse history of the region and its communities.

Long-standing cultural events such as the Vermont Dairy Festival in Enosburg Falls and Franklin County Field Days reflect the important role that agriculture continues to play in the region. For example, in St. Albans City, the Vermont Maple Festival typically draws more than 50,000 participants each year in honor of maple syrup, Vermont's "liquid gold." Newer and smaller cultural events, including those increasing awareness of the culture of the Region's indigenous people, are also noteworthy. These and other cultural events, from farmers' markets to concerts and parades too numerous to name, provide invaluable contributions to the local sense of place. Another event long considered symbolic of Vermont culture is Town Meeting Day. Indeed, residents in municipalities across the Region gather annually on or near the first the Tuesday in March to vote and make decisions that affect their local communities. Some municipalities have changed to Australian ballot voting combined with a public information session. Many municipalities temporarily halted in-person Town Meetings to respond to the COVID-19 pandemic, though by 2023 all communities in the region have returned to in-person Town Meetings or information sessions.

Beyond the historical richness of the region, Northwest Vermont boasts a robust mosaic of diverse landscapes, from the Adirondacks-backed agricultural viewsheds of the Lake Champlain islands to the heavily wooded western slopes of the Green Mountains. With sensitive siting and design, it's possible for scenic landscapes to be developed and still retain much of their intrinsic character. Aesthetic considerations are recognized as a legitimate public concern under Criterion 8 of Act 250. Conserving the region's aesthetic resources is crucial to maintaining its sense of place.

Our downtowns and historic village centers provide a gathering place for the community, a sense of identity and a unique heritage that is an important cultural and historic resource. State programs that "designate" downtowns and village centers provide a mechanism to access grants and tax credits to assist redevelopment projects and promote growth in these places. The Certified Local Government (CLG) program establishes a preservation partnership between a local historic preservation commission, the State Historic Preservation Office, and the National Park Service. St. Albans City achieved CLG designation in 2020. As such, the city can access CLG grant funding for locally-based preservation projects.

Natural Resources

Bedrock and the Physical Landscape: The Foothills of the Green Mountains are separated from the Champlain Lowlands by a series of thrust faults running north–south through Franklin County. The Hinesburg Thrust Fault and related erosional remnants—including Aldis Hill, Prospect Hill and Georgia Mountain—are among the most prominent landscape features in this part of the region. The Foothills are characterized by rolling hills and valleys ranging in elevation from 500 to around 1,000 feet above mean sea level. This area is differentiated from the Green Mountain chain more by elevation and topography than geology. Many of the region's more picturesque villages and hamlets are located there.

The Green Mountains—which are part of the Appalachian chain and once stood higher than the Rockies—now reach heights within the region of less than 4,000 feet. Nevertheless, these old mountains still present a formidable barrier along Franklin County's eastern border. Exposed bedrock, boulder surfaces, steep slopes and shallow soils are common. Because of its remoteness, elevation, steep slopes, shallow soils and poor

drainage, this area of the region has not been heavily developed. Farming historically has been confined to stream and river valleys. Forestry remains the predominant use of the land in this part of the region.

Climate: The climate of Northwestern Vermont is dominated by prevailing Westerlies—cold, dry air from Canada in winter; warmer, moist air from the Gulf of Mexico in summer; and occasionally damp, cold air moving in from the North Atlantic. The area enjoys the strong seasonal variations that are characteristic of northern New England. The diversity of elevation and proximity to Lake Champlain that define the region contribute to substantial differences in micro-climate between the Champlain Valley and the hill country of eastern Franklin County. Grand Isle County, which benefits from the moderating effects of Lake Champlain, tends to have milder weather, longer growing seasons and less snowfall than the more mountainous parts of the region.

Global climate change may have significant implications for our region. According to the U.S. Environmental Protection Agency (EPA), over the past century, Burlington, Vermont, has seen an average temperature increase of 0.4°F. By 2100, it predicts an additional increase of up to 4 or 5°F. This could significantly alter weather patterns and have implications for agriculture, forestry, maple production and tourist-related industries. Vermont's Global Warming Solutions Act required the adoption of a Climate Action Plan that will reduce greenhouse gas emissions and address climate resilience and adaptation. "As climate change continues to be observed in Vermont, the characteristics of these hazards are also changing and this sets up cultural, socioeconomic and policy implications for Vermonters as individuals, municipalities, communities, and indigenous peoples, as well as for the built and natural environments." (Vermont Climate Action Plan, 2021)

Soils: Soils are an important environmental factor influencing the use of land in rural areas. Within the context of land use planning, the characteristics that are of primary concern are bearing capacity, erodibility, drainage, septic suitability and resource value. Resource values may include productivity for growing crops or for sustaining specific species or communities.

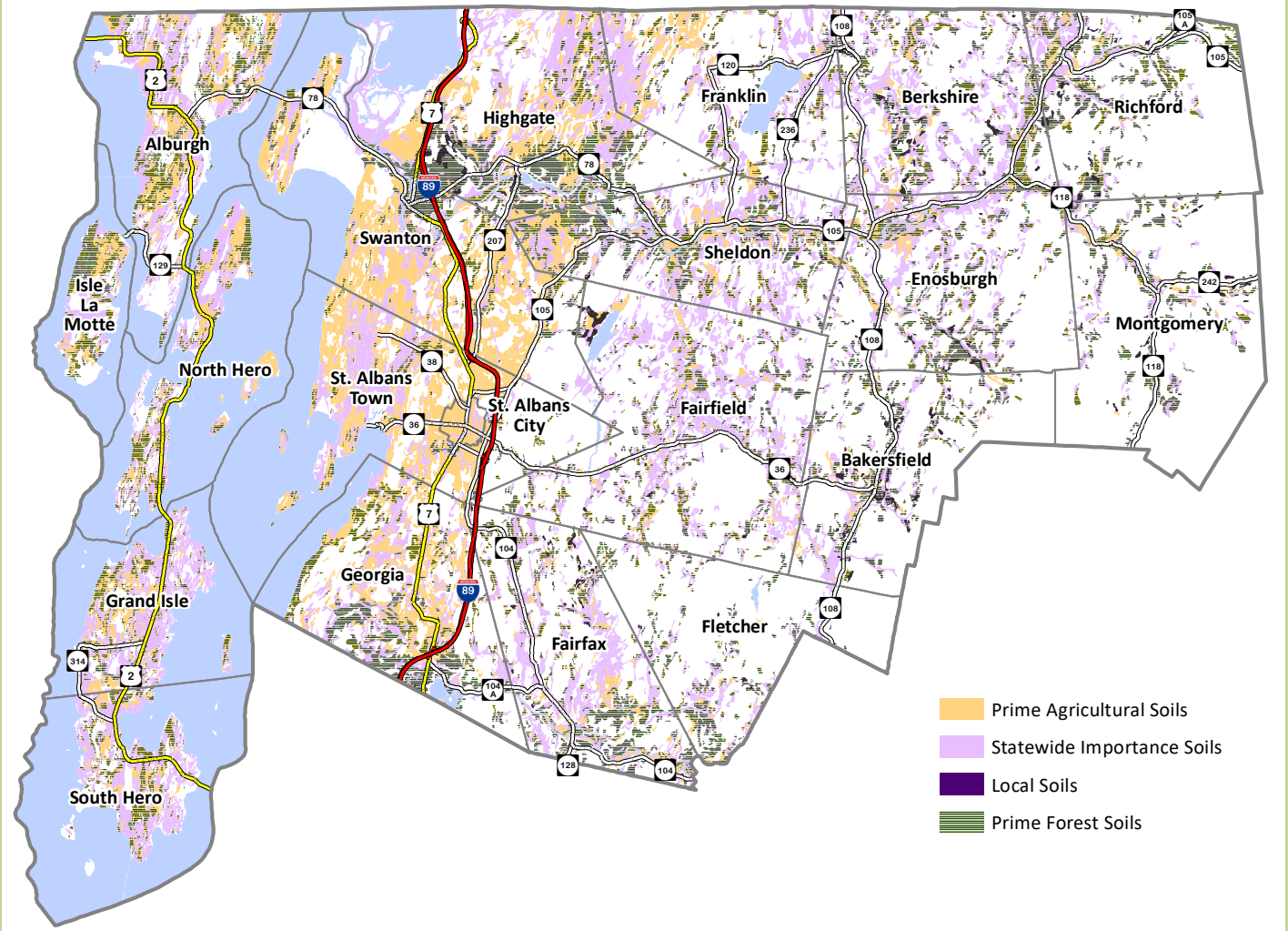
"Primary agricultural soils," as defined for use in Act 250 proceedings, are soils mapped as important farmland soils according to the Natural Resources Conservation Service (NRCS). NRCS classifies many soils as having prime, statewide or local importance for agriculture. Soils designated as having prime or statewide importance cover 41% of the region, the majority of which are in Franklin County (Map 6). Franklin County contains one category of local importance soils, defined as Missisquoi loamy sand, with 8% to 15% slopes.

Many of the region's agricultural enterprises depend upon the availability of high-quality soils in sufficiently large, contiguous parcels to allow for economical hay and field crop production. Because of their physical qualities, however, these soils are often also considered the best suited for land development and corresponding subdivision. Farmland conversion and fragmentation are a concern both regionally and statewide. The parcelization and development of good farmland effectively takes it out of production over the long term and reduces an already limited resource base.

The NRCS has also identified "prime forest soils," which are important to sustaining commercial forestry operations in the region. Prime forest soils can be classified according to their relative productivity (Map 6). These soils cover 12% of the region and in some cases overlap with important agricultural soils signifying areas of high soil quality. Similar concerns exist regarding the development and fragmentation of forest soils.

Other Earth Resources: A prominent geological site, the Chazy Reef—the oldest reef in the world—is visible and accessible in Isle la Motte. Other earth resources—including sand and gravel deposits and quarry stone—are of critical importance to road maintenance and construction and their use in products or industrial processes. An example of the latter is Isle La Motte's high quality black marble. Resource value asides,

MAP 6: Agricultural and Forestry Soils



SOURCE: *Natural Resources Conservation Service (NRCS)*

improper or excessive resource extraction is extremely damaging to the natural and scenic resources of the area, with far-reaching implications for surface and ground water quality as well as the archaeological and aesthetic resources of the region. Sand and gravel deposits often serve as important areas for aquifer recharge and filtration, so they are vital for high-quality sources of drinking water.

Rivers and Watersheds: Rivers and streams offer sustenance, scenic beauty and recreational opportunities, and they heavily influence the cultural, social and economic environment in Northwest Vermont. Within Franklin and Grand Isle Counties they form three major drainage basins, all of which empty into Lake Champlain (Map 7). Watersheds are a critical geographic unit when planning for natural resources. The Department of Environmental Conservation (DEC) has worked with NRPC and communities to complete Tactical Basin Plans for these watersheds. These basin plans are prepared to protect each basin's surface waters and ensure that they meet or exceed the Vermont Water Quality Standards.

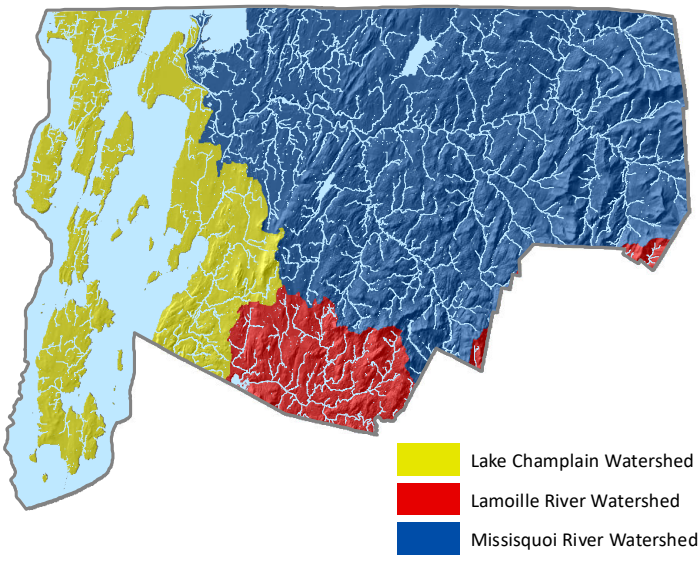
Development in and around the region's rivers can significantly affect the health of the river by reducing water quality, impacting the lives of stream biota, and increasing flood hazards. Of particular concern is development within a river's floodplain. During flood events, the floodplain provides an area for flood waters to spread out, slowing down their flow and depositing sediment. Development in the floodplain restricts the flood waters and

decreases the area available for flood storage. Channelization of streams, creeks and rivers also increases the severity of flooding and erosion by increasing the velocity of water and the amount of suspended sediment in the water. Much of the region's floodplain is currently used for agriculture, taking advantage of the rich soils.

The Federal Emergency Management Agency (FEMA) requires communities to adopt flood hazard regulations under the National Flood Insurance Program (NFIP) for property owners to be eligible for flood insurance and home mortgages. Floodplain delineations provided by FEMA have traditionally been inaccurate and/or difficult to interpret and did not serve as robust planning tools for floodplain management. All municipalities in the region are enrolled in the NFIP. Most NFIP maps in the region are over 40 years old and need updating. FEMA has begun work on new and improved flood maps for communities in the Northwest region which should be available in 2024. NRPC anticipates working with many communities on flood bylaw updates based on these maps.

Previously the NRPC has worked with local communities to complete studies known as stream geomorphic assessments. These assessments found that the lack of riparian buffers and past channel management practices—including channel straightening— are the two main stressors for the streams and rivers within the region. The absence of trees and other woody vegetation along stream banks can accelerate the rate of erosion and—since soil particles will bind with nutrients— increase the amount of phosphorus that is entering Lake Champlain in places like Missisquoi Bay. Due to these local conditions, and due to similar conditions in other watersheds, VANR has designated "river corridors" for streams and rivers across Vermont to ensure that new development does not further contribute to fluvial erosion and degradation of surface waters.

MAP 7: Northwest Region Watersheds



SOURCE: *Vermont Open Geodata Portal*

Vegetative stream buffers along rivers provide bank stability and shade the water, contributing to cooler water temperatures and lowering suspended sediment concentrations. Vegetation growing on the river banks also helps regulate flow, absorbing water to mediate the effects of flooding and releasing water during periods of low flow.

Many of Vermont's major wildlife species depend on riverine areas for various habitat needs. Several areas along the Missisquoi and Lamoille Rivers, including many tributaries, have been identified as optimum or critical habitat for deer, moose and water birds by the Vermont Department of Environmental Conservation (DEC). These sites are found mainly in eastern and southern Franklin County, and in many cases, they correspond to the location of deer wintering habitat.

The region's rivers also support a variety of game fish species, including wild populations of rainbow, brown and brook trout; northern pike; largemouth bass; smallmouth bass; and walleye. Muskellunge have also been periodically stocked in the Missisquoi River since 2008 to restore a self-sustaining population in the lower portion of the river. Many non-game fish species can also be found in the region including several rare (R), threatened (T), or endangered (E) fish species including lake sturgeon (E), Eastern sand darter (E), stonecat (E), American brook lamprey (T), greater redhorse (R), and silver redhorse (R).

Lakes and Ponds: Lake Champlain is without a doubt among the most treasured of Vermont's waters. At more than 400 square miles in size (158 square miles within Franklin and Grand Isle Counties), the lake—aside from the Great Lakes—is among the largest fresh waterbodies in the United States, and it is a dominant feature in the natural and cultural landscape of the region.

Other waters in the region—which are defined as lakes and ponds of state jurisdiction when 10 acres or larger in size— include Fairfield Pond, portions of Arrowhead Mountain Lake, Lake Carmi and Metcalf Pond. Across the region, particularly in Franklin County, these lakes and many smaller water bodies serve critical functions in the provision of wildlife habitat and migratory corridors, overland nutrient filtration, opportunities for recreation and public water supply. Shorelands along water bodies larger than 10 acres are subject to state regulations aimed at enhancing the vegetative and pervious cover along the shoreline to protect water quality and aquatic habitat.

Wetlands: Although wetlands often serve as transition areas between dry land and open water, they can also be isolated from any obvious connection to water. Franklin and Grand Isle Counties include approximately 46,200 acres of wetlands. Vermont's wetlands—including the extensive wetland complexes found in Franklin and Grand Isle Counties—serve numerous functions, including flood control, shoreline anchoring, water quality, habitat and contributing to socio-economic value. They account for 2.7% and 7.5% of the total land area for each, respectively. These counties rank among the top four in the state for the highest ratio of wetlands to total land area, with Grand Isle County being number one by a wide margin.

Wetlands are protected through local, state and federal regulations; the state wetland rules identify the types of wetlands that fall under state-level jurisdiction. The majority of wetlands in the Region are Class II wetlands. The wetland complex at the mouth of the Missisquoi—parts of which lie within the Missisquoi National Wildlife Refuge—is considered by some to be a candidate for class I wetland status. The Refuge was established in 1943 and now occupies an area of over 7,200 acres. The U.S. Army Corps of Engineers has jurisdiction over Class III wetlands. The Vermont Wetlands Program launched an effort to update Vermont's wetland maps in 2021. State official posted materials on their website and sought public comment on the draft documents through July of 2022, when associated Wetland Rule changes were filed. A final version of the revised wetland maps is expected to be published in 2023.

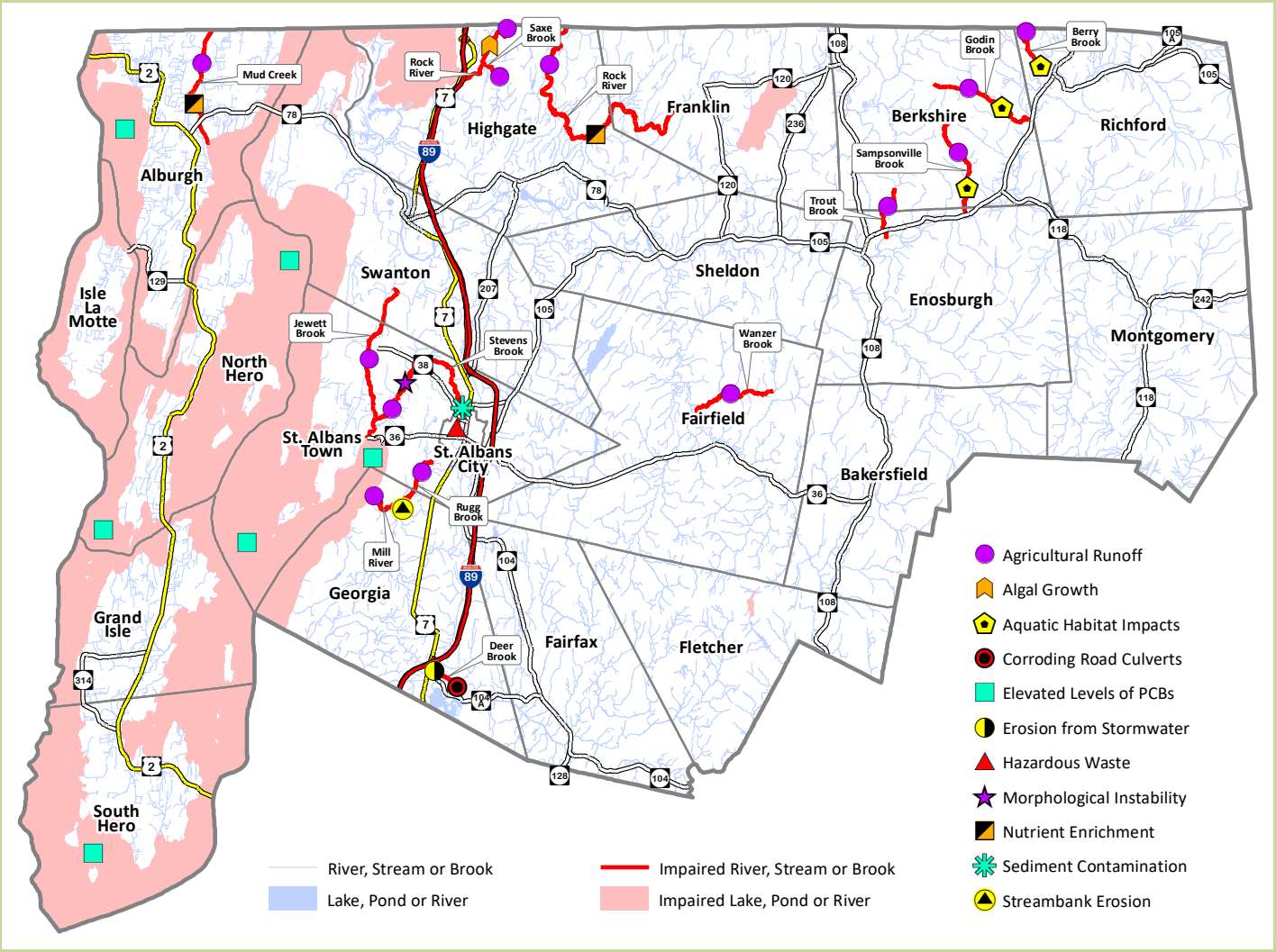
Groundwater: The region enjoys a general abundance of groundwater supplies, though yields and quality vary depending on local hydrology. Groundwater is a critical resource to the region for its obvious importance as a drinking water source. Approximately 66% of Vermont residents rely on groundwater as a source of drinking water. Although the quality is generally good, the resource is nonetheless fragile. Once supplies are contaminated, cleanup is difficult and comes at great public cost.

Water Quality: Many surface waters in the region, such as Lake Champlain, do not meet federal or state standards for water quality. These "impaired" areas have been identified across Vermont. Impaired waters located within the Northwest region are depicted in Map 8. Threats to water quality come from a variety of stressors. The underlying causes of these stresses include urban and agricultural runoff, invasive species, hazardous waste disposal and septic systems. See Table 4 for a list of stressors impacting the region.

When land is developed, there is a related increase in impervious surfaces, particularly pavement and roofs. As the area of impervious surface increases, the landscape's capacity to absorb and filter nutrients is reduced, resulting in higher levels of phosphorus and other nutrients running overland into water bodies and accelerating the process of eutrophication.

As noted in the basin plan for the Missisquoi Bay basin, agricultural runoff, if not properly managed, can negatively impact water quality. "Without proper management of fields and farmsteads, agricultural land use

MAP 8: Targeted Impaired Areas



SOURCE: *Vermont Agency of Natural Resources*

can be a source of nutrients, sediment, pathogens and toxins to surface waters." Improving the soil health of fields as well as managing application of nutrients through use of Agricultural Best Management Practices helps address water quality concerns and protect surface waters.

Toxic substances can be defined as chemicals capable of causing harm to plants and animals including humans. Vermont's Statewide Surface Water Management Strategy notes several classes of toxic substances have potential to affect surface waters in Vermont, including mercury, organic and inorganic contaminants, metals, and pesticides. Two significant threats of emerging concern being addressed statewide are chlorides and a class of chemicals knowns a PFAS. Inadequate or poorly maintained on-site septic systems also can impact water quality as noted in the Missisquoi Bay basin plan.

Management of shorelands, both developed and undeveloped, is also an important challenge for the region. Grand Isle County, which contains an overwhelmingly large ratio of lakeshore to land area, continues to experience development pressures due to second-home construction, the ever-expanding commuter shed of Chittenden County, and what some are calling "COVID migration." Franklin County's Lake Champlain shorelands face similar development pressures in part because of their close proximity to Interstate 89. Because of the variety of issues associated with these stressors, there is no "one size fits all" solution. Instead, several approaches are needed to deal with each problem effectively.

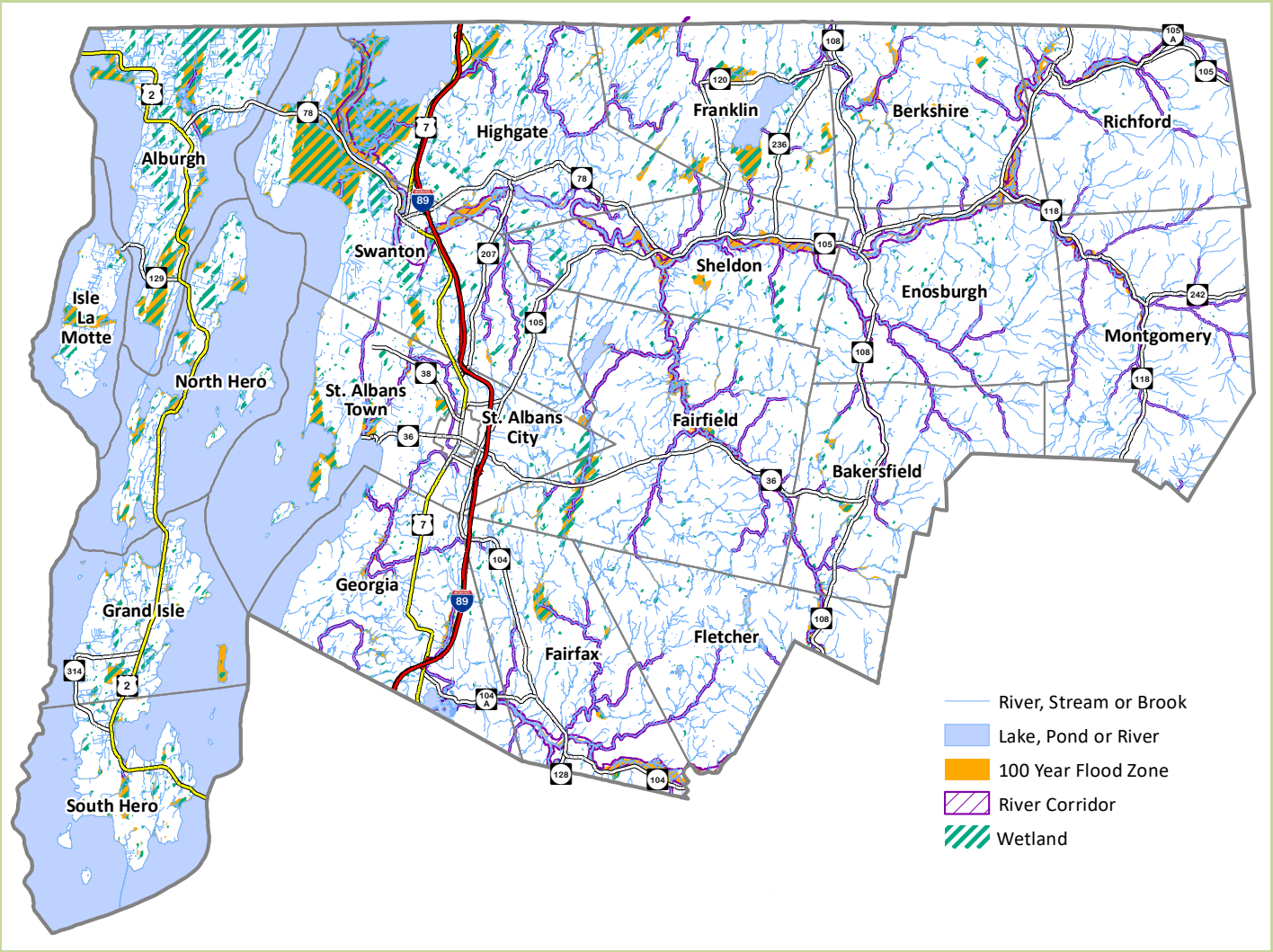
TABLE 4: Major Surface Water Stressors in the Region and Underlying Causes

STRESSOR	UNDERLYING CAUSE
ACIDITY from:	• atmospheric deposition • mine tailings runoff
ALTERED HYDROLOGY resulting in periodic dewatering or inundation of habitat (including extremely high velocities and rapidly changing flow) from:	• non-natural variation in flows due to withdrawals • decreased/altered flows from flood control and hydropower dams • lake or reservoir fluctuations • ditching of wetlands
AQUATIC INVASIVE SPECIES that cause loss of recreational opportunities and habitat/ecological integrity of aquatic or riparian habitats, due to:	• human dispersion (aquaria release, ballast release, boat/trailer transfer, fish tournaments) • natural spread (avian transfer)
CHANNEL EROSION causing increased sediment & nutrient loading due to mass wasting and stream disequilibrium (erosion/transport/deposition) from:	• increased flow peaks (watershed ditching/draining, impervious cover runoff, dams, and climate change) • sediment discontinuity (dams, diversions, and culverts) • channelization practices (channel dredging, straightening, berming, and armoring) • bed and bank disturbance
ENCROACHMENTS from loss of habitat, equilibrium, and ecological process due to encroachments within or adjacent to floodplains, wetlands, lakes, streams, and rivers from:	• earthen fills • roads • buildings • utilities • stream crossings • dams
LAND EROSION causing increased sediment & nutrient loading due to erosion of exposed soils and gully erosion from:	• ditching (conveyed surface flow) • cropland • forestland uses • construction sites • stormwater runoff
NUTRIENT LOADING (non erosion) to surface waters from:	• over-fertilization (urban, agriculture) • inadequately treated domestic waste • animal and milk house wastes
PATHOGENS from anthropogenic waste attributable to:	• poorly functioning septic systems • domestic animals • agricultural runoff • nuisance wildlife
TOXIC SUBSTANCES in surface water and groundwater from:	• atmospheric deposition • inorganic and organic contaminant releases • pesticides • contaminants of emerging concern • biologically derived toxins
THERMAL STRESS	• removal of woody and herbaceous riparian/shoreland vegetation • impoundment • climate change

SOURCE: *Vermont Surface Water Management Strategy*

Water Quality Initiatives: Several initiatives are underway in Vermont to reduce the amount of phosphorus entering Lake Champlain and other waterbodies. Phosphorus is naturally occurring, but excess phosphorus due in large part to human activity, has significant negative impacts on water quality. Efforts to control phosphorus focus on a range of land use sectors, including agricultural land, developed land, forestland and stream corridors. They include regulations as well as voluntary actions. To achieve targets agreed to by the

MAP 9: Water Resources



SOURCE: *Vermont Agency of Natural Resources and Flood Insurance Rate Maps*

State of Vermont and the Environmental Protection Agency, phosphorus loading within the region will need to be reduced as much as 66% in some basins. Lake Carmi is also a focus of efforts to reduce its high phosphorus levels. Both water bodies experience blue-green algae blooms and growth of invasive weeds fed by the elevated phosphorus levels. Lake Carmi has been designated a "Lake in Crisis" by the State of Vermont and as such has a specific management plan and dedicated resources to address ongoing water quality issues.

In 2019, the Vermont General Assembly approved the Clean Water Service Delivery Act, also known as Act 76. Act 76 provides a long-term funding source for water quality projects, prioritizes financial support for voluntary projects, and establishes a network of decentralized Clean Water Service Providers (CWSPs) and Basin Water Quality Councils (BWQCs) to identify and implement voluntary projects. CWSPs have multifaceted responsibilities. Their role includes establishing partnerships with non-profit groups and landowners, creating and supporting BWQCs, and identify and implementing projects to meet Phosphorus reduction targets established to clean up Lake Champlain. CWSPs are also responsible for verifying and inspecting projects over time and ensuring consistency with Tactical Basin Plans. NRPC has been selected to serve as the Clean Water Service Provider for the Missisquoi and Lamoille Basins and will also be an active participant in the BWQC representing interests in northern Lake Champlain. Improving water quality will require a long-term, sustained effort.

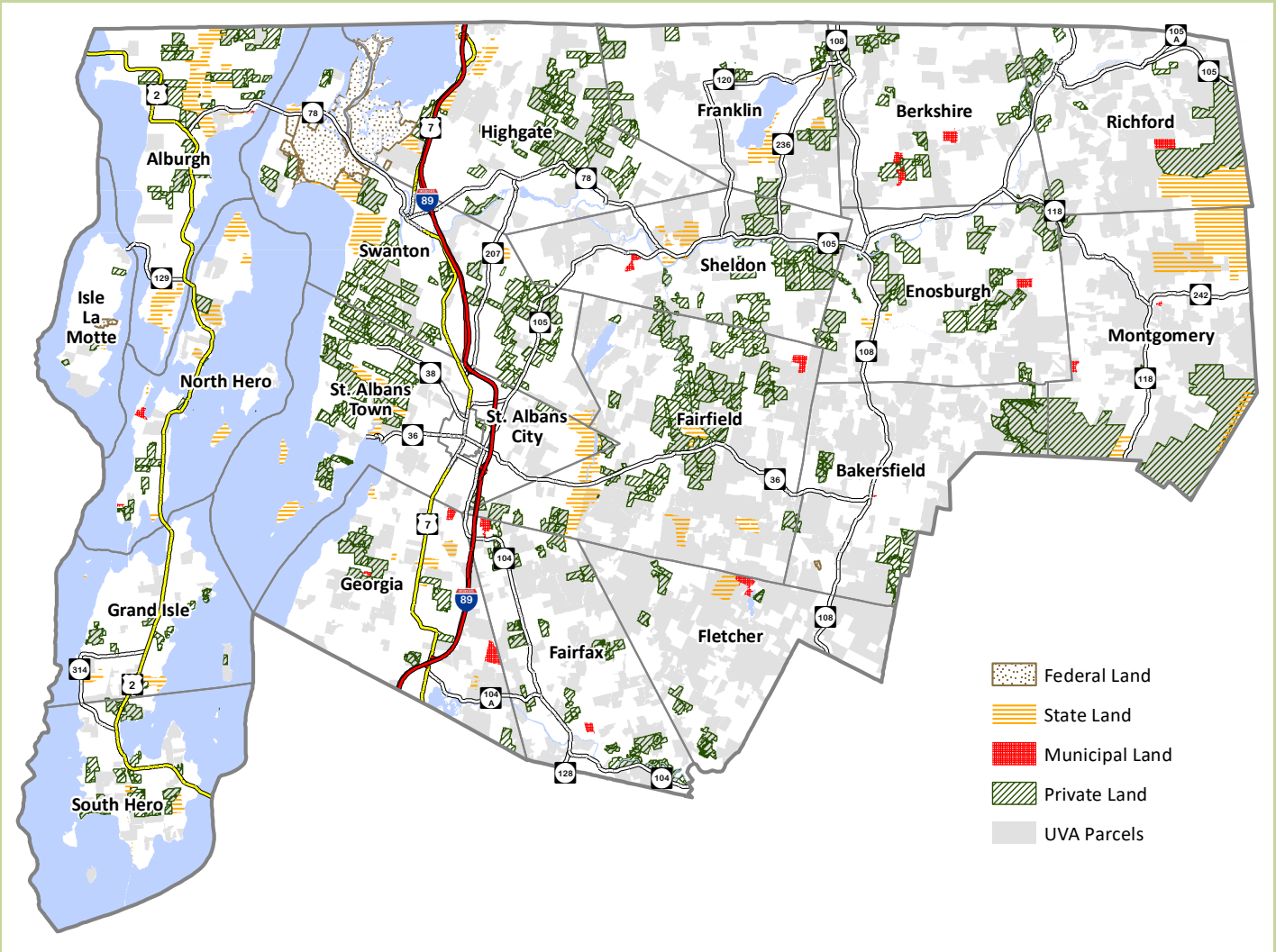
Forest Resources: The region's forests play an important role as a natural, cultural and economic asset to the local communities. Indeed, several communities in the region maintain town forests. These and other forests throughout the region are used for recreational and educational purposes and activities.

Northwestern Vermont is part of the Northern Forest, an area stretching across northern New York and New England and encompassing 26 million acres of forestland. The upland area of northwestern Vermont contains the largest tracks of contiguous woodland in the Northern Forest. This area is characterized by steeply sloping mature softwood and hardwood forests as well as streams that flow into the Missisquoi and Lamoille Rivers. The region's uplands strongly correlate with the preferred habitat for Vermont's black bear population, and these areas are generally the most undeveloped lands in Franklin County.

Forest products are a vital component of the local economy. According to the United States Department of Agriculture (USDA), Vermont produced 48.1% of the nation's maple syrup in 2014, with Franklin County a leading production area in the state. Timber is also an essential industry in the region, and more than 10,000 MBF (million board feet) and 7,614 cords of pulpwood were produced by Franklin County in 2010.

Fifty percent of the land in the region is enrolled in Vermont's Current Use or Use Value Appraisal (UVA) Program, which means the land is being actively managed for agriculture or forestry (Map 10). The amount of

MAP 10: Conserved Land



SOURCE: *Vermont Open Geodata Portal and Use Value Appraisal (UVA) Program*

forestland enrolled in the program has increased from 72,500 acres in 2000 to 166,860 acres in 2020. UVA is a temporary land conservation measure, unlike other more permanently conserved lands shown on the map.

The extensive, relatively undeveloped tracts of forested uplands in the region have the potential—with proper management—to serve as areas of core wildlife habitat substantial enough to support viable populations of large mammals, such as moose and black bear.

Additional information on the characteristics and values of the forest in the region along with measures that can be taken to ensure good forest stewardship can be found in the Northwest Regional Forest Stewardship Plan (2015).

Fragile Areas: In 1977, the Vermont Legislature established the Fragile Areas Registry (10 VSA Chapter 158). The goal of the Fragile Areas Registry is to protect significant natural areas through a process of site identification and documentation, resulting in heightened public awareness and serving as aids in state and local planning. Three areas in Franklin and Grand Isle Counties are currently listed in the Fragile Areas Registry:

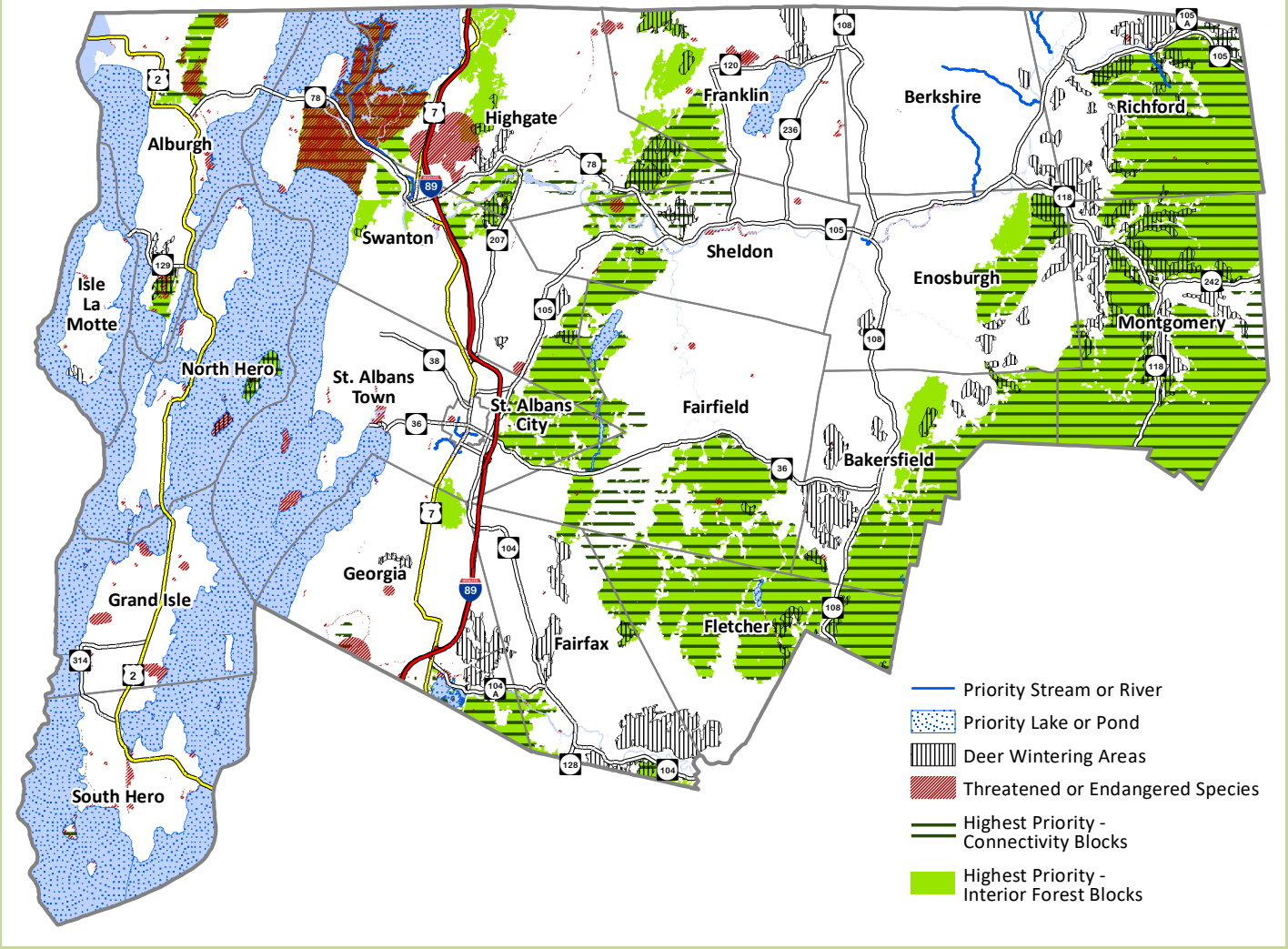
- **Missisquoi River Delta:** This 1,500-acre area of freshwater marsh and forest is recognized for its significance as a large, diverse, rich ecosystem supporting populations of several rare birds and game fish.
- **Chazian Coral Reef:** Found in numerous outcroppings in Isle La Motte, the Chazian Coral Reef is more than 480 million years old and is the oldest coral reef in the world. The reef represents a valuable resource for paleontological research.
- **Franklin Bog:** This 300-acre bog is located one-quarter of a mile north of Lake Carmi. Franklin Bog is exemplary for its size and its corresponding species and landscape richness, which includes several interpenetrating zones of conifer forest, open bog mat and streams with active beaver populations.

In the years since the creation of the Fragile Areas Registry, Vermont has created and expanded its Natural Heritage Inventory. The inventory includes data about both individual species and natural communities and supports conservation and monitoring at local, regional, and state levels.

Wildlife and Plant Habitat: The region provides critical habitat to a variety of wild animals as shown in Map 11. Development must be planned properly to ensure habitat conservation and to avoid fragmenting habitat and negatively impacting the local wildlife. Steps also must be taken whenever possible to prevent the degradation of habitats by invasive species. Map 11 shows some of the region's important habitat areas. Many habitat areas in the region are not depicted but nonetheless should be considered when planning for the future. Habitat for plant and animal species can occur within many landscapes present in the region such as wetlands, forestland, riverine and riparian environments. Indeed, wetlands serve as habitat for 95 species of threatened or endangered plants nationwide, and more than 43% of all federally recognized threatened or endangered plant species are found in Vermont wetlands (VT DEC).

Act 171 revised state law to encourage municipalities and regions to address protection of forest blocks and habitat connectors—which are vital to wildlife conservation—while also supporting forest industries. The highest priority forest blocks provide "core forest habitat," or interior forest not impacted by surrounding human uses. These more substantial undisturbed areas are particularly necessary for animals whose habitat requirements include large home ranges. Systems of core habitat—connected by smaller "connectivity blocks"—provide wildlife travel corridors between core areas and promote healthy animal populations by ensuring genetic mixing among animals from different core habitat areas. The highest priority connectivity blocks often feature water and may consist of surface water and riparian areas or riparian wildlife connectivity areas. Riverine areas support fish and wildlife species for various habitat needs, including winter shelter, food supply, breeding and use as travel corridors and migratory bird staging sites. Several areas along the Missisquoi and Lamoille Rivers, including many tributaries, have been identified as optimum or critical habitat for deer, moose and water birds.

MAP 11: Wildlife Habitat



SOURCE: *Vermont Open Geodata Portal*

Invasive species can be harmful to native wildlife and their habitats by "out competing" native species and displacing them. According to DEC, significant aquatic invasives found in Franklin and Grand Isle Counties include plants such as such as purple loosestrife, water chestnut, or Eurasian milfoil, and animals like zebra mussels, spiny water flea and white perch. Significant terrestrial invasive species include plants like garlic mustard, buckthorn and Japanese knotweed that can poison soils, cause streambank erosion, and crowd out native plants. Forest pest insects of concern include the Asian long-horned beetle, emerald ash borer, and hemlock wooly adelgid.

Numerous locations in the region support populations of designated rare, threatened or endangered plants and animals. The species identified have very particular habitat requirements, or they are at the edge of their natural range, are vulnerable to collection or disturbance, or have difficulty reproducing. The majority of identified sites are located in Grand Isle County and in western Franklin County. Many are found on the lesser islands of Grand Isle County and its shoreland areas.

Although not endangered, black bears are at risk. Black bears prefer mountainous and forested landscapes on the wooded slopes of the Green Mountains. Thus, a significant amount of regional bear habitat exists in eastern Franklin County. Because of its large home range, the black bear is vulnerable to habitat loss through the fragmentation of large forested areas into smaller units and isolated "forest islands."

Deer wintering areas, or "deer yards," provide critical habitat for white tail deer and other species of vertebrates. These areas of hemlock, spruce, fir, cedar and pine species provide shelter from deep snows and permit easier winter travel for deer, compared to deciduous forests. Deer yards also benefit 169 of Vermont's 386 vertebrate species (excluding fish). Of these, five species are threatened or endangered, and four are of special concern due to their limited population size. Numerous deer wintering areas have been identified throughout Franklin and Grand Isle Counties, the most extensive of which are located in the heavily forested areas of eastern Franklin County.

For habitat serving large mammal populations, the area along the Green Mountains on the eastern boundary of the region is critical. The Cold Hollow to Canada initiative is a partnership of community members in Franklin and Lamoille Counties. Its mission is to work together toward the common goal of land stewardship and wildlife habitat conservation across property and municipal boundaries through education, outreach and conservation of land and water resources. On a larger scale, several state and federal organizations have mapped large contiguous habitat blocks in the Green Mountains and vital corridors that connect them; these connectors are important for enabling the movement of large mammals (Map 11).

Scenic Resources: The region's scenic resources are plentiful and include both natural and human-influenced elements. Undeveloped ridgelines are among the region's highly valued natural scenic resources, serving both as vantage points (the areas we enjoy views from) and as terminal views (and create the scene we are enjoying through our observation). Because impacts on scenic resources are assessed as part of the Act 250 development review process, communities in the Region may wish to incorporate a scenic resource assessment as part of their planning processes.

Moose in a Highgate Wetland
PHOTO CREDIT: *Bill Ashton*

GOALS AND POLICIES

1 GOAL **Protect significant natural resources, including air, wetlands, wildlife, lakes, ponds, woodlands, earth resources, open spaces, groundwater resources and wildlife habitat.**

a. Support efforts to reduce air pollutants generated in the region from the residential, commercial, industrial and transportation sectors.
b. Ensure that development will not present an undue risk of degrading the region's air quality.
c. Plan, construct and manage mineral and earth resource extraction and processing facilities to ensure that negative impacts are limited and rehabilitation is certain. Minimize noise and adverse impacts on existing or planned uses within the vicinity of the project, fish and wildlife habitat, water quality, prime agricultural soils and scenic resources. Ensure projects do not interfere with the function and safety of all modes within the transportation system.
d. Ensure that development in floodplain or river corridor areas does not impede the flow of flood waters or endanger public health, safety and welfare.
e. Locate and configure land development to avoid the fragmentation of and adverse impacts to natural areas, forest blocks, critical wildlife habitat and connectivity areas identified in the regional plan or local plans by the Vermont Agency of Natural Resources, or through site investigation.
f. Ensure that outdoor lighting is designed to minimize the amount of light leaving development sites, overly bright areas or hot spots, and the amount of light pollution illuminating the night sky.
g. Assist in efforts to combat the spread of invasive species.

2 GOAL

Protect and conserve historically significant buildings and locations, archaeological resources, and important scenic and aesthetic resources identified in local and regional plans.

a. Ensure that new land development minimizes impact on archaeological sites.
b. Ensure that land development along prominent ridgelines and hilltops is designed to fit within the landscape and avoid undue adverse visual impacts.
c. Encourage communication facilities to limit their impact on scenic resources by reducing their size or location so that exterior lighting is not required, by seeking opportunities for co-location, and by choosing sites, shapes and colors of structures that reduce visual impact.
d. Encourage energy generation and distribution facilities to minimize their visual impact on ridgelines, slopes and open areas.
e. Ensure that historically significant buildings and locations are conserved and/or made available for adaptive reuse whenever feasible considering their cost and condition.

3 GOAL

Maintain and wherever possible improve the quality of lakes, ponds, rivers, streams and groundwater.

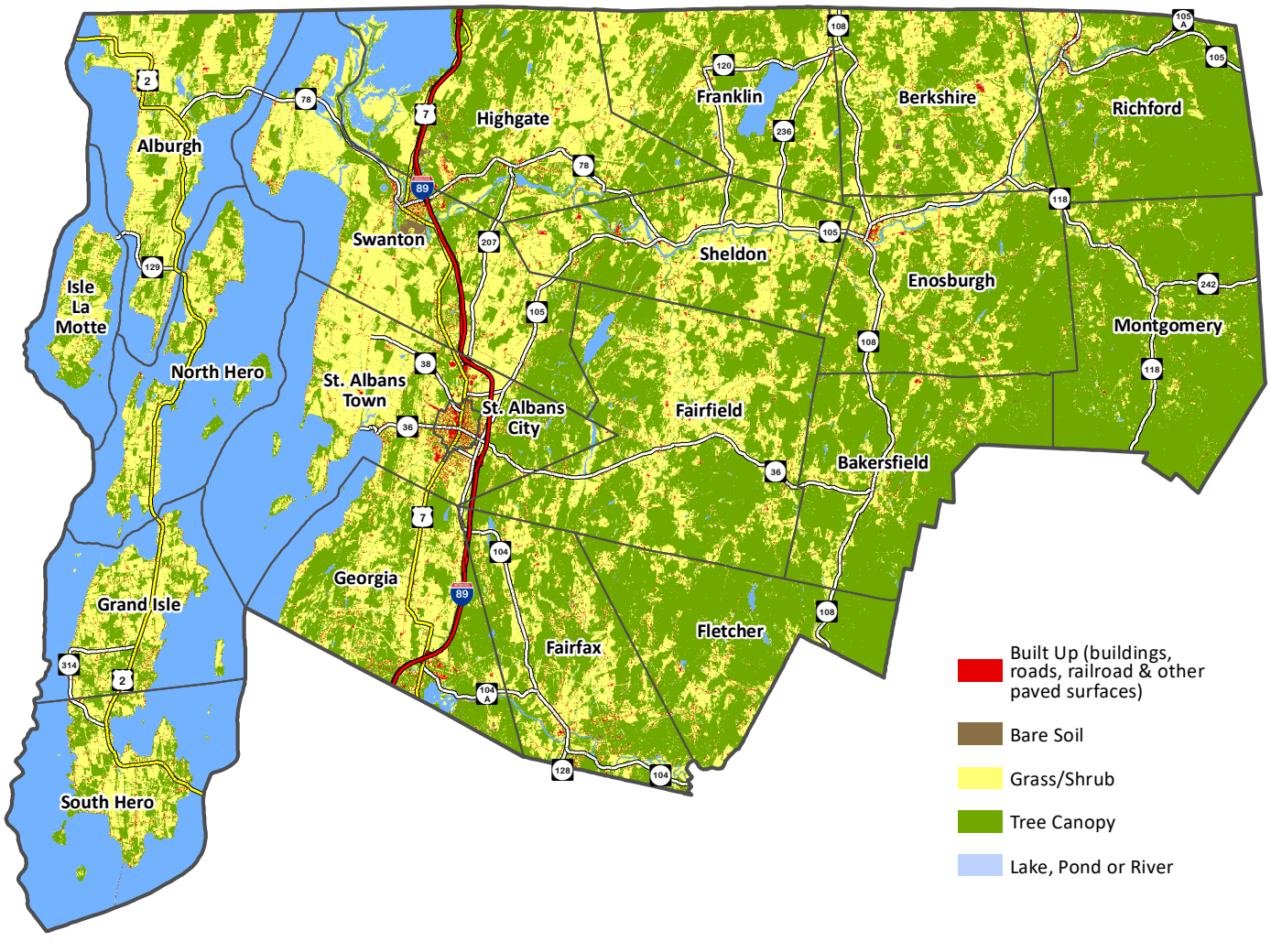
a. Forbid the use of persistent harmful and toxic pollutants in groundwater recharge areas or in areas where they could enter surface or sub-surface waters.
b. Ensure that development mitigates the anticipated effects on water quality through Low Impact Development techniques, such as limiting the amount of impervious surface on a site and incorporating adequate amounts of vegetation, trees and shrubs to aid in stormwater treatment.
c. Improve surface water quality and protect it from point and non-point nutrient loading.
d. Maintain and expand vegetative buffers along surface waters of sufficient width as a tool for improving water quality and protecting habitat.
e. Support efforts to remove as much of the Missisquoi and Carry Bay causeways as possible given permitting and funding constraints.

LAND USE

GOALS

1. The region is characterized by compact villages and growth centers separated by rural countryside and the working landscape.
2. Maintain healthy and diverse forest and conservation areas as well as a strong working landscape of agriculture and forestry.
3. Target future economic growth primarily in the region's existing and planned growth areas.

MAP 12: Current Land Use



SOURCE: *Vermont Open Geodata Portal*

CURRENT LAND USE PATTERNS

The region is composed of two counties with distinctly different land features that have influenced unique human settlement and use patterns over time (Map 12).

The topography of Grand Isle County consists of generally flat areas to rolling hills characterized by large farm fields, orchards and wetlands, and the county is surrounded on three sides by the small beaches and rocky shoreline of Lake Champlain. Predominantly clay soils and lack of public wastewater facilities limit development possibilities. As a popular summer destination, families have built camps and second-homes along the shoreline. With a population that more than doubles in the summer months and a continuing trend of converting seasonal homes to year-round use, the island's villages and amenities are growing, particularly in South Hero and Alburgh. US Route 2 (the region's first and only Scenic Byway) bisects the county from north to south and serves as the only access on and off the islands.

Franklin County's topography changes markedly from the Lake Champlain Valley in the west to the rising spine of the Green Mountains in the east. Farmland is highly concentrated in the Champlain Valley and extends east along the Missisquoi River Valley. East of the Champlain Valley, the topography gets hillier and more forested, particularly along the eastern border in Richford, Montgomery and Bakersfield. Franklin County has generally maintained the traditional pattern of densely settled villages surrounded by sparsely populated farm and forest land, although over the last several decades farmland conversion and a demand for affordable housing and has led to scattered homes throughout some of the rural areas of the county. In a few areas, commercial sprawl has become a concern. In the west of the county is St. Albans City, the region's only urban center, and the Interstate 89 Corridor, which provides quick access to Chittenden County and Montreal. These features orient the settlement pattern toward the west and the south for access to jobs, shopping and services in St. Albans City and via I-89.

ASSETS, OPPORTUNITIES AND CHALLENGES

Designated Centers

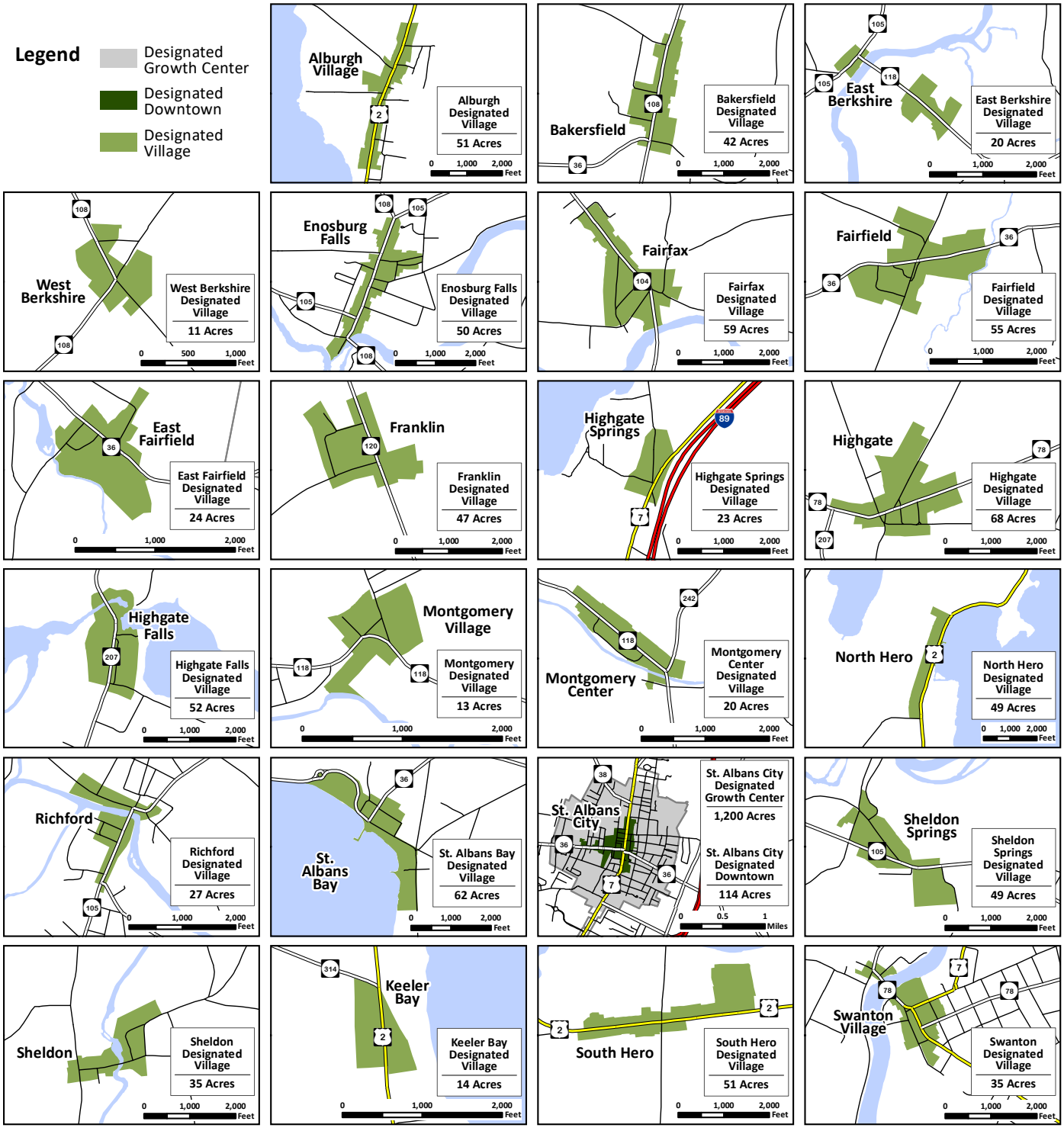
Vermont has established a framework of "designations" to offer incentives that encourage communities to maintain vibrant concentrated settlements separated by rural countryside. These programs provide a variety of incentives for development in the designated areas, but each program has a set of unique goals for making

TABLE 5: State Designations

DESIGNATION	INTENT/INCENTIVES
Village Center	Village Center Designation supports small town revitalization with a variety of tax credits and priority consideration for several state grants. Village Center planning also helps to build community connections and economic resilience.
Downtown	Downtown Designation provides communities with the help and resources they need to make downtown revitalization a community effort through a variety of incentives ranging from tax credits to tax increment financing to priority consideration for many state grants.
Growth Center	The Growth Center program designates areas that are planned for new development in keeping with historic development patterns and offers a variety of incentives ranging from tax increment financing to Act 250 master permit application to priority consideration for many state grants.
New Town Center	The New Town Center program provides the option for town that lack a historic downtown to designate a New Town Center. Benefits include being able to set up a special tax district to fund capital and operating costs of a project in the center, in addition to affording certain benefits during Act 250 Review and priority consideration for many state grants.
Neighborhood Development Area	The Neighborhood Development Area program designates areas that are within or adjacent to village centers, new town centers or growth centers for mixed income housing, providing special permit and tax incentives for communities and developers.

the region's centers vibrant places (Table 5). The region has one designated downtown and growth center (St. Albans City) and 23 designated village centers (Map 13). Of the remaining region's municipalities, several could benefit from seeking village center designation, such as Grand Isle, Fletcher and Georgia. Neighborhood Development Areas may be great options for many of the region's existing village centers to incentivize new housing opportunities that are walkable to amenities and services. New Town Center designation takes significant investment in planning but could be appropriate for Georgia's South Village.

MAP 13: Regional Designated Growth Center, Downtown and Villages



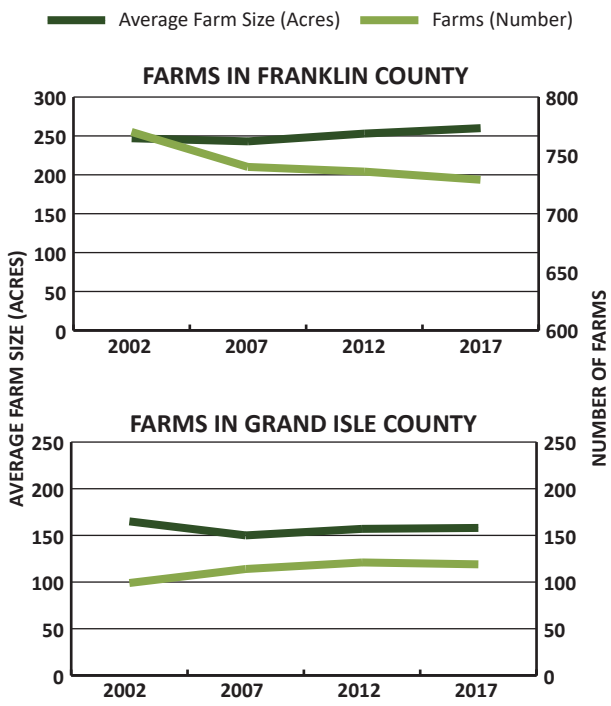
SOURCE: *NRPC Collected Data*

Farms and Farmland

Franklin County remains one of the most productive agricultural counties in the state, generating 24% of Vermont's farm sales in 2017(the most recent year data is available). Although farms are a common land feature in both counties, the setting in each county is very different. On average, farms in Grand Isle County are significantly smaller in size and tend to be more diversified than farms in Franklin County. In Franklin County, the average size of farms and the amount of acreage in agricultural use is increasing (average of 260 acres in 2017) while the number of farms is decreasing (729 farms in 2017), which supports the trend of small and medium farms (primarily dairy) consolidating into fewer larger farms (Figure 3). In Grand Isle County, the number and size of farms has remained steady at around 120 farms at an average size hovering below 160 acres, along with a recent decrease in the amount of acreage in agricultural use. The trend of consolidating small and medium dairy farms has been consistent and is a major factor affecting the working landscape in the region. Competition is high and requires large scale production to be successful in shipping conventional fluid milk. In response, there is growth in diversified and value adding farming in both counties. For example, the amount of land used for harvesting vegetables increased from 126 acres to 266 acres from 2012 to 2017. Diversification and value-added production are key strategies for small and medium producers to stake out a place in the market. (Sources: Census of Agriculture).

There are many strategies that municipalities can implement to strengthen agriculture and maintain the number of small and medium farms in the region. This includes incorporating pro-agriculture land use policies in town plans and bylaws, such as encouraging accessory on-farm businesses, encouraging the conservation of farmland through the purchase of development rights or other means, supporting programs that assist new farmers succeed, whether though land access, business planning or other training, and working with farmers and local groups to promote diversified agriculture, value added production and strengthening the regional food system.

FIGURE 3: Northwest Region Farms



SOURCE: *U.S. Census of Agriculture*

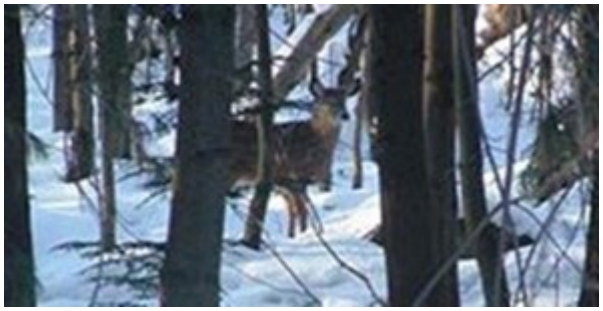
Strategies for Supporting Agriculture

- Support agriculture in municipal plans.
- Conduct an agricultural resource inventory.
- Establish agricultural districts.
- Adopt local right-to-farm laws.
- Clarify and streamline permitting for accessory on-farm businesses.
- Establish or support land trusts.
- Establish a transfer of development rights.
- Adopt local tax stabilization plans.
- Increase local awareness of agricultural issues.
- Encourage the production of value-added products and the purchase of locally produced products.

Forestland and Wildlife Habitat

The NRPC supports settlement patterns that maintain connecting patches of forestland and other habitat in order to sustain viable wildlife populations and biodiversity, which will lead to a healthier ecological system. State statute encourages municipalities and regions to address protection of forest blocks and habitat connectors—which are vital to wildlife conservation—while also supporting forest industries. This is discussed in more detail and mapped in the Natural and Cultural Resources chapter.

Tools for protecting wildlife habitat and other natural resources are shown in the text boxes on this page. The NRPC encourages all municipalities in the region to consider implementing one or more of these tools in order to manage growth and, ultimately, protect natural resources. By working to preserve corridors of wildlife habitat and large tracts of undisturbed forest, our communities can share the forest with a thriving wildlife population.



White Tail Deer in Highgate
PHOTO CREDIT: *Bill Ashton*

Population, Housing, and Commercial Growth

Franklin and Grand Isle Counties are consistently among the fastest-growing counties in Vermont in terms of population and housing units based on U.S. Census data. This high growth can largely be attributed to the region's proximity to Chittenden County. As land and housing prices in Chittenden County continue to increase, many people are trading a longer commute for more affordable land and housing and a more rural setting. In this region, it is critical to have the tools and resources in place to plan for and manage the impacts of growth.

Tools for Natural Resources Protection: Zoning Based Options

- Change allowed uses and/or minimum lot size requirements in zoning districts.
- Revise planned unit development (PUD) provisions for conservation.

  For lot size requirements:
  - ◊ Allow a smaller minimum lot size for PUDs than for subdivisions.
  - ◊ Establish a maximum lot size for subdivisions or PUDs.

  For review triggers:
  - ◊ Require that all subdivisions be reviewed as PUDs.
  - ◊ Require that all subdivisions of a certain size be reviewed as PUDs.

  For open spaces:
  - ◊ Provide a density bonus for "managed" open space or for other desired features or standards.
  - ◊ Require a percentage of open space.
  - ◊ Provide incentives for or require planned connections of open space between multiple parcels of land.
- Increase flexibility for Accessory Dwelling Units and two-unit dwellings.
- Develop road limitations and/or standards to reduce forest and habitat fragmentation.
- Limit development with regard to the availability of or access by municipal services.
- Restrict development within deer yards, bear habitat and/or other natural habitats.
- Exclude high value resources and undevelopable land from density calculations.
- Establish a transfer of development rights program.

Tools for Natural Resource Protection: Non-Zoning Based Options

- Create a conservation commission.
- Implement impact fees.
- Update town plans.
- Provide training for municipal officials and board members.
- Seek funding for municipal systems or expansion.
- Obtain Growth center designation and complete master plans.
- Establish road standards.
- Develop road limitations and/or standards to reduce forest and habitat fragmentation.
- Ensure adequate municipal infrastructure/facilities.
- Obtain Village/downtown designation.
- Create or update a capital budget.
- Complete a Town Forest Management Plan
- Support forest landowner cooperatives or land conservation

With sufficient planning, cumulative commercial and residential development can avoid creating problematic conditions over time, such as traffic congestion, lack of or insufficient infrastructure and services, lack of or poorly designed parking, pedestrian inaccessibility and sprawl. The beginning of these growth-related issues can be seen in some areas of the region. While recognizing the opportunities that residential and commercial expansion brings to the region in terms of economic growth, it is critical to strike a balance between embracing growth and managing it to preserve rural character and traditional settlement patterns. It is also crucial to ensure that municipal and regional infrastructure, facilities, utilities and services are adequate and functional. An important role of the NRPC is to work with local municipalities in developing plans and local regulations to effectively manage growth. Specific tools and resources are discussed in the next section.

PLANNING FOR GROWTH AND DEVELOPMENT

Most communities in Franklin and Grand Isle Counties have updated their plans and local regulations to keep pace with changing development pressures. However, ensuring local capacity to manage land use planning and development review continues to be a challenge. Faced with growth and development pressures, the workload and responsibilities of local governments will only expand in the coming years. Assistance and educational opportunities from the NRPC, the state, the Vermont League of Cities and Towns, and other organizations will help make land use planning and development review more manageable now and in the future. It will also be important to take advantage of opportunities to share resources among municipalities.

Regional Planning Area Mapping Criteria

Agricultural Resource Planning Area

- Farmed prime soils > 20 acres
- Farmed non-prime soils > 20 acres
- Negligible acreage of unfarmed prime soils

Forest and Conservation Planning Area

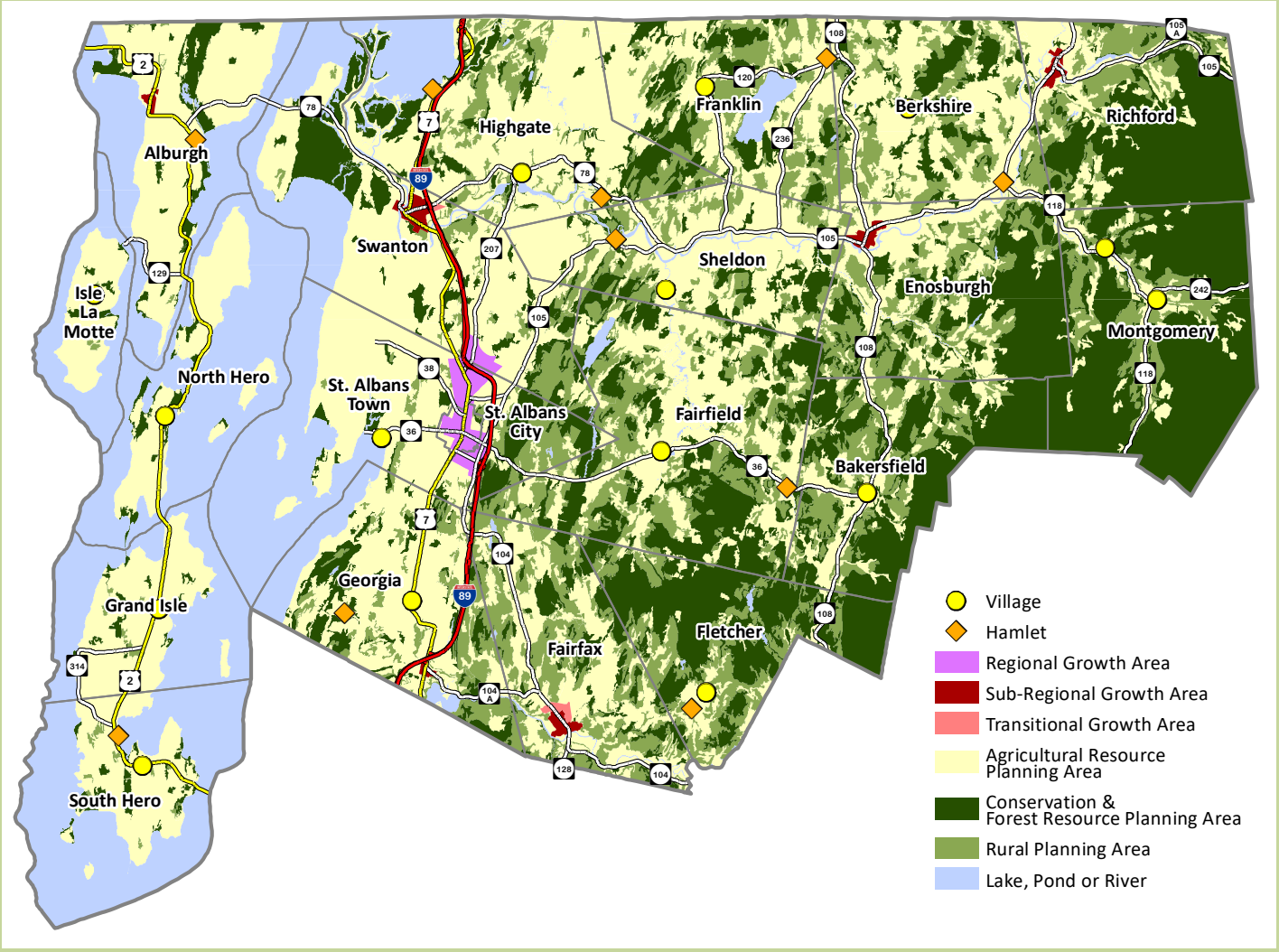
- Wetlands > 5 acres
- 100-year floodplain
- Uplands (> 1,000’ elevation)
- Public lands
- Shore land (< 500’ from waterline)
- Everything from “moderate to severe” on suitability map

To guide land use planning and development in this state, the Vermont Planning and Development Act outlines 13 planning goals and 9 smart growth principles. The smart growth principles are the core of the growth center designation program passed into law in 2006 and discussed later in this plan. If followed, these principles will prevent sprawl by focusing development in compact, pedestrian-friendly village, town, city or growth centers. The 13 state planning goals from 24 V.S.A. §4302 establish a policy framework for land use planning in Vermont. All municipalities are encouraged to adopt local plans that further these goals. The act enables communities to utilize numerous regulatory and non-regulatory tools to implement these goals, including but not limited to zoning bylaws and subdivision regulations.

PROPOSED LAND USE

The NRPC has divided the region into several proposed land use planning areas to encourage the conservation of valued resources and a development pattern that will maintain the character and quality of life that is important to this region. These planning areas are illustrated in Map 14 and include Agricultural Resource Planning Areas, Forest and Conservation Planning Areas, Rural Land Planning Areas, Growth Planning Areas and Sub-Regional Growth Planning Areas. In addition, the NRPC has identified villages, hamlets and transitional growth planning areas. It is important to note that planning areas designated in this plan are regional planning tools, not regulatory zoning districts. When reviewing land uses for conformance with this plan, emphasis will be placed not on whether the use is located entirely within or just outside a particular area, but on the impact the land use will have on underlying resources and how the use will affect the intent and function of the particular land use planning area.

MAP 14: Proposed Land Use



SOURCE: *Vermont Agency of Natural Resources and NRPC Collected Data*

Land Use Planning Areas

Agricultural Resource Planning Areas: Agricultural Resource Planning Areas represent the best farmland in the region and shall be given the highest level of support for their continued use as active agricultural lands. Nearly 39% of the region is included in this category, reflecting the significant acreage of prime agricultural soils, the large number of farms in the Northwest and the importance of agriculture in the region's economy. Strategies that support the long-term protection of these lands from conversion to non- agricultural use are supported by NRPC. Where development does occur, it shall be located to minimize impact to primary agricultural soils. Recognizing the importance of farming to the region's character and economy, and also recognizing that existing farms may occupy some good farming lands that would otherwise be categorized as Forest and Conservation Planning Area, Agricultural Resource Planning Areas were given precedence over the Forest and Conservation designation. For example, if a particular area has characteristics of both an Agricultural Resource Planning Area and a Forest and Conservation Planning Area, the area would be characterized as the former.

Forest and Conservation Planning Areas: Forest and Conservation Planning Areas, which constitute 25% of the region, include a variety of land types that are well suited for tree growth and habitat and generally not suitable for development. Land in this category usually should not be developed in order to protect the forest resource value of the lands. Development that does occur shall be limited due to natural resource constraints,

such as wetlands and floodplains, wildlife and scenic values in the case of uplands, or an overall low suitability for development based on soils, distance from roads and other factors.

Ridgelines and hilltops contribute significantly to the beauty of the region. Development in these areas can damage characteristic and picturesque viewsheds that contribute to the region's beauty. The use of these lands shall be limited to a mix of forest and conservation purposes including maple syrup production, logging, appropriate agricultural operations, wildlife habitat and recreation. These lands shall be protected from fragmentation and conversion.

Rural Land Planning Areas: A relatively small amount of the region's growth is anticipated in Rural Land Planning Areas, which occupy 16% of the region. Cluster development—such as planned unit developments and other methods that conserve open space, common land and/or farmland useful for its intended purpose—is encouraged in these areas, particularly in situations where developers plan to build numerous units. Methods of creating useful open space, common land or farmland include but are not limited to ensuring the land is appropriate and of value for the intended use, locating it adjacent to other open spaces in similar use, and requiring a management plan. Based upon historical development trends NRPC expects that much of the growth in rural areas will involve single-family homes. Areas included in this category require particularly careful planning to ensure that strip development and sprawl are minimized and the goals for the other land use areas are promoted.

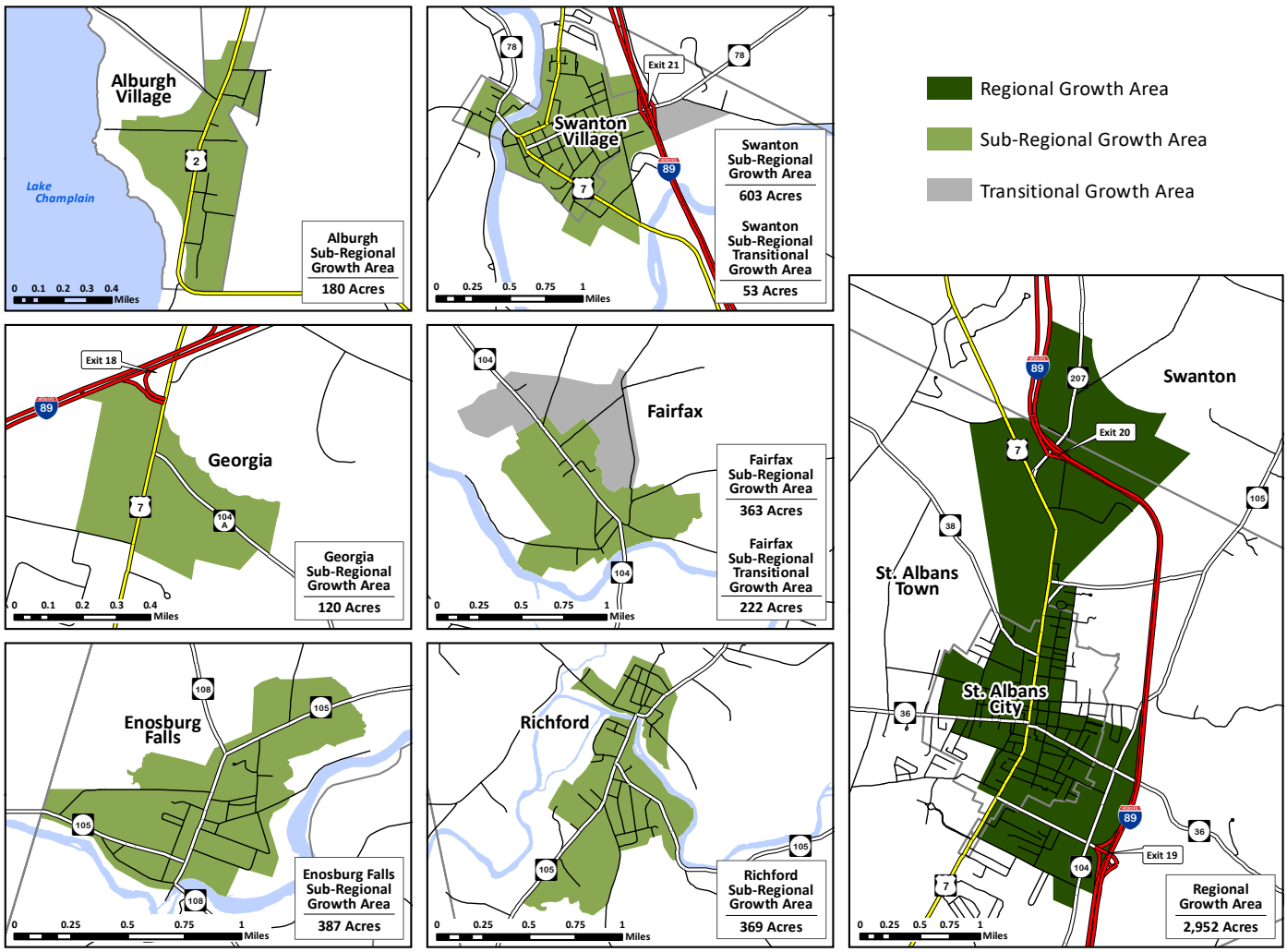
Smart Growth Principles

The term "smart growth principles" (as enacted into law under 24 V.S.A. § 2791) means growth that:

- Maintains the historic development pattern of compact village and urban centers separated by rural countryside
- Develops compact mixed-use centers at a scale appropriate for the community and the region
- Enables choices in modes of transportation
- Protects the state's important environmental, natural and historic features, including natural areas, water quality, scenic resources and historic sites and districts
- Serves to strengthen agricultural and forest industries and minimizes conflicts of development with these industries
- Balances growth with the availability of economic and efficient public utilities and services
- Supports a diversity of viable businesses in downtowns and villages
- Provides for housing that meets the needs of diverse social and income groups in each community
- Reflects a settlement pattern that, at full buildout, is not characterized by:
  - ◊ Scattered development located outside of compact urban and village centers that is excessively land consumptive
  - ◊ Development that limits transportation options, especially for pedestrians
  - ◊ The fragmentation of farmland and forestland
  - ◊ Development that is not serviced by municipal infrastructure or that requires the extension of municipal infrastructure across undeveloped lands in a manner that would extend service to lands located outside compact village and urban centers
  - ◊ Linear development along well-traveled roads and highways that lacks depth, as measured from the highway

Regional Growth Areas and Sub-Regional Growth Areas: This Regional Plan recognizes one regional growth area and six sub-regional growth areas in the Northwest region (Map 15). The six growth areas are located within municipalities that have expressed the desire and planned for managed, high-density, mixed-use development and the infrastructure to support it. St. Albans City and areas in St. Albans Town by exits 19 and 20 of Interstate 89 constitute the regional growth center. The five sub-regional growth centers include areas within the three incorporated villages (i.e., Swanton, Enosburg Falls and Alburgh), the village areas of Richford and Fairfax and a planned growth area in Georgia. Growth areas were chosen for their capacity to accommodate greater levels of economic and social activity than other areas in the region. Only the St. Albans growth area was found to have the scale and capacity to serve the entire region. The sub-regional growth areas are expected to serve as economic and cultural hubs for surrounding towns.

MAP 15: Designated Regional and Sub-Regional Growth Areas



SOURCE: *NRPC Collected Data*

In Focus - Northwest Regional Growth Area: The Northwest Regional Growth Area consists of the historic downtown area of St. Albans City at its center, along with a south wing, a north wing and a northeast wing—all with varied land uses and characteristics (Map 16).

St. Albans City, with its designated downtown and historic district, provides a traditional mixed-use "Main Street" setting of small storefronts with residential apartments above. In addition, Taylor Park, Welden Theater and City Hall are among the other municipal, cultural and service amenities. Surrounding the city center are networks of high-density residential neighborhoods and areas of industrial and commercial land uses. The city has a state-designated downtown and a state- designated growth center.

The **South Wing** consists of high-density residential neighborhoods south of the SASH Highway (connection from I-89 to Route 7) and commercial uses on either side of Interstate 89's exit 19. There is great

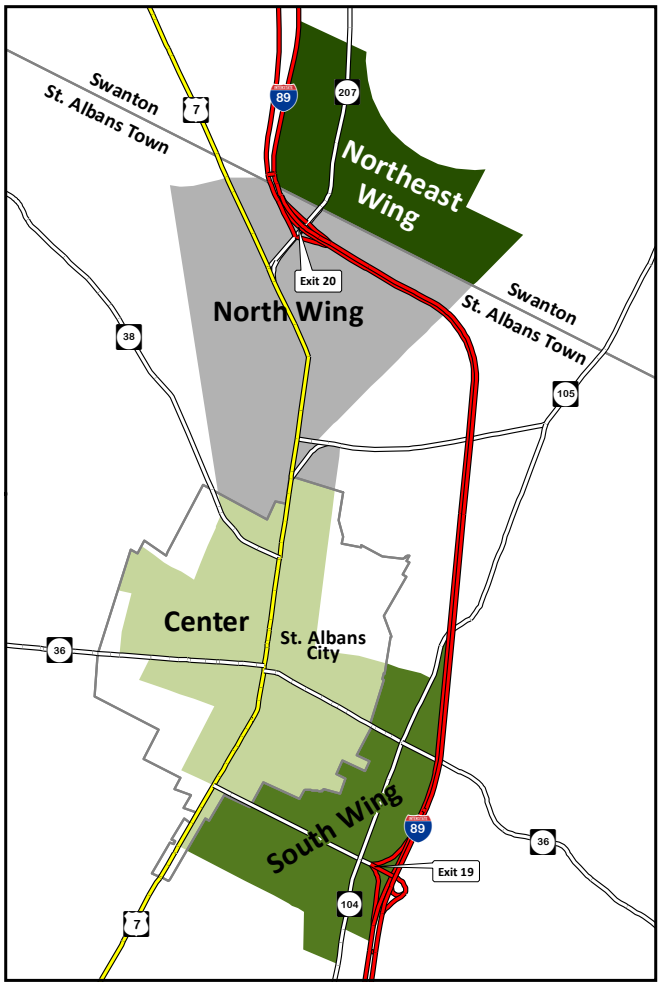
Shopfronts in St. Albans City
The heart of the Regional Growth Center

potential for further development in this wing of the growth center, but further development cannot continue any existing patterns of strip development. Although exit 19 creates demand for automobile-oriented development, it is important that future development link with both existing and future residential neighborhoods through pedestrian-accessible sidewalks or paths and that public transportation is provided.

The **North Wing** has experienced the bulk of recent development in the Northwest Regional Growth Area; however, most of it has been automobile-oriented commercial development in the form of strip malls, fast-food restaurants, car dealerships and banks. Like the south wing, the north wing is influenced by an interstate exit (i.e., exit 20). Future development in the north wing shall not continue the existing patterns of strip development and shall instead consist of infill development and/or projects that help promote the characteristics of growth centers noted earlier in this section. Pedestrian accessibility, public transportation, mixed uses (residential and commercial uses) and compact high-density design are necessary to further growth area goals.

The **Northeast Wing** in Swanton is the newest addition to the Northwest Regional Growth Area, and it is largely undeveloped. The Town of Swanton is committed to planner-driven development, creating a foundation for this area to serve as an example of smart growth planning and development for the region. The NRPC is dedicated to working with Swanton in planning for a mix of pedestrian-oriented mixed- use development (including commercial, residential and civic uses), a network of high-density residential neighborhoods and green spaces for recreational uses. The NRPC strongly encourages Swanton to use a master plan to guide growth and to follow-through on strategies to secure sewer and water infrastructure. All new development shall connect to sewer and water infrastructure or otherwise provide infrastructure necessary to support development that meets smart growth principles and growth area characteristics described in this plan. In addition, due to the risk of strip development along Route 207 and Bushey Road, the NRPC strongly encourages development that adds depth through a network of interconnected public streets.

MAP 16: Northwest Regional Growth Area



SOURCE: *NRPC Collected Data*

Other Planning Areas

Villages and Hamlets: There are many historic village centers and hamlets in the region where residential and modest commercial development is concentrated, but where infrastructure is generally limited (some, but not all, hamlets are shown on Map 13). The NRPC supports the continuation of historic village and hamlet centers through local planning and village center designation efforts that preserve their traditional character and if supported by local planning, to grow as concentrated settlements.

Transitional Growth Areas: Given the rate of growth in the region, some areas are certain to experience—due to geographic location or local planning—increased rates of local growth. To ensure well-planned and well-financed infrastructure and foster smart growth principles, it is of utmost importance for municipalities to plan for development in advance, rather than planning around established development after the fact. The NRPC will help municipalities with planning for these areas. Transitional growth areas have been identified north of the Fairfax sub- regional growth area and east of the Swanton sub-regional growth area.

Industrial Areas: The NRPC supports industrial parks, districts and areas that encourage economic expansion and high-wage businesses to locate in the region without adversely affecting neighboring land uses. Industrial parks and districts should be carefully planned to ensure access and connectivity. This can be achieved through public transportation service and walkability - both within the district in addition to making connections from the district to adjacent pedestrian and bicycle infrastructure. Thoughtful site planning can both ensure that off-site impacts, such as noise, are mitigated through buffers, landscaping and other design considerations while at the same time ensuring good quality of life and integration with the local community.

GOALS AND POLICIES

1 GOAL — Ensure the region continues to be characterized by compact villages and growth centers separated by rural countryside and the working landscape.

a. Support infill and redevelopment of designated growth centers or existing strip development areas over new commercial strip development.
b. Locate intensive residential development primarily in areas within or related to state or regionally designated growth areas and support redevelopment and infill opportunities.
c. Ensure that residential development outside of growth centers, downtowns, villages and hamlets is clustered or otherwise designed to work with the landscape in terms of energy efficiency, protection of ecologically sensitive areas and conservation of farmland and agricultural soils.
d. Ensure that public investments—including public facilities and the construction or expansion of infrastructure—will promote expansion in growth areas designated in this plan and will not encourage the development and/or fragmentation of farmlands or other resource areas.
e. Ensure that the scale, siting, design and management of new development respect the existing landscape and the character of the area's built environment.

2 GOAL — Maintain healthy and diverse forest and conservation areas as well as a strong working landscape, including agriculture and forestry.

a. Ensure that development respects the physical limitations of the site and avoids negative impacts on the natural and cultural features of the landscape.
b. Ensure that development in rural, forestry and conservation areas will not diminish the viability of agricultural or woodland operations, or fragment high-priority forest and connectivity blocks and other large contiguous tracts of woodland or wildlife habitat/ corridors.
c. Limit the loss of prime and primary agricultural soils and active farmland to the greatest degree possible, and mitigate it whenever the loss cannot be prevented.
d. Maintain all right-to-farm protections for agricultural operations that have acceptable agricultural practices.
e. Ensure that development in designated conservation areas on the proposed land use map will be small scale and will not diminish the environmental value of the lands. Only allow development farther than

1,000' from road centerlines in conservation areas if it advances conservation goals.

f. Encourage the development of local businesses that add value to agricultural and forest products grown in Vermont and site them in locations that minimize conflicts with neighboring land uses.
g. Support agricultural, forest and conservation land protection strategies including but not limited to transfer of development rights, purchase of development rights, fee-simple purchase of agricultural lands and use of value tax assessment; these protection strategies can allow for compatible uses that support other key policy goals.
h. Support initiatives that assist agricultural businesses with adapting to the impacts of climate change.

3 GOAL

Target future economic growth primarily in the region's existing and planned growth areas.

a. Locate industrial development first in existing industrial areas. Ensure that industrial growth outside of existing industrial areas is located near or within growth areas designated in the municipal and regional plan, on property with sufficient infrastructure.
b. Ensure that mixed-use development occurs at significantly higher densities and on a larger scale in planned growth areas than in the surrounding region.
c. Scale retail and commercial developments to primarily serve the market of the regional, sub-regional or local growth center.

DISASTER RESILIENCE

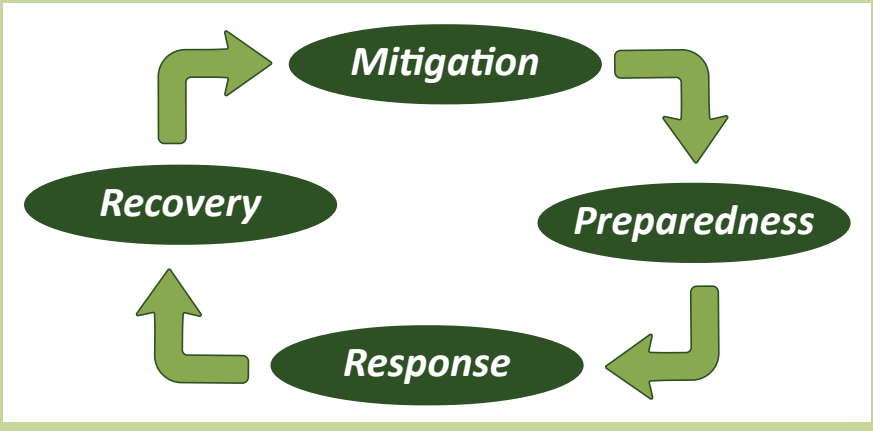
GOALS

1. **Reduce the loss of life, injury, and economic harm resulting from all-hazards events and climate change and focus efforts on those who are most vulnerable to impacts.**
2. **Reduce infrastructure damage and the financial losses incurred by municipal, residential, industrial, agricultural and commercial establishments due to disasters.**
3. **Ensure the region's communities are resilient to all-hazards events; include hazard mitigation planning, such as flood resiliency, in the municipal planning process.**

BACKGROUND

Resiliency is the ability of a community to respond and adapt to natural and human-caused disasters. Vermont Statutes require that regional plans include a flood resilience element. This plan incorporates a broader all-hazards resilience element instead of a flood resilience element due to the broad impact of disasters of all types on our region.

FIGURE 4:
Four Phases of Emergency Management



The impact of expected, but unpredictable, natural and human-caused disasters can be reduced through community planning. The purpose of this section is to provide communities in the Northwest region with all- hazards disaster resilience planning goals and policies that will help mitigate risks to public and private investments by protecting flood-prone and other vulnerable areas through municipal land use plans, municipal ordinances and capital improvement plans. The four phases of emergency management are mitigation, preparedness, response and recovery (Figure 4). In addition, economic resilience to disasters and to the impacts of Climate Change are important factors to incorporate into NRPC's future planning efforts.

The emergence of the Coronavirus disease (COVID-19) created a global pandemic which greatly impacted Vermont communities beginning in 2020. COVID-19 is an infectious disease caused by the SARS-CoV-2 virus. The pandemic affected all sectors of society including economic, public health and education systems. Federal, state and local governments responded with innovative solutions to limit disruptions and continue operations so that citizens could return to daily life. The efforts also sought to mitigate impacts to local economies by allowing essential services to continue to operate. There are now better systems in place to cope with

a future pandemic including public health surveillance, monitoring and response, improved food systems security, expanded broadband services in unserved and underserved areas and continuity of operations for governments.

Scientists are concerned that the changing climate could increase future events similar to the COVID-19 pandemic. Moreover, climate change is causing major shifts in weather patterns, sea levels, animal habitats, and temperatures. As these climate extremes continue to increase in severity and variability, many of the dangers discussed in the chapters are at risk of increasing.

Mitigation

Hazard mitigation is any sustained action that reduces or eliminates long-term risk to people and property from natural and human-caused hazards and their effects. Based on the results of previous mitigation efforts, federal and state agencies have come to recognize that it is less expensive to prevent disasters than to repair damage after a disaster has struck. Communities have opportunities to identify and implement disaster resiliency goals and policies through their municipal land use planning process, land use regulations and local hazard mitigation plans. Hazards cannot be eliminated, but it is possible to determine what the most likely hazards are, ascertain where their impacts would be most severe and then identify local actions that can be taken to reduce their severity.

Preparedness

This phase includes developing plans for what to do, where to go and who to call for help before an event occurs—actions that improve the chances of successfully dealing with an emergency either individually or as a community. Franklin and Grand Isle Counties annually update their Emergency Operations Plans and provide the adopted plans to the NRPC and the Vermont Division of Emergency Management. In addition, local and regional public safety officials regularly participate in simulated disaster exercises.

Response

Public safety and well-being during an emergency depend on how prepared communities and individuals are to respond to a crisis. By being able to act responsibly and safely, communities and individuals will be better protected.

The Franklin County International Firefighters Association, the Grand Isle County Mutual Aid Association and Local Emergency Planning Committee Districts 4 and 13 serve their member municipalities throughout the region by offering planning, training and exercising for all-hazards events.

Emergency service organizations and municipalities have mutual aid agreements in place to assist one another during emergency responses. There are two fire mutual aid associations in the region: the Franklin County International Firefighters Association and the Grand Isle County Mutual Aid Association. Each association is composed of municipal first response and rescue agencies within each county. There is a mutual aid agreement between the municipalities of each county and between each association to assist one another in times of crisis, and it offers agreed-upon rates of reimbursement for expended resources.

Recovery

After the immediate danger of an emergency is over, continued public safety and well-being will depend on the community's ability to cope with getting life back to normal. During the recovery period, communities must be able to manage disaster-related financial burdens. At this time, communities should also consider steps to take that would mitigate the effects of future similar disasters.

The 2019 Halloween Storm, 2018 Missisquoi River flood, 2011 Lake Champlain flood, Tropical Storm Irene, and ice storms in 1998 and 2013 have increased public recognition of the need to link regional and municipal

land use planning, mitigation planning and capital improvement planning. Communities can improve their resiliency by following a comprehensive planning process that considers impacts from natural and human-made disasters.

IDENTIFYING HAZARDS AND ASSESSING VULNERABILITY

The NRPC used a FEMA approved Hazard Identification Risk Assessment (HIRA) process to rank hazard types in the region (Table 6). Additionally, Vermont Agency of Transportation's Resilience Planning Tool is used to supplement the HIRA. Hazards that scored High in the ranking system are considered the worst threat in terms of their probability of occurrence and their impact on the community. The risk assessment produces a Relative Risk score using a qualitative process to compile estimates of the likely frequency of occurrence, the extent of the community impact and the likely consequences in terms of public safety, property damage, economic impacts and harm to environmental resources. The resulting analysis provides a Relative Risk score for each hazard as High, Moderate or Low. This information is summarized below and can be found in more detail within local hazard mitigation plans for communities as well as the Franklin & Grand Isle All Hazards Assessment prepared by the NRPC.

TABLE 6: Relative Risk

HAZARD	RELATIVE RISK
Flood, Fluvial Erosion	High
Severe Winter Storm, Extreme Cold, Ice Storm	High
Hazardous Materials	High
Structure Fire	High
Severe Wind, Tropical Storm, Hurricane	Moderate
Severe Thunderstorms (hail, high winds, lightning)	Moderate
Landslides	Moderate
Terrorism	Moderate
Ice Jam	Low
Tornado	Low
Drought	Low
Earthquake	Low
Major Fire -Wildland	Low
Pest Infestation	Low

SOURCE: *NRPC Hazard Identification Risk*

Because of limited roadway access points and the geography of the Islands, Grand Isle County has a unique vulnerability to being isolated as a result of natural or man-made disasters. Grand Isle Mutual Aid, with support from NRPC, meets regularly to coordinate among first responders in the county.

It should be noted that the region's overall risk rating is low (380 out of a possible high of 1,200 points in the Risk Assessment tool).

Flooding

The greatest risk to the region and the state is from flooding in the form of inundation and fluvial erosion. The region is most prone to flooding during the spring and summer months. During spring, partially frozen soils, melting snow and springtime rains produce an annual spring flood cycle. During summer, localized storm events produce flood conditions as soils become quickly saturated by high volumes of rain. Recent storms have caused significant damage to local transportation infrastructure, typically due to inappropriately sized culverts and other diversion systems. Erosion along stream banks from flooding often affects the roads, facilities, residences and utilities located nearby. Localized flash flooding is becoming more common as large rainstorms impact small areas during brief periods. Floods can be worsened by ice or debris dams and the failure of infrastructure (especially culverts), private dams and beaver dams.

In the region, there is a history of flooding and fluvial erosion along the Missisquoi River, Trout River, Tyler Branch, Black Creek, Rock River and Pike River, and along the shores of Lake Champlain as well as many brooks. Studies have shown that damaging floods are occurring in areas outside of mapped special flood hazard areas. The greatest threat to flooding is caused by changes in land use and increased development near riverbanks and in floodplain areas. Increased development encroachment on rivers and streams leads to greater volumes

of stormwater runoff and greater erosion of stream banks. Improperly built stormwater infrastructure also disrupt stormwater flow and can overload culverts with additional stormwater. Federal Major Disaster Declarations since 1995 due to flooding in the region are listed in Table 7.

The Vermont Agency of Natural Resources (ANR) has adopted river corridor protection, an avoidance strategy to restore and protect the natural stability of rivers and minimize flood damage. River corridor protection is recognized as a critical state wide goal in statute. Municipalities protecting River Corridors are eligible for incentives including increased post-disaster funding.

TABLE 7: Federal Disaster Declarations in the Region

	Franklin County	Grand Isle County
DR-1184 (July 15 – 17, 1997)	Severe Storms and Flooding	Not affected
DR-1201 (Jan. 6 – 16, 1998)	Severe Winter Storm / Ice Storm	Severe Winter Storm / Ice Storm
DR-1228 (June 17 – Aug. 17, 1998)	Severe Storms and Flooding	Not affected
DR-3157 (Mar. 5 – 7, 2001)	Not affected	Severe Winter Storm
DR-1428 (June 5 – June 13, 2002)	Not affected	Severe Storms, Tornado and Flooding
DR-1559 (Aug. 12 – Sept. 12, 2004)	Severe Storms and Flooding	Not affected
DR-1778 (June 14 – 17, 2008)	Severe Storms and Flooding	Severe Storms and Flood
DR-1784 (July 18, 2008)	Severe Storms and Flooding	Not affected
DR-1951 (Dec. 1 – 5, 2010)	Severe Winter Storms and Flooding	Not affected
DR-1995 (Apr. 23 – May 9, 2011) *Individual Assistance Declaration	Severe Storms and Flooding	Severe Storms and Flooding
DR-4043 (Apr. 23 – May 9, 2011)	Severe Storms and Flooding	Severe Storms and Flooding
DR-4022 (Aug. 27 – Sept. 2, 2011)	Severe Storms and Flooding	Severe Storms and Flooding
FEMA 338 EM (Aug. 29, 2011)	Tropical Storm Irene	Tropical Storm Irene
DR-4178 (Apr. 15 – 18, 2014)	Severe Storms and Flooding	Not affected
DR-4207 (Dec. 9 – 12, 2014)	Severe Winter Storm	Not affected
DR-4356 (Oct. 29 – 30, 2017)	Severe Storms and Flooding	Severe Storms and Flooding
DR-4380 (May 4 – 5, 2018)	Not affected	Severe Storms and Flooding
DR-4474 (Oct. 31 – Nov. 1, 2019)	Severe Storms and Flooding	Not affected
Anticipate (Dec. 23 – 25, 2022)	Severe Winds	Severe Winds

SOURCE: *FEMA*

TABLE 8: Structures Identified within Flood Zones 2023 (approximate)

COUNTY	Total Structures	Camp	Mobile Home	Multi Family	Other Residential	Single Family	Commercial	Government	House of Worship	Industrial	Public	Utility	Other/Unknown
Franklin County	1,128	441	59	35	5	413	64	2	2	2	11	10	84
Grand Isle County	536	262	39	1	4	177	13	0	1	0	1	2	36

SOURCE: *Flood Insurance Rate Maps & E911 Data*

Severe Winter Storms, Extreme Cold, Ice Storms

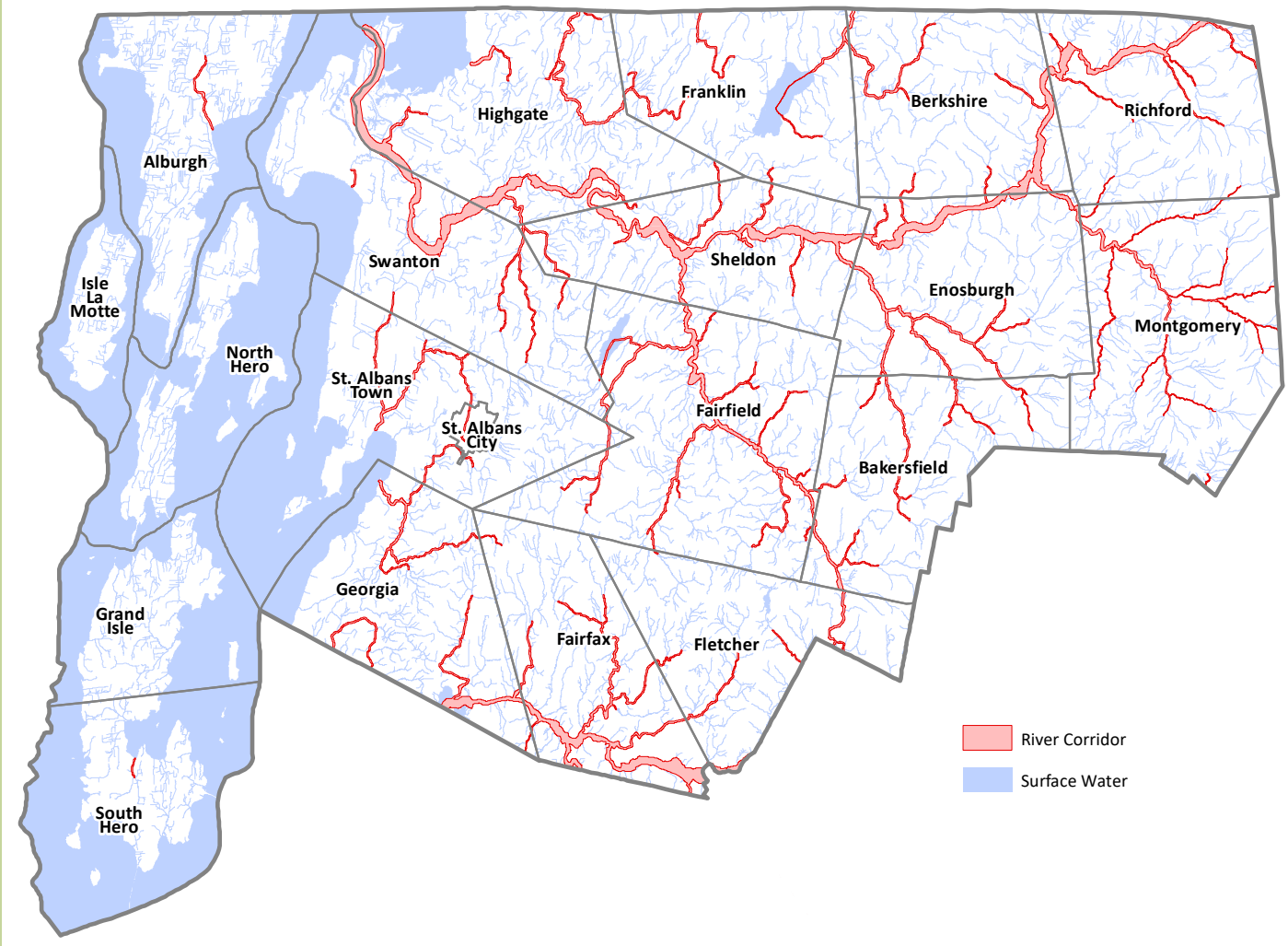
The second greatest risk to the region is from severe winter weather including winter storms, ice storms and extreme cold. In northwestern Vermont, a severe winter storm can last for several days and can be accompanied by strong winds, creating blizzard conditions with blinding wind-driven snow, substantial drifting

TABLE 9: Structures Identified within River Corridors 2023 (approximate)

COUNTY	Total Structures	Camp	Mobile Home	Multi Family	Other Residential	Single Family	Commercial	Government	House of Worship	Industrial	Public	Utility	Other/Unknown
Franklin County	645	21	63	59	3	363	48	5	1	6	6	17	53
Grand Isle County	1	0	0	0	1	0	0	0	0	0	0	0	0

SOURCE: *Vermont Agency of Natural Resources & E911 Data*

MAP 17: River Corridors



SOURCE: *Vermont Agency of Natural Resources*

and dangerous wind chill. Strong winds, accumulations of ice and heavy snow can knock down trees, utility poles, communication towers and power lines. Communications and power can be disrupted for days while utility companies work to repair the extensive damage. People have been trapped at home for up to two weeks without utilities or other services. Some of the worst winter storms in the region have left ice accumulations of 2 to 4" (January 1998 and December 9, 2014) as well as wind speeds up to 50 mph (December 23, 2022). On the evening of December 22 through the evening of December 23, Vermont was hit by a winter storm "bomb cyclone", leaving nearly 100,000 without power and wind gusts approaching 75 mph.

Hazardous Materials (Fixed Site and Transport)

The third greatest risk to the region is from a hazardous materials incident. Local industry, natural gas and fuel oil distributors, and agricultural operations present the opportunity for a hazardous materials incident either at a fixed site or during transport anywhere within the region. Areas at risk for a stationary or on-site hazardous materials incident include the locations of hazardous materials manufacturing, processing or storage facilities, as well as all hazardous waste treatment, storage and disposal sites. Areas at risk for a hazardous materials transport incident include the region's transportation corridors and adjacent population centers. The Highgate Springs Border Station in Franklin County is a heavily traveled port of entry that is served by Interstate 89 (with connections from Routes 2, 78 and 105) and receives a high volume of freight trucks containing hazardous materials.

There are two active rail lines in the region that move freight: the New England Central Railroad (NECR) and the Northern Vermont Railroad (NVRR). The threat of a derailment and/or hazardous materials spill exists along every rail line in operation, although mandated rail yard speeds greatly reduce the probability of a derailment resulting in a spill.

Any incident that occurs within the region requires an initial response conducted by the local fire departments. The nearest hazardous materials (HazMat) response vehicle is located at the IBM facility in Essex, Vermont. HazMat decontamination trailers are stationed in Swanton Village, Essex Junction and South Hero.

Structure Fire

The Vermont Fire Marshall's Report notes that Vermont has a high per-capita death rate from fire compared to other states, and older adults have a greater risk of fire death than the overall population. Vermont experiences an average of 8 fire deaths a year. Fire safety officials, fire departments and other safety advocates have all contributed to the overall reduction in fire deaths over time. Although, the National and State fire death rates have decreased, the elderly and young children are still the most vulnerable populations. Older adults have a greater risk of fire death than the overall population. In the five-year period from 2017 to 2021, 31% of Vermont's fire deaths have been seniors over the age of 65. This is a drop from 48% during the five-year period (2012-2016). Although fire causes vary, there are several common contributing factors such as poverty, climate, education, code enforcement and demographics.

According to the State Fire Marshal in 2021, cooking fires and heating appliances continue to be the leading causes of structure fires in Vermont. Unattended cooking was the leading cause of cooking fires and casualties. Almost one third of the people killed by cooking fires were asleep when the fire started. More than half of the non-fatal injuries occurred when people tried to control the fire themselves. A lead contributing factor to home heating fires is failure to clean creosote from solid-fueled heating equipment chimneys. Vermont ranks first in the nation for its per-capita use of wood for heat, with at least one in six Vermont households use wood products as their primary heating source. The long cold Vermont winters put added stress on heating systems. Furthermore, fluctuating fuel prices can force people to use alternative heating sources that may not be safe. An improperly installed and maintained heating appliance is dangerous and can result in carbon monoxide poisoning or be the source of a fire.

Vermont's housing stock is dominated by older, owner-occupied homes. It is the second oldest in the nation behind Maine. About 44% of the housing stock is comprised of year- round, owner-occupied homes built before 1950. A third of all rental and owned homes in the state were built before 1950. (State Fire Marshal, 2021)

A fire in a downtown can be devastating. In 1997, a fire engulfed the City Feed and Lumber building and warehouse in St. Albans City. The fire also threatened the neighboring Century Arms building, a local weapons manufacturer, and the Fonda Container building. In 2005, a fire destroyed much of the historic downtown block in Enosburg Falls. For that fire, 11 fire departments responded through mutual aid plus one department from Sutton, Quebec. On December 2, 2022, a series of structure fires occurred in the St. Albans City that were pushed by high winds. One 18,000 sq ft warehouse, a vacant house and barn were destroyed with over $600,000 in damages.

Severe Thunderstorms (Lightning/High Winds/Hail)

Thunderstorms are the most frequent natural hazard event occurring in Vermont. Thunderstorms and their associated hazards can occur anywhere in the region at any time of the year; however, spring and summer are the most common times for severe thunderstorms. Supercell thunderstorms that produce tornadoes can be the most destructive and cause widespread damage to land, crops and property. Severe thunderstorms can produce hail that is damaging to crops, structures and vehicles as well as lightning that can damage infrastructure, plants and property, and can start forest fires. Flash floods are likely to occur after a severe thunderstorm that produces a large amount of precipitation over a short duration. Mountainous areas in the region are particularly prone to flash flooding due to the steep terrain. According to the EPA as well as The Center for Climate Sciences at NASA's Jet Propulsion Laboratory, it's a relatively well-accepted fact within the science community that as global temperatures increase, extreme precipitation and including more intense short duration storms will very likely increase as well.

Severe Winds, Tropical Storms, Hurricanes

Severe winds are a hazardous threat to the region and most commonly accompany other storm events. They typically occur as strong frontal systems move across the Adirondacks and southern Canada from the west. The region is far inland and unlikely to receive a direct hit from a hurricane; however, severe winds from tropical storms have occurred as weakened storms originating in the Atlantic Ocean track near the region (Table 10).

Power lines and trees are most vulnerable to wind. Power outages can result in significant loss of business, high repair costs and threats to public safety.

TABLE 10: Tropical Storm Impact

NAME	DATE
Unnamed	November 3, 1927
Andrew	August 1990
Floyd	September 1999
Hannah	September 14-15, 2007
Isidore	September 27, 2007
Katrina	August 30, 2005
Irene	August 28, 2011

Mobile home parks are uniquely vulnerable to flooding resulting from tropical storms. This increased risk is related to siting of park communities in flood hazard areas, and limitations of the structures themselves. Income, disability status and age can make park residents more vulnerable to the impacts of disasters with fewer resources for recovery. An assessment completed in 2012 by researchers at the University of Vermont found that one-fifth of Vermont's 247 mobile home parks have at least one lot that is located within a flood hazard area, and nearly 12% of all mobile home park lots are located in flood hazard areas.

Landslides

Vermont has a relatively high incidence of landslides partially due to soils. Clay "hard pan" soils reside underneath sand; water that infiltrates the sand rests on top of the clay, resulting in a sheering effect that

causes the sand and topsoil to slide off the clay. This type of disaster rarely results in injury, but it can destabilize roads and threaten structures. Landslides can be caused by seismic events, manmade or natural changes to groundwater flow, removal of vegetation, and manmade or natural undercutting of steep banks. In the region, slides along the Missisquoi River in Highgate have threatened residential properties, a cemetery, the Highgate Transfer Station, infrastructure and local roads.

Terrorism

Terrorist events are possible in the region but are considered rare. Two types of terrorism could occur: international and domestic. The region is situated along the northern border of the United States and contains several Ports of Entry into Canada. Border crossings in upstate New York at Champlain and Rouses Point connect New York to Vermont via Route 78. Lake Champlain is an open waterway between New York and Vermont that flows north into Canada as well. Interstate 89 provides easy transportation to population centers located in New York City, Boston and Washington, DC.

Domestic acts of terrorism such as a school shooting incident, bomb threats and citizen confrontations at government offices are a regional concern. Schools have prepared by implementing school crisis plans, adding security features to school buildings, and conducting drills with local law enforcement and first response agencies.

Low Risk Hazards

Ice Jams: Ice jams occur in streams and rivers when warm temperatures and heavy rain cause snow to melt rapidly, and they typically take place in sharp river bends, decreases in slope and constrictions within the stream channel as well as at confluences. The five most notable locations where ice jams occur in the region are the Lamoille River along VT 104A between Georgia and Fairfax near the Georgia High Bridge; the Missisquoi River along VT 78 west of Swanton Village; the Missisquoi River in East Highgate; the Missisquoi River along VT 105 between Enosburgh and Berkshire; and West Hill Brook at the intersection with VT 118 in Montgomery.

From 1867 to 1999, there were 753 ice jams on 74 rivers and in 127 towns in Vermont. The Lamoille and Missisquoi Rivers (both of which flow through the region) each account for nearly 10% of all statewide ice jams. These ice jams occur most often in March (44%), January (24%) and February (18%). There are 99 records of ice jams along the Missisquoi River alone. (U.S. Army Corps of Engineers Cold Regions Research and Engineering Laboratory (CRREL).

Most recently, mid-winter ice jam break ups have occurred in Swanton and Highgate in January 2020 and January 2018. These ice jams caused flooding related damages to roads and residential properties, along with evacuations. The impacts occurred mainly along N River St (VT78) and Monument Rd. In 2020, a Missisquoi River Ice Jam report issued for this stretch of river was developed by the Army Corps of Engineers and reviewed by state and local officials. The report noted that an advance mitigation measure that should be investigated further is an early warning system. This system would require engineering to include a variety of elements including but not limited to stream gages, weather forecast stations, web cameras, ice motion detectors, first hand observers, etc. The main objective of such a system would be to allow for the collection of data and information to assist emergency managers with staging a response to a probable or imminent ice jam event. As these events are becoming more frequent, residences, buildings and other infrastructure built within the floodplain will be susceptible to all flood types, including those caused by ice jams.

Wildfire: Wildfire in the region typically comes in the form of grass fires. Forest fires in the NRPC region are currently rare; however, the fuel potential for large fires exists. Grass fires occur in spring and early summer as fields are cleared of fall and winter debris. Wildfire suppression comes from the local fire department and

mutual aid organizations. Throughout the region, large tracts of forested land could be at risk during sustained dry periods. With changing weather patterns associated with climate change, wildfire risks are increasing in Vermont. The NRPC region can expect and should plan for increasing wildfire danger in the coming decades, as well as air quality impacts from fires in adjacent regions, states and Canada. Education and outreach to increase community awareness will be important.

Tornado: Tornadoes may form when strong thunderstorms track through the area. These phenomena are rare in Vermont. Environmental impacts would include felled trees, while business impacts would take the form of destroyed crops. Building damages may include destroyed windows, torn roofs and destroyed barns. Tornadoes occurred in Franklin County on June 18, 1957; June 13, 1961; August 3, 1970; and July 19, 1972.

Drought: Severe droughts are rare in occurrence and relatively brief in duration. They have affected residential and commercial water supplies and can pose a serious threat to the region—especially to agriculture-based businesses, such as commercial farms and horse boarding stables. Droughts can be a problem in late summer, when local springs and wells are reduced to minimal flows. Water tables reached an all-time low during the drought of 1988; however, recovery was fairly rapid. Weather shifts have lowered drought risks in the near future compared to historical values, but the risk of drought related to climate change will increase with the upward moving temperature trends. Warmer air temperatures will cause higher evaporation levels from water bodies, soil and vegetation. Warmer and shorter winters will result in higher precipitation as rain rather than snow, causing snow to melt earlier in the season. This result in lower snowpack that would supply water to bodies in the spring when water is needed more. As storms continue to more intense, heavy levels of rain runoff directly into surface waters. This prevents the water from having time to absorb into the ground and refill aquifers.

Earthquake: Earthquakes have been felt in the region and remain a geologic possibility. The region is situated in a moderate earthquake zone. Although earthquakes are not a frequent event, they have the potential to cause extensive damage to masonry (i.e., brick) buildings that are not reinforced as well as older bridges. FEMA used its Hazus earthquake risk analysis and loss model to conduct an analysis at the regional level in 2004. There is moderate potential for serious damage to buildings and infrastructure where losses would easily be in the millions if a high- magnitude earthquake occurred.

Pests and Invasive Species: Infestations of pests and invasive species threaten the diversity and survival of native species and can affect commercial, agricultural or recreational activities that depend upon the native species. They negatively impact the quality of wildlife habitat, create financial burdens for landowners and reduce the economic value of working forests. Sugarmakers, foresters, conservation groups, landowners and water facility operators are increasingly concerned about the economic toll of managing invasive species. In Vermont, a landowner could spend $200 to $800 per acre or more to manage invasives (Vermont Chapter of The Nature Conservancy). The maple, elm, horse chestnut, willow, ash, poplar, European mountain ash, hackberry, and hemlock have all seen population impacts from invasives. A caterpillar infestation caused more than $8 million in damage to the 2001 hay crop in Vermont, with some farmers losing up to 90% of their crop that year. Invasive plants and pests—such as Eurasian Watermilfoil and zebra mussels in Lake Champlain and the Asian Longhorned Beetle and hemlock wooly adelgid (HWA), —cause millions more in damage in Vermont annually. The arrival of the Emerald ash borer (EAB) in the region has the potential to devastate ash trees in forests and communities, the state, municipalities; foresters and conservation groups have begun mitigation efforts to prevent their spread.

Emerald Ash Borer
PHOTO CREDIT: *VT ANR*

High Heat: Over the past 50 years alone, air temperatures in Vermont have increased more than 4°F in winter and more than 2°F in summer. The risk of heat related events including heat waves will increase in Vermont, with the number of days reaching 87°F per year are expected to increase from 6 to 20 (CDC). To help prevent heat related events, municipalities in the region have begun local emergency planning efforts to reduce their vulnerability to heat, both in response to an extreme heat event and as part of longer-term planning to lessen future risk. Examples include developing shelter annexes within their local emergency management plans which includes identifying local cooling spaces and cooling shelters and resources support lists. To safeguard people's health in the short term, local municipalities can establish early warning systems, cooling areas, and raise awareness about heat related illness. Municipalities can modify roads, train tracks, and other infrastructure to use more heat-resilient materials and reduce heat absorption. Heat-waves are capable of placing high stress on electricity systems and cause possible disruptions. It is crucial that the Northwest Region continues its commitment to implement energy efficient measures throughout the network to lower the risk of these events.

CLIMATE CHANGE

Climate change refers to any significant change in the measures of climate lasting for an extended period of time. Increasing concentrations of greenhouse gases in the atmosphere are causing climate patterns to change. Predicted impacts of climate change include more variable temperatures and rainfall, extreme weather events and rising lake levels.

Vermont is often considered a "climate haven," and one of the best protected states from natural hazards and the effects of climate change. However, many of the state's greatest hazards are climate driven. Extreme weather events such as the more frequent and severe precipitation events experienced in the past decade will likely cause a greater frequency of current "100-year flood" levels (severe flood levels with a one- in-100 likelihood of occurring in any given year). Higher temperatures could lead to greater risk of wildfire or drought conditions.

Impacts to the regional economy from climate change could be significant, especially where deciduous forests (e.g., maple, beech and birch forests) are concerned. Warmer fall temperatures would mean decreased colors and decreased tourist revenues during the foliage season. Warmer temperatures and a shorter spring season could affect the quality and quantity of sap produced, impacting the maple sugaring industry.

Water quality could be diminished as well, with more frequent algae blooms in Lake Champlain, Fairfield Pond, Lake Carmi, Arrowhead Mountain Lake and Metcalf Pond. This would drive down property values for lake shore properties, decreasing the tax base of municipalities.

One of the largest impacts from Climate Change will be seen in the agricultural sector. Some of the heating effects of climate change have lengthened the grow season, created milder average temperatures, and therefore have allowed for the expansion of new species into Vermont. The changing climate is also bringing agriculture setbacks, with fruit-bearing species like apples struggling with shorter winters, and the maple syrup industry in danger due to higher temperature variations impacting the length and quality of the sugaring season. Climate models predict overall tougher growing conditions caused by higher variability in temperature and precipitation, including floods and droughts leading to potential crop damage. According to the EPA, increases in temperature will likely reduce milk yields and slow weight gain in dairy cows. The projected increases in temperature will negatively affect operations, because production costs will increase with reductions in milk and meat production.

Vermont's hunting and fishing industry will also be affected by climate change. Warmer summers and shorter winters will result in an increased growing season and create changes in the makeup of natural communities. As ecological conditions change, habitats may become less suitable for some species and more suitable for others. For example, certain climate-sensitive habitats such as the high-elevation spruce fir forest may shrink or vanish, with implications for specialized species. Some species of fish and wildlife may shift their distribution on the landscape to follow the presence of preferred or essential habitats. Species formerly uncommon in Vermont, or only present during warmer seasons, may become more commonplace. Vermont's Fish and Wildlife Department states that habitat and species management will be critical in adapting to climate change, as will the protection of conservation lands.

Residents of the region rely on Vermont's downhill ski industry for recreation and employment. A shortened ski season due to briefer winters will mean decreased earnings for seasonal ski industry workers and related tourism businesses. Many ski areas have begun to expand upon recreation opportunities, such as offering summer recreation camps, to make the resorts economically viable year-round.

DISASTER RESILIENCY

Front Line Communities

Frontline communities are those that experience the "first and worst" consequences of climate change. These communities include smaller, less resourced municipalities, low-income homeowners, renters, individuals without homes, and those who have high transportation burdens. Traditionally underserved and impacted communities must be identified, and their input solicited on the expansion and creation resiliency efforts.

Historically, the effects of climate change and local disasters ha ve not been equally distributed, and this is no different in Vermont. Hurricane Irene was a terrible disaster, and left millions of dollars of damage throughout the state. Although this was an extreme weather event, it is not isolated. The University of Vermont projects approximately 5.29 billion dollars in flood damages in the next century. (Inequities in the distribution of flood risk under floodplain restoration and climate change scenarios, Jesse D. Gourevitch, Rebecca M. Diehl, Beverley C. Wemple, Taylor H. Ricketts, January 2022).

This dollar value is more than double the expectations under current weather conditions, but the projected increased severity of storms due to climate change causes a 148% increase. The study found that low-income homeowners and mobile home owners are expected to face the largest burden from flooding, with mobile homes facing much higher risk compared to higher-value properties. 5.8% of all mobile homes are exposed to inundation during a 500-year flood event (Figure 6b). By comparison, approximately 1.9% of all multi-family and commercial properties are exposed to flooding. Although the study presents that 20% of these hazards can be alleviated by floodplain restoration, higher-value properties are expected to benefit more from this investment. If these disparities go unnoticed, flood risk could continue to be a factor to inequality in society.

A strategy to help remove some of these unequal effects is using metrics of social vulnerability, which ranks flood projects with consideration for their social vulnerability. In Vermont, the socioeconomic and demographic variables needed to create the variable are not paired with property data sets, and therefore makes it much harder to measure. It is important that social measures are taken into consideration in planning to ensure the most equitable outcome. Vermont's Municipal Vulnerability Tool, currently under development by the Vermont Climate Council, should help identify more vulnerable communities.

Infrastructure

Disaster resilience efforts seek to alter hazards by eliminating or reducing the frequency of occurrence; avert hazards by redirecting their impact by means of a structure or land treatment; adapt to hazards by modifying

structures or standards; or avoid hazards by stopping or limiting development. Disaster-resilient projects include:

- Implementing proactive land use planning that encourages development or redevelopment outside of floodplains and other flood-prone areas
- Ensuring critical facilities are safely located
- Establishing and enforcing appropriate building codes to promote safer development
- Identifying and upgrading undersized culverts
- Properly building and maintaining roads
- Flood-proofing structures
- Tying down propane/fuel tanks in flood-prone areas
- Elevating furnaces and water heaters
- Identifying and modifying high-traffic incident locations and routes
- Ensuring an adequate water supply
- Elevating structures or utilities above flood levels
- Buying out and relocating structures to less vulnerable areas
- Providing information to the public

The Local Hazard Mitigation Plan (LHMP), helps communities identify important local hazards, prioritize steps, and find access to funding. There are a wide variety of ways that communities can invest into mitigation. To help address issues, the State of Vermont has developed the Transportation Resilience Planning Tool to identify at-risk areas of Vermont infrastructure. They have set forward four groups of mitigation strategies to support broad planning and to begin an alternative analysis to reduce vulnerability. Mitigation recommendations were established based on the characteristics that contribute to vulnerability and criticality for each location. The strategies include River and Road Stabilization (fortify road embankments, bridges, or culverts to resist erosion), Conveyance of Flood Flows (Increase space for passing water, sediment, and other flood debris), Floodplain Protection and Road Relocation (Protect floodplains and river corridors from permanent infrastructure), and Improve Vegetation (Naturalize the riverbanks, and riparian buffers to provide filtration, and natural habitat). Making these changes to communities is key to mitigation, and ensuring peoples safety and health.

Economic Resiliency

Resilience pertains to how a community sustains itself through change via adaptation and occasional transformation. One aspect of economic resilience is the way a community reduces economic losses due to disasters. Investing in infrastructure to lessen the impacts of flooding and other disasters is one way communities and businesses can limit rebuilding and recovery costs. Protecting functioning river corridors and floodplains can lessen the impacts of flooding. Maintaining the local economy during times of disaster—including saving jobs and keeping businesses open—is an indicator of a healthy, strong community. The Economic Chapter provides additional information about Climate Resilience.

GOALS AND POLICIES

1 GOAL **Reduce the loss of life, injury, and economic harm resulting from all-hazards events and climate change and focus efforts on those who are most vulnerable to impacts.**

a. Leverage existing public health infrastructure to build climate resilience and engage and serve front line communities that are most vulnerable.
b. Ensure that municipalities identify emergency management directors and emergency management coordinators who are qualified to fulfill the duties as required under Title 20 V.S.A. § 6.

c. Ensure that municipal and regional response plans are in place for large events including community events such as fairs, festivals and sporting events.
d. Ensure that all municipalities and major employers have flood emergency preparedness, all-hazards preparedness and response plans in place that include a focus on those who are most vulnerable to impacts.
e. Except in growth areas designated in local and regional plans, discourage new development in identified flood hazard, fluvial erosion and river corridor protection areas. If new development is to be built, it must not exacerbate flooding and fluvial erosion.
f. Support local volunteer efforts and mutual aid agreements during response and recovery efforts.
g. Utilize Vermont's new Municipal Vulnerability Tool to identify key communities or parts of communities that need additional support to plan for the impacts of climate change.

2 GOAL

Reduce infrastructure damage and the financial losses incurred by municipal, residential, industrial, agricultural and commercial establishments due to disasters.

a. Support community projects and grant applications that seek to reduce losses from all-hazards events through programs to elevate, relocate or retrofit buildings and infrastructure within flood-prone areas, prioritizing people or communities at greatest risk.
b. Consider conservation of open space by acquisition of repetitive loss structures.
c. Identify sites that have limited to zero risk of natural hazards for potential future residential, commercial and industrial development activities.
d. Promote good construction practices and enforce effective building codes and local ordinances to eliminate structural problems during hazard events.
e. Ensure facilities such as schools, daycare providers, government, public utilities and public safety facilities are not located in areas identified as being at high risk for natural or manmade disasters.

3 GOAL

Ensure the region's communities are resilient to all-hazards events; include hazard mitigation planning, and climate resiliency, in the municipal planning process.

a. Recognize the connections between land use, stormwater, road design and maintenance as well as how they might be affected by disasters and climate change, and incorporate mitigation into site design and infrastructure planning.
b. Ensure that resiliency measures are compatible with natural features, including floodplains, river corridors, land adjacent to streams, wetlands, and upland forests; historic resources; the character of neighborhoods; and the capacity of the community to implement them.
c. Encourage communities to identify vulnerable areas with known hazards and consider impacts of climate change when planning for future land development.
d. Support the municipal adoption of all-hazards resilience plans (24 V.S.A. Section 4382) and river corridor, flood plain and buffer bylaws.
e. Evaluate land use restrictions within designated flood zones such as no-build zones and prohibition or tie down of buoyant hazardous materials storage tanks.
f. Ensure communities remain in good standing with the National Flood Insurance Program.
g. Protect and restore floodplains and upland forested areas that attenuate and moderate flooding and fluvial erosion.

INFRASTRUCTURE: WATER SUPPLY, WASTEWATER, STORMWATER AND SOLID WASTE

GOALS

1. **The water supply for the region will not be contaminated, depleted or degraded, and there will be sufficient quantity to support existing and future residential, commercial and industrial needs.**
2. **Residents, communities and businesses will have access to solid waste disposal, wastewater treatment systems and stormwater treatment methods that are cost-effective and environmentally sound.**

WATER SUPPLY

Residents of and businesses in Franklin and Grand Isle Counties access drinking water from a variety of sources. Some of the sources are referred to as public even if they are not public in the traditional sense[1], while the majority are private and small. Map 18 illustrates the service areas of larger public water and sewer systems in Franklin and Grand Isle counties. There are 30 public water systems in the region drawing water from 45 different source points. Lake Champlain is the source for all public water systems in Grand Isle County, and supplies the major portion of water to the St. Albans City system, the largest public water system in the region. Other systems in the region draw from groundwater or in some cases from specific streams. Most if not all the public water systems in the region are operating below 90% capacity, the threshold at which communities would need to begin planning for expansion. (Occasional shortages are experienced in some smaller systems reliant on groundwater.)

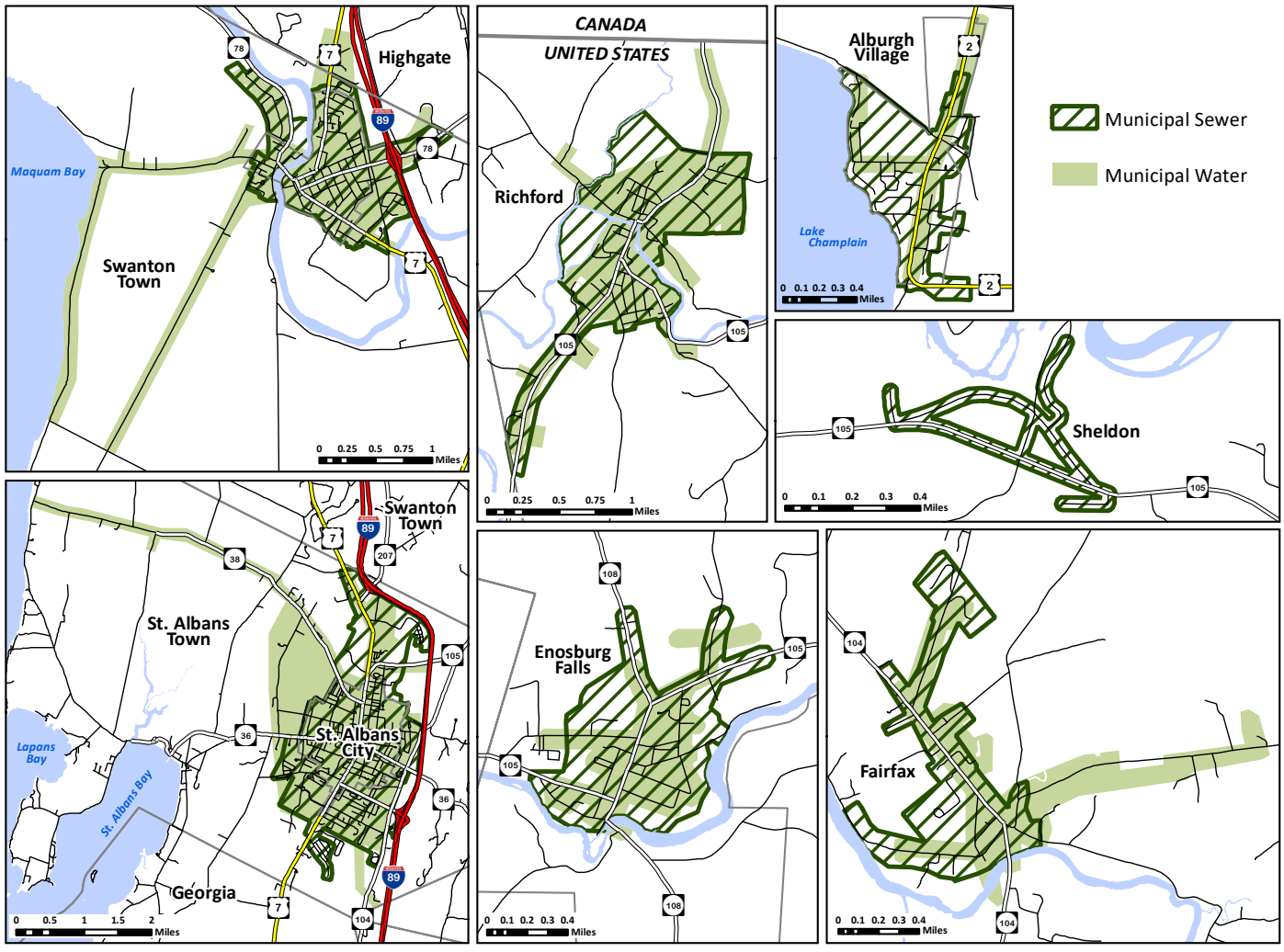
Public water supplies, whether from ground or surface waters, are challenging resources to manage and protect. Take groundwater, for example. It is important that groundwater aquifers are protected from pollutants because restoring an aquifer after it has been contaminated can be extremely expensive and take a very long time. One tool for protecting public water supplies is to map and develop plans for Source Protection Areas (SPA). SPAs delineate zones around a ground or surface water supply. Any contaminants reaching the

[1] *In the context of water supply systems in Vermont, a "public" water supply system is one serving 25 or more year-round residents or having 15 or more year-round connections. The term also includes systems serving 25 or more people for shorter periods of time, ranging from 60 days to six months per year.*

SPA are reasonably likely to move toward the system's intake point. While operators of a water system do not have authority to control land uses on any land within the SPA unless they own the land or have specific legal agreements with the landowner, towns can adopt local ordinances or bylaws that restrict uses that are not compatible within a SPA. State regulations do not currently limit land uses within and buffering SPAs, although these areas may have bearing under Act 250, Vermont's Land Use and Development Law.

The water quality of Lake Champlain is particularly important to those communities for whom the lake is their drinking water source. This includes all towns in Grand Isle County as well as the St. Albans City and Swanton Village systems. Invasive plant and animal species are also a growing problem facing systems drawing water from the lake. Barring a breakthrough in control methods the cost of preventing infestation will rise substantially in coming years. As noted in the Natural and Cultural Resources section of the plan, other stressors to water supplies include nutrient loading from over fertilization, pathogens from animals and poorly functioning septic systems, toxic substances from contaminant release and pesticides, and acidity from atmospheric deposition. Threats associated with climate change include impacts from large storms (e.g., flooding) as well as drought.

MAP 18: Municipal Sewer and Water Systems



SOURCE: *NRPC Collected Data*

WASTEWATER

There are seven municipal wastewater treatment plants serving the northwest region with a range of treatment systems including chemical treatment, aerated lagoons and activated sludge. The majority of these systems have adequate capacity to serve future growth. Insufficient uncommitted capacity is a concern for growth in at least one village in the region. Some communities maintain combined wastewater and stormwater systems where both outputs are transported to a treatment plant by way of a network of sewer pipes and storm drains. Such combined networks increase demands on wastewater treatment facilities and during periods of highest stormwater flow may overwhelm treatment processes. The village of Fairfax has limited capacity for additional service connections thereby creating a potential barrier for future development in the village and growth area. In addition to hydraulic capacity, wastewater systems are limited by the composition of the wastewater that must be treated. Particular problems to be monitored include phosphorus, organic compounds, industrial wastes, sludge production and disposal, and storm water runoff.

Most communities in the region do not have a municipal wastewater system and utilize private septic systems. This lack of infrastructure can limit the way in which a community can grow and attract economic development opportunities. In addition to striking agreements with neighboring communities (as was recently done between Swanton Village and the Town of Highgate), communities could explore the development of small-scale wastewater treatment systems or facilitate the building of multi-user systems to aid development in and around the community's growth areas. These community-scale wastewater treatment systems may also be appropriate for clusters of shoreland development where wastewater disposal is particularly challenging because of small lot sizes and close proximity to surface waters.

Several state and federal programs are available to provide grants and low or no-interest loans for infrastructure planning and construction. Examples include the Vermont Clean Water Revolving Fund and USDA Rural Development facilities programs. As a result of the COVID-19 pandemic and recently passed federal spending and infrastructure bills, more funding than normal is available for water, wastewater and stormwater infrastructure.

STORMWATER

For the majority of communities in the region, stormwater infrastructure consists of a system of culverts and ditches that moves stormwater from one place to another. Typically, these systems drain directly or indirectly into nearby waterbodies. In many cases, these waters move through the system without any retention or treatment. The result is whatever pollutants the stormwater carries are discharged. Because stormwater lines concentrate flows, they also increase erosion risk from the additional volume of water funneled into stream. Impervious surfaces such as paved or gravel driveways, sidewalks and roofs typically result in creating stormwater runoff as the water that hits these surfaces cannot be absorbed into the ground and drains off the site.

As development occurs in communities the ability to handle the volume of stormwater should be monitored. If stormwater runoff is not managed properly, it can impair water quality in local watersheds by carrying more sediment and pollutants into streams, rivers and lakes. In recent years, the reduced water quality seen in Lake Champlain and its bays has brought greater awareness to the role of stormwater on water quality. As of 2013 both the City and Town of St. Albans were required to obtain a federal stormwater management permit for its Municipal Separate Storm Sewer System (MS4) and are implementing stormwater management programs to reduce the contamination of stormwater runoff and prohibit illicit discharges. In 2015, Vermont adopted Act

64 requiring municipalities to obtain coverage under a permit aimed at reducing stormwater-related erosion from municipal roads. The legislation also required development of new stormwater rules aimed at addressing stormwater on already-developed properties with more than 3 acres of impervious surface and no prior permit.

Communities benefit from encouraging sponsors of new and existing development to reduce the amount of stormwater runoff leaving their sites. Communities benefit still more by ensuring that storm water systems are maintained properly. This could be achieved in several ways; one of them is through implementing Low Impact Development (LID) Best Management Practices (BMPs) to effectively manage stormwater onsite. LID systems infiltrate, filter, store, evaporate and detain runoff to minimize stormwater runoff and pollution. Examples of these BMP methods include rain gardens, rain barrels, cisterns, vegetated swales, roof-top disconnection, infiltration trenches, green roofs, and pervious pavement. These systems are meant to be used in conjunction with traditional stormwater systems to treat the maximum amount of stormwater possible on site and reduce the burden on municipal infrastructure and impacts to water quality.

The State of Vermont regulates stormwater runoff on construction sites and on substantial development and redevelopment projects. Given the cumulative impact many small developments can have, communities should explore incorporating stormwater standards into their development regulations to address the stormwater created from all land development. The Agency of Natural Resources is currently updating their stormwater manual which may bring changes to the Agency's rulemaking and incentives for incorporating new measures.

The Franklin County Stormwater Collaborative was launched in 2014 to encourage residents and business owners to get involved in reducing stormwater pollution. The Collaborative is a partnership between the City and Town of St. Albans with the Northwest Regional Planning Commission. The City and Town of St. Albans are working together to encourage area residents to get personally involved in reducing stormwater pollution in Lake Champlain. This effort is being conducted as a part of a public education requirement of a federal Environmental Protection Agency stormwater system permit, called Municipal Separate Storm Sewer System (MS4). The Stormwater Collaborative was designed to allow other municipalities to participate in the future.

Three communities, the City of St. Albans and the Villages of Swanton and Enosburg Falls, have combined stormwater and wastewater systems. In the City of St Albans, approximately 11% of the stormwater drainage area—or 160 acres with a total of 149 connected catch basins—goes into the combined sewer system The City is planning for projects to create offline combined sewer storage as well as separate portions of the combined system where feasible. These will reduce the number and magnitude of overflows during rain events.

SOLID WASTE

All Vermont municipalities are required to adopt a Solid Waste Implementation Plan (SWIP; 10 V.S.A. § 6604) that details a comprehensive waste management strategy such as identifying services and how waste will be disposed. This plan must comply with the statewide Materials Management Plan. For the collection of waste and recycling in the region, all communities except Fairfax are members of the Northwest Vermont Solid Waste Management District. The Town of Fairfax has a separate SWIP and therefore coordinates the services for its community members.

The Northwest Vermont Solid Waste Management District's (NWSWD) current SWIP was adopted in 2020 and is renewed at least once every five years. Based on hauler reports in 2021, NWSWD estimates that the per capita waste generated in the region was 4.0 pounds/person/day, which is below the national average of 4.4

pounds/person/day. NWSWD estimates that 30% of this waste is recycled thereby reducing the amount of waste headed to landfills to 2.8 pounds/person/day.

In 2000, the NWSWD implemented a mandatory recycling ordinance in member towns. Recyclable material collected at NWSWD waste facilities is transported to its Georgia Recycling Center to be processed and sent to be recycled into further products. Overall, removing and recycling materials from the waste stream cuts disposal costs, reduces environmental impact of both waste disposal and goods production, and lowers energy consumption overall.

NWSWD has a list of 31 private haulers that operate within the district, and the Town of Fairfax has a contract with a private hauler for curbside pick-up. Six of the nine transfer stations are operated by NWSWD, the Highgate Transfer Station is operated by Casella Waste Management, and the municipalities of Grand Isle and Alburgh each operate a transfer station. In March 2023, voters in the NWSWD approved a bond of up to $1.5 million to finance the cost of renovating the NWSWD Georgia Recycling Facility to increase capacity and improve safety.

The District offers collection of household unregulated hazardous waste--such as used motor oil, paint, and batteries--at the Georgia Transfer Station year-round and at special collection events throughout the year. In a typical year, 1500 households take advantage of these services. NWSWD contracts with a hazardous waste transporter to transfer and manage this waste efficiently; the material is typically shipped out of the Region and is often incinerated for fuel.

The majority of the landfill-bound waste collected in the area is shipped to the Highgate Transfer Station or the Williston Transfer Station. From there the waste is shipped in bulk to the Coventry Landfill. The NWSWD owns a 154 acre property in Sheldon intended to be used as a landfill site when existing landfill capacity is exhausted or export becomes less cost effective. The NWSWD received a permit from the ANR in 1997 to construct and operate a lined landfill on 7 acres of the site; this permit was recertified in 2011. The facility still needs to obtain Act 250 and local permits before commencing operation.

Legislation known as Act 148 (AKA the Universal Recycling law) was passed in 2012 to reduce the amount of waste going to landfills by banning recyclables, food scraps and yard or leaf debris from landfills. Amendments to the law in 2018 established a new framework for waste fees, leaf and yard waste and food waste. Changes to the law in 2019 prohibited retailers and food establishments from providing customers with single-use plastic bags, straws, stirrers, or polystyrene containers.

FUTURE NEEDS

The Vermont Agency of Natural Resources estimates “across Vermont there is more than $2 billion of investment needed in drinking water, wastewater and stormwater systems over the next 10 years, to both refurbish existing systems and to prepare this essential infrastructure for increasingly disruptive and potentially devastating effects of climate change.“ According to a 2019 “report card” issued by the Vermont section of the American Society of Civil Engineers, these system are among the lowest scoring infrastructure categories in the state. This cost estimate does not include any additional capacity that might be needed to support increased housing growth called for elsewhere in this plan. Examples of water and wastewater-related investment priorities for the Northwest Region include development of systems in Highgate (in Highgate Center village as well as near the State airport), South Hero and Keeler Bay villages, Georgia and St. Albans Town. They also include the updating of systems in Swanton Village (including water line upgrades and significant wastewater plant upgrades to reduce phosphorus) and St. Albans City.

ANR's stormwater-related investment priorities for the Northwest Region will be pursued in the context of a law known as Act 76. In addition to providing a long-term funding source for water quality projects, Act 76 establishes a network of Clean Water Service Providers (CWSPs) and Basin Water Quality Councils (BWQCs) to identify and implement voluntary projects. NRPC has been selected to serve as the Clean Water Service Provider for the Missisquoi and Lamoille Basins and will also be an active participant in the BWQC representing interests in northern Lake Champlain.

Climate change will have an impact all forms of water infrastructure, particularly from flooding and also drought. More frequent and more intense rain events can strain stormwater systems and impact drainage patterns. New and updated public drinking water and wastewater system design should consider climate change impacts, such as more droughts and more wet periods. Wellhead protection areas should take climate change impacts into account and can be integrated into land conservation and recreation objectives. Stormwater systems must account for changes in expected weather patterns. (Vermont Climate Action Plan, 2021)

With respect to solid waste needs, in Highgate, a significant solid waste related priority involves the site of the Highgate transfer station and previously capped landfill. Slope stabilization has been proposed at the transfer station to protect human health, the natural environment, and a town owned infrastructure.

GOALS AND POLICIES

1 GOAL

The water supply for the region will not be contaminated, depleted or degraded and there will sufficient quantity to support existing and future residential, commercial and industrial needs.

a. Land development shall not threaten to pollute or deplete groundwater resources or exceed existing or planned public water supply capacity.
b. Development that could negatively impact ground and surface water must not be located in identified water protection areas and groundwater recharge areas or where such development is likely to adversely impact water supplies.
c. Withdrawal of groundwater must not exceed the recharge rate over a reasonable period of time and must not interfere with the reasonable withdrawal of groundwater by other users.

2 GOAL

Residents, communities and businesses will have solid waste disposal, wastewater treatment systems and stormwater treatment methods that are cost-effective and environmentally sound.

a. New or upgraded wastewater management systems will reinforce the desired settlement patterns of compact villages and growth centers separated by rural countryside.
b. Creative inter-municipal and public/private partnerships that promote cost-savings for providing wastewater and stormwater treatment are encouraged.
c. Long-range community facility plans and capital budgets will guide the creation, upgrade or expansion of wastewater and stormwater treatment systems and will consider impacts from climate change.
d. New development that creates an undue adverse impact on solid waste disposal, wastewater treatment and/or stormwater treatment will contribute funds to increase the capacity of these systems.

e. The cumulative impact of development on stormwater facilities must be addressed in considering stormwater treatment options.
f. Stormwater management and facility design must incorporate: consideration of cumulative impact, low impact development techniques, green stormwater infrastructure and long-term maintenance plans.
g. Solid waste will be recycled, reused and composted to the greatest extent possible prior to disposal.