SECTION 4

ENVIRONMENTAL INVENTORY AND ANALYSIS

This section explores the biological and physical components of some of the town's ecosystems. These components include soils, surface and ground water, vegetation, fisheries and wildlife. The *Soils, Geology, and Topography* subsection provides a general understanding of the ways different soil characteristics can impact land use values. *Landscape Character* provides an overall scenic context. *Water Resources* describes all of the water bodies in town, above and below ground, including their recreational value, public access, and any current or potential quality or quantity issues. In the subsection *Vegetation*, Shelburne's forest, farmland, and wetlands are documented and in *Fisheries and Wildlife*, wildlife, habitat, special corridors, and rare, threatened, and endangered species are discussed. Shelburne's *Scenic Resources and Unique Environments* are identified. Finally, *Environmental Challenges* addresses current and potential problems that may influence open space or recreation planning.

The natural resources and scenic landscapes of the Town of Shelburne have been cherished by residents for generations, and there are a number of Action Items in the Seven-Year Action Plan which speak to the preservation of these assets. This Open Space and Recreation Plan is intended to help residents protect the town's scenic value and natural resources in the face of potential increasing development and changes in land use, while recognizing that people need places to live, learn, work and play. These needs – when sited in areas previously unsettled rather than as infill in existing developed areas – can require infrastructure such as homes, roads, power, water, and wastewater systems. These collective needs, in turn, depend upon and impact critical natural systems. One way to understand the impact of development on natural resources is to understand the ecosystem of the town and the region. This section begins with a definition and discussion of ecosystems – their value and the mapping available for Shelburne to use in its open space and recreation planning and decision-making processes.

A. ECOSYSTEMS AND MAPPING

A.1 Ecosystems

An ecosystem is a geographically specified system of organisms, including humans, their environment, and the processes that control their dynamics. Ecosystems involve complex connections between organisms and their environment, and the processes that drive the system and can occur at different scales.[1] A large forest and a decayed tree trunk are both examples of ecosystems. The health and function of ecosystems depend on the relationship between living beings and their environment.

[1] http://ecosystems.noaa.gov/what_eco.htm

Ecosystems provide a variety of "services" that are very important to human communities. Wetlands, for example, filter rainwater, store floodwaters, recharge water to groundwater aquifers, and provide habitat for many aquatic plant and animal species. All ecosystems are vulnerable to any changes to the environment, whether naturally occurring or human made. Understanding the complexity of the systems in which we live can help Shelburne residents to consider the impact of actions and land uses on the environment and on their quality of life.

A.2 Documenting and Mapping Ecosystems:

BioMap2

Just as the Town of Shelburne contains multiple and varied ecosystems, the state of Massachusetts, while relatively small, has many diverse ecosystems and habitats. Documentation and mapping of such ecosystems and habitats – and their associated flora and fauna – can be a first step toward protecting and preserving these resources.

To that end, in 2010 the Massachusetts Department of Fish and Game and The Nature Conservancy launched *BioMap2: Conserving the Biodiversity of Massachusetts in a Changing World.*[2] This project, produced by the state's Natural Heritage and Endangered Species Program (NHESP), is a comprehensive biodiversity conservation plan for Massachusetts. Last updated in 2001, this new plan endeavors to protect the state's biodiversity in the context of projected effects of climate change.

BioMap2 combines NHESP's 30 years of rare species and natural community documentation with the Division of Fish and Wildlife's[3] 2005 State Wildlife Action Plan (SWAP). It also integrates The Nature Conservancy's assessment of ecosystem and habitat connections across the State and incorporates ecosystem resilience in the face of anticipated impacts from climate change.[4]

The following are the core findings summed up in *BioMap2*'s Executive Summary.

Core Habitat Statewide Summary: Core Habitat consists of 1,242,000 acres that are critical for the long-term persistence of rare species and other Species of Conservation Concern, as well as a wide diversity of natural communities and intact ecosystems across the Commonwealth. Core Habitat includes:

- Habitats for rare, vulnerable, or uncommon mammal, bird, reptile, amphibian, fish, invertebrate, and plant species;
- Priority Natural Communities;
- High-quality wetland, vernal pool, aquatic, and coastal habitats; and
- Intact forest ecosystems.

[2] http://www.mass.gov/dfwele/dfw/nhesp/land_protection/biomap/biomap_home.htm
[3] http://www.mass.gov/dfwele/dfw/
[4] *BioMap2* data replaced former BioMap and Living Waters data.

Shelburne BioMap2 at a Glance

Shelburne lies within the Vermont Piedmont Ecoregion, an area where forests are transition hardwoods and northern hardwoods.

Core Habitat

- 5 Exemplary or Priority Natural Community Cores
- 11 Aquatic Cores
- 18 Species of Conservation Concern Cores
  - 3 birds
  - 4 insects
  - 1 crustacean
  - 11 plants

Critical Natural Landscape

- 1 Wetland Core Buffer
- 11 Aquatic Core Buffers

American Bittern
State Status: Endangered

Critical Natural Landscape Statewide Summary: Critical Natural Landscape (CNL) consists of 1,783,000 acres complementing Core Habitat, including large natural Landscape Blocks that provide habitat for wide-ranging native species, support intact ecological processes, maintain connectivity among habitats, and enhance ecological resilience; and includes buffering uplands around coastal, wetland and aquatic Core Habitats to help ensure their long-term integrity. CNL, which may overlap with Core Habitat, includes the largest Landscape Blocks in each of 8 ecoregions; and adjacent uplands that buffer wetland, aquatic, and coastal habitats.

Table 4-1: *BioMap2* Statewide Summary Total Acres and Acres Protected[5]

	Total Acres	Percent of State	*BioMap2* Acres Protected
Core Habitat	1,242,000	24%	559,000
Critical Natural Landscape	1,783,000	34%	778,000
***BioMap2* Total (with overlap)**	2,092,000	40%	861,000

For Shelburne, the BioMap2 Town Report provides local biodiversity information to assist in specific conservation efforts at the town or regional level (see Appendix *). The Shelburne BioMap2 Town Report includes descriptions of the important species, natural communities, and coarse filter elements of BioMap2 that can be found within a specific town and its surrounding area.

The electronic version of the Shelburne BioMap2 Town Report is a powerful conservation tool because it contains hyperlinks to fact sheets for the various elements of biodiversity in the town, such as the American Bittern, a stocky and well-camouflaged heron that lives in tall reed beds. Using the Town Report in conjunction with the BioMap2 Interactive Map provides the ability to zoom to specific areas, turn the different GIS layers on and off, and to obtain the Core Habitat and Critical Natural Landscape numbers with a click of the mouse.[6]

[5] http://www.mass.gov/eea/docs/dfg/nhesp/land-protection-and-management/biomap2-summary-report.pdf
[6] http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/land-protection-and-management/biomap2/biomap2-town-reports.html; Picture of American Bittern © Kevin T. Carlson. Downloaded from the Cornell Lab of Ornithology website http://www.allaboutbirds.org/guide/american_bittern/id

NHESP Priority Habitats

Priority and Estimated Habitats is a program administered by NHESP. Identification and mapping of Priority and Estimated Habitats is based on the known geographical extent of habitat for all state-listed rare species, both plants and animals, and is codified under the Massachusetts Endangered Species Act (MESA). Habitat alteration within Priority Habitats is subject to regulatory review by the Natural Heritage & Endangered Species Program. Priority Habitat maps are used for determining whether or not a proposed project must be reviewed by the NHESP for MESA compliance.[7]

Benefits of BioMap2 and NHESP Priority Habitats

On the statewide level, mapping Core Habitat and Critical Natural Landscapes helps to guide strategic conservation to protect those areas that are most critical to the long-term survival and persistence of rare and other native species and their related habitats and ecosystems. On the local level, Shelburne can use this information to better understand where the Town's ecosystems and habitats fit into the bigger picture. For example, a seemingly insignificant parcel of land could be a key link to two larger, intact ecosystems.

On an individual landowner level, *BioMap2* – as well as NHESP Priority and Estimated Habitats – are important tools that can be used to apply for grants to help improve, manage and monitor certain lands. A current example is the Mass Wildlife Landowner Incentive Program, which helps fund efforts to maintain grasslands and create areas of young tree and shrub growth (early woodlands) to enhance wildlife habitat, with preference given to land that is classified as, or located nearby, NHESP areas.[8]

Information and mapping from *BioMap2* and NHESP Priority Habitats will be referenced in other sections of this chapter. Related maps are located at the end of this chapter.

B. TOPOGRAPHY, GEOLOGY, AND SOILS

Decisions about land use must take into consideration the inherent suitability of a site for different kinds of development. Geology, soils, and topography are essential to determining potential sites for future residential, commercial and industrial development and for new parks, hiking trails and conservation open space.

[7] http://www.mass.gov/dfwele/dfw/nhesp/regulatory_review/priority_habitat/priority_habitat_home.htm

[8] http://www.mass.gov/eea/agencies/dfg/dfw/wildlife-habitat-conservation/

B.1 Topography

The topography of the Town of Shelburne consists of steep and rolling hills, high elevation plateau, open fields, numerous streams and the "crown jewel", the Deerfield River, which forms the town's western boundary. The Deerfield River enters Shelburne in the northwestern corner of the town and flows southeastward to its eventual confluence with the Connecticut River in the town of Deerfield. Shelburne's highest point is Massamett Mountain, at 1,588 feet, located in the western section of town.

B.2 Geology

The Town of Shelburne as we know it today is the result of millions of years of geologic history: great upheavals of the earth's crust and volcanics, and the sculpting power of moving water, ice and wind. This distinctive physical base has determined the distribution of the town's water bodies, its soils and vegetation and its settlement patterns, both prior to and since colonial times. Understanding Shelburne's current landscape requires a brief journey back in time and a review of some basic geological concepts.

The earth's crust is a system of plates whose movements and collisions shape the surface. As the plates collide, the earth's crust is compressed and forced upward to form great mountain ranges. In the northeastern United States, the plates move in an east-west direction, thus the mountains formed by their collisions run north to south.

The pressure of mountain building folded the earth, created faults, and produced the layers of metamorphosed rock typically found in New England. Collision stress also melted large areas of rock, which cooled and hardened into the granites that are found in some of the hill towns in Massachusetts today. Preceding the collisions, lines of volcanoes sometimes formed, and Franklin County shows evidence of this in bands of dark rock, called schist, that metamorphosed from lava flows and volcanic ash.

Hundreds of millions of years ago, a great continent, known as Pangaea, formed through the collisions of plates. Pangaea began to break apart almost 200 million years ago, and continues to do so as the continents drift away from each other. This "continental drift" caused earthquakes and formed large rift valleys, the largest of which became the Atlantic Ocean. The Connecticut Valley was one of many smaller rifts to develop. Streams flowing into the river from higher areas to the east brought alluvium, including gravels, sand and silt. At the time, the area that is now the town of Shelburne was located south of the equator. The Dinosaur era had begun, and the footprints of these giant reptiles are still visible in the rock formed from sediments deposited on the valley floor millions of years ago.

By the close of the Dinosaur age, the entire eastern United States including Shelburne was part of a large featureless plain, known as the peneplain. It had been leveled through erosion, with the exception of a few higher, resistant areas. Today, these granite mountaintops, called monadnocks, are still the high points in this region. Local examples include Mt. Wachusett, Mt. Greylock, and Mt. Monadnock in New Hampshire.

As the peneplain eroded, the less resistant rock eroded to form low-lying areas, while bands of schist remained to form upland ridges. By this time, the Connecticut Valley had been filled with sediment, while streams that would become the Deerfield, Westfield and Farmington Rivers continued to meander eastward. The westward-flowing streams would become more significant later on.

A long period of relative quiet in geologic terms followed the Dinosaur era. Then, as the Rocky Mountains were forming in the west eight million years ago, the eastern peneplain shifted upward a thousand feet. As a result of the new, steeper topography, stream flow accelerated, carving deep valleys into the plain. Today, the visible remnants of the peneplain are the area's schist-bearing hilltops, all at about the same 1,000-foot elevation.

Mountain building, flowing water, and wind had roughly shaped the land; now the great glacial advances would shape the remaining peneplain into its current topography. Approximately two million years ago, accumulated snow and ice in glaciers to the far north began advancing under their own weight. A series of glaciations or "ice ages" followed, eroding mountains and displacing huge amounts of rock and sediment. The final advance, known as the Wisconsin Glacial Period, completely covered New England before it began to recede about 13,000 years ago. This last glacier scoured and polished the land into its final form, leaving layers of debris and landforms that are still distinguishable.

The glacier picked up, mixed, disintegrated, transported and deposited material in its retreat. Material deposited by the ice is known as *glacial till*. Material transported by water, separated by size and deposited in layers is called *stratified drift*. The glacier left gravel and sand deposits in the lowlands and along stream terraces. Where deposits were left along hillsides, they formed kame terraces and eskers. Kames are short hills, ridges, or mounds of stratified drift, and eskers are long narrow ridges or mounds of sand, gravel, and boulders.

B.3 Soils

Soil is the layer of minerals and organic material that covers the rock of the earth's crust. All soils have characteristics that make them more or less appropriate for different land uses. Scientists classify soils by these characteristics:

- topography;
- physical properties including soil structure, particle size, stoniness and depth of bedrock;
- drainage or permeability to water;
- depth to the water table and susceptibility to flooding;
- behavior or engineering properties; and
- biological characteristics such as presence of organic matter and fertility.[9]

Soils are classified and grouped into associations that are commonly found together.

[9] Natural Resource Inventory for Franklin County, University of Massachusetts Cooperative Extension, May 1976.

The soils of Shelburne are predominantly of the Westminster-Colrain-Buckland association. These soils are generally well-drained and range from fine sandy loams to rocky loams, and are found in the rolling to steep hills and narrow valleys in town. Minor soils in this association are the well-drained Shelburne soils and the poorly drained Cabot soils. The Westminster-Colrain-Buckland soils support dairy farming and apple orchards, as well as the production of maple syrup.

As Shelburne plans for the long-term use of its land, residents should ask:

1. Which soils constrain development given current technologies?
2. Which soils are particularly suited for recreational opportunities and wildlife habitat? and
3. Which soils are best for agriculture?

The answers to these questions can help lay a foundation for open space and recreation planning in Shelburne. The following sub-section provides a description of the soils in Shelburne based on their impact on drinking water issues, wastewater issues, recreation opportunities, erosion, wildlife habitat, and agriculture.

Which soils constrain development given current technologies?
The Westminster soils are found on the moderate to steep slopes in Shelburne. They consist of well-drained, shallow, rocky loams, which developed in deposits of glacial material. Depth to bedrock is generally eighteen inches, but can range from bare outcrop to a depth of more than two feet in some places. The Colrain soils can be found on gently sloping to very steep slopes, but are limited in use due to their extreme stoniness. They are well-drained soils that formed in glacial deposits. The Colrain soils have a moderate to high moisture holding capacity. The Buckland soils, which formed in compact glacial deposits, are found in nearly level to moderately steep slopes. They consist of moderately well drained fine sandy loams and have a hard layer at a depth of approximately twenty inches. Although water passes through the surface layer and subsoil of the Buckland soils somewhat readily except when saturated, they are considered wet as water moves slowly through the dense substratum.

In general, wet and shallow soils do not provide for adequate filtration of wastewater pollutants associated with private septic systems. Shallow soils are often associated with steep slopes or hilltops while wet soils are often found along floodplains and wetland systems.

Which soils are particularly suited for recreational opportunities and wildlife habitat?
Outside of flat areas for sports fields, the soils best suited for rural recreational purposes are the same as those that provide upland wildlife habitat. Different recreational uses are constrained by different soil and topographical characteristics. Sports fields require well-drained soils and level topography, whereas lands with slopes greater than 25 percent are attractive to mountain biking and hiking enthusiasts.

Erodability of soils has important implications for the impact of recreational uses. Erodable soils include those that are shallow, wet, sandy, or sloped, or those with a combination of these characteristics. Hikers, mountain bikers and ATVs can create and exacerbate erosion on steep slopes and in sandy soils.

There is a good correlation between soils that support wildlife habitat and soils that present the most constraints to development. These soils include the extremely rocky loam type soils of the Westminster and Colrain series found on the moderate to steep slopes.

Which are the best soils for agriculture?

The Natural Resources Conservation Service (NRCS), formerly known as the Soil Conservation Service of the U.S. Department of Agriculture is responsible for classification of soils according to their suitability for agriculture. NRCS maintains detailed information on soils and maps of where they are located.

Information on soils presented in this plan is based on 1967 USDA Natural Resource Conservation Service (NRCS) mapping for Franklin County. New digital soils data was recently released by NRCS and the Franklin Regional Council of Governments is currently working to integrate it into our database for Franklin County. This information is useful as a general indicator of town-wide soils. Especially under forest cover, however, mapped soil type over large areas can have inclusions of other types too small to differentiate. Therefore, mapped soils data are inaccurate indicators of potential development limitations.

What is Prime Farmland?

According to Natural Resources Conservation Service (NRCS), Prime Farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and that is available for these uses. It has the combination of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if managed with acceptable farming methods.

In general, prime farmland has an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, an acceptable level of acidity or alkalinity, an acceptable content of salt or sodium, and few or no rocks. Its soils are permeable to water and air. Prime farmland is not excessively eroded or saturated with water for long periods of time, and it either does not flood frequently during the growing season or is protected from flooding.

Designated farmland soils are comprised of three classes of soils that have been identified by the NRCS:

- Prime Farmland
- Unique Farmland, and
- Farmland of statewide or local importance.

These soil classes have been identified as contributing to the agricultural productivity of the country and should be protected from conversion to non-agricultural uses. Unique farmland is defined as "land other than prime farmland that is used for production of specific high value food and fiber crops," with such crops defined by the Secretary of Agriculture. Farmland of statewide or local importance is defined as "farmland, other than prime or unique farmland, that is of statewide or local importance for the production of food, feed, fiber, forage, or oilseed crops." Only Prime Farmland is shown on the maps for this Open Space and Recreation Plan.

These agricultural soils are a finite resource. If the soil is removed, or the land is converted to another use, the capacity for food and fiber production is lost.

Prime farmland soils have contributed to the town's economic stability throughout its history. The more common soils that constitute these prime agricultural lands include the Colrain, Buckland, and Shelburne soils. The Colrain soils are deep and well-drained, and are found in gently sloping to moderately steep areas. The Buckland soils are moderately well-drained, fine sandy loams found in nearly level to moderately steep slopes. Shelburne soils are well-drained stony loams found in gently sloping to steep areas. In Shelburne, prime farmland soils are located primarily in the central and eastern thirds of the town.

The characteristics that make prime farmland soils suitable for agricultural also make them easy to develop. Large tracts of level, well-drained farmland are attractive to developers because the cost of installing roads and other infrastructure is relatively low. Residents interested in helping to conserve the town's agricultural landscapes should consider all farmland soils to be rare, valuable, and vulnerable to development.

C. LANDSCAPE CHARACTER

Shelburne's diverse landscape distinguishes it from surrounding communities. The town is one of steep forested hills, open hilltop views, agricultural lands, large active farms, numerous streams, and abundant wildlife. The Deerfield River, which flows southeastward, forms the town's western boundary. To the east of the Deerfield River lies a long, broad ridge line, Massaemett Mountain, with an elevation of 1,588 ft. The ridge extends approximately from Route 2 to Patten Hill. The Patten Hill area, also of significant elevation, is home to many agricultural landscapes including pastures, orchards and cultivated fields. Patten Hill offers magnificent distant views to the north and northeast. Many of the other agricultural lands can be found in the eastern two-thirds of the town and within the floodplains of its streams. The town has two villages, Shelburne Falls located along the Deerfield River and Shelburne Center, located south of the Mohawk Trail. Shelburne Falls is comprised of a mix of residential, business and commercial development within a compact village landscape. The Town of Shelburne also has a considerable number of retail and service businesses within its commercially zoned area along Route 2, a transportation corridor, which bisects the town. The views from Bardwells Ferry Road from Shelburne Center to Bardwells Ferry Bridge encompass both intimate glimpses of farm life and vast long-range views of rolling hills and tree-crested hill tops.

D. WATER RESOURCES

D.1 Watersheds

Shelburne is rich in water resources, including a river, brooks, streams, vernal pools, wetlands, and aquifers *(See the Natural Resources Map)*. Most of the land in Shelburne drains into the Deerfield River, which forms the western and southern boundaries of Shelburne, and is an important sub-watershed within the Connecticut River Watershed. This section focuses on waters within the Town of Shelburne, but it is important to keep in mind that improvement in

water quality in the Deerfield River and the other brooks and streams in town have impacts beyond town borders.

D.1.1 Deerfield River (sub-watershed of the Connecticut)

The Deerfield River Watershed is a sub-watershed of the Connecticut River Watershed that drains approximately 665 square miles of the Southern Green Mountains in Vermont and the Northern Berkshires in Massachusetts. Three hundred and forty-seven square miles of this land is located in all or part of twenty (20) western Massachusetts towns. From its headwaters at Stratton Mountain in Vermont, the Deerfield River flows southeastward for approximately seventy (70.2) miles through the steep terrain of the Berkshires to its confluence with the Connecticut River.

The northern portion of the watershed from Somerset to Route 2 in Massachusetts is primarily forested and steep, accounting for approximately 78 percent of the total watershed area. Much of the land along the remaining length of the river is open and agricultural land.

The Deerfield River drops 1,000 ft. in elevation along its length in Massachusetts. This feature has resulted in the management of the Deerfield River for hydroelectric power generation with ten (10) hydroelectric developments constructed on the river since 1911, of which xx are still producing approximately xx KW of hydropower.

Despite the River's regulation by hydroelectric facilities, the Deerfield River's cold and clean waters makes it one of the best fisheries in the State. As part of the Connecticut River restoration project, the Massachusetts Division of Fisheries and Wildlife (DFW) and U.S. Fish and Wildlife Service were responsible for a Atlantic salmon restoration effort in the Deerfield River. The stocking program released Atlantic salmon fry into tributaries of the Connecticut River and for many years, the Deerfield River Watershed and its twenty-one tributaries were stocked with hundreds of thousands of Atlantic salmon fry each spring. However, the devasting damage to the White River National Fish Hatchery in Bethel, VT from Tropical Storm Irene in 2011 and other factors, including budget cuts and the recent poor returns of adult salmon to the Connecticut River, resulted in the end of the Connecticut River Atlantic Salmon Program in 2012.[10] The River continues to support native and stocked trout, making the Deerfield River one of the premier rivers for fishing in the New England.

Recreational opportunities within and along the Deerfield River abound. Whitewater sports, hiking, biking, hunting, fishing, cross-country skiing, and snowshoeing are some of the activities enjoyed by residents and visitors alike.

According to the Massachusetts Department of Environmental Protection (MassDEP), the Deerfield River from the Vermont-Massachusetts State Line to its confluence with the Connecticut River is given a Class B water quality designation. Class B waters are considered

[10] http://ctriversalmon.org/newsletter/Summer2013.pdf

suitable habitat for fish, other aquatic life and wildlife and safe for primary and secondary contact recreation. Class B waters have an overall consistent aesthetic quality.

The Deerfield River and many of its major and minor tributary rivers and streams are also designated as a Coldwater Fish Resources (CFR).[11] A CFR is defined as a waterbody that meets at least one of the following criteria:

1. Brook, brown or rainbow trout reproduction has been determined.
2. Slimy sculpin, longnose sucker, or lake chub are present.
3. The water is part of the Atlantic salmon restoration effort or is stocked with Atlantic salmon fry or parr.

The identification of Coldwater Fish Resources is based on fish samples collected annually by Division of Fisheries and Wildlife staff biologists and technicians. The identified CFRs are organized geographically by watershed and the information is updated annually. As of 2011, there are nearly 900 streams identified statewide. The CFR lists are useful tools for highlighting environmentally sensitive areas. Conservation Commissions, Planning Boards, land trusts, consultants and town Open Space Committees may find this information useful for conservation planning.[12]

The MassDEP Division of Watershed Management (DWM), Watershed Planning Program (WPP) 2012 Integrated List of Waters represents the combined reporting elements for the 2012 cycle of both sections 305(b) and 303(d) of the Federal Clean Water Act (CWA). The objective of this statute is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. As one step toward meeting this goal each state must administer a program to monitor and assess the quality of its surface waters and provide periodic status reports to the U.S. Environmental Protection Agency (EPA), the U.S. Congress, and the public.

Section 305(b) of the CWA codifies the process whereby waters are evaluated with respect to their capacity to support designated uses as defined in the 314 CMR 4.00: Surface Water Quality Standards pdf format of 314 CMR 4.00: Surface Water Quality Standards. These uses include fish, other aquatic life and wildlife (i.e. aquatic life), fish consumption, public water supply, shellfish harvesting, primary contact-recreation (e.g., swimming), secondary contact-recreation (e.g., boating), and aesthetics. The 305(b) process entails assessing each of these uses, where applicable, for rivers, lakes and coastal waters. Causes and sources of use impairment are also identified where possible. Section 303(d) of the CWA requires states to identify those water bodies that are not expected to meet surface water quality standards after the implementation of technology-based controls and to prioritize and schedule them for the derivation of Total Maximum Daily Loads (TMDLs).

The Massachusetts Year 2012 Integrated List of Waters report was approved by the EPA in May 2013. The Deerfield River, from the outlet of the Sherman Reservoir in the towns of Monroe

[11] http://www.mass.gov/eea/agencies/dfg/dfw/wildlife-habitat-conservation/coldwater-fishery-resources-deerfield-river-watershed.html

[12] http://www.mass.gov/eea/agencies/dfg/dfw/wildlife-habitat-conservation/coldwater-fishery-resources-deerfield-river-watershed.html

and Rowe, to the rivers' confluence with the Connecticut River in Deerfield, is classified in the DEP's 2012 Integrated List of Waters as a *Category 2 Waters - Attaining Some Uses; Other Uses Not Assessed*. According to the 2012 Integrated List, the Deerfield River meets the designated use criteria for Aesthetics; Fish, other Aquatic Life and Wildlife (provides adequate habitat); Primary Contact Recreation; and Secondary Contact Recreation.[13]

The Deerfield River Watershed Association (DRWA) has been monitoring the Deerfield River and several of its tributaries in Massachusetts for water quality since 1990. According to information on DRWA's website (www.deerfieldriver.org), the Deerfield River is one of the most pristine rivers in Massachusetts. Due to cool temperatures, high oxygen content, and neutral rather than acidic conditions, the river is home to a variety of aquatic life. Despite ten dams and five waste water treatment plants on its river shores, the watershed is not densely populated and most of the land use is forests. Because the river is clean and scenic, it is used heavily for recreation. Currently, DRWA monitors the river for temperature, pH and alkalinity in the spring and temperature and E. coli bacteria in the summer. Previous years' data can be found in the archived data section of the DRWA's website (http://deerfieldriver.org/archivedresults.html). In addition, the DRWA has a treasure trove of water quality data from the early 2000′s, which can be accessed using this link http://deerfieldriver.org/waterquality.html.

Surface Water Resources in the Deerfield River Watershed

All of the waters listed in this section are Coldwater Fish Resources.

Dragon Brook
Dragon Brook originates at Baker Swamp between Reynolds and Little Mohawk Roads in central Shelburne. From Baker Swamp to Bardswell Ferry Road, the brook valley is somewhat flat and broad. South of Bardswell Ferry Road the brook becomes much steeper as it reaches its confluence with the Deerfield River. In the spring, the Massachusetts Division of Fisheries and Wildlife stocks Dragon Brook with trout.

Great Brook
Great Brook, located in eastern Shelburne, originates in the area of Greenfield Mountain. It flows into Hawkes Brook.

Hawkes Brook
Hawkes Brook flows into Dragon Brook in south-central Shelburne.

Sluice Brook
Sluice Brook is located in the western half of Shelburne and originates in the area of Patten Hill. It flows generally southward to its confluence with the Deerfield River in the southwestern section of town.

Shingle Brook

[13] http://www.mass.gov/eea/agencies/massdep/water/watersheds/2012-integrated-list-of-waters.html

Shingle Brook is located in southeastern Shelburne and originates south of South Road to the east of Shingle Hill. It flows southward to its confluence with the Deerfield River in the town of Deerfield.

D.1.2 Green River Watershed

The Green River Watershed is located in southern Vermont and northwestern Massachusetts. It has a drainage area of 89.9 square miles, which includes portions of Shelburne, Colrain, Leyden, Bernardston and Greenfield, as well as five communities in Vermont. The total length of the Green River is 28.3 miles, 16.3 miles of which are in Massachusetts. The River itself originates in southeastern Vermont on the south side of the Mt. Olga-Hogback Ridge in the town of Marlboro, Vermont. The Green River enters Massachusetts in the town of Colrain and forms the town's eastern border with the town of Leyden. It flows south and east through a steep, narrow valley for much of its length and, as it enters the town of Greenfield, its gradient lessens and the floodplain widens. The Green River boasts an undeveloped river corridor, in part due to its steep terrain and geologic features. Most roads in the watershed remain unpaved, with minimal riverside development. Most of the watershed is forested, although along the Massachusetts section, agricultural and open land can be found as well. Only as the river reaches the town of Greenfield does it begin to flow through some areas of urban development.

The Green River Watershed provides many opportunities for recreational use. Swimming, fishing, whitewater boating, hiking, biking, horseback riding, hunting, cross country skiing and snowmobiling are popular and common in the watershed.

The Massachusetts Department of Environmental Protection has given the Green River a Class B, Cold Water Fishery, High Quality Water designation from the Vermont-Massachusetts border to the Greenfield Wastewater Treatment Plant. From the Wastewater Treatment Plant to its confluence with the Deerfield River, the Green River is designated a Class B, Cold Water Fishery.[14] According to the 2012 Integrated List of Waters, most of the Green River is designated as Category 2 waters:

- from the Vermont border with the Town of Colrain to the Greenfield water supply dam, north of Eunice Williams Road in Greenfield, the river meets the criteria for Aesthetics and Fish, other Aquatic Life and Wildlife Habitat.
- From the Greenfield water supply dam to the Greenfield swimming pool dam, northwest of Nashs Mill Road, Greenfield, the river meets the criteria for Aesthetics, Fish, other aquatic Life and Wildlife Habitat, Primary Contact Recreation; and Secondary Contact Recreation.[15]

From the Greenfield swimming pool dam to the river's confluence with the Deerfield River, approximately 3.73 miles, the river is listed as a Category 5 Waters – " Waters Requiring a TMDL" for fecal coliform.

[14] http://www.mass.gov/eea/agencies/dfg/dfw/wildlife-habitat-conservation/coldwater-fishery-resources-deerfield-river-watershed.html

[15] http://www.mass.gov/eea/agencies/massdep/water/watersheds/2012-integrated-list-of-waters.html

Surface Water Resources in the Green River Watershed, a sub-watershed of the Deerfield River

All of the waterbodies listed in this section are Coldwater Fish Resources except Stewart Brook and Wheeler Brook.

Punch Brook
Punch Brook is located in the northeastern corner of Shelburne. It originates in the town of Colrain and flows southeasterly to its confluence with Hinsdale Brook in the town of Greenfield.

Stewart Brook
Stewart Brook is located in the northeastern corner of Shelburne. It originates near Van Ness Road in the town of Colrain and is a tributary of Hinsdale Brook.

Hinsdale Brook
Hinsdale Brook, located in northeastern Shelburne, flows southeasterly to its confluence with the Green River in the town of Greenfield.

Allen Brook
Allen Brook, located in east-central Shelburne, is a mountain brook with steep gradient, small pools and waterfalls. Its originates in two wetland areas, one extending southward from Skinner Cemetery and the other located north of the intersection of Skinner Road and Colrain-Shelburne Road. It flows eastward through what is reputed to be among the deepest gorges in Massachusetts to its confluence with the Green River in the town of Greenfield.

Wheeler Brook
Wheeler Brook originates in the area of Old Greenfield Road near the town boundary with Greenfield. It flows eastward to its confluence with the Green River.

D.1.3 North River Watershed (sub-watershed of the Deerfield River)
The North River Watershed is located in northwestern Massachusetts and southern Vermont, draining 94.2 square miles. It is formed by the confluence of the East Branch and the West Branch. Below this confluence, the North River is impounded by a dam. The North River flows south and west, paralleling Route 112. Forests predominate the upland slopes of the watershed while the floodplain areas in the valley are mostly agricultural. Residential and industrial development in the watershed is primarily concentrated within the river floodplain. The floodplain narrows as the North flows toward its confluence with the Deerfield River, just south of North River Road at the Shelburne, Charlemont and Buckland town lines. The North River has been given Class B, Cold Water Fishery, High Quality Water designation from the confluence of the East and West Branches to the Veratec Treatment Plant site in Colrain and Class B, Cold Water Fishery for the remainder of the river to its confluence with the Deerfield River (Mass. DEP, 2000). According to the 2012 Integrated List of Waters, the main stem of the North River to its confluence with the Deerfield River is classified as Category 2 Waters, with water quality meeting all designated uses (Aesthetics; Fish, other Aquatic Life and Wildlife (provides adequate habitat); Primary Contact Recreation; and Secondary Contact Recreation).

The East Branch North River is also classified as Category 2 Waters, with water quality meeting all designated uses. The West Branch North River has been classified as Category 2 Waters, attaining only the Fish, other Aquatic Life and Wildlife uses, with other uses not assessed.

Given its water quality and environmental factors providing for good cold water fishery habitat, the North River is stocked with trout on an annual basis.

Surface Water Resources in the North River Watershed, a sub-watershed of the Deerfield River

Fox Brook
Fox Brook originates in north-central Shelburne and southwestern Colrain and is a Coldwater Fish Resource. It flows to its confluence with the North River in southwestern Colrain. Action Item II-1-F in the Seven-Year Action Plan calls for Shelburne to coordinate with neighboring towns on water corridor management. The Fox Brook Reservoir is a three (3) acre emergency water supply reservoir, part of the supply that serves customers in Shelburne, Buckland, and Colrain.

D.2 Flood Hazard Areas

Flooding along rivers is a natural occurrence. Floods happen when the flow in the river exceeds the carrying capacity of the channel. Some areas along rivers flood every year during the spring, other areas flood during years when spring runoff is especially high, or following severe storm events. The term "floodplain" refers to the land affected by flooding from a storm predicted to occur at a particular interval. For example, the "one hundred year floodplain," is the area predicted to flood as the result of a very severe storm that has a one percent chance of occurring in any given year. Similarly, the 500-year floodplain is the area predicted to flood in a catastrophic storm with a 1 in 500 chance of occurring in any year.

The 100- and 500-year floodplains are mapped by the National Flood Insurance Program (NFIP) after study of waterways. The 100-year floodplain is used for regulatory purposes. According to the NFIP maps effective 1980, one hundred year floodplains in Shelburne occur along:

- The entire length of the Deerfield River in Shelburne;
- Along Tributary B of the Deerfield River from a point east of Arms Cemetery, southwest to Warren Court and then west to the Deerfield River;
- Dragon Brook from a point approximately 1,000 ft. northeast of Mercy Anderson Road to a point approximately 1,000 ft. south of Mercy Anderson Road;
- Dragon Brook beginning at a point approximately 800 ft. from the intersection of Little Mohawk and Bardswell Ferry Roads to a point approximately 800 ft. southeast on Bardswell Ferry Road from its intersection with Orchard Road;
- Hinsdale Brook from the Colrain town line to the brook's intersection with Fiske Mill Road;
- Hinsdale Brook from approximately 500 ft. west of the intersection of Colrain and Greenfield Roads to a point approximately 600 ft. downstream of Wilson Graves Road;

- Hinsdale Brook from the Greenfield town line to a point approximately 4,400 ft. upstream;
- An approximately 3,000 ft. section of Allen Brook beginning roughly 800 ft. downstream from the intersection of Peckville and Percy Roberts Roads;
- Great Brook beginning just downstream of its headwaters to a point approximately 1,200 ft. upstream from its confluence with Hawkes Brook;
- The length of Hawkes Brook to its intersection with Bardswell Ferry Road;
- Sluice Brook beginning just downstream of its headwaters to its intersection with Shelburne Road;
- Sluice Brook beginning approximately 200 ft. south of Shelburne Road to a point approximately 1,100 ft. downstream; and
- Shingle Brook beginning at the Deerfield town line to a point approximately 2,300 ft. upstream.

The 100-year floodplain is shown on the Natural Resources Map at the end of this section.

If the dam holding back the Harriman Reservoir were ever to give way, the Town of Shelburne would be impacted dramatically, including parts of the highly populated village of Shelburne Falls. The predicted extent of the area likely to be flooded is shown on a "worst case scenario" map prepared for Shelburne's Emergency Management Plan and is included in Appendix xx of this Plan. Action Item II-1-G in the Seven-Year Action Plan identifies a need to restore and preserve flood plain areas to absorb as much river overflow as possible while minimizing damage.

D.3 Wetlands

Wetlands are transitional areas where land-based and water-based ecosystems overlap. Inland wetlands are commonly referred to as swamps, marshes and bogs. Technically, wetlands are places where the water table is at or near the surface or the land is covered by shallow water. Sometimes, the term “wetlands” is used to refer to surface water as well.

Historically, wetlands have been viewed as unproductive wastelands, to be drained, filled and “improved” for more productive uses. Over the past several decades, scientists have recognized that wetlands perform a variety of extremely important ecological functions. They absorb runoff and prevent flooding. Wetland vegetation stabilizes stream banks, preventing erosion, and trap sediments that are transported by runoff. Wetland plants absorb nutrients, such as nitrogen and phosphorus, which would be harmful if they entered lakes, ponds, rivers and streams. They also absorb heavy metals and other pollution. Finally, wetlands are extremely productive, providing food and habitat for fish and wildlife. Many plants, invertebrates, amphibians, reptiles and fish depend on wetlands to survive. Wetlands have economic significance related to their ecological functions: it is far more cost-effective to maintain wetlands than build treatment facilities to manage stormwater and purify drinking water, and wetlands are essential to supporting lucrative outdoor recreation industries including hunting, fishing and bird-watching.

In recognition of the ecological and economic importance of wetlands, the Massachusetts Wetlands Protection Act is designed to protect eight “interests” related to their function: public

and private water supply, ground water supply, flood control, storm damage prevention, prevention of pollution, land containing shellfish, fisheries, and wildlife habitat. To this end, the law defines and protects "wetland resource areas," including banks of rivers, lakes, ponds and streams, wetlands bordering the banks, land under rivers, lakes and ponds, land subject to flooding, and "riverfront areas" within two hundred feet of any stream that runs all year. Local Conservation Commissions are responsible for administering the Wetlands Protection Act; some towns also have their own, local wetlands regulations.

Many of Shelburne's wetlands can be found in its forested upland areas. Some of these wetlands are mapped by the National Wetlands Inventory (NWI) (*see Natural Resources Map*). Action Item II-1-A of the Seven-Year Action Plan calls for identifying wetland resources that would benefit from conservation.

Vernal Pools

Vernal pools are temporary bodies of fresh water that provide critical breeding habitat for many vertebrate and invertebrate wildlife species. They are defined as "basin depressions where water is confined and persists for at least two months during the spring and early summer of most years, and where reproducing populations of fish do not survive". Vernal pools may be very shallow, holding only 5 or 6 inches of water, or they may be quite deep. They range in size from fewer than 100 square feet to several acres. Vernal pools are found across the landscape, anywhere that small woodland depressions, swales or kettle holes collect spring runoff or intercept seasonal high groundwater, and along rivers in the floodplain. Many species of amphibians and vertebrates are completely dependent on vernal pools to reproduce. Loss of vernal pools can endanger entire populations of these species.

The state's Natural Heritage and Endangered Species Program (NHESP) has predicted the location of vernal pools statewide based on interpretation of aerial photographs. NHESP believes that its method correctly predicts the existence of vernal pools in 80 to 90 percent of cases. They acknowledge, however, that the method probably misses smaller pools.[16] There continues to be some debate about the reliability of the NHESP method to identify potential vernal pools.

According to information on the NHESP website, NHESP reviews and processes applications for the official "certification" of vernal pool habitats, based primarily on the documentation of wetland use by species that depend on vernal pool habitats to complete their life cycles (i.e., "obligate vernal pool species"). This certification process relies largely on volunteers to survey possible vernal pools and to submit documentation of certain biological and physical evidence of vernal pool habitat. The NHESP has guidelines for the certification of vernal pool habitat that describe how citizens can provide the necessary documentation for certification, including gaining landowner permission before entering private lands. Surveying vernal pool habitats and compiling information for their certification is an excellent way for people to learn about vernal

[16] See Survey of Potential Vernal Pools at http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/vernal-pools/

pools and the animals that use them, and to become more involved in the protection of natural resources in Massachusetts.[17]

Certified vernal pools are protected by the Massachusetts Wetlands Protection Act and by additional state and federal regulations.[18] There are 3 certified vernal pools in Shelburne.

D.4 Potential Aquifers and Recharge Areas

Aquifers are composed of water-bearing soil and minerals, which may be either unconsolidated (soil-like) deposits or consolidated rocks. Consolidated rocks, also known as bedrock, consist of rock and mineral particles that have been welded together by heat and pressure or chemical reaction. Water flows through fractures, pores and other openings. Unconsolidated deposits consist of material from the disintegrated consolidated rocks. Water flows through openings between particles.

As water travels through the cracks and openings in rock and soil, it passes through a region called the "unsaturated zone," which is characterized by the presence of both air and water in the spaces between soil particles. Water in this zone cannot be pumped. Below this layer, water fills all spaces in the "saturated zone." The water in this layer is referred to as "groundwater." The upper surface of the groundwater is called the "water table" (Masters; 1998).

The route groundwater takes and the rate at which it moves through an aquifer is determined by the properties of the aquifer materials and the aquifer's width and depth. This information helps determine how best to extract the water for use, as well as determining how contaminants, which originate on the surface, will flow in the aquifer.

Aquifers are generally classified as either unconfined or confined (EPA and Purdue U; 1998). The top of an unconfined aquifer is identified by the water table. Above the water table, in the unsaturated zone, interconnected pore spaces are open to the atmosphere. Precipitation recharges the groundwater by soaking into the ground and percolating down to the water table. Almost all the public wells in Massachusetts and many private wells tap unconfined aquifers (Mass. Audubon Society, 1985). Confined aquifers are sandwiched between two impermeable layers (Masters; 1998). Wells that rely on confined aquifers are referred to as "artesian wells."

Shelburne's surficial geology has characteristics that would support low yield aquifers. A low-yield aquifer provides a yield of between 0 and 50 gallons per minute. According to MassGIS and U.S. Geological Survey documents, these low yield aquifers are associated with streams and wetland areas in Shelburne *(see Natural Resources Map)*.

Potential Community Drinking Water Supplies

The Franklin County Regional Water Supply Study (2003) developed by the Franklin Regional Council of Governments identified areas of land atop estimated aquifers without constraints for

[17] http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/vernal-pools/vernal-pool-certification.html
[18] http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/vernal-pools/

wellhead protection areas. The study based its analysis on a model developed by the U.S. Geological Survey in cooperation with the Cape Cod Commission in the mid-1990s, which is summarized in "Water-Resources Investigation Report 94-4156, Identification of Potential Public Water-Supply Areas of the Cape Cod Aquifer, Massachusetts, using a Geographic Information System."

Identifying the best location for a new community well site is dependent on two main types of requirements. The first type has to do with the capacity of the water source, the aquifer, to provide clean water of a volume and flow required for a community water supplier. The second set of requirements concerns allowable land use within the Zone I wellhead protection area, which is an area of land with a radius of between 100 and 400 feet from the potential well site. Any well that pumps at least seventy gallons per minute (100,800 gallons per day) must have a Zone I radius of 400 feet. DEP requires that towns own the land within the Zone I of all new sources. The land within the Zone I cannot be used for any other purpose than for water supplies.

The USGS/Cape Cod model used GIS to determine the locations of potential Zone I wellhead protection areas that towns could acquire for future water supply source development. The model developed a set of land use-based constraints and other factors that were excluded from Zone I areas by state law: restricted use lands, wetland zones, developed land uses, and the potential saltwater intrusion zone. The Franklin County Study adapted this model to the region by excluding a saltwater intrusion zone and by making other modifications to the selected criteria list.

The resulting analysis identifies the following potential future community water supply protection areas (for low to medium yield aquifers):

- Along the Hawkes Great Brook main stem south of Shelburne Center;
- Near the confluence of Sluice Brook and the Deerfield River; and
- East of Rte. 2 and south of Shelburne Falls.

Action Item II-1-B of the Seven-Year Action Plan addresses the issue of securing and protecting actual and potential water sources for public supply.

E. VEGETATION

Plants are a critical component of ecosystems in Shelburne. Plants convert solar energy into food, which supports all animal life. Plants cycle energy through the ecosystem by decaying, by removing carbon from the atmosphere and by shedding oxygen. Plants help moderate temperatures and act as shelter and feeding surfaces for herbivores, omnivores, and carnivores.

Plants and animals together make up *natural communities*, defined as interacting groups of plants and animals that share a common environment and occur together in different places on the landscape (NHESP; 2001). Over the past decade, ecologists and conservationists in Massachusetts have devoted increasing effort to studying and protecting these natural

communities, rather than focusing on individual species. This section and the following section will address both natural communities and their component species.

E.1 Forests

In 2005, forests comprised 71 percent of the total land area in the Town of Shelburne (MassGIS; 2005). (See Forest Map xx) According to Agricultural and Forestry Land Maps of the Buckland-Shelburne Master Plan (1999), the majority of these forests are considered Prime Forestland. These Prime forestlands occur mainly in the central and eastern thirds of the town. As described by the Department of Forestry and Wildlife at the University of Massachusetts in their research bulletin entitled "Prime Forestland Classification for Forest Productivity in Massachusetts", prime forestland are those soils that are able to support a production of wood fiber at a rate greater than eighty-five cubic feet per year. Only forestland with Prime 1, 2, and 3 soils is cost-effective to manage intensively for wood products.

Forests in Shelburne are classified as Transition Hardwood Forests (USDA; 1992). The Transition Hardwood Forest consists of northern hardwoods such as yellow and paper birch (*Betula alleghaniensis* and *Betula papyrifera*), beech (*Fagus grandifolia*), and sugar and red maple (*Acer saccharum* and *Acer rubrum*). On the dryer sites, the Hardwood Forest consisting of oaks and hickories can be found with red oak (*Quercus rubra*) being the most abundant deciduous species. Hemlock (*Tsuga canadensis*) occurs in the moist cool valleys, north and east slopes, and sides of ravines of Shelburne. White pine (*Pinus strobus*) is characteristic of the well-drained sandy sites. These forest types commonly occur up to an elevation of one thousand five hundred feet (1,500 ft.) above sea level in upland central Massachusetts and southern New Hampshire, northward through the Connecticut Valley.

The second highest natural resource goal in the *Franklin County 2035 Regional Plan for Sustainable Development (RPSD)* is to protect forests. Forests important to protect include unfragmented forests, old-growth forests, and forests that support rare and endangered plant and animal species. Forests along rivers and streams are also a priority to protect for their important habitat, water recharge functions, and bank stabilization. Forests located on soils good for timber production should also be protected. The plan lists several potential impacts on forests due to climate change, including decline of maple syrup production, the deterioration of the Eastern Hemlock, and the spread of invasive plant species. According to the plan, sustainable forestry practices, such as planting and selectively harvesting trees, can increase the ability of forests to sequester carbon. Sustainable forestry practices also provide employment, support rural communities, and encourage landowners to retain their woodlots rather than selling them. Benefits of forest management include providing a sustainable source of wood products, increasing the diversity of habitats for wildlife, and offering places for recreation. The monitoring and control of invasive species greatly contributes to a forest's health and ability to regenerate and sustain native wildlife.

A proposal in development calls for the potential for landowners to voluntarily enter into conservation restrictions on private forest lands which would then be overlaid with a National Forest designation. More study of this proposal and its potential pros and cons for Shelburne

forests is required. Action Item I-1.B of the Seven-Year Action Plan calls for an inventory of forest resources, and Action Item I-1.C calls for study and discussion of the USDA Forest Service proposal.

E.2 Unusual Natural Communities

The Natural Heritage and Endangered Species Program (NHESP) of the Massachusetts Division of Fisheries and Wildlife has noted the Town of Shelburne as having a number of uncommon ecologically significant natural communities within its borders, which support a number of the state-listed rare and endangered species. These communities include:

Rich, Mesic Forests

Rich, mesic forests are one type of unusual natural community known to occur in the Town of Shelburne. The rich, mesic forest is nutrient-*rich*, moderately moist (*mesic*) variant of the northern hardwood forest. It is found in areas of calcium-rich bedrock and alkaline groundwater. In the Northeast, these forests occur at low to moderate elevations below 2,400 feet and usually on the north or east-facing, concave, middle to lower slopes. Within the Commonwealth of Massachusetts only a limited number of rich, mesic forests can be found. Sugar maple (*Acer saccharum*) and/or basswood (*Tilia americana*) are the dominant species of this forest. White ash (*Fraxinus americana*), yellow birch (*Betula alleghaniensis*), butternut-hickory (*Carya cordiformis*), and sweet birch (*B. lenta*) also occur in small numbers. Autumn Coralroot (*Corallorhiza odontorhiza*) and Barren Strawberry (*Waldsteinia fragariodes*) are two species of special concern identified by the Natural Heritage and Endangered Species Program (NHESP) that may be found in this forest type in Shelburne.

Riverside Seep

Riverside seeps occur at the base of steep riverbanks where groundwater seeps out of the bottom of the slope. These seepages are usually mineral rich leading to great plant diversity. Periodic flooding helps to prevent woody shrubs from establishing themselves. The riverside seeps known to occur along the Deerfield River are not calcareous (limey), which is common with the seeps along the Connecticut River in Vermont and New Hampshire. Riverside seeps are often associated with riverside outcrop communities and high-energy riverbanks. Vegetation is that of a mixed herbaceous community with the wettest spots being mossy with a mixture of herbs and sedges.

Riverside Rock Outcrop Community

Riverside Rock Outcrop Communities occur on flood scoured bedrock along rivers. The outcrops may be low or steep on the river's edge, or may extend into the river channel.

Vegetation is that of sparse, mostly low and scattered herbaceous vegetation limited to crevices where soil accumulates. In Shelburne, the NHESP has identified two rare plants that utilize this outcrop community. Tradescant's aster (*Symphyodtrichum tradescantii*) is a threatened species and Roundleaf Shadbush (*Amelanchier sanguinea*) is a species of special concern.

Black Ash-Red Maple-Tamarack Calcareous Seepage Swamp

The Black Ash-Red Maple-Tamarack Calcareous Seepage Swamp is a mixed deciduous-coniferous forested swamp found in areas where there is calcareous (calcium-rich) groundwater seepage. Although the soils are mineral, there is a thin layer of peat at the surface. The more calcium-rich the seepage, the more rare plant species may be found. In Shelburne, the Showy Lady's-Slipper (*Cypripedium reginae*) is a species of special concern that may be found in this community.

E.3 Agricultural Land

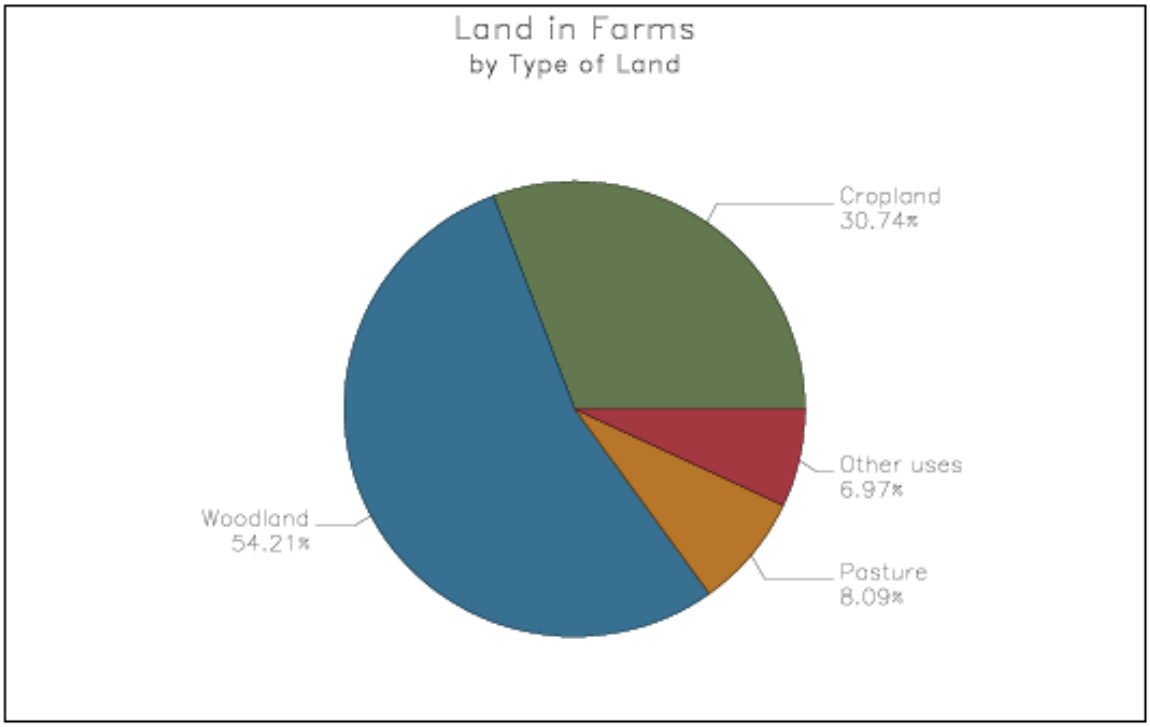
In 2005, agricultural land in Shelburne comprised 17 percent of the town's total land area, including pasture land, crop land and orchards (MassGIS; 2005). According to 2012 Assessors' data, there are 1,360 acres of farmland in Shelburne in the Agricultural Preservation Program. The 1997 U.S. Census of Agriculture indicated that Shelburne had forty-six farms, thirty-four of which were fifty acres and over in size. The U.S. Census of Agriculture is conducted every 5 years. The results of the 2012 census have not yet been released, but a recent rough inventory by the Shelburne Agricultural Commission identified 40 landowners that produce various agricultural and forest-based commodities (see Map: Existing Farms and Agricultural Land on page xx)

The 2007 U.S. Census of Agriculture does not provide municipal-level data for the specific amount of land in farms or the number of farms only a summary of data for Franklin County.[19] Action Item I-1. L in the Seven-Year Action Plan calls for extracting and analyzing data sets at the Town level to better understand the impact of farms and farming on the community.

The 2007 Census data for Franklin County does contain several things of note. Between 2002 and 2007, the number of farms in the county increased from 586 to 741. The average size of the farms in 2007 was 107 acres, just slightly smaller than 127 acres in 2002. It is interesting, but perhaps not surprising to residents of Shelburne, that the type of land in these farms was predominantly woodland. The other things to note are:

- the average age of the principal operators of farms in Franklin County is 54 years;
- the average total per farm production expenses are $69,578; and
- the average per farm net cash income is $12,227.

19 http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/Massachusetts/cp25011.pdf



Shelburne's agricultural lands and working farms give the town its rural character, contribute to the local property tax base, and are at the heart of what residents love about living here. As discussed in Section 3, working farms provide Shelburne residents and those from neighboring towns with access to fresh, local food and jobs. The farms also preserve significant historical landscapes and prime agricultural soils, and are integral parts of the scenic, rural landscape that is treasured by residents and visitors alike.

Many of Shelburne's farms have been in operation and farmed by the same families for decades, which provides stability and continuity to the rural landscape and helps to preserve the character of the town. Every ten years the Massachusetts Farm Bureau and the Massachusetts State Grange honor the Massachusetts Century Farms. Century Farms are farms that have been in the same family for 100 years or more and have been continuously farmed during that same period of time. Hawks Farm, established in 1780, was included in the 2000 list of Century Farms in Shelburne. Graves Glen Farm and Wheel View Farm were recognized as Century Farms in 2010.[20] The reader should note that because the Century Farms designation is voluntary, and the information partially gathered by volunteers, in any given decade, this official list may not be complete.

Protecting farmland and local food supplies was identified as the top natural resource goal in the *Franklin County 2035 Regional Plan for Sustainable Development (RPSD)* and this was a top issue in the survey of Shelburne residents. (see appendix xx) To examine whether Franklin County has the land resources needed to support an increasing demand for local food – and to achieve some level of food self-reliance – the Conway School of Landscape Design (CSLD) was

[20] http://mfbf.net/MACenturyFarms/tabid/335/Default.aspx

hired to undertake an analysis of Franklin County's farmland for the RPSD. The study found that currently, 48 percent of Franklin County's farmland actively being farmed is west of the Connecticut River Valley, including the majority of the County's pasture land and orchards. The study found that Franklin County contains enough agricultural land to achieve food self-reliance. However, in order for the County to achieve food self-reliance, 10,691 acres of existing farmland would need to be put into agricultural production, the majority for cropland of specific crops. Currently, the land is farmed but the crops are exported from the County or the land may be used as pasture. The study also notes that while population growth in the County overall is expected to be low in the future, towns along the I-91 corridor and within easy commuting distances to the Five-College area may experience higher development pressures, making the need for protecting farmland and prime farmland soils more urgent in these towns.[21]

E.4 Public Shade Trees

Public shade trees are defined by the state as "all trees within a public way or on the boundaries thereof." Action Item I-3-G of the Seven-Year Action Plan calls for the creation of a Town Tree Committee to improve the management, maintenance and public support for public shade trees. Public shade trees are located throughout the town, along its roads, and although not legally public shade trees, the trees on town-owned land, such as those in town cemeteries and in Shelburne Falls, have the perception of being "owned" by the citizens. In a Town as heavily forested as Shelburne, preserving public shade trees may seem unnecessary; however, loss of trees along rural roads and in public spaces can significantly change the character of a town. Some methods a town can use to protect shade trees include adopting a Scenic Roads Bylaw, limiting the amount of salt used on roads during the winter, and developing a plan and dedicating funding to the care and replacement of trees in public spaces. Shelburne's Tree Warden is responsible for the town's Public Shade Trees. A Public Hearing must be held (except in certain circumstances), pursuant to state law, before any cutting, trimming, or removal of a Public Shade Tree may take place. Many communities have found that a Tree Committee can work effectively with their Tree Wardens to improve the management, maintenance and public support for Public Shade Trees. For example, the Tree Committee could advocate for measures that mitigate the loss of these trees, which are public assets, such as the town requiring the applicant to plant replacement trees in the affected area at the Tree Warden's direction or requiring the applicant to provide a donation to the Town's tree planting fund.

E.5 Rare, Threatened and Endangered Plant Species

The Natural Heritage and Endangered Species Program (NHESP) of the Massachusetts Division of Fisheries and Wildlife (MassWildlife) has designated several "Priority Habitat" areas in the Town of Shelburne. A Priority Habitat is an area where plant and animal populations protected by the Massachusetts Endangered Species Act Regulations (321 CMR 10.00) may occur. These

[21] *Franklin County Farmland and Foodshed Study*, Conway School of Landscape Design, 2012. As presented in the *Franklin County 2035 Regional Plan for Sustainable Development* Natural Resources Chapter. http://www.frcog.org/services/landuse/landuse_HUD.php

areas mostly follow rivers and brooks in Shelburne, and also include several forested areas. (please see Natural Resources map at end of this section).

Statewide, NHESP has identified 256 native plant species as rare in the Commonwealth, and a number of rare plants have been documented in the Town of Shelburne (*see Table 4-2*). These plants occur in some of the Priority Habitats identified above. Plants (and animals) listed as *endangered* are at risk of extinction (total disappearance) or extirpation (disappearance of a distinct interbreeding population in a particular area). *Threatened* species are likely to become endangered in the foreseeable future. Species of *Special Concern* have been documented to have suffered a decline that could result in its becoming threatened, or occur in very small numbers and/or have very specialized habitat, the loss of which could result in their becoming threatened.[22]

Fifteen (15) rare plant species have been documented in the Town of Shelburne (see Table 4-3 below). These plants occur in some of the Priority Habitats identified above. NHESP has produced fact sheets for some rare species. NHESP also has fact sheets for non-listed species of conservation interest.[23] The fact sheets include the species status, description, aids for identifying and habitat as well as drawings or photos.

Table 4-3: Rare Plant Species in the Town of Shelburne

Scientific Name	Common Name	State Status
Goodyera repens	Dwarf Rattlesnake-plantain	Endangered
Penstemon hirsutus	Hairy Beardtongue	Endangered
Trisetum spicatum	Spiked False Oats	Endangered
Ophiogomphus carolus	Riffle Snaketail	Threatened
Alnus viridis spp. crispa	Mountain Alder	Threatened
Ophioglossum pusillum	Adder's-tongue Fern	Threatened
Platanthera dilatata	Leafy White Orchis	Threatened
Platanthera flava var. herbiola	Pale Green Orchis	Threatened
Aster tradescantii	Tradescant's Aster	Threatened
Amelanchier sanguinea	Roundleaf Shadbush	Special Concern
Adlumia fungosa	Climbing Fumitory	Special Concern
Clematis occidentalis	Purple Clematis	Special Concern
Corallorhiza odontorhiza	Autumn Coralroot	Special Concern
Equisetum scirpoides	Dwarf Scouring-rush	Special Concern
Waldsteinia fragarioides	Barren Strawberry	Special Concern

Source: http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/species-information-and-conservation/town-species-viewer.html accessed October 2013.

[22] http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/species-information-and-conservation/mesa-list/

[23] http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/species-information-and-conservation/mesa-list/list-of-rare-species-in-massachusetts.html
http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/species-information-and-conservation/mesa-list/non-listed-species-of-conservation-interest.html

F. FISHERIES AND WILDLIFE

Shelburne's upland forests, rivers, wetlands, and open farmland provide habitat for a variety of common and rare wildlife species. This section discusses wildlife species and their habitats from the perspective of natural communities, individual species, and patterns of wildlife distribution and movement across the landscape.

F.1 General Description and Inventory of Wildlife and Wildlife Habitats

The Town of Shelburne contains a significant amount of upland and floodplain habitat. Forests in Shelburne consist of large unbroken tracts, which allow for wildlife species movement within the town and the surrounding region.

F.2 Rare, Threatened and Endangered Wildlife Species

NHESP has mapped several "Estimated Habitats of Rare Wildlife" in the Town of Shelburne, which are shown on the Natural Resources Map at the end of this section. These habitats provide for wildlife species that are endangered, threatened and of special concern. Shelburne's rare, threatened and endangered wildlife species are listed in Table 4-4.

Table 4-4: Rare, Threatened and Endangered Wildlife Species found in Shelburne

Scientific Name	Common Name	State Status
Invertebrates		
Limnadia lenticularis	American Clam Shrimp	Special Concern
Neurocordulia yamaskanensis	Stygian Shadowdragon	Special Concern
Boyeria grafiana	Ocellated Darner	Special Concern
Vertebrates		
Bartramia longicauda	Upland Sandpiper	Endangered
Botaurus lentiginosus	American Bittern	Endangered
Ixobrychus exilis	Least Bittern	Endangered

Source: http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/species-information-and-conservation/town-species-viewer.html

F.3 Conserving Shelburne's Biodiversity

There are two concepts that can be used to help explain Shelburne's options for pursuing the conservation of the town's biodiversity: Island Biogeography and landscape ecology.

The theory of Island Biogeography is based on observations that biodiversity is greater on large islands than on small ones, and greater on islands that are close to the mainland. The concept of islands surrounded by water has been applied to the idea of "islands" of protected open space surrounded by developed areas. Based on this theory, ecologists predict that increasing the size of a protected area increases its biodiversity (MacArthur and Wilson; 1967). Therefore,

connecting two protected areas via a protected corridor to create one large area should also increase natural biodiversity (Wilson and Willis; 1975).

Another model for wildlife habitat protection aggregates similar land uses while allowing other uses in discrete areas (Forman; 1997). This model is reflected in Shelburne in that the several villages and the floodplain areas concentrate development, agriculture is concentrated where prime farmland soils occur along river corridors, and large blocks of forest remain intact.

Individual animals move within a landscape. When and where wildlife and fish species move is not well understood by wildlife biologists. However, we do know that animals pay little attention to political boundaries. This underscores the importance of collaborating with abutting towns to conserve large tracts of land as wildlife corridors across town lines, and speaks to the interest in further exploring the National Forest Designation referenced in Action Item I-1-C. Wildlife seek natural cover for shelter and food, but some species willingly forage where human uses, such as farm fields, gardens and even trash cans, provide browse or food. As the land within Shelburne continues to be fragmented by development, it is reasonable to expect that remaining large blocks of undeveloped forest and the parcels of land connecting them will become more important to area wildlife, and that conflicts between the needs of wildlife and residents will become more common.

Many species of wildlife in Shelburne have home ranges greater than fifty acres in size. Even those species with smaller home ranges move across the landscape between sources of shelter, water, food and mating areas. Some animals, including white-tailed deer and black bear, seek both interior forest habitat and wetland edges where food sources may be more abundant.

Roads are a form of connection for humans but they can be an impediment to some wildlife movement. Wildlife benefit from having land to move within that is isolated from human uses. Conservation planning that recognizes this need often focuses on the development of wildlife corridors. Permanently protected wildlife corridors are particularly critical in a landscape which is experiencing development pressures to ensure that animals have the ability to travel across vegetated areas between large blocks of habitat.

Connections between bodies of water and sub-watersheds are also important for wildlife and fisheries species. Some of the more common animals that use river and stream corridors are beaver, muskrat, raccoon, green heron, kingfish, snapping turtle, and many species of ducks, amphibians, and fish. Since many species rely on a variety of habitats during different periods of their life cycle, species diversity is greatest in areas where several habitat types occur in proximity to each other. With this in mind, the protection of all habitat types is vital for maintaining and enhancing biodiversity in Shelburne.

How will the town of Shelburne determine the most appropriate conservation strategies for wildlife habitat? There are three general paths to follow in conserving the health of wildlife populations. One is to protect the habitat of specific species that are rare, threatened, or endangered. It is thought that other species will also benefit from this strategy. A second path is to conserve landscape-level resources such as contiguous forest or riparian areas. This helps to protect the habitats of a large number of species, but it might not meet the needs of all rare and

endangered species. The third method is a combination of the first two. Maintaining the biodiversity of Shelburne over the long term will likely require the protection of both unique habitats for specific species and networks of habitat across the landscape. Conservation strategies for the town to consider include Action Item II-2-C to explore ways to monitor species locations, numbers, and movements to maintain biodiversity; the protection of core habitat areas as identified by the BioMap2 (*see Open Space Map*); the continued protection and linkage of large blocks of contiguous forestland; the retention of early successional habitats like fields and grasslands; and the protection of vernal pools, wetlands, and riparian corridors that sustain the greatest diversity of life in Shelburne.

F4 Resiliency to Climate Change (include this section as originally intended and refer to The Nature Conservancy analysis)

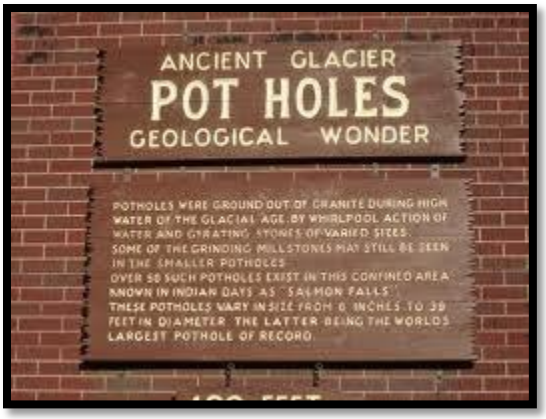
G. SCENIC RESOURCES AND UNIQUE ENVIRONMENTS

The characteristics that allow a stranger to distinguish Shelburne from other towns in the region may be different than the unique qualities and special places that only residents can really know. This section identifies the scenic resources and unique environments that most Shelburne residents would agree represent the essence of Shelburne's character.

In many ways the history of Shelburne--how people came to settle the land, use its resources, and enjoy its forests, streams, and bodies of water--can be seen in the landscapes that have retained a sense of the past. The unique environments in Shelburne play a very important role in providing residents with a sense of place.

Scenic landscapes often derive their importance from location relative to other landscape features. The purpose of inventorying scenic resources and unique natural environments in Shelburne is to provide a basis for setting resource protection priorities. To this end, the following section includes information about the different values associated with each type of scenic resource, and indicates areas where multiple values are represented in one landscape. Those landscapes that contain, for example, scenic, wildlife, and cultural values may be given higher priority for protection than a landscape that contains only one value.

These documented resources include historic landscapes and special places. This inventory is based on a formal survey done in 1992 for the Franklin County Rural Historic Landscape Preservation Plan Report and the Town of Shelburne's Cultural Inventory Map prepared by Dodson Associates, Ltd. in 2003. The report distinguishes between types of landscapes, identifies in general terms the locations of rural historic landscapes in each town, and provides examples of different preservation strategies. The methodology for identifying significant historical landscapes was based on National Park Service criteria including area of significance, period of significance and historical integrity. NPS classifies landscapes into four different categories: landscapes that reflect major patterns of a region's history (e.g. agricultural landscapes), landscapes that are associated with historically significant individuals (e.g. institutional grounds and buildings), landscapes that are important due to their design or physical characteristics (e.g. an 18th century Colonial Period Connecticut Valley rural farm), and landscapes that yield or have the potential of yielding significant information on pre-history or



history (e.g. a native American encampment site). The Cultural Inventory Map from the 2004 Shelburne Open Space and Recreation Plan is included in the Appendix. Unfortunately, some of the data used to create the 2004 map (and described above) was not available for this update. The 2014 Cultural Inventory Map includes available data and information provided by the members of the Open Space and Recreation Plan Update Committee.

The following are summaries of scenic resources with associated ecological, recreational, and historical values.

G.1 Unique Geologic Features[24]

Shelburne is one of the "Hill Towns", that include the areas of Franklin, Hampshire, and Hampden Counties west of and above the border of the ancient rift valley through which the Connecticut River flows. The defining geological forces that formed Shelburne's landscape—uplift, stream erosion, and glaciation—resulted in the rolling landform and hills we see today. Heading west from the flat, verdant Connecticut River valley, the landscape transitions to rounded hills and steep river valleys of Shelburne and neighboring towns to the west that form the foothills of the Green Mountains to the north and the Hoosac Range to the west, all part of the ancient Appalachian chain. Most of Shelburne is a rolling upland of schist, gneiss and other resistant metamorphic rocks with intrusions of pegmatite and granite. Scraping by continental glaciers during the Pleistocene Epoch left thin, rocky soils in the town's upland areas while glacial meltwater streams deposited thin beds of more permeable soils in the narrow river valleys. The 1,000+ foot elevation difference between Shelburne's uplands and the Connecticut River Valley produced streams and rivers with gradients around 40'/mile that flow through steep-sided valleys, notably the Deerfield River and its larger tributaries.

Shelburne, like many of Western Massachusetts' Hill Towns, is a popular tourist destination, featuring scenic beauty and opportunities for outdoor recreation. Perhaps the most spectacular and often visited geologic attraction is the "Glacial Potholes", which began to form after the last ice age. Potholes, also known as Giant's Kettles or cauldrons, are cavities or holes that appear to have been drilled in the surrounding rocks by eddying currents of glacial melt water bearing stones, gravel and other detrital matter. Potholes vary in size from a few inches to more than 30 feet in diameter. The interiors of potholes tend to be smooth and regular.[25]

[24] http://en.wikipedia.org/wiki/Western_Massachusetts and http://www.boston.com/travel/explorene/massachusetts/galleries/hill_towns/

[25] http://geology.about.com/gi/o.htm?zi=1/XJ&zTi=1&sdn=geology&cdn=education&tm=130&gps=59_10_1067_506&f=00&su=p284.13.342.ip_&tt=33&bt=1&bts=17&zu=http%3A//www.shelburnefalls.com/visitor-information/3-see-the-glacial-potholes-in-the-center-of-shelburne-falls and http://en.wikipedia.org/wiki/Giant%27s_kettle and http://www.atlasobscura.com/places/glacial-potholes for picture of pothole sign.

Photo courtesy Ali West of Flickr under Creative Commons license accessed October 2013.
http://geology.about.com/od/geology_ma/ig/MAgallery/MAshelburnefalls.htm

G.2 Stream Corridors

There are thirteen scenic rivers, streams, and brooks that have been identified in Shelburne including the Deerfield River, which have distinctive recreation, habitat, and historical values. The Massachusetts Natural Heritage and Endangered Species Program (NHESP) considers the Deerfield River, North River, and Hinsdale Brook as containing Priority Habitats for Rare Species. The Deerfield River is considered to have high recreational value for non-motorized boating and fishing. In addition, the Dragon Brook is stocked with trout by the Massachusetts Department of Fish and Game.

G.3 Agricultural Landscapes

Outside of Shelburne Falls and the steep slopes of Mount Massaemett, much of the landscape is part of an active farm. Many of these farms have woodlands, open fields, barns and farmhouses that have been part of working agricultural operations for many decades and for some, centuries. Many agricultural landscapes are not only some of the most scenic areas in town, they are also considered to be of significant historical value. These significant historical agricultural landscapes are found along the following roads: Cooper Lane, Tower Road, Patten Road, Carpenter Road, Reynolds Road, Bardswell Ferry Road, Williams Road, Fisk Mill Road, Zerah Fiske Road, Old Greenfield Road, and Peckville Road.

G.4 Distinctive and Noteworthy Landscapes

Much of Shelburne's landscape is classified as Distinctive or Noteworthy by the Massachusetts Scenic Landscape Inventory report published by the Department of Environmental Management in 1982.[26]

Distinctive Landscapes - Areas of the highest visual quality. Typically consists of openness, low population density, high relative relief, historical structures and land uses, agriculture, surface water, significant vegetation, important geological features, and lack of contemporary development.

Noteworthy Landscapes - Areas of lesser, but nevertheless important, visual quality. Typically contains the same factors as 'Distinctive' landscapes but in lesser amounts or in lower quality.

Many landscape and cultural features have been identified by residents through public meetings and surveys as important to the character of Shelburne. The Cultural Inventory Map at the end of this section shows the historic, scenic, and recreational resources identified by participants of the October 2012 public forum and Committee members as being unique and special places in Shelburne. Historic properties and cultural resources can be important economic assets, often increasing property values and attracting businesses and tourists to a community. While preservation of historic and cultural assets can require funding, it can also stimulate economic development and revitalization.

G.5 Recreational Areas

There are several recreational areas in Shelburne that are considered to have high value. High Ledges, a popular sanctuary with an extensive trail system, is owned by the Massachusetts Audubon Society. High Ledges provides long-range panoramic scenic views of Mt. Greylock and the Deerfield River Valley. Mount Massaemett Fire Tower and Shelburne State Forest are managed by the Massachusetts Department of Conservation and Recreation (DCR) and are also considered to comprise a historical recreation/conservation landscape. Unfortunately, long-term access to the Fire Tower may be constrained by the privately owned land that surrounds it. Finally, Wilcox Hollow, also under the management of DCR, provides recreational access to the Deerfield River, off of Rte. 2.

The Mahican-Mohawk Trail, conveniently accessed from Wilcox Hollow and Franklin Land Trust property off Rt. 2, provides enjoyable hiking with dramatic views of the Deerfield River. Again, access to a continuous trail along the river from Deerfield to Shelburne Falls is constrained by private landowners who limit access to their property along the river.

G.6 Transportation Corridors

[26] The DEM is now the Department of Conservation and Recreation (DCR). The report is available from the Historic Landscape Preservation Initiative program and the mapping is now available from MassGIS. http://www.mass.gov/dcr/ Contact Wendy Pearl wendy.pearl@state.ma.us

The Mohawk Trail, also known as state highway Route 2, was one of the earliest Scenic Byways in New England. The road was the first to be designated and built as a scenic tourist route, and opened in 1914. The Route 2 corridor is also zoned commercial, leaving it open for development which could compromise the scenic value of this route. As evidenced in the survey results, the balance between development, landowner rights and scenic corridor is a complex issue, and Action Item I-4-C of the Seven-Year Action Plan calls for establishing discussion points about this issue. The Mohawk Trail Scenic Byway Corridor Management Plan (2002) inventoried a vast number of scenic, cultural, recreational, and natural resources between Greenfield and Williamstown, Massachusetts. For some part of the way, Rte. 2 follows a series of Native American trails, which have been recently combined into the Mahican-Mohawk Trail that runs along the Deerfield River in Shelburne and along Route 2 in Charlemont.

Other scenic transportation-related resources in Shelburne include Bardwell's Ferry Bridge and connecting roads, which provide scenic views of surrounding farm landscapes as well as the Deerfield River from the historic bridge, and a number of roads in town that provide scenic views of mostly agricultural landscapes.

G.7 Cultural Sites

Shelburne contains an abundance of historic structures, sites, and landscapes, which have been inventoried in the Buckland-Shelburne Master Plan. These cultural resources include the Shelburne Falls National Historic District, a historically significant Village Center business district located primarily to the north and south of Bridge Street in Shelburne; the Bridge of Flowers, an abandoned trolley bridge transformed into a garden walkway across the Deerfield River in 1929; and Salmon Falls, an important Native American and Colonial fishing site. According to the Massachusetts Historical Commission's MACRIS database, there are approximately 350 historic civic, residential, commercial, institutional, and industrial structures, areas, and burial grounds in Shelburne Falls and in the surrounding areas.[27]

H. ENVIRONMENTAL CHALLENGES

The following discussion of the environmental challenges faced by the town was compiled by the Shelburne Open Space and Recreation Plan Update Committee members following a review of the list of challenges in the 2004 plan, input gathered from the residents who attended the October 24, 2012 Public Forum and responses to the survey.

Invasive Species

Invasive species are a growing concern in Shelburne's forests, forest edges, fields and ponds. Invasive species are non-native species that can form self-sustaining populations, spread, and cause environmental or economic harm. Invasive plants can eventually crowd out the native plants that local wildlife have come to rely on for food and shelter and reduce the productivity of farmland and working forests. Invasive insects and diseases can cause defoliation and potentially kill trees and other plants, especially those that have been weakened by ice storms,

[27] http://mhc-macris.net/Results.aspx accessed October 2013.

disease, drought or other environmental factors. The Shelburne Open Space Committee has hosted workshops to educate its citizens about invasive plants and what to do about them and will continue to do so going forward as called for in Action Item I-3-C and II-2-F of the Seven-Year Action Plan.

Of particular concern to the Shelburne OSRP is the impact of invasives on agriculture areas, forests and open space, and Action Items I-2-F and G of the Seven-Year Action Plan have been developed to increase awareness to better address this concern. Landowners and farmers are challenged to keep properties from being overrun by a number of species. Left unchecked, they can nearly consume pasture and forest areas in a few years, and it is very difficult and expensive to try to bring back the land to productive use. Exacerbating the situation are large tangles of these invasives along state highways and in public areas which continually feed and replenish the seedbank.

In Shelburne, one of the most common invasive plant species is Japanese knotweed, which is especially dense and prolific on the banks of the Deerfield River where it forms large monocultures. Research has shown that it excludes certain frog and salamander species and its roots do not prevent riverbanks from eroding as was previously assumed. Other invasive vines and shrubs that have a strong foothold in Shelburne include Oriental (Asiatic) bittersweet, Japanese barberry, multiflora rose, exotic bush honeysuckles, and autumn olive. Purple loosestrife, an invasive herbaceous plant common in many other areas of the state, is present but not yet common in Shelburne.

Garlic mustard, a newer invader, has become much more prevalent in the past several years, usually starting along roadsides and then spreading to the forest. Research shows that it emits a chemical that disrupts native plants' ability to take up nutrients. The Boy Scout troop from Shelburne Falls has been working with the Shelburne Open Space Committee to pull it from Patten Road to prevent it from spreading to the important wildlife habitat in and around High Ledges Wildlife Sanctuary.

There are several invasive species not yet known to be in Shelburne at the time of this writing, but are close enough that they should be watched for and controlled promptly before they can become established. Japanese stiltgrass, mile-minute vine, water chestnut, and wild chervil are current examples.

The hemlock wooly adelgid, already present in Shelburne, will likely change the composition of conifers and species inhabiting ravines. The emerald ash borer (recently discovered in MA, CT, and NH) can quickly spread and kill all ash trees in a region. Other important pests with the potential to severely impact forests or community trees include Asian longhorn beetle, winter moth, beech bark scale, and oak gall wasp, all found in other Massachusetts communities. One way of slowing the spread of these insect pests is to prevent the transport of firewood from impacted communities. Insects pests with the potential of severely impacting fruit crops and not yet known in Massachusetts include the Spotted Wing Drosophila (SWD) fruit fly and the brown marmorated stinkbug.

An invasive species with the potential to become established in and impact the Deerfield River and other fast-moving rocky streams is Didymo, also known as rock snot. This species is thought to be spread to clean waters on uncleaned equipment (including felt-soled waders) that have been used in infected waters.

Reducing the impact of these and other invasive species include learning what to look for, how to report and control them and how to prevent their spread. Preventing them from establishing in the first place through early detection and rapid response, is the most efficient and effective measure. The U.S. Department of Agriculture's Natural Resource Conservation Service (NRCS) at times provides funding to landowners who want to control invasive species on their land. Biological controls are under study with some already being tested in the field. The webpage of the Massachusetts Invasive Plant Advisory Group (MIPAG, http://www.massnrc.org/mipag/) includes: 1) the entire list of invasive plants listed and banned from sale in Massachusetts, 2) guidelines for control, and 3) a list of species newer to the state or certain counties. Widespread establish of these species is still possible if early detection and rapid response actions are taken.

Road Salt Use

Road salt use in the winter months by both local and state highway departments is a concern for residents and town officials. Road salt, which is used as a de-icing material, is a pollutant that should be used carefully. Recent research by A. Rhodes, Assistant Professor of the Department of Geology at Smith College, shows a direct correlation between road density (number of road mile/unit of land area) and surface water pollution in the Mill River Watershed in Conway and Whately. Road salt is the most significant pollutant in that particular sub-watershed. Road salt use has also been blamed for the contamination of a community water supply in Deerfield. Road salt can also have a negative effect on roadside trees. Browning of leaves is one symptom that can result in a decrease in the overall scenic qualities of roads. The town may want to acquire accurate baseline water quality information on its surface waters throughout town. Periodic water sampling would then provide for a method of determining which streams were most sensitive to contaminants and which needed to be protected in some fashion. The Smart Growth Toolkit that was developed as part of the EPA-funded Targeted Watershed Initiative project for the Connecticut River contains the following Best Management Practices for road salt use. Another source of training and information about alternatives to road salt is the Baystate Roads Program http://baystateroads.eot.state.ma.us/ .

Did you know that Towns can…

- Implement regulations and bylaws for road salt application for town roads, private plowing contractors, parking-lot owners and residential driveways and walkways.
- Pre-treat roads with salt brine to prevent ice buildup and reduce the amount of salt needed during a storm.
- Equip plow trucks with slat calibration devices so that less salt can be applied in designated reduced salt zones.
- Keep accurate records of salt application amounts per storm.
- Prohibit dumping or plowing snow into rivers, streams, lakes or frozen water bodies or their buffer areas.
- Recover sand and prevent it from running off to rivers, streams and lakes.

Underground Storage Tanks

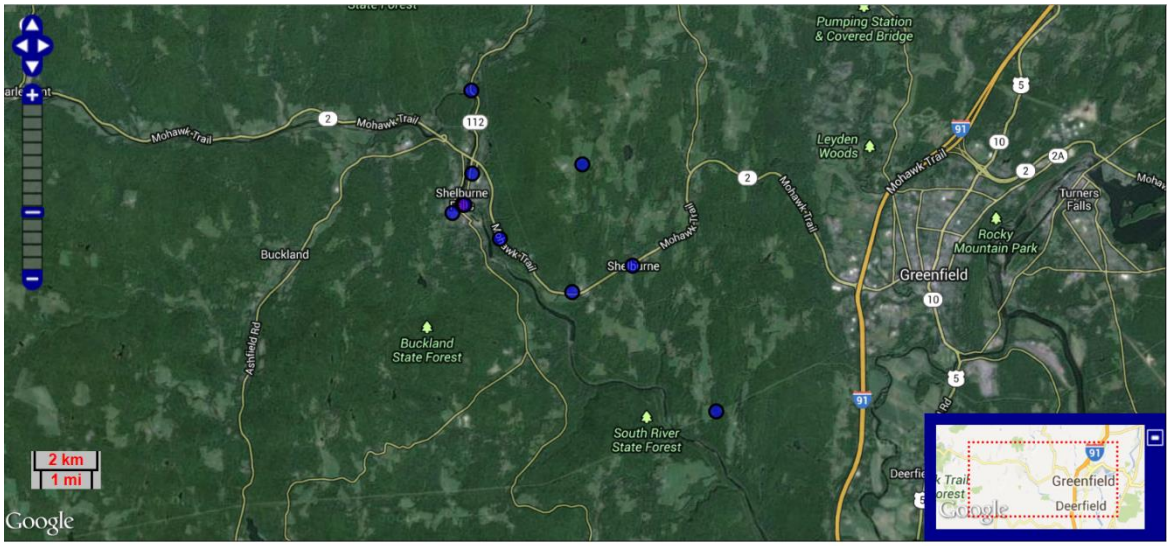
Federal and state laws regulate gas storage tanks larger than 1,100 gallons, but smaller tanks and those for heating oil fall outside this purview. The DEP Underground Storage Tank Query Tool[28] lists one location in Shelburne Falls that currently has underground storage tanks that are regulated by the state. The Mobil gas station on Rte. 2 currently has four active USTs on the list, including two 6,000 gallon gasoline USTs with cathodic protection and approved in-tank monitors and product line leak detectors; a 3,000 gallon diesel USTs with cathodic protection, an approved in-tank monitor, double-walled product line; and one 8,000 gallon gasoline double-walled UST with approved in-tank monitor and double-walled product line and leak detector.

Underground fuel storage tanks, especially those near rivers or wells, which are not covered by state or Federal regulations, should be a priority for investigation by the town. Action Item II-1-J of the Seven-Year Action Plan calls for the inventory and mapping of such existing underground fuel tanks with a risk analysis as to their potential to compromise water resources and agricultural areas. Shelburne likely has underground storage tanks of all categories that are part of every aspect of life: residential, agricultural, industrial, and commercial. The DEP's Underground Storage Tank Query Tool only lists underground storage tanks for Shelburne Falls, not the rest of the town. The DEP's website should be consulted for funding resources and other guidance.[29]

Hazardous Materials, Hazardous Waste and Landfills

The MassDEP has records on-line of 14 hazardous materials spills/releases in Shelburne, which occurred between 1996-2013.[30] All of the spills/releases have been cleaned up and the files closed.

[28] http://public.dep.state.ma.us/UST/ustResultsPage.asp accessed October 2013.
[29] http://www.mass.gov/dor/businesses/programs-and-services/underground-storage-tank-program/
[30] http://public.dep.state.ma.us/SearchableSites2/Search_Results.aspx accessed October 2013.



Open Sites Closed Sites Closed Sites with Use Limitation

Continuous education of landowners about proper hazardous waste disposal is essential to protecting the water supply. The Board of Health has approved the Shelburne transfer station to be a hazardous waste collection site for batteries and fluorescent tubes. Shelburne regularly participates in regional hazardous waste collection days sponsored by the Franklin Regional Council of Governments.

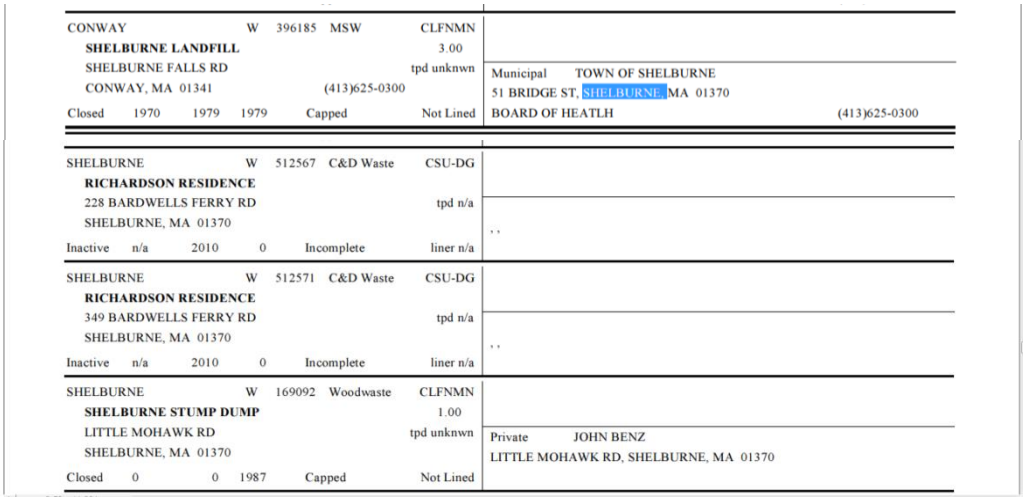
Some of Shelburne's businesses handle hazardous materials or generate hazardous wastes, and all presumably are operating within the law (such as pesticide, solvent and waste oil disposal, etc.). Homeowners, and possibly some of the cottage businesses, are not as likely to be aware of their responsibility to protect groundwater. Implementation of Action Item II-1-C of the Seven-Year Action Plan will provide homeowners with more information on best practices to protect water resources. According to the MassGIS 2012 data, there are no hazardous waste sites in Shelburne. According to MassDEP data[31] that is current through June 2013, there are no active landfills in town.

There are four inactive landfills, two of which have been capped and no environmental monitoring is required. The Shelburne Landfill on Shelburne Falls Road in Conway is an unlined landfill that was capped in 1979. The Shelburne Stump Dump on Little Mohawk Road in Shelburne is closed and was capped in 1987. There are two dump sites on private property located on Bardwells Ferry Road whose closure status is Incomplete, according to the MassDEP's *Inactive/Closed Landfills & Dumping Grounds List, June 2013*.[32]

Although the information available from the DEP website indicates that there are no environmental problems associated with these landfills, the status of the closure of the construction and demolition dumping sites on private property should be further investigated by

[31] http://www.mass.gov/dep/recycle/solid/swfacil.htm
[32] http://www.mass.gov/eea/docs/dep/recycle/solid/inactlf.pdf

the Board of Health.



CONWAY	W	396185	MSW	CLFNMN		
SHELBURNE LANDFILL				3.00		
SHELBURNE FALLS RD				tpd unknwn	Municipal	TOWN OF SHELBURNE
CONWAY, MA 01341			(413)625-0300		51 BRIDGE ST, SHELBURNE, MA 01370	
Closed 1970	1979	1979	Capped	Not Lined	BOARD OF HEATLH	(413)625-0300
SHELBURNE	W	512567	C&D Waste	CSU-DG		
RICHARDSON RESIDENCE						
228 BARDWELLS FERRY RD				tpd n/a		
SHELBURNE, MA 01370					, ,	
Inactive n/a	2010	0	Incomplete	liner n/a		
SHELBURNE	W	512571	C&D Waste	CSU-DG		
RICHARDSON RESIDENCE						
349 BARDWELLS FERRY RD				tpd n/a		
SHELBURNE, MA 01370					, ,	
Inactive n/a	2010	0	Incomplete	liner n/a		
SHELBURNE	W	169092	Woodwaste	CLFNMN		
SHELBURNE STUMP DUMP				1.00		
LITTLE MOHAWK RD				tpd unknwn	Private	JOHN BENZ
SHELBURNE, MA 01370					LITTLE MOHAWK RD, SHELBURNE, MA 01370	
Closed 0	0	1987	Capped	Not Lined		

Forestry

The Shelburne Open Space and Recreation Plan Update Committee and survey respondents identified invasive plant species as a significant concern. Action Items I-2-F and G of the Seven-Year Action Plan address these issues. See *Invasive Species* for a discussion about this topic in regards to both forested and non-forested lands. There are no major blow-down areas which could serve as fuel for forest fires. There are areas of steep forested land throughout town and these areas could be difficult to access in the event of a forest fire.

Chronic Flooding

In Shelburne, the 100-year floodplain covers about 333 acres, or approximately 2 percent of the town, including an estimated 8 acres of developed residential land.[33] (See Floodplain Management Map xx)As previously mentioned, Action Item II-1-G calls for the development of strategies to restore, protect and preserve flood plain areas to help ensure their maximum effect in the event of river overflow. In addition to the 100-year floodplain, there are a number of streams in Shelburne with the potential to cause localized flooding. The 2010 Shelburne Comprehensive Emergency Management Plan identifies the Deerfield River Valley/Village of Shelburne Falls, and the Fellowship Hall Pond-earthen dam barrier as flood prone areas in town.

The Town of Shelburne's Multi-Hazard Mitigation Plan (Draft, 2013) identifies two streams in Shelburne with the potential to cause localized flooding, including:

- Bardwells Ferry Road at Allen Road - The Dragon Brook periodically overruns the road, and does not currently align with existing box culverts.
- Brook Road – Flooding of the Hinsdale Brook, which runs parallel to the road, causes frequent erosion, landslides, and slumping. Periodically the road is closed due to these

[33] 2005 MassGIS land use data.

conditions. Brook Road is a designated evacuation route for the northeast section of town so its tenuous reliability during storm events is a safety concern.

Other than the occasional problems caused by beaver, there were no other areas of chronic flooding identified by the Committee.

Erosion and Sedimentation

Shelburne's water systems are both strong and fragile. Rivers and brooks are plentiful throughout town and add considerably to the beauty of the landscape. Many swell into intermittent torrents periodically, particularly in the spring. Because of the nature of the soils, the rushing waters cause a great deal of erosion. Even inconspicuous courses of freshets have been known to undermine roadways or bury them in gravelly silt during heavy rainstorms, especially below upland pastures and home sites. As a result, future development near rivers, streams, and brooks should be carefully evaluated to minimize erosion and sedimentation during construction and ensure that stormwater runoff is properly managed. Siltation from eroding banks can compromise habitat for fish and aquatic life, particularly during low flow conditions. Other siltation comes from road sand and loose soil in roadside swales.

On-site Wastewater Treatment Inspection

Over the past forty years, wastewater treatment in the region has helped to reduce the level of pollution in the Deerfield River. And yet concern for the impacts of failing septic systems is a driving force behind maintaining large minimum lot sizes in areas without access to public sewer, especially in soils that constrain proper treatment of on-site wastewater. It is important for the town to support the Board of Health (BOH) in its enforcement of percolation (perc) tests and in its siting of new homes in only those areas that have passed a perc test. In addition, the BOH should continue to identify systems needing upgrades. The main motivation for this level of inspection is to ensure that groundwater, wetlands, surface waters, and drinking water supplies are free from contamination by untreated wastewater and, that homeowners do not become needlessly over-burdened by failing on-site septic systems.

Light Pollution

Light pollution occurs when lamps or lights direct their brightness in a manner that detracts from the dark night sky of surrounding areas. Towns can pass zoning amendments that limit the size, brightness and the design of the lamps to limit their impact. Many people relate a dark night sky with rural character.

Wildlife Habitat Fragmentation

Wildlife habitat fragmentation is a problem in New England. The National Forest Designation cited in Action Item I-1-C could help alleviate this issue. Habitat can become fragmented by development. In Shelburne, most of the residential development outside of Shelburne Falls is on frontage lots. Were all roads in town built-out to the maximum number of allowable frontage lots, some wildlife species would find their habitats severely limited to backlands in between roads. If subdivisions became the dominant form of development in town, remaining backland habitat would become further fragmented. Large blocks of forest, riparian corridors, wetlands, and fields are four types of wildlife habitat that can become fragmented through poorly planned

development. Action Items I-4-H, I, and J advance the discussion about updating zoning to address these issues.