SECTION 3. COMMUNITY PROFILE

NATURAL ENVIRONMENT

physical setting

Barre City developed along the Stevens and Jail Branches of the Winooski River, and the rivers and surrounding terrain have shaped its development pattern. Most of the developed areas of the city are located in the relatively flat river valley with residential neighborhoods extending up into the hills above the downtown within and beyond the city limits. The terrain rises up steeply on the west side of the river, while to the east the valley is wider and the grade climbs more gradually. West Hill to the northwest is nearly 800 feet above the valley floor.

The terrain also defines Barre City's drainage patterns, resulting in three primary watersheds within the city limits with most of the city draining to the Stevens Branch below the Jail Branch. These primary watersheds can be further divided into smaller drainage areas associated with tributaries to the Stevens and Jail branches. The river and stream valleys in the city, and in the surrounding uplands beyond, are relatively narrow – a fact that has contributed to flooding being an ongoing challenge for the city.

Barre is known as the Granite City for the high quality stone that has been, and continues to be quarried in the area. The presence of granite as the predominate bedrock is a result of the geologic history of this part of Vermont. Granite is a very hard, igneous rock and it has remained while softer, metamorphic rocks have eroded away. Millions of years of erosion have lowered and smoothed the terrain, creating the hill and valley topography that exists today. Over this bedrock, the process of glaciation deposited a layer of unsorted tills as the ice receded. In the city, the soils are primarily loams with limited deposits of sand and gravel.

Barre City experiences a moderate climate with a 130-day growing season. Average annual rainfall is 42 inches and average annual snowfall is 89 inches. July is the warmest month with an average high temperature of 81°F and January is the coldest month with an average low temperature of 4°F.

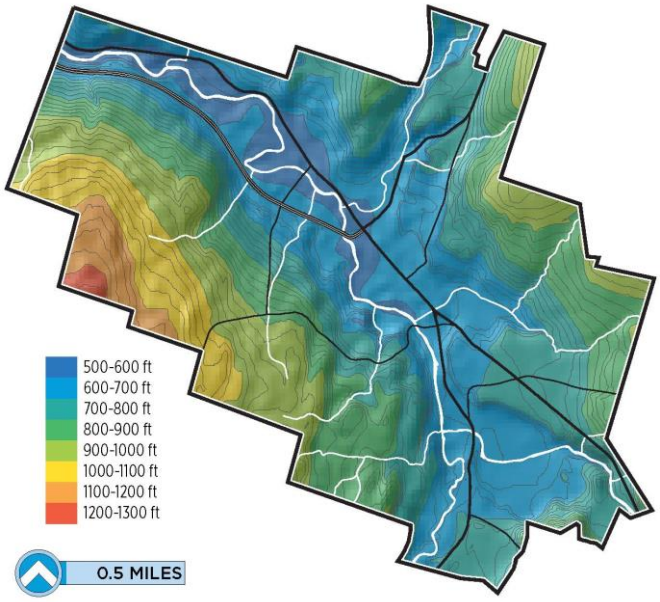

Figure 15. Terrain and Elevation Map

Before widespread clearing in the 1800's, land within the city would have been forested primarily with native Northern Hardwood forest. With perhaps the exception of the steepest slopes, wooded areas within the city are regrowth of land that was cleared at some point during the previous 200 years. While development and fragmentation of habitat has adversely affected the wildlife that would have resided in the native forest, many species are still thriving in the undeveloped land within and just beyond the city limits.

There are approximately 750 acres of primary agricultural soils, as mapped and classified by the Natural Resource Conservation Service, within the city. More than half of these soils have been built upon, but several hundred acres of agricultural soils remain undeveloped on the large tracts of open land left within the city (further discussed under Open Space below). One farm continues to operate within the city used for hay fields by the Fairmont Farm of East Montpelier, Vermont.

water resources

Rivers. Barre City's two primary rivers are the Jail Branch and the Stevens Branch of the Winooski River. The Jail Branch begins in the Town of Washington and flows 16 miles before joining the Stevens Branch behind 121 South Main Street in Barre City. The Jail Branch passes through a retention dam in East Barre built for flood control after the devastating flood of 1927. The Stevens Branch originates in Williamstown and travels 13 miles before emptying into the Winooski River in Berlin. It flows 3.5 miles through the city.

The Jail Branch, Stevens Branch and their tributaries were assessed for their geologic and river characteristics that contribute to stream stability in 2004 (Phase 1 Geomorphic Assessment). That initial assessment was followed up by a more detailed study in 2009 of the least stable sections of the streams (Phase 2 Geomorphic Assessment). The resulting reports, 2004 Stream Geomorphic Assessment of the Stevens Branch and the 2009 Stevens Branch Watershed River Corridor Management Plan, are incorporated as reference to this plan.

Watersheds. The Jail Branch drains nearly 31,000 acres and the Stevens Branch above the Jail Branch drains approximately 22,000 acres. All development and changes in land cover that increase runoff or decrease infiltration rates within these 53,000 acres affect the quality, quantity and velocity of the water flowing through the city. Increase in impervious surface and/or loss of forest cover within these watersheds increase the potential for flooding downstream in Barre City.

Within the city, more than 145 properties abut the two rivers – including a mix of residential, commercial, and industrial uses. The land in the Jail Branch watershed within the city is largely undeveloped and steep. With the exception of the hillside that rises next to Route 62, the terrain is less severe in the areas of the city within the Stevens Branch watersheds and accordingly those watersheds are considerably more developed.

Flood Hazards. Flooding is a fact of life in Barre City, a community built largely in floodplains. While actions have been taken to control the rivers and minimize the destructive force of floodwaters from the inception of development along the riverbanks, the city continues to experience flooding on a fairly regular basis. Historically, river management and flood control focused on engineering solutions like straightening, armoring and/or damming. In recent decades, the focus of river management and flood control has shifted towards restoring the natural functions of river corridors and better management of development within floodways and floodplains.

Water Quality. The Vermont Agency of Natural Resources has placed the lower half-mile of Gunner Brook (a tributary of the Stevens Branch that runs along Farwell Street) on the 303(d) list of impaired waters; this is the only surface water body within the city so designated. Water quality problems in Gunner Brook are a result of leachate from the closed Farwell Street landfill and surface runoff from developed land.

The Vermont Agency of Natural Resources has identified both the Stevens Branch and Jail Branch within the city as priority surface waters in need of further assessment. Problems affecting water quality in these rivers are largely related to surface runoff from developed land, but the state has not yet documented a violation of Vermont's Water Quality Standards that would result in the rivers being placed on the 303(d) list.

States establish water quality standards and identify impaired waters that do not meet those standards under the authority of Section 303(d) of the federal Clean Water Act. Under that law, a TMDL (total maximum daily load) must then be established for the pollutant(s) that are impairing water quality, resulting in a higher level of state regulation throughout the affected watersheds. Keeping additional rivers and tributaries within the city from being placed on the 303(d) list will require careful management of stormwater and hazardous waste, as the primary pollutant of concern is surface runoff from developed land.

Stormwater. Stormwater poses a significant challenge within the city. Historically, stormwater was "managed" solely to remove it from the built environment as quickly as possible – this often meant collecting and piping the water directly to the nearest stream or river. As the amount of development within a watershed increases, this type of management becomes unsustainable. More water is entering streams and rivers more quickly during storms leading to downstream flooding. Stormwater picks up and carries sediments and pollutants as it flows over surfaces, which reduces water quality in the receiving streams, rivers and lakes. Stormwater has little opportunity to infiltrate into the ground and replenish the supply of groundwater.

The amount of development within the city's watersheds has made it necessary to do more than simply remove stormwater from rooftops, streets and parking lots. The water needs to be managed so that sediment and pollutants are removed, so that there is opportunity for infiltration, and so that the rate of release to streams and rivers is controlled to minimize flooding.

These objectives are all difficult to accomplish in areas that are densely developed. Low impact development (LID) techniques can be used to integrate stormwater management more effectively into the built environment. These techniques include rain gardens (small green spaces designed to collect, treat and infiltrate stormwater), green roofs (which collect and hold rainwater), and pervious paving (which allows water to infiltrate). More effective management of stormwater on individual properties will forestall the need for costly municipal infrastructure improvements or other significant city actions to address stormwater.

The simplest approach to stormwater management is to minimize the amount of impervious surface within the watershed. There are many opportunities within the city to reduce the amount of impervious surface as private properties and public spaces are revitalized and redeveloped. Not only is this beneficial in reducing stormwater runoff, but increased greenspace within the city is beneficial for the microclimate, for aesthetics, for wildlife, and for residents' quality of life.

Wetlands. The Vermont Agency of Natural Resources has mapped and classified less than 3 acres of wetlands within the city. The amount of hydric soils within Barre City suggests that many wetlands were filled and built upon as the city developed, as was common practice until recent decades.

Science has now shown that wetlands provide essential ecological services and the loss of wetlands to development exacerbates flooding and water quality problems within a watershed. Wetlands function like a sponge, holding excess water that runs off from adjoining uplands or that overflows the banks of flooded streams and rivers. They store that water, allowing it to slowly infiltrate into the ground or seep into adjacent water bodies. By reducing the rate of surface flow, sediment and pollutants drop out of the water and are deposited in the wetland.

Within the city, there are locations where wetland functions can be protected or restored. One example is the Canales Wetland, a two-acre parcel of land at the corner of Pleasant Street and Fortney Place, which was purchased by the Capital Area Land Trust to preserve a significant wetland and which is now city owned. Plans call for using this property as a small wooded park with walking trails.

River Corridor Revitalization. Historically, Barre City's riverfront was developed as an industrial and transportation corridor. The Main Street buildings turn their backs to the river. For much of the city's history, there has been limited physical and visual access to the river. Changes in development and land use along the riverfront are making it possible for the river corridor to have a new life as a natural, recreational and scenic asset within the city.

Within the downtown, the Stevens Branch runs through an industrial area that is anticipated to be redeveloped with a new mix of uses over the next decade. This redevelopment presents an opportunity to improve the appearance of the riverfront with public walkways, landscaping, and lighting. Such improvements would allow residents to rediscover this natural resource. Riverfront improvements would require acquisition of public easements over private land and considerable public investments in walkways.

brownfield remediation & redevelopment

A brownfield is land that has been contaminated, usually as a result of industrial activity or the intentional or unintentional spilling/dumping of hazardous materials. Many brownfields have been left essentially "ownerless" as companies have gone out of business, leaving the responsibility for clean-up to federal, state and local governments. It is often difficult to sell brownfield sites as potential purchasers can have difficulty securing financing for a contaminated site. In recent years, Barre City has successfully obtained state and federal funding to assist with brownfield remediation with the goal of transforming blighted properties into sites suitable for private redevelopment.

Hazardous Waste Sites. As of 2019, the state Agency of Natural Resources had identified 90 hazardous waste sites within the city, the majority of which had been remediated or required no further action. Many of these are locations, such as gas stations, where small spills occur from time-to-time; several such incidents are reported within the city each year and with appropriate response most pose little threat to environmental quality or human health.

The state has identified four high-priority sites within the city that have more serious contamination issues. These include the Barre Coal Tar site on Williams Lane, the former Howe Cleaners site on Depot Square, the Enterprise Aly Redevelopment Area, and one private residence that experienced a major fuel oil spill. The Bonacorsi and Sons site on Prospect Street has been dropped to a medium priority site. Remediation at these sites is in various stages of planning and implementation.

- **Williams Lane**. A 0.87-acre parcel at the end of Williams Lane next to the Stevens Branch currently is listed as a brownfield site due to coal tar remaining in the soil. The state currently operates wells to monitor the movement of the coal tar from the site. The area cannot be disturbed to any degree, although indications are that the coal tar movement is limited. "Capping off" the site with an impervious surface would further reduce the potential for the coal tar to migrate off the site and potential into the adjoining river. Currently, there is no funding to remove the hazardous materials. This site must continue to be monitored until such time that it can be remediated or capped off and be redeveloped.

- **Enterprise Aly Redevelopment Area**. This is a 0.05-acre parcel, part of the new parking lot redevelopment, that also includes 9 Depot Square. A Corrective Action Plan was implemented. Significant soil excavation occurred in combination with redevelopment activities. We are currently implementing insitu chemical oxidation, and soil vapor extraction is in place to manage migration of vapors from site plume to adjacent properties. The 9 Depot Square/Former Howe Cleaners site has been combined with this site, since they were essentially the same.

- **Depot Square**. The property at 9 Depot Square is listed as a brownfield because it is contaminated with dry cleaning chemicals. It was once considered a Superfund site and there were legal battles over cleanup costs. The building on the property was destroyed by fire in 2008. The city acquired the property and final remediation is occurring as part of the Enterprise Aly Redevelopment Area above.

Large Undeveloped Tracts. Approximately 480 acres of undeveloped land in large tracts remain within Barre City. Some of this land is suitable for development, but a significant amount has natural resource constraints (primarily steep slopes) that limit development potential. Much of this land is forested and some has been logged over the years. The remaining land is farmland with open fields, some of which remains in agricultural use. These lands provide a diverse and productive mix of habitat types supporting abundant wildlife, including turkey, deer, fox, porcupine, rabbit, and many other species of birds such as hawks and owls.

Forest fragmentation is when our forests and wooded lots are threatened by the conversion to other uses and parcelization (subdivision of land). Conversion of forest blocks can occur when there is a change in landowner objectives and development, or even a new property owner, or property tax burden. Forest blocks, when fragmented, impacts wildlife habitat, and the integrity of natural communities.

The Current Use Program administered by the Vermont Department of Taxes allows for the valuation and taxation of farm and forest land based on its remaining in agricultural or forest use, instead of its value in the market place. Currently, the Valsangiacomo lands off Berlin Street, Booth Brothers lands off Allen Street, and Quantum Keyes land off North Main Street near the Berlin town line have enrolled their lands in the program, and manage their forest integrity according to the program.

Forest and Habitat Terminology

- Forest Fragmentation: the division or conversion of a forest block by land development other than by a recreational trail or use exempt from regulation.
- Forest Block: a contiguous area of forest in any stage of succession and not currently developed for non-forest use. A forest block may include recreational trails, wetlands, or other natural features that do not themselves possess tree cover.
- Habitat/Wildlife Connector: land or water or both that links patches of wildlife habitat within a landscape, allowing the movement, migration and dispersal of animals and plants and the functioning of ecological processes.

The framework for protecting forest integrity focuses on protecting priority interior forest blocks and priority habitat connectivity blocks, as defined and mapped by the Agency of Natural Resources. The State has identified general goals for interior forest conditions:

Avoiding permanent interior forest fragmentation resulting from development;

Undertaking forest management activities that maintains forest structure; and

Conserving interior forest blocks that support ecological processes as well as viable populations of Vermont's native fish and wildlife.

The ANR's Biofinder map shows there is a very large chunk of Priority Interior Forest Blocks on the Valsangiacomo lands which, besides being in Current Use (as stated previously) also has a forest management plan and have agreed to keep the woodland undeveloped. These forest blocks extend into the Town of Berlin, so they are part of a larger whole.

The Planning Commission completed a study of undeveloped land called the 2005 Vacant and Underdeveloped Land Use Study, and was a part of the 2005 Municipal Plan. This was updated in 2011 while preparing the 2014 Plan; the study is incorporated into this plan as an appendix. The

study examined the opportunities and constraints for future use of not only these large tracts, but other undeveloped or vacant lands within the city.

These lands also serve an important function in their undeveloped state as open space. This open space provides a range of environmental services, including wildlife habitat and erosion and runoff control. These lands also provide opportunities for passive or low-impact recreation, allowing city residents to enjoy outdoor activities more typically associated with rural living. Further, greater interest in the local food movement may make continued agricultural use of some of the open land once again an economically viable option. For all these reasons, the large, undeveloped tracts contribute positively to the quality and character of the community as a whole – making Barre City a more attractive place to live, work or visit.

City-Owned Land. Barre City owns a significant amount of open and green space available for public access or recreation. Some of this land is developed as parks and formal recreation areas, but much of it is undeveloped land including a former rail bed, which is planned to be redeveloped as a bike path through the city, and the 'Cow Pasture' (see discussion of this property in the Land Use Chapter below). The undeveloped municipal land includes two large parcels: the closed 20-acre landfill off Farwell Street and a 10-acre lot north of Rotary Park. In addition to these larger parcels of land, there are miles of mature street and shade trees within the public right-of-way. These trees fall under the responsibility of the City's Tree Warden, with the assistance from Public Works. They provide cultural value, shade, reduce dust and control soil erosion.

The Cow Pasture property is a 67-acre municipally owned property has a 2017-2027 Management Plan, and has been endorsed by the City Council. This property was pasture for the City's work horses in the late 1800's. It now has a complete list of allowed uses, such as hiking, dog-walking, running, cross-country skiing, sledding, berry-picking and snowmobiling. There is also a complete list of what is not allowed, and that includes hunting or tapping, fires, camping, among other things. The Cow Pasture contains an extensive trail network from wide mowed paths to single-track wooded trails. There is a small parking area at the end of Maplewood Avenue that allows visitors to access the trail network from the south. This management plan is incorporated as reference into this plan.

Other Open and Green Space. The city and other civic entities own more than 140 additional acres of land that also serve as open and green space. This includes 90 acres within cemeteries, including the 55-acre Hope Cemetery, whose memorials reflect Barre City's stone working and sculpting heritage. The school district owns approximately 35 acres, including developed recreation fields and facilities. There are also a number of privately-owned properties that include formal green space and many more developed properties that have retained undeveloped natural areas.

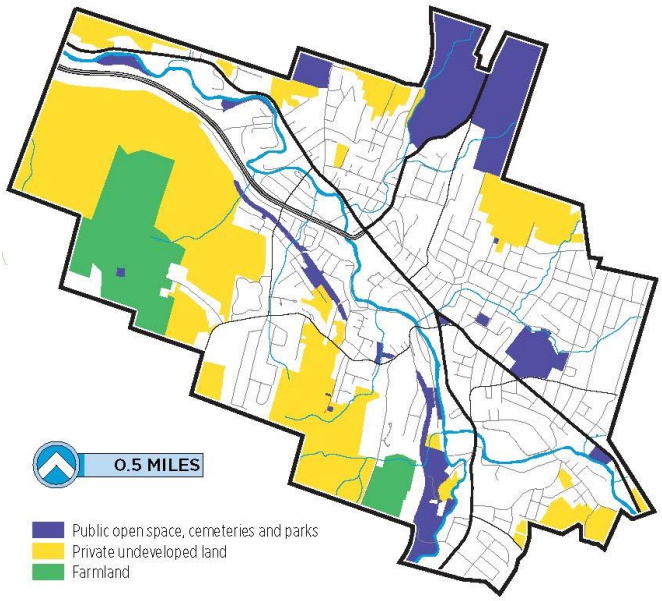

Figure 16. Open Space Map

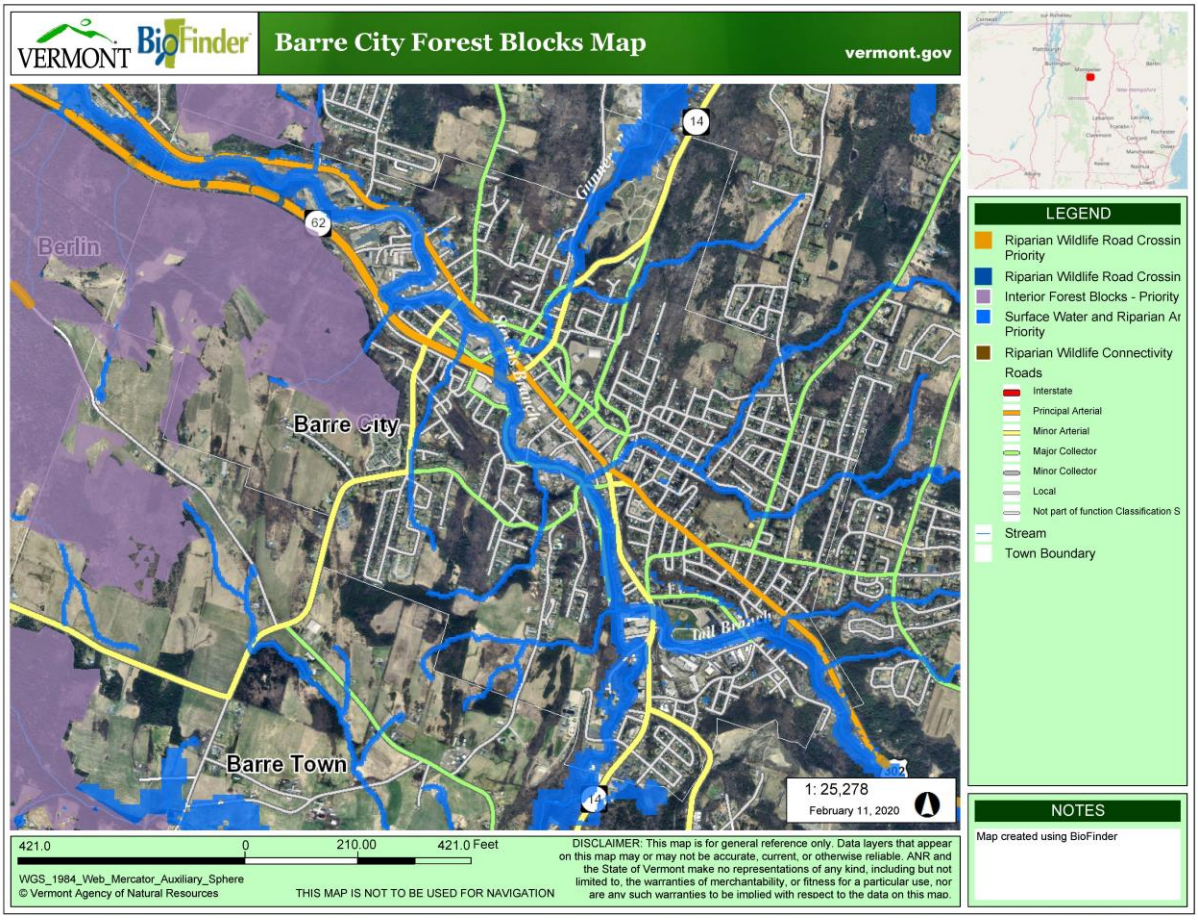

Figure 17. Forest Block Map