Natural Resources Inventory

A Survey of Guilford's Geology, Flora, and Fauna

2019–2022

Guilford Conservation Commission

Patti Smith | Naturalist/Conservation Projects | Bonnyvale Environmental Education Center | Brattleboro, VT

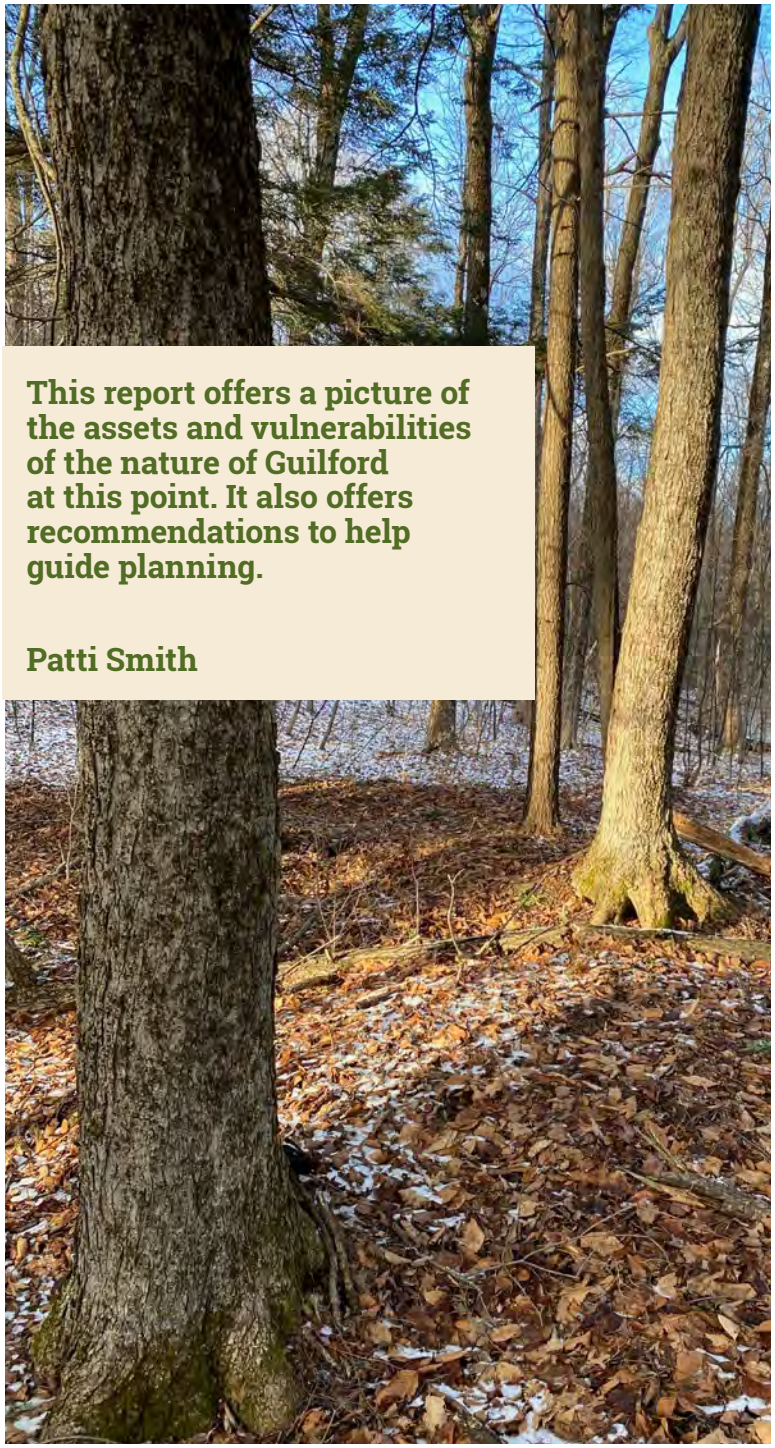
TABLE OF CONTENTS

MAPS AND TABLES

MAPS

TABLES

OTHER



This report offers a picture of the assets and vulnerabilities of the nature of Guilford at this point. It also offers recommendations to help guide planning.

Patti Smith

FOREWORD BY GUILFORD CONSERVATION COMMISSION

Appreciation of Guilford's rural character is something that unites residents, whether we are here by birth or by choice. Guilford's woods, fields and farms form the backdrop for our lives, a source of pride and enjoyment for all.

This Natural Resources Inventory takes stock of our town's unique natural heritage, offering a biodiversity catalog and assessment of our plants, animals, and natural communities. It places Guilford within the larger context of state and regional conversations around conservation, preservation, and land use.

It is a snapshot of Guilford today, a baseline for measuring changes that may occur over the coming years as we face the challenges of development and climate change. It is a tool for identifying areas to consider as highest priorities for preservation. It is also where residents can learn more about their own land and neighborhoods. We hope it will serve citizens and town planners in deciding how to make best use of our most valued asset—the land we live on, so it will be here to benefit future generations.

The Guilford Conservation Commission is deeply grateful to naturalist Patti Smith, of the Bonnyvale Environmental Education Center, for her dedicated and insightful work on this 4-year project. We worked closely with Patti to help identify key parcels for field surveys and contacted landowners to arrange for site visits. We appreciated Patti's progress reports as well the opportunity to offer feedback on the essential maps which were designed with the help of Alex Kaisand from the **Antioch Spatial Analysis Lab**. Our mutual goal was to produce a living document that is user friendly and accessible to Guilford residents, reflective of the present, but easily edited to document future changes.

The timing of the report aligns well with state, regional and federal efforts to balance two pressing needs Guilford shares with the rest of Vermont and New England: conserving lands to protect biodiversity and mitigate climate change while providing housing options for future residents. The specific information about natural communities is vital for responding to newly enacted state legislation such as **H.126, the Community Resilience and Biodiversity Protection Act**, which sets targets of conserving 30 percent of land in the state by 2030 and 50 percent by 2050, and **H.171, Forest Blocks and Habitat Connectors**, which encourages towns to map connected forest areas and wildlife corridors. It can help Guilford landowners identify forest blocks to enroll in the Current Use program's new category of **Reserve Forestland (H.697)** to promote the many benefits of old forests.

23	20	19	150	28	1
parcels visited	forest blocks	natural communities	years as working forests	rare/uncommon species found	Important beech mast stand found

A NOTE ABOUT THE TITLE, "NATURAL RESOURCES INVENTORY"

The members of the Guilford Conservation Commission had a spirited debate about what to call this document. We recognize that the term "natural resources" is controversial because it presents a view of the natural world as a commodity for human use, resource extraction, and exploitation. Our own experiences in Guilford's fields and forests teach us the inter-connectedness and inter-dependence of humans and the natural world. We know that the future well-being of humans on our planet depends on preserving an abundant diversity of plants and animals, which in turn hinges on conserving natural habitats. In the end, we stuck with the original title of our project, Natural Resources Inventory, because we had requested funding for the project under that title and felt an obligation to the selectboard and townspeople not to cause confusion. However, we hope to open a conversation about what we mean when we talk about "natural resources" that reflects our inter-connected relationship with the natural world around us.

HOW TO USE THE NATURAL RESOURCES INVENTORY

This report begins with an overview of Guilford's natural assets, from bedrock to soil conditions and natural communities, to present a snapshot of the town as a whole and its relationship to neighboring towns and regions. The **Overview** below is a good place to start if you are curious about the characteristics of key natural communities such as old forests and wetlands, as it provides definitions and descriptions of our natural surroundings. It closes with a summary of **uncommon plants and animals**. The lists of **Maps and Tables** after the general **Table of Contents** direct you to other visually organized resources. The **Glossary** at the end of the report provides a handy key to terms that were new to many of us.

Most sections of the overview end with discussions of **Conservation Considerations**, which make specific recommendations for understanding the value of the feature and what steps we can take in Guilford to make best use of these assets now and in the future.

The rest of the report focuses on the 10 largest **Forest Blocks** in Guilford and the unique characteristics of each, including landscape features, wildlife connectivity, and natural communities, well-illustrated with maps and photos. If you are primarily interested in your own property or neighborhood, this is a good place to start. It complements the additional information available to Vermonters in the **Vermont Agency of Natural Resource's Atlas**, where you can examine map layers with specific information for your site.

If your goal is to understand which areas in town are the highest priority for preservation or conservation, pay attention to the **Summary Tables** which introduce each of the Forest Block pages. They list the Priority rating for Interior Forest and Connectivity. These rankings are also summarized in **Table 1: Guilford Forest Block Attributes**.

OVERVIEW BY PATTI SMITH

This inventory was commissioned by the **Guilford Conservation Commission** to locate and describe areas of importance for maintaining the natural wealth of Guilford. The first phase was a landscape analysis—a gathering of existing information on the town from relevant sources, including previous field studies, aerial imagery and GIS data. Information from the **Vermont Natural Heritage Inventory** provided information on significant natural communities and rare, threatened and endangered species that had been documented in Guilford in previous survey work. The remote analysis helped to prioritize the sites for field visits. A list of

fifty parcels was developed and they were ranked as high or moderate priority. Conservation Commission members then contacted landowners to gain permission for site visits. Field inventories took place between 2017 and 2021. Twenty-three parcels were visited during the course of the survey work.

The project focused on features established by **Vermont Conservation Design (VCD)** as highest priority for maintaining an **ecologically functional landscape**.

Interior Forest Blocks: The roads within Guilford divide the landscape into twenty forest blocks. Each of these areas has been assessed for its value to biodiversity. Surveys were conducted in each of the largest forest blocks. This report recommends the highest level of protection for the Roaring Brook, Stage Road, Owl's Head, Governor's Mountain and Sweet Pond forest blocks.

Connectivity Blocks and Road Crossings: Guilford's large forest blocks are essential for wildlife movement on a regional level. Connections between these unfragmented areas is generally still good in most of Guilford, with undeveloped stretches of road providing places for wildlife to cross safely. Some areas where few and narrow crossings remain have been highlighted.

Physical Landscapes: Bedrock geology, landforms, and soils information were gathered and mapped to identify the range of these features within town. Highlights include:

- Guilford's calcium-rich bedrock leads to rich soils and rich forest communities.
- The rugged landscape on the west side of town lends itself to high levels of habitat diversity.
- Sand and gravel deposits from glacial meltwater and lakeshore deposition provide a substrate for pine-dominated forests.

Natural Communities: Nineteen natural community types were mapped and described, nine upland communities and ten wetland communities.

Old Forests: Guilford's forests have been working forests for the past 150 years. None of the forests surveyed were old. Old growth forests have a number of qualities not found in young or managed forests. This report recommends the establishment of one or more forest reserves where old growth forests can be restored.

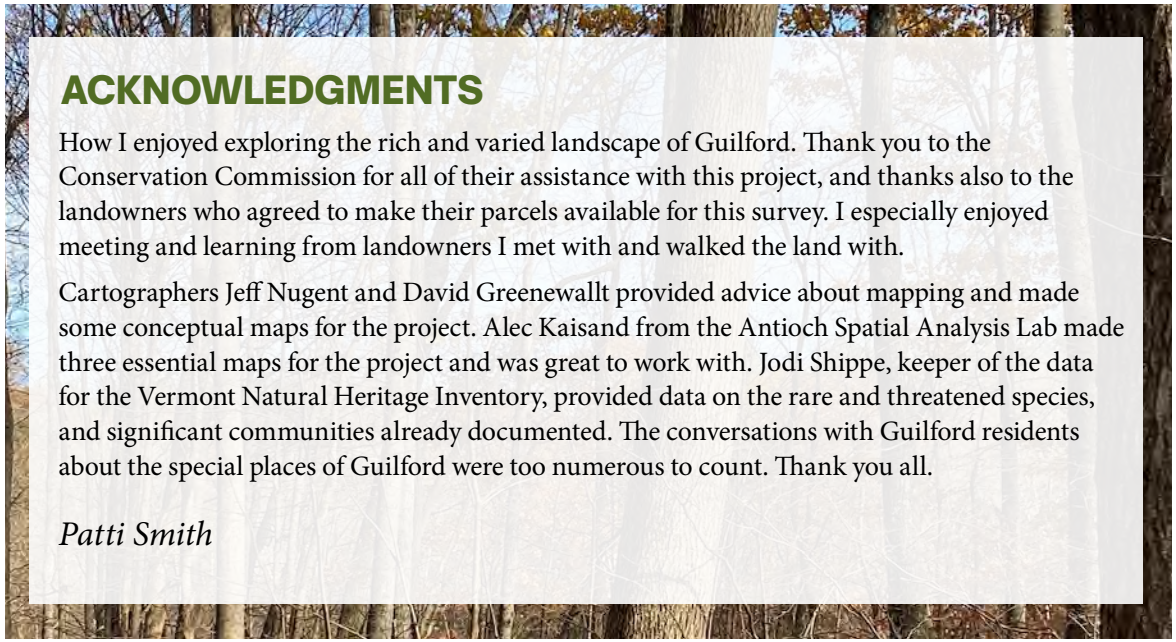
Shrub-forb Communities: Young forests and shrublands, an important habitat component, are found in the VELCO powerline right-of-way and other smaller locations.

These areas require management to control invasives.

Uncommon and Rare Species: Twenty-eight rare or uncommon species have been found in Guilford, including three documented during this inventory. Additional populations of other rare species were located.

One important **beech mast stand** was found.

Carefully stewarded, these are the features that will contribute to the long-term viability of Guilford's natural heritage.



ACKNOWLEDGMENTS

How I enjoyed exploring the rich and varied landscape of Guilford. Thank you to the Conservation Commission for all of their assistance with this project, and thanks also to the landowners who agreed to make their parcels available for this survey. I especially enjoyed meeting and learning from landowners I met with and walked the land with.

Cartographers Jeff Nugent and David Greenewallt provided advice about mapping and made some conceptual maps for the project. Alec Kaisand from the Antioch Spatial Analysis Lab made three essential maps for the project and was great to work with. Jodi Shippe, keeper of the data for the Vermont Natural Heritage Inventory, provided data on the rare and threatened species, and significant communities already documented. The conversations with Guilford residents about the special places of Guilford were too numerous to count. Thank you all.

Patti Smith

ABOUT THIS PROJECT

This report contains the results of an inventory of the natural features important to maintaining the native flora and fauna of Guilford. While it is not feasible to document every species and consider the needs of each, the science of conservation biology has refined a list of features that, if protected and wisely stewarded, will provide the best chance of maintaining an ecologically functional landscape. These are the focus of this inventory.

These features can be grouped into three scales, landscape level, community level, and species level. Landscape level features include bedrock, soils, elevation, hydrology, and landforms.

Also included at this scale are large tracts of contiguous undeveloped land. These large areas are more likely to contain a diversity of natural community types and higher species diversity than smaller areas.

Also essential are the habitat connections that allow species to shift their ranges and move to meet their habitat requirements.

Because large areas might miss some unusual small areas, this project set out to look for features that might give rise to unusual communities of plants and animals. Preserving representatives of all community types in a natural condition will help ensure habitat for all species.

In addition, some species require habitat components that have a very patchy distribution. Among these are beech and oak mast stands, ledgy denning areas, vernal pools, and undeveloped streams. You will find more information on these features in the report.

Two Vermont Agency of Natural Resources (ANR) landscape analysis projects form the foundation of this project. The **2014 Vermont Habitat Blocks & Habitat Connectivity** assessment identified and prioritized for conservation "existing contiguous forest blocks and associated linkages that allow for upward and northward movement (of species) in response to climate change." The second analysis, **Vermont Conservation Design (VCD)**, built upon this previous modeling to identify the areas of the state that are of highest priority for maintaining ecological integrity. **VCD** ranked all of the Guilford blocks over 500 acres in size as conservation priorities—important for regional connectivity, for providing core habitat, or both. Nearly every one ranks as a Highest Priority Landscape Feature. These analyses both show that the natural landscape of Guilford remains largely intact.

Its forest blocks and connections are important not just locally, but on a state and regional level. These remote sources provide, literally, an overview of the town. Some information, however, can only be gleaned from site visits, like the presence of mast stands, vernal pools, or unusual natural communities, and so this project included field work at parcels throughout town where these unusual features were considered most likely to occur.

This report gives an overview of each of the conservation elements and how they manifest in Guilford. We then take a closer look at each of the large forest blocks and see how these features contribute to the blocks unique properties and values.

Missing from this inventory are the rivers and streams and the aquatic life they host. These are already surveyed as part of Vermont's tactical basin planning.

ABOUT GUILFORD

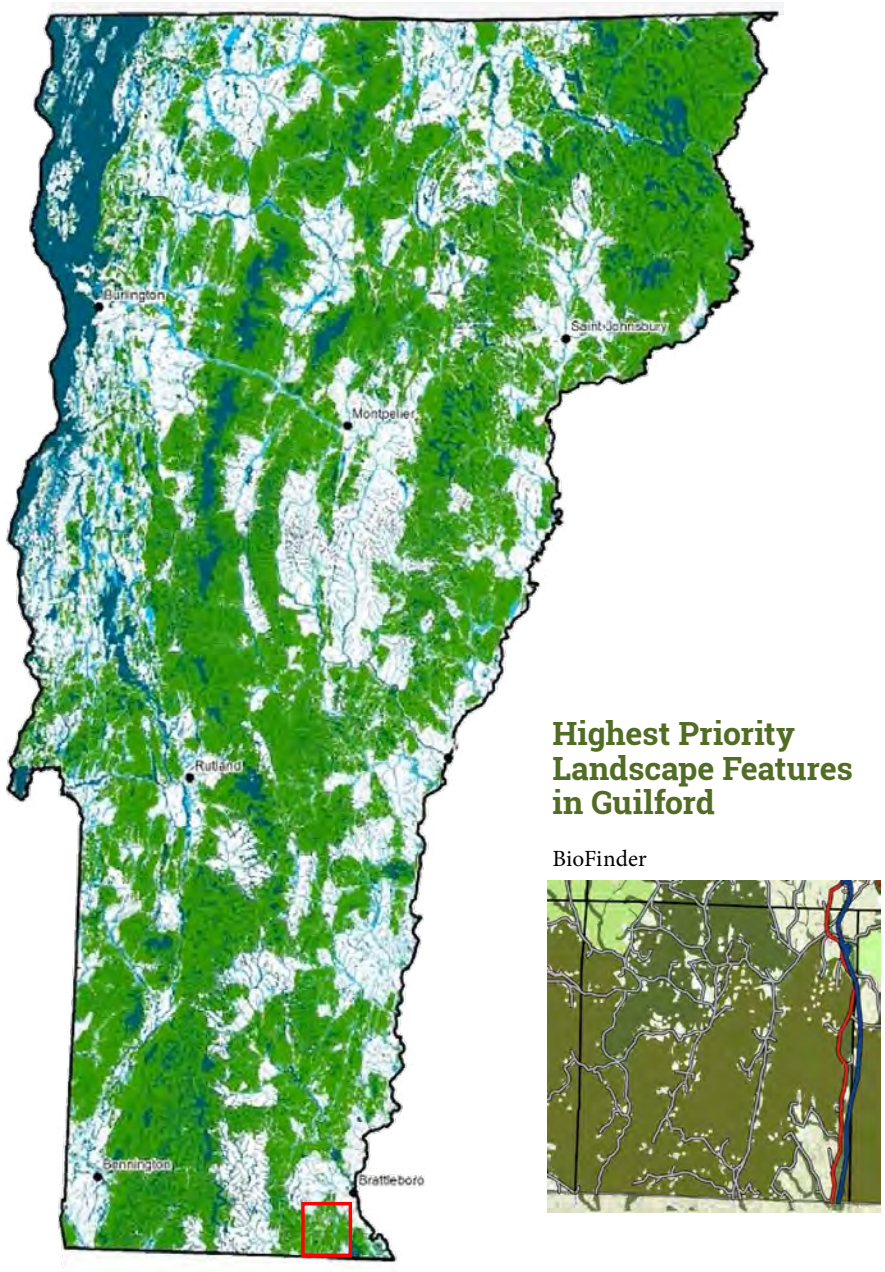
The forests of Guilford are productive and diverse, thanks to calcium-rich bedrock and the town's mild climate, by Vermont standards. Guilford's location on Vermont's southern border makes it among the most species-rich in the state. Many species exist here at the northern or southern limits of their ranges. Furthermore, with the climate warming, species shifting their ranges to the north will appear first in the low-elevation southern towns like Guilford. Large habitat areas that remain connected will give the best chance of maintaining healthy natural systems.

The town is in a good position to plan for the future. It remains largely rural and has large blocks of unfragmented habitat. However, there is no time to lose. The COVID-19 pandemic has provided a taste of what is to come for Vermont as the climate warms. According to a property transfer data analysis by the Vermont Center for Geographic Information, in 2020, residential property sales to out-of-state buyers increased by 38% statewide compared with 2019. The amount spent increased by 79%. While the increase was most dramatic in and around resort towns, numbers were up throughout the state. In Guilford, 9 residences were sold to out-of-state buyers in 2020.

Development trends from the Guilford Town Plan show that between 2001 and 2008, 92 structures were built in Guilford, 59% of which were more than 300 feet from a public road. Between 2009 and 2019, an additional 72 houses were constructed, 63% of which were more than 300 feet from a public road.

This report offers a picture of the assets and vulnerabilities of the nature of Guilford at this point. It also offers recommendations to help guide planning.

Vermont Conservation Design Executive Summary Map: Highest Priority Landscape Features



Note the importance of Guilford as a link in southeastern Vermont's habitat connectivity.

METHODS

This project began with remote analysis—gathering existing information from many sources. Observations of plants and animals were gathered by the Guilford Conservation Commission at Town Meetings. Information also came from conversations with community members and the landowners whose parcels were visited. The **Vermont Department of Fish & Wildlife** curates the data on significant natural communities and uncommon species in their **Natural Heritage Inventory** (**VNHI**). These reports indicate that survey work has been conducted at Fort Dummer State Park, along the Green River, on Owl's Head Mountain, at Sweet Pond, and at Weatherhead Hollow Pond.

Spatial data was assembled from several online sources: Vermont Conservation Design's **BioFinder**, the Vermont ANR's **Natural Resources Atlas**, and the **Vermont Center for Geographic Information**. These sites provided maps of the town's soils, topography, bedrock geology, and statewide priorities for conservation based upon remote analysis. The Nature Conservancy's **Center for Resilient Conservation Science** provided a regional look at conservation priorities. Among the most useful sources was a Windham County mapping project conducted by the MA-VT Woodlands Partnership, Climate Resilient Biodiversity Conservation Planning, a project of the **Vermont Land Trust** and the **Windham Regional Commission**. They pulled together information from many of the sources listed above to identify parcels in Windham County to target for conservation.

The remote analysis helped to prioritize the sites for field visits. A list of fifty parcels of interest was developed and ranked as high or moderate priority. Conservation Commission members then contacted landowners to gain permission for site visits. Field inventories on parcels where permission was obtained took place between 2017 and 2021. Twenty-three parcels were visited during the survey work.

For each site visit, a route was chosen to include areas most likely to contain unusual elements and to provide good sight-line coverage of the parcel. A mapping program was used in the field to document the route. Embedded photos mark the sites of noteworthy features as well as the representative forest cover. Field notes were kept in a personal journal.

A complete species list was beyond the scope of this project, but representative plants were noted for the communities visited. A list of plants observed is included in **Appendix 1**. Here you will find the scientific names of the species. Common names are used throughout the report. Many have also been recorded in the iNaturalist project, **Wild About Guilford**.

The Nature Conservancy's **Map of Terrestrial Habitats of the Northeast** was used as a starting point for mapping the upland communities of Guilford. Completed in 2013, their mapping is based on 71 ecological variables and a compilation of over 70,000 ecological community samples. It has been matched to their community types with Vermont classifications (described in *Wetland, Woodland, and Wildland* by Eric Sorenson and Liz Thompson). Many of the communities mapped were not visited during this project. In those places, the map gives a sense of the mature community most likely to be supported by the conditions of the site.

The **Antioch Spatial Analysis Lab** was hired to create three maps for this report. One map shows the roads, topography, and forested areas. Forested areas were delineated using a collection of publicly available statewide data sources. Fields and agricultural lands were excluded, as well as a 60-foot buffer around buildings, a 12-foot buffer on driveways, a 20-foot buffer on town roads, and a 30-foot buffer on state roads. Where there was no development for 500 feet along town roads, forests were mapped up to the road to show potential wildlife crossing zones.

The **Core Forest** map uses the same buffering for developed areas but differentiates between tree-covered areas near development and areas without forest. An important feature of this map is the core forest zone, delineated at 200 meters from the edge of all buffered areas.

BEDROCK

Bedrock forms the stage upon which life performs, and like a stage, it establishes some of the parameters for the action. The mineral composition of the bedrock often influences the plant communities that will grow on it. Guilford's bedrock was created when colliding continents plowed up and crushed deep ocean and shoreline sediments. Among this mix were deep deposits of the calcium-rich remains of early life-forms. We see them now as punky, brown, impure limestone in outcrops and stone walls in the areas underlain by Waits River Formation bedrock. Where this occurs, soils can be rich and contribute to the development of tall trees and the lush understory of a rich hardwood community. This is a natural community that produces displays of spring wildflowers and grows some of the world's finest sugar maples. Waits River runs in a band up the eastern side of Vermont.
While not as rich as the limestones found on the western side of the state, the Waits River bedrock is one of the reasons Vermont is famous for its sugar maples.

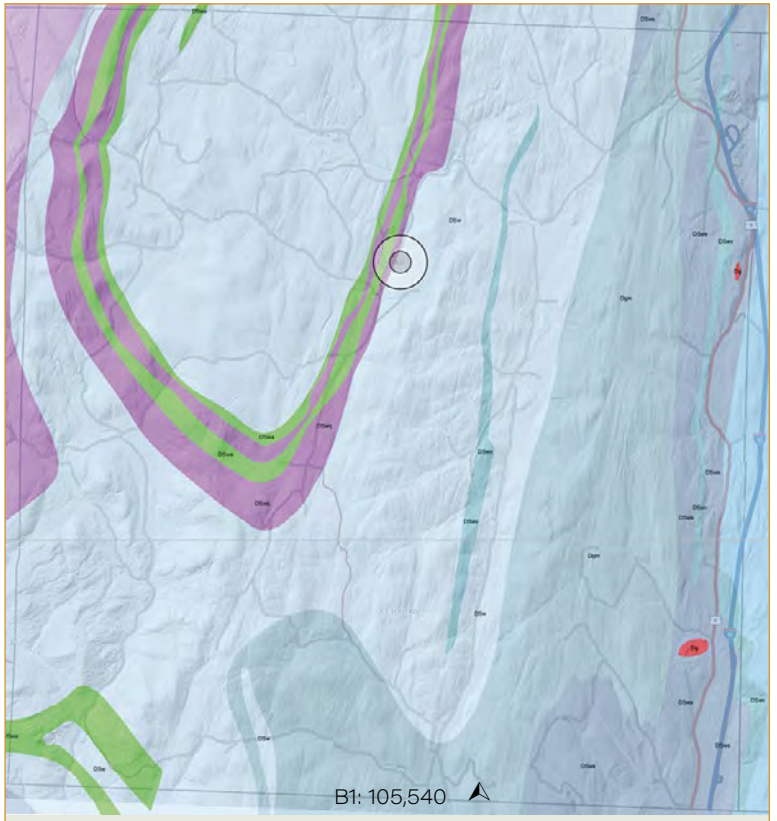
The Waits River Slate and the Northfield Phyllite also have calcium rich material, but it occurs less frequently.

The slate belt on the eastern side of Guilford supports plants that thrive in acid soils, like huckleberry and bracken fern.

Two small exposures of granite occur on the eastern side of town. The larger has been quarried. Granite breaks down very slowly into coarse, acidic soils and supports unusual plant communities, but these intrusions are likely too small to support such a flora.

Waits River: punky, brown impure marble.

Map 1. Bedrock



Key

- DSw — Waits River: Phyllite
- DSwq — Waits River: Quartzite
- DSwa — Waits River: Mafic
- DSwv — Waits River: Volcanic
- DSws — Waits River: Slate
- Dgm — Giles Mountain: Meetinghouse slate
- Northfield: Phyllite
- Littleton: Schist
- Granite

Map created using ANR's Natural Resource Atlas.

Map data: Bedrock geologic map of Vermont: USGS Ratcliffe, N.M., Stanley, R.S., Gale, M.H., Thompson, P.J., and Walsh, G.J., 2011.

LANDSCAPE DIVERSITY

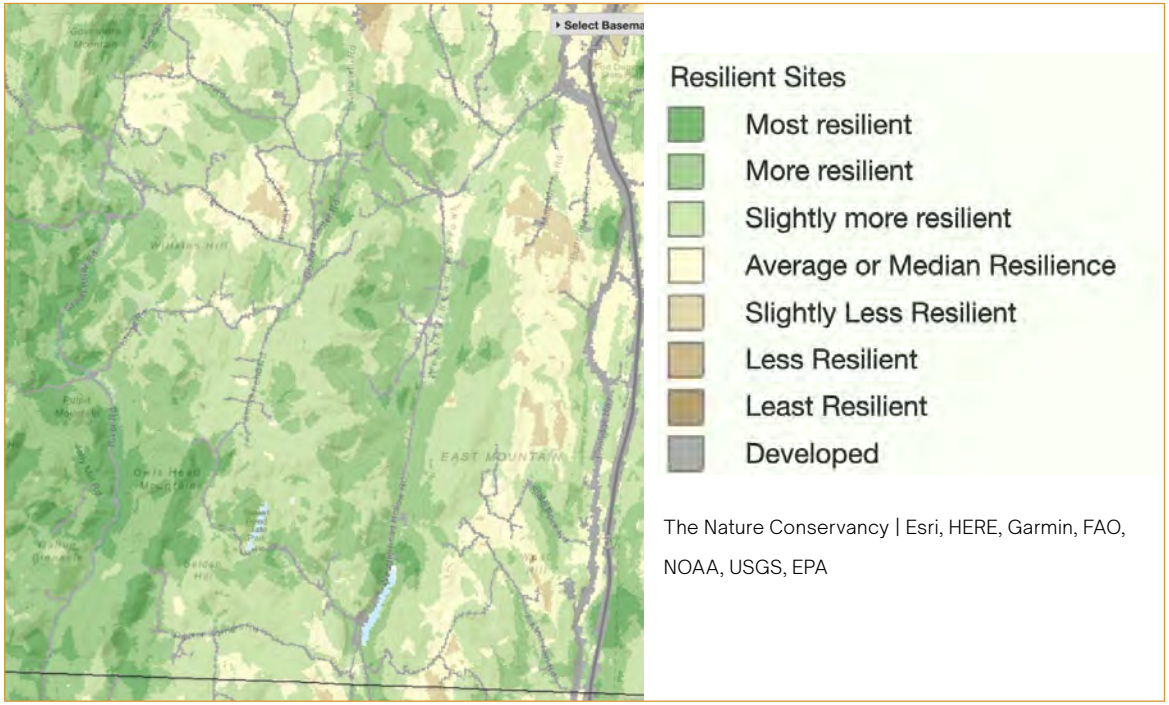
In general, the more physically diverse the landscape, the more habitat variation there will be. A 100-acre parcel with steep slopes facing in different directions, rocky areas, and plateaus with deep soil, will host a greater number of species than a 100-acre parcel that is flat or is on a uniform slope. The Nature Conservancy has developed an algorithm for mapping climate resilience that considers the physical diversity of the landscape and the connectedness of forested areas. Their map of resilient sites was used to help determine which parcels to survey. Most of Guilford is above average in landscape diversity. Portions of the western side of town are far above average in the Nature Conservancy's ranking.

The complexity of the landscape generally increases from east to west, from the Connecticut River Valley toward the Green River.

The calcium-rich bedrock of Guilford makes the town important on a regional scale. VCD maps most of the town as Responsibility Physical Landscape. Responsibility landscapes are types that are found more often in Vermont than in neighboring parts of the Northeast and Canada, thus making it our responsibility to ensure their protection.

There are a few small areas in Guilford that are mapped as Rare Physical Landscapes by VCD. These are "Water- and Ice-Deposited Glacial Sediments Along Major Rivers." These deposits are found along Broad Brook in the town center, at the base of Barney Hill, and the northwestern toe slope of East Mountain.

Map 2. TNC Resilient Sites



SOILS

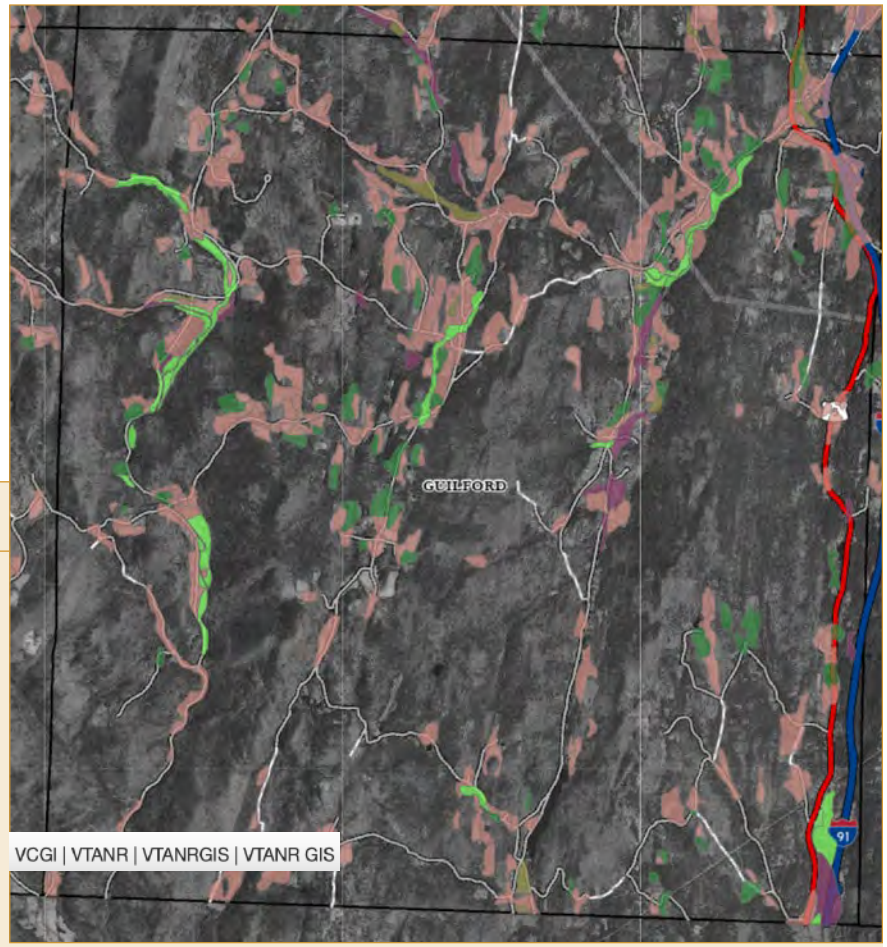
During the last retreat of the ice sheets, the rocks, soil, and clay they transported were left behind as glacial till. This till is the stony matrix cursed by New England farmers. In some places, however, moving water sorted these materials and left well-drained sand and gravel. These deposits were often left by meltwater streams flowing between the ice and hillsides. Silt, sand, gravel, and rock were dropped as the stream's energy varied. When the ice was gone, these stream beds remained as kame terraces. These terraces are made up of layers of sand and gravel. A kame terrace is found along the headwaters of the Broad Brook between Bonnyvale and Ashworth Road, and another extends along Weatherhead Hollow and east along Guilford Center road most of the way to Algiers. Glacial Lake Hitchcock extended up the Broad Brook channel where a large deposit of lake sand is found on the southern side of the brook. These well-drained soils have the potential to host natural communities that are drought adapted.

In the thousands of years since the retreat of the glaciers, soil-building processes have been underway, with downslope movement contributing to deeper, richer soils in the valleys. Human land use has influenced the depth and fertility of Guilford's soils over the past 175 years, as forest clearing and grazing have increased erosion and compaction.

Pre-settlement soils had more depth, structure, and complexity. Most of these original soils had deeper humus, more coarse woody debris, more fungal and microbial diversity, and a higher capacity to hold moisture and nutrients (Adams, D. et. al., 2015).

Soils classified as "prime agricultural" persist in many places. The places where land remains in agricultural use match very closely the places where prime agricultural soils occur.

Map 3. Prime Agricultural Soils



All colored shapes represent prime agricultural soils mapped by the US Natural Resources & Conservation Service.

CONSERVATION CONSIDERATIONS

The basic conservation precept "save all the pieces" applies here. A landscape that will provide habitat for all species should include representatives of the full diversity of soil types. In this case, special attention should be paid to the well-drained glacial deposits.

Our understanding of soil complexity is evolving rapidly, but there is much we don't know. Leaving some forests to grow and evolve in an unmanaged state will gradually return the soils to something of their original condition. VCD recommends that ten percent of Vermont's forestland be reserved as unmanaged future old growth forest.

A 2015 manual from the Vermont Department of Forests, Parks, & Recreation, *Creating and Maintaining Resilient Forests in Vermont: Adapting Forests to Climate Change*, includes recommendations for building soil health and climate resilience in managed forests.

Recommendations

- Leave dead trees as snags or downed woody material to build soils.
- Feed soil by leaving large diameter trees.
- Leave more trees standing to moderate temperature and moisture fluctuations in forest soils.
- Encourage the establishment and maintenance of healthy native herbaceous vegetation.
- Assess soil capabilities and conduct harvests to minimize negative impacts.
- Time harvests in sensitive areas carefully with flexibility to take advantage of mitigating conditions such as deep snow or frozen ground.

CONTIGUOUS FOREST BLOCKS

Forest habitat is fragmented by roads and the development that occurs along them. Forest blocks are the contiguous forested areas between them. They may include such naturally unforested areas as ponds and wetlands.

In general, the larger the forest block, the more species it will support. Maintaining large blocks of contiguous forest is the best way to ensure habitat for the most species. These blocks and the lands that connect them are such a priority that Vermont amended its municipal planning legislation to encourage towns to protect them. Act 171 provides a mechanism for towns to address these habitat elements in their land use plans, as Guilford's Town Plan now does.

The forest at the edge of each block has different characteristics than the forest in the center—the core forest. The edges have more invasive plants, noise, pets, and higher populations of wildlife that thrive near humans, like raccoons and crows.

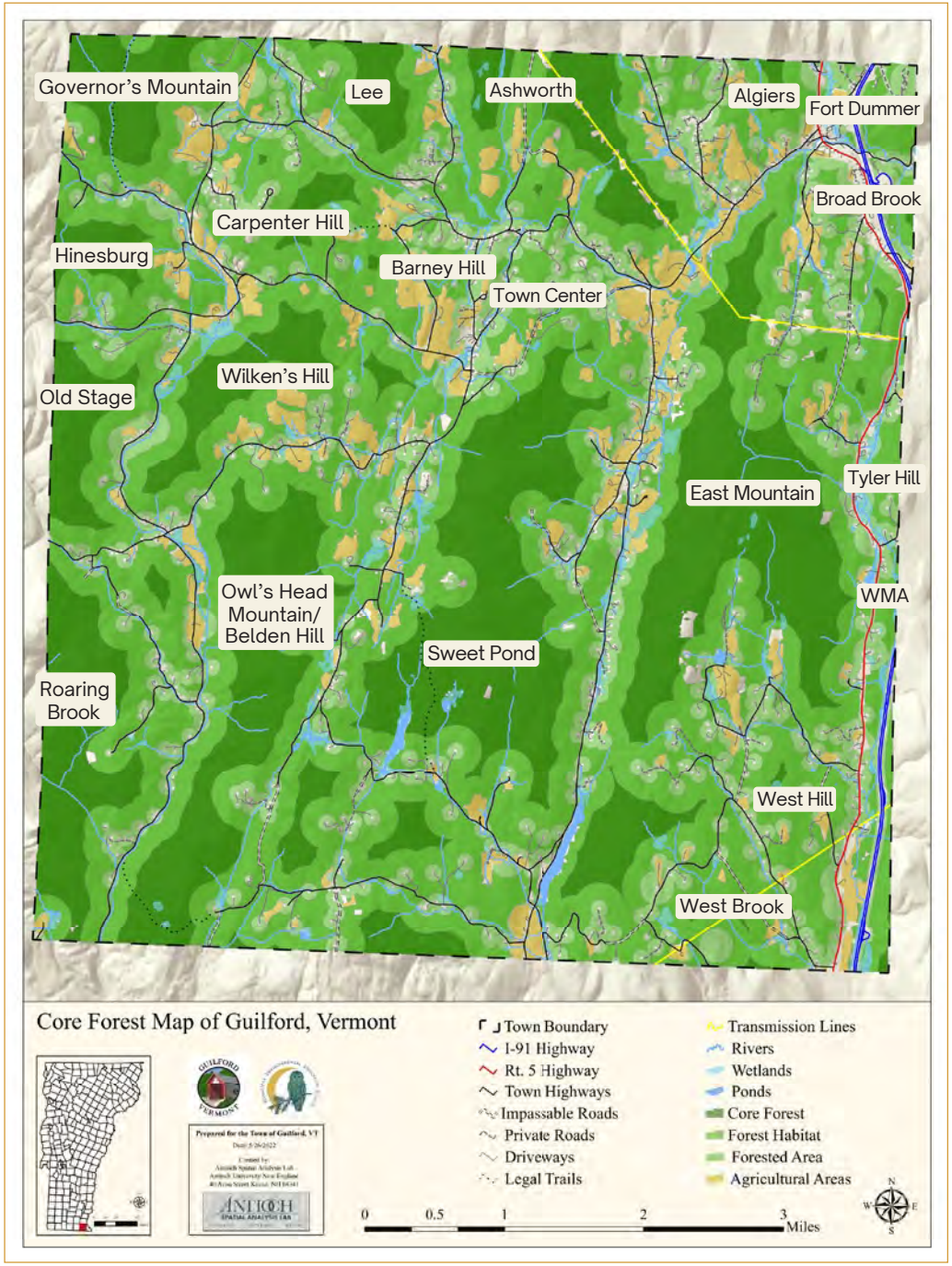
A number of species depend upon remote forests to thrive. Bobcat, otter, and moose are among the species that prefer remote forests. Bears need remote beech and oak forests for feeding in the fall. Some birds, such as the ovenbird and hermit thrush, depend on deep forest for survival. While some of these species may be seen in edge zones and even in backyards, core forest areas are essential for the longterm survival of their populations.

This report uses the Vermont Conservation Design definition of core forest areas—those zones over 200 meters from forest edges.

Guilford contains all or part of 20 different habitat blocks ranging from 34 acres to over 4,000 acres. For the sake of this project, and with suggestions from the Conservation Commission, these blocks have been named.

The 2014 Vermont ANR **Habitat Blocks & Habitat Connectivity** report scored each block using a combination of features, including size, percentage of core habitat, percentage of ponds and wetlands, and length of rivers and streams. The scale is one to ten, with higher numbers given to higher priority areas. Each block also received a threat score based upon the average parcel size, the amount of conserved land, and the

Map 4. Contiguous Forest Blocks



density of development along the periphery. The threats were taken into account when giving each block a weighted score. Statewide, block scores range from .08 to 8.3 with an average score of 3.9. **Table 1** shows the scores for Guilford blocks, as well as the percentage of core habitat and percentage of wetlands.

The second analysis, **Vermont Conservation Design (VCD)**, built upon this previous modeling to identify the areas of the state that are priorities for maintaining ecological integrity. VCD ranked all of the Guilford blocks over 500 acres in size as Conservation Priority—important for regional connectivity, for providing core habitat, or both. See **Table 1** for the scores for each block.

The standout block on both counts is **Old Stage**, much of which is in Halifax. The parcels surveyed in that block suggest this designation is warranted. In particular, one site along the Green River had a Rich Northern Hardwood Forest on deep, moist soils. This truly lush parcel had one of the few patches of wild leeks found in this survey.

Based upon the field work conducted for this report, the **Roaring Brook** and **Sweet Pond** blocks would rank next for ecological importance. **Governor's Mountain** and **Owl's Head/Belden Hill** both have a number of significant features that enhance their importance for wildlife and climate resilience.

The ANR gives the **East Mountain** block its second highest score. This block is regionally very important for wildlife movement. The long, north-south ridge is a natural movement corridor. This is imperiled by fragmentation, especially at the northern and southern ends of the block. This largest block in Guilford is narrow, and is penetrated by several roads. Most of this block is on Guilford slate bedrock, so the soils receive less calcium enrichment than bedrock-nourished soils on the west side.

The **Wilken's Hill** block received a high weighted score from the **Vermont Habitat Blocks & Wildlife Corridors (ANR)** analysis. This block's score benefits from a high percentage of conserved land (26%), its importance as connecting land, and the presence of a Rare Physical Landscape.

All of the blocks that are conservation priorities are described in the **Forest Blocks** section.

CONSERVATION CONSIDERATIONS

This report recommends the highest level of protection for the Roaring Brook, Old Stage, Owl's Head, Governor's Mountain and Sweet Pond forest blocks for interior forest values. The East Mountain block is vital for habitat connectivity.

In several of these blocks, the bulk of the core forest is in just a few large parcels. Proactive conversations with these landowners might help ensure that they will retain their values, whether through longterm stewardship, conservation easements, or purchase by a land trust or other conservation group. A few of these parcels are already conserved.

According to VCD,"There is considerable leeway on what can happen within a forest block and still maintain interior forest function. For example, most forest management activities are compatible with maintaining the long-term interior forest functions for these blocks, providing these activities are thoughtfully planned."

Development on the edge of large forest blocks may not have significant adverse effects as long as it does not reduce connectivity between blocks and does not encroach into the forest block interior.

Regulatory Steps

Since Guilford has no zoning or subdivision regulations, there are no regulatory mechanisms in place to prevent many types of incursions into these core areas. Such regulations are far from a panacea, but can be an important tool.

Help for Landowners

Enrollment in the Use Value Appraisal (UVA) program is one way to keep the ownership of large forest parcels affordable.

Education

Build community awareness of and appreciation for the value of these core forest areas.

Table 1. Guilford Forest Block Attributes

Block Name In order of size (in Guilford)	Acres in VT	Acres in Guilford	% Core	% Wetlands	ANR Score*	Weighted Score*	Highest Priority Interior Forest**	Priority Interior Forest**	Highest Priority Connecting Land**	Priority Connecting Land**	Physical Landscape**
East Mountain	4,161	4,161	45	1.31	6	5.25		x	x		
Owl's Head/Belden Hill	3,361	3,361	38	1.1	6			x	x		
Sweet Pond	3,243	3,243	52	1.34	6	5.05		x	x		
Roaring Brook	2,680	1,400	53	.84	6	5.2		x	x		
Governor's Mountain	3,130	1,336	41	.65	6	4.6		x		x	
Ashworth	1,869	1,199	34	2.1	5	4.4		x		x	x
Wilken's Hill	1,133	1,133	30	2.45	7	5.35	x			x	
Carpenter Hill	741	741	0	.85	4	3.7		x		x	x
Old Stage	3,911	627	64	1.75	7	5.6	x		x		
Hinesburg	2,875	524	43	.48	5	4.55			x		
Lee	541	466	0	.9	4	3.25				x	x
West Hill	444	444	0	.63	3	2.55					
West Brook	408	408	0	2.24	3	2.55					
Fort Dummer	403	273	0	1.2	3	2.95					x
Algiers	690	141	0	3.85	4	3.75					
Tyler Hill	152	115	0	7.5	5	4.15		x			x
Barney Hill	90	90	0	.03	4	3.15					x
Broad Brook	1022	68	34	.16	6	4.85					
WMA	42	42	0	8.1	5	4.05					
Town Center	34	34	0	6.63	3	3					x

* Sorenson, E. and J. Osborne. 2014. *Vermont Habitat Blocks & Wildlife Corridors, an analysis using geographic information systems.* Vermont Fish & Wildlife Department. Rank from 0-10, lowest to highest priority.

** Sorenson, E and Zaino, R. 2018. *Vermont Conservation Design: Maintaining and Enhancing an Ecologically Functional Landscape.* Vermont Agency of Natural Resources.

CONNECTING LANDS

Many animals need to travel widely to meet their needs. While some species, like deer and foxes, show little aversion to human houses and roads, others will not cross open spaces or avoid most human disturbances. Populations that become isolated in habitat fragments often disappear.

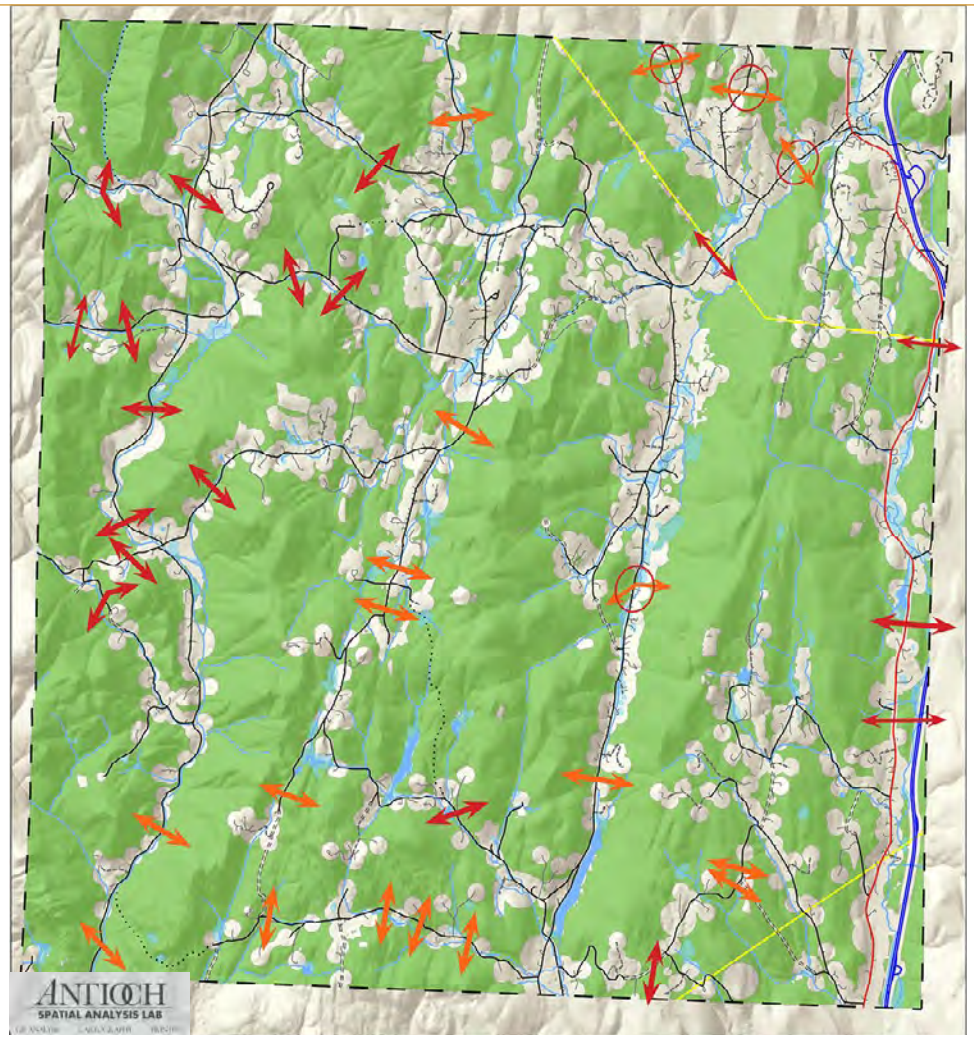
The ability to move across the landscape becomes more important as the climate warms. The survival of many species will depend upon their ability to shift their range and move freely to locate needed resources. Within the largely forested landscape of Guilford, there are relatively few impediments to the movements of wildlife. The picture is very different if we zoom out. Much of the landscape to the south is highly fragmented and developed. Two arms of green reach up on either side of the Connecticut River—a very narrow route from the Quabbin region to the east and a wider path from the Berkshire hills to the west. Guilford's large forest blocks are an important part of this regional corridor to the largely unfragmented Green Mountain National Forest.

The VCD analysis shows this north-south connectivity ribbon running from Guilford's southern border and funneling northward along the Green River.

Roads and development are major impediments to some species. Protecting critical undeveloped road crossing areas will be essential to maintaining habitat permeability.

Ridgelines and watercourses offer natural travel routes for many species. To identify important crossing areas, areas where these features intersect with roads have been mapped (**Map 5**). The best crossings have trees or dense brush right up to the edge of the road. They have no houses or other development for a stretch of at least several hundred feet. They have no guardrails or fences.

Map 5. Road Crossings



Forestland mapped by A. Kaisand, Antioch Spatial Analysis Lab. Crossing arrows added by P. Smith.

Forested area

Undeveloped* crossing linking ridgelines or riparian areas

Narrow crossing linking ridgelines or riparian areas

Undeveloped crossing

Narrow crossing

Isolated linkage in developed area

** 500 feet or more from a developed area.*

If the crossing zones are along a river or stream, the ideal crossing is a wide bridge or an over-sized culvert that animals can easily move through.

The Route 5, I-91 corridor is the most challenging obstacle for wildlife on the move. All wildlife moving from the east must find a way across. The two southern crossing zones show the most promise. In both cases, streams and wetlands provide natural travel corridors. A third site is along the VELCO powerline, a feature that some species use for travel and foraging habitat. Guilford resident Stephen Soszynski has documented the wildlife traffic across Guilford Center Road on this powerline cut, including bears, coyotes, white-tailed deer and bobcats. An otter was killed crossing the road at that site. A site visit and trail cams confirm wildlife use of this powerline area.

The forested area on the Vernon side of this northern crossing is more fragmented than it is at the two southern crossings, though the powerline edges provide some brushy cover.

Note: Fencing along the interstate probably blocks all of these crossing zones.

Weatherhead Hollow Road has just one undeveloped crossing site remaining. There is another narrower crossing site to the north where animals sensitive to human disturbance might find enough cover to cross.

The northeastern portion of town has few and narrow crossing sites.

The mapped crossings are based on a remote analysis of structural connectivity. Field verification using track surveys would provide more robust data.

Fish and other aquatic organisms also need habitat connectivity and can be thwarted by dams and hanging culverts (a culvert with a drop-off at the downstream end). A stream crossing data set can be found at the ANR Atlas site. Many of the Guilford culverts mapped as impassable impede upstream movement to very small stream segments and/or very seasonal streams, but others, like the double culverts on Lowry Road, prevent aquatic life from moving into two miles of upstream territory.

The following recommendations come from Vermont Conservation Design, **Wildlife Road Crossings**:

> "Maintaining or restoring natural vegetation on both sides of identified road crossing segments will maximize the effectiveness of the road crossing for connectivity."

There are some species that do not range widely, but need to make seasonal migrations. Spotted salamanders and woodfrogs are among the amphibians that migrate to vernal pools and other wetlands to lay their eggs. Their migration usually occurs on rainy nights in April. When these amphibians cross roads to reach their breeding sites their local populations are threatened.

A hanging culvert under Old Stage Road is a barrier to aquatic organism movement.

This culvert/bridge beneath Hale Road allows good passage for mammals and aquatic organisms.

The **Bonnyvale Environmental Education Center** organizes volunteers to help at road crossings throughout Windham County on these migration nights. Two of the busiest sites are in Guilford. One is near the Brattleboro border on Hinesburg Road. The other is on Green River Road. Other sites have been reported but not confirmed. To report other crossing sites or to sign up to become a salamander crossing guard, visit the **Bonnyvale website**.

Spotted salamander.

CONSERVATION CONSIDERATIONS

"Forest management that maintains forest cover adjacent to the road is compatible with this function. Roadside development that further restricts animal movement is detrimental to connectivity. Road and highway structures that allow or promote fish and wildlife movement, such as bridges and oversized culverts, and limiting the use of fences and roadside barriers that impede movement, are all effective in promoting wildlife passage."

Creating naturally vegetated buffers along streams would aid habitat connectivity in the more developed and agricultural portions of town.

The ideal buffer for wildlife is 660 feet on each side of the stream (Adams, D. et. al. 2015), however in agricultural areas such a wide buffer may not be possible. A 50 foot minimum is recommended as a buffer for all waterways, and that would certainly increase connectivity in the more agricultural parts of Guilford's landscape, especially along the streams that flow through fields in Weatherhead Hollow.

A wider zone of natural vegetation would also make the powerline crossing zone on Guilford Center Road a more popular destination for wildlife on the move.

Additional Actions to Take

STEWARDSHIP

Work with landowners in key crossing zones to provide good stewardship. Keep these zones undisturbed and/or increase natural vegetation.

PRESENTATIONS

Presentations for landowners on connectivity enhancement, including in and adjacent to riparian areas.

IDENTIFY ZONES

Identifying more amphibian crossing zones.

GATHER DATA

Gathering crossing data to support the protection of critical crossing zones.

COMMUNICATION

Contacting VTRANS to discuss the potential for increasing safe crossing zones on I-91.

NATURAL COMMUNITIES

Across the landscape, species composition changes in predictable ways as the physical conditions change. One set of plants and animals will be found on dry, fire-prone slopes, while a different group will be in moist soils at the base of a slope. These assemblages of species form natural communities. Conserving representatives of all natural communities in sizes that are ecologically viable is a good strategy for ensuring habitat for most species.

These communities are divided into two categories, **upland** and **wetland**. Wetlands are found in places where soils are saturated with water for at least part of the year. Uplands make up the rest.

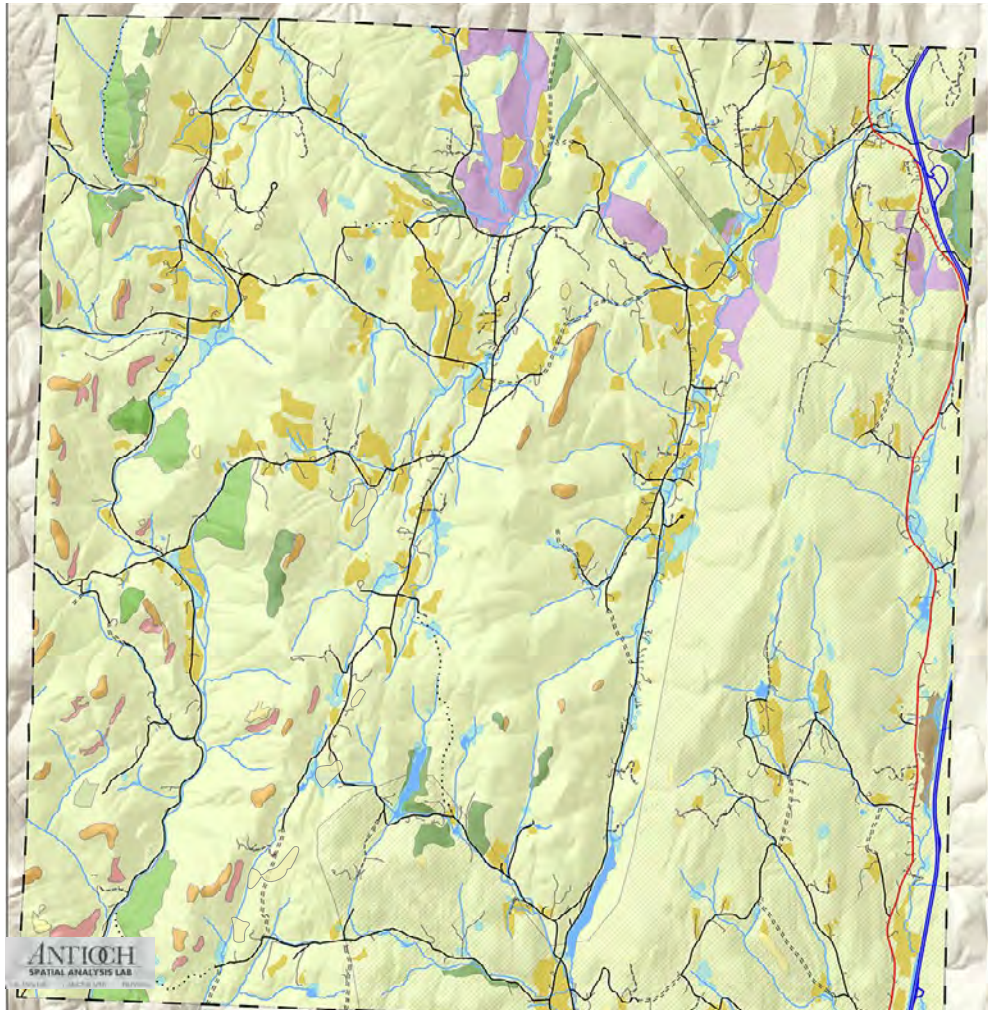
UPLAND COMMUNITIES

Natural communities that predominate over a large portion of the landscape are called matrix communities.

Large patch communities are typically 50–100 acres and are associated with an excess or deficit of environmental variables like moisture or sunlight. Hemlock forest communities, usually found on hillsides that receive less sun, are in this category. **Small patch** communities consist of species adapted to take advantage of a very specific set of conditions. Examples of small patch communities are a vernal pool, fen, or the Dry Oak-Hickory-Hophornbeam Forest found on many of Guilford's thin-soiled hilltops. Unusual species are often found in these communities.

The Upland Natural Communities Map created for this project was based upon The Nature Conservancy's **Map of Terrestrial Habitats of the Northeast**. Completed in 2013, their mapping considered 71 ecological variables and a compilation of over 70,000 ecological community samples. They use the habitat classes (analogous to natural communities) developed by NatureServe, The Northeast Terrestrial Habitat Classification System (Gawler 2008).

Map 6. Upland Natural Communities



For this project, these classifications were refined based upon site visits, windshield tours, and personal knowledge of the Guilford landscape. They were then matched with the Vermont classifications described in Wetland, Woodland, and Wildland by Eric Sorenson and Liz Thompson. Note that most of the communities mapped were not visited during this project. In those places, the map gives a sense of the mature community most likely to occur on the site.

GUILFORD'S MATRIX COMMUNITIES

Unlike the majority of Vermont, which falls within the Northern Hardwood Formation vegetation zone, Guilford is in the Oak-Pine Northern Hardwood Formation, considered transitional between the Northern Hardwood Formation and the Central Hardwood Formation (Thompson & Sorenson, 2020). The forests in Guilford are warmer, oakier and somewhat deficient in one of the defining canopy trees of the Northern Hardwood Forest, the yellow birch. NatureServe calls the matrix community of Guilford Appalachian (hemlock)-Northern Hardwood, a community type with sugar maple and beech mixing with hemlock and white pine. Black cherry, white ash, red oak, basswood, and black birch are also common hardwoods in this community type. The Vermont community classification that is the closest match on the calcium-rich Waits River bedrock is the Mesic Maple-Ash-Hickory-Oak Forest.

MAPLE-ASH-HICKORY-OAK FOREST

Guilford's matrix forest is a productive community where trees grow tall and quickly. On the richest sites, sugar maple, white ash, red oak, and bitternut hickory are mixed in the canopy. White pine, hemlock, paper birch, black birch, black cherry and bigtooth aspen are all common. Shrubs include maple-leaved viburnum, striped maple, and witch hazel.

The variations in this community follow gradients of light, moisture, and soil depth. Warmer sites favor oaks over maples. Cooler sites, those on north and east facing slopes, especially those with hemlock in the mix, have fewer shrubs and less growing on the forest floor. These tilt in the direction of Northern Hardwood Forest.

Where the calcium-rich Waits River bedrock is near the surface, the richest variant of this community type is found. This is a match for the Rich Mesic Forest of the Massachusetts natural community classifications.

These were exciting places to explore. You know you have entered such a community by the lush green of the forest floor. In the spring, you will find ephemerals like spring beauties, squirrel corn, and Dutchman's britches. Ferns and other herbs remain green all summer.

This community type was more widespread before the arrival of European colonists. Harvard Forest researchers have studied the impact of historical agriculture on such rich-site forests. They found that while trees will return quickly given a chance, the species composition will include trees adapted to grow in disturbed sites, altering forest dynamics.

They also found that the recovery of the herb layer takes far longer and may never occur (Bellemare, Motzkin & Foster, 2003). Forest herbs evolved for life in the understory of mature forests. They are patient plants. They make take several years to store enough energy to fruit. Many also lack mechanisms for long-distance seed or spore dispersal. In many cases, populations of these plants were limited to large bedrock exposures where grazing could not occur. These places serve as refugia for many of these forest herbs.

Guilford's most exemplary rich forest sites were found in the western portion of town, the areas with the most exposed Waits River Bedrock. You will find descriptions of these forests in the **Old Stage** and **Roaring Brook** forest block sections.

NORTHERN HARDWOOD FOREST

The matrix forest on the eastern side of town grows on the bands of slate which contribute less calcium to the soils. This community is a Guilford variant of the Northern Hardwood Forest. These forests have more pine, black birch, and red maple than the forests in the rest of town, and less white ash.

DRY OAK HEMLOCK FOREST

A portion of the Roaring Brook Wildlife Management Area extends into eastern Guilford, and hosts the matrix community for much of the WMA—Dry Hemlock-Oak Forest. It has been described for the Natural Heritage Inventory as follows:

> "Canopy cover is greater than 90%, and much of this is hemlock. The terrain is dry and rocky with sloped ground. The soils are often quite dry. Trees species include Hemlock, Yellow Birch, Red Maple, Black Birch, White Oak, Northern Red Oak… Herb species include Common Miterwort, Interrupted Fern, Wild Cucumber, Canada Mayflower, Creeping Snowberry, Bracken, Common Oatgrass, and a panic grass species." (Richardson, L., 2004. NHI)

More than 1,500 acres of this community occur in the WMA and on adjacent parcels. This is a State Significant example of this community type.

LARGE PATCH COMMUNITIES

DRY TRANSITION HEMLOCK FOREST

These forests are found on steep, west facing slopes in Guilford. In these forests, hemlock forms a closed canopy. Very little vegetation is found on the forest floor. They are important deer wintering areas since less snow accumulates in these woods. Porcupines feed on hemlocks in winter and their dens are often located in or near hemlock stands. These are good places to listen for black-throated green warblers and red-breasted nuthatches.

An exemplary Dry Transition Hemlock Forest is found on the west side of Governor's Mountain. Read more about it in the **Governor's Mountain** section.

DRY RED OAK-WHITE PINE FOREST

This community type more closely resembles the **Laurentian-Acadian Pine-Hemlock-Hardwood Forest** described by the Nature Conservancy than the Dry Red Oak-White Pine Forest, which seemed the closest of the Vermont types. The dominant trees for this community type are white pine, hemlock, and red oak, with hardwoods like sugar maple, beech, and birch also occurring. This forest type occurs on low-nutrient loamy to sandy soils.

See the **Ashworth Block** for a description of one site with this community type.

SMALL PATCH COMMUNITIES

DRY OAK-HICKORY-HOPHORNBEAM FOREST

These are the forests found on the summits with thin soils. These airy forests have carpets of grasses and sedges and can appear park-like. Where soil is deeper, or rich bedrock outcroppings are at the surface, red oak, sugar maple, white ash, and bitternut hickory are found in the canopy. The herb layer includes rich site indicator plants. See **Governor's Mountain** and **Owl's Head/Belden Hill** for descriptions of this community. State Significant examples of this forest community were found in these blocks. Smaller patches of this community are found on many of the mountains in town.

TEMPERATE CALCAREOUS CLIFFS

Most of the cliffs where this community type occurs in Guilford are modest compared with those elsewhere in the state. They host a community of plants that thrive in small, mineral-rich pockets of soil. These are also the refuges where plants once common in the understory of rich forests can still be found. See descriptions in **Roaring Brook**.

DRY OAK FOREST

Found on dry, infertile soils, these forests will have a mix of oak and pine species. Blueberry and other heath shrubs are found in the understory. A State Significant example of this community type was mapped for the Natural Heritage Inventory in Fort Dummer State Park (Engstrom, B. 2008). Engstrom described a mature, even-aged forest with red oak, black oak, and tall white pines. Red maple and beech were abundant in the mid-canopy, while shade tolerant beech and hemlock hovered in the understory waiting for a break in the canopy. Blueberry grew in the herb layer, along with starflower, false lily-of-the-valley, and partridge-berry.

OLD FORESTS

Forests that have never been cleared or logged are exceedingly rare in Vermont. I encountered no such forests in Guilford. In recent decades, as we have learned more about the complexity of natural systems, conservation biologists are recommending conserving some of the landscape as unmanaged forest—areas set aside to evolve as purely natural systems. For a nice synopsis of the importance of old and unmanaged forests, see **Biodiversity, the Language of Wilderness** by Janet McMahon, a publication of the Northeast Wilderness Trust.

Vermont Conservation Design considers Old Forest to be a highest conservation priority. VCD has set a target of 15% of Vermont's matrix forests to be managed as or for old growth. In the Southern Vermont Piedmont, the biophysical region Guilford is part of, the acreage goal is 31,000 in patches of 1,000 acres or more. Currently, the Northeast Wilderness Trust holds an easement on a 191 acre parcel in the Sweet Pond block that will become old growth.

SHRUB-FORB HABITAT

Shrublands and old fields are habitats that feature dense low-growing plants and/or shrubs. Among the birds that depend on them are American woodcock, brown thrasher, prairie warbler, field sparrow, eastern bluebird, and eastern kingbird. The VELCO powerlines that run through town offer the most significant acreage of shrub-forb habitat. Surveys along the powerlines revealed their importance for mammals as well, with signs of bears foraging for berries and marking poles.

Powerlines are a mixed blessing. While they create habitat diversity, they are also a fragmenting feature, allowing species that prefer open and edge habitat (like raccoons and cowbirds) access to core forest areas. Fortunately for Guilford, the VELCO power lines avoid the most important core forests and instead travel through some of the more fragmented parts of town.

Guilford's forests are nearly all working forests, and lack the structural complexity and diversity of old forests.

Sunny, dry conditions on the powerline give rise to plants adapted to such shrub-forb sites.

VCD has set a goal of .5% of the landscape in Upland Shrub Forb habitat for Guilford's Southern Vermont Piedmont biophysical region. A measurement of the VELCO powerline area shows it to be roughly 131 acres in Guilford which is .496% of town—pretty good! Ideal shrub and forb habitat has few invasive plants, a nearly impossible state to achieve. While invasive buckthorn and honeysuckle were abundant on the powerline cuts in the places surveyed, native plants were also well represented—staghorn sumac, blackberries and raspberries, old apple trees.

This, in combination with openings created by forestry and natural disturbances, this allows Guilford to meet this target easily.

See **Old Stage** for a description of another example of early successional/shrub-forb habitat.

CONSERVATION CONSIDERATIONS

Shrub-forb habitats are very prone to becoming dominated by invasive plants and require active management to give native plants an edge. Visit **Vermont Invasives** for recommendations on managing invasive plants.

Sugar maple and sharp-lobed hepatica.

Table 2. Significant Natural Communities

Community Type	State Significant	Locally Significant	Forest Block
Mesic Maple-Ash-Oak-Hickory		X	Hinesburg, Old Stage, Roaring Brook, Owl's Head, Sweet Pond, East Mountain
Dry Transition Hemlock	X	X	Governor's Mountain, Hinesburg
Dry Oak-Hemlock Forest	X	X	WMA
Dry Oak-Hickory-Hophornbeam	X	X	Governor's Mountain
Temperate Calcareous Cliffs		X	Governor's Mountain, Roaring Brook, Owl's Head
Dry Red Oak-White Pine Forest		X	Ashworth, East Mountain
Dry Oak Forest	X	X	Fort Dummer
Red Maple-Black Ash Swamp	X	X	Roaring Brook, East Mountain, Tyler Hill, Algiers
Rich Fen	X	X	Algiers
Sugar Maple-Ostrich Fern Riverine Floodplain Forest	X	X	Owl's Head
River Cobble Shore	X	X	Owl's Head

Table 3. Rich Forest Indicator Plants Identified

Actaea alba (L.)	Doll's eyes
Actaea rubra	Red baneberry
Adiantum pedatum	Maidenhair fern
Allium tricoccum	Wild leek
Asarum canadense	Wild ginger
Asplenium rhizophyllum	Walking fern
Athyrium pycnocarpon (S3)	Narrow-leaved glade fern
Botrychium virginianum	Rattlesnake fern
Carex albursina (S3)	White bear sedge
Carex plantaginea	Plantain-leaved sedge
Carex platyphylla	Broadleaf sedge
Caulophyllum thalictroides	Blue cohosh
Deparia acrostichoides	Silvery glade fern
Dicentra cucullaria	Dutchman's breeches
Dicentra canadensis	Squirrel corn
Dryopteris goldiana	Goldie's fern
Eupatorium rugosum	White snakeroot
Geranium robertianum	Herb Robert
Hackelia deflexa	American stickseed
Hepatica acutiloba	Sharp-lobed hepatica
Impatiens pallida	Pale jewel-weed
Laportea canadensis	Wood nettle
Oryzopsis racemosa	Mountain rice
Osmorhiza claytonii	Sweet cicely
Panax quinquefolius (S3,SCN)	American ginseng
Phegopteris hexagonoptera (S3)	Broad beech fern
Sanguinaria canadensis	Bloodroot
Solidago flexicaulis	Zigzag goldenrod

CONSERVATION CONSIDERATIONS

Because the richest forest sites have the highest plant diversity and take the longest to recover from disturbance the richest parcels would be a good place to begin piecing together an old forest reserve.

- Since no single landowner has 1,000 acres in Guilford, meeting the minimum patch size will require cross-boundary cooperation and could extend beyond the boundaries of town.
- ACT 146 will allow qualifying land in the UVA program to be managed as 'Reserve Forestland' for the purpose of attaining old forest values and functions. This legislation takes effect in 2023. Eligible parcels must include Ecologically Sensitive Treatment Areas (ESTAs): old forests; State Significant natural communities; rare, threatened, and endangered species; riparian areas; forested wetlands; or vernal pools.

"The community's limited geographical extent, high species richness and associated rare plant taxa make Rich Mesic Forests a conservation priority throughout the region."

Legacies of the Agricultural Past in the Forested Present: An Assessment of Historical Land-Use Effects on Rich Mesic Forests

Jesse Bellemare, Glenn Motzkin and David R. Foster

CONSERVATION CONSIDERATIONS

An important goal of conservation planning is to save high quality examples of every natural community in sizes large enough to be viable. Any management of these conserved areas must prioritize the enhancement of the natural characteristics of the site.

Uncommon and rare natural communities, along with small-patch natural communities, are areas with disproportionate biological and physical diversity for their acreage.

In Guilford, these small patch communities include:

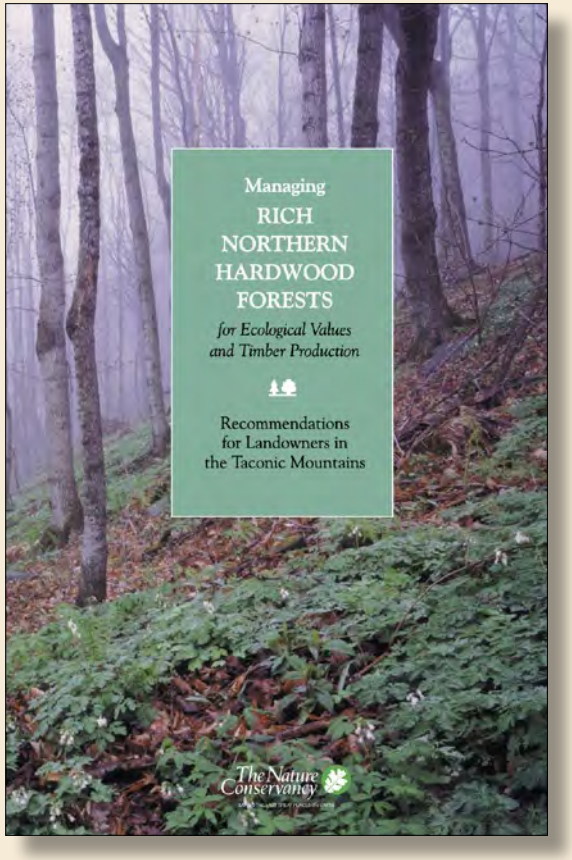
- Dry Oak-Hickory-Hophornbeam Forests (**Governor's Mountain** and **Owl's Head**)
- Dry Oak Forest (Fort Dummer)
- Temperate Calcareous Cliffs (Owl's Head, **Roaring Brook**, **Hinesburg**, Old Stage, Governor's Mountain)

Guilford's nutrient-enriched communities are under-represented in other parts of the Northern Forest. Their high species diversity and productivity make them special places. Because the forests of Guilford are working forests, none of the sites surveyed represented the full potential of a rich Mesic Maple-Ash-Oak community—the old growth forests of much of Guilford pre-European settlement. An old growth forest reserve of 1,000 or more acres that includes Temperate Calcareous Cliff refuges and Mesic Maple-Ash-Oak would be quite a place to visit in a few centuries (see **Old Forests**).

When rich forests are managed for timber products, there are techniques that will lead toward a more complex and natural forest. The Nature Conservancy gathered these recommendations for Vermonters who live on the limestone parts of the Taconic mountains west of us. You can read their recommendations **here**.

ADDITIONAL SURVEY WORK

The southeastern part of Guilford was neglected because of lack of physical diversity. Additional survey work in that part of town might find examples of a less-enriched community types, like Oak-Black Birch Talus Woodland.



WETLANDS

Wetlands are those areas that are neither aquatic nor dry land. They are inundated or saturated by water during at least a portion of the growing season. They contain soils rich in organic matter that form in reduced oxygen conditions and are dominated by plants that are adapted to live in saturated soils.

As with forests, there are a variety of wetland community types. Four factors influence the community formation: hydrology, nutrient availability, the movement of water and ice, and climate. These factors lead to different wetland communities. Wetlands occupy only five to ten percent of the land area of Vermont but provide essential habitat for a disproportionately high number of plant and animal species. Of 153 threatened and endangered plants in Vermont, 54 are found exclusively in wetlands (Thompson, Sorenson, 2017).

A wetlands survey was beyond the scope of this project, though some parcels selected for field surveys were chosen because they had wetlands. Where wetlands were encountered, they were described but not delineated. You will find them described in the sections devoted to the forest blocks.

In 1997, The Green River Watershed Preservation Alliance(GRWPA) hired an ecologist to map the wetlands in the watershed. Wetlands were delineated using color infrared aerial photos taken in 1992. Fieldwork was conducted to increase the accuracy of the photo interpretation. Wetland data was also available from the National Wetlands Inventory (NWI), a survey that uses aerial imagery to locate wetlands. These wetlands and those mapped by the GRWPA are shown on **Map 7**. Those mapped by the NWI are Class II wetlands and are protected by the **Vermont Wetland Rules.** Guilford has no Class I wetlands.

Several additional wetlands that qualify for Class II status were found during the survey and are numbered on **Map 7**.

Headwaters seep in the Roaring Brook block.

WOODLAND SEEP (S4*) (#1, 2, 5)

Seeps are places where groundwater reaches the surface and keeps soils saturated. Seeps occur as small patches within a variety of community types, and the wetland plants that thrive in them vary accordingly. The temperature of the water in a seep is the temperature of groundwater, usually just under 50°F. These are places where there is open water in the winter and cool water in the summer. Seeps are often the first places where plants green up in the spring and can be important feeding areas for bears. Seeps that form wetlands at the headwaters of streams are eligible for Class II wetland status. Three such headwaters seeps have been noted on **Map 7**, numbers 1, 2, and 5.

HEMLOCK-SPHAGNUM BASIN SWAMP (S2) (#3)

A 2.5-acre hemlock swamp was found in the Roaring Brook block. While located in a basin, this swamp did not have the well-developed sphagnum typical of this community type. The understory was dominated by cinnamon fern. This wetland had an open canopy, with hemlock and red maple as dominants. As a headwaters wetland, this swamp is eligible for Class II designation. Additional survey work would be needed to determine if this warrants inclusion in the Vermont Natural Heritage Inventory.

** S (State) and G (Global) ranking numbers are explained on page 32.*

Map 7. Wetlands

Mapped by GRWPA

- Wooded Swamp
- Shrub Swamp
- Mixed Wooded Swamp
- Marsh
- Open Water
- Coniferous Swamp

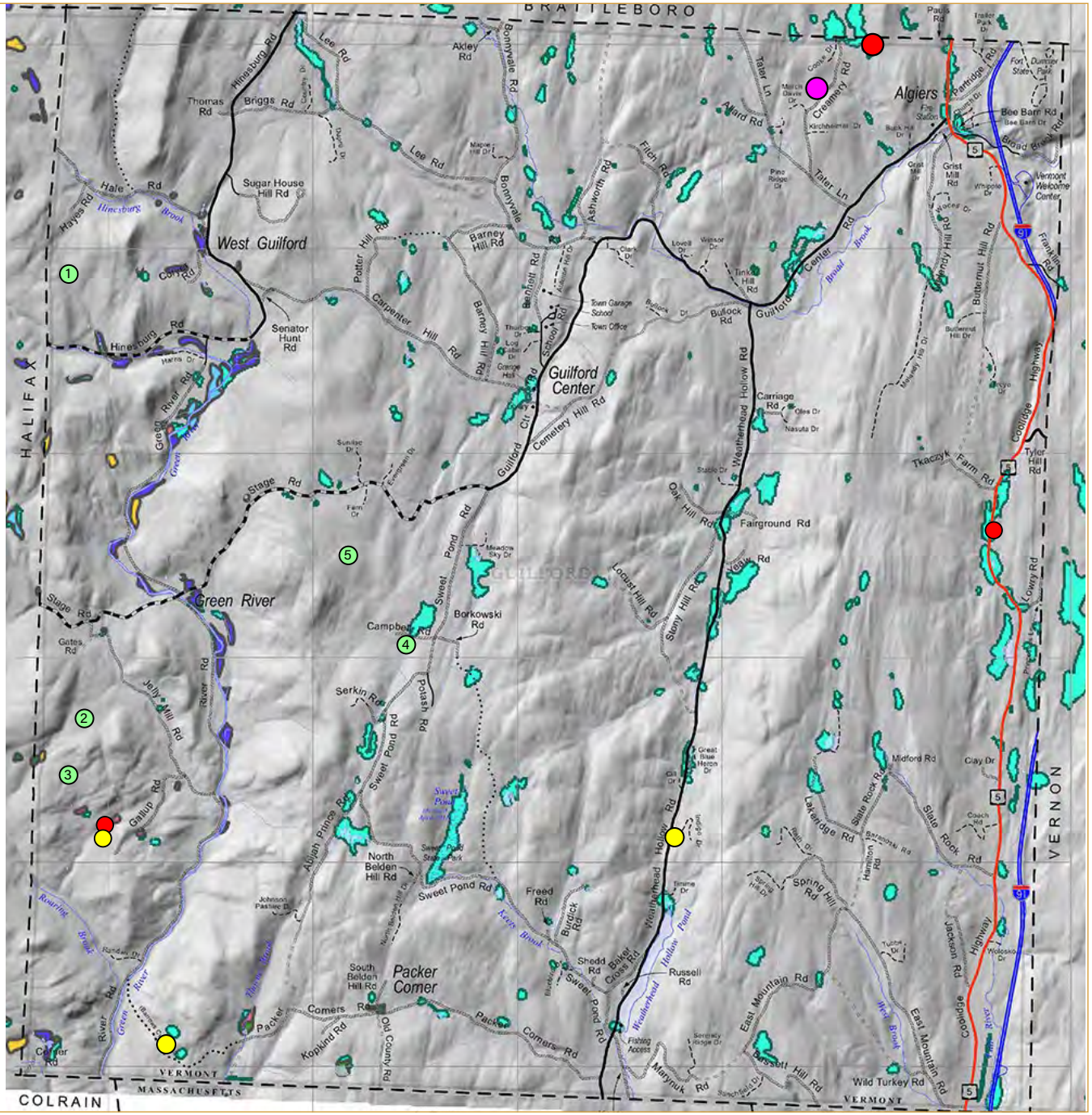
Mapped by NWI

- Class II Wetlands

Other Wetlands

- Black Ash-Red Maple Seepage Swamp
- Rich Fen
- Vernal Pools
- Undesignated Class II

See descriptions of numbers in text.



NORTHERN HARDWOOD SEEPAGE FOREST (S3)(#4)

Two areas in the **Owl's Head/Belden Hill Block** had interesting hardwood swamp/seepage areas. Both were dominated by white ash in the canopy. One was adjacent to a large marsh/beaver wetland mosaic. Barbed wire was found in a row of old fenceline white ash trees next to a small meandering stream. A closed canopy of young trees included white ash, sugar maple, basswood, and white pine. Saturated soils supported the lush growth of wet soil-affiliated ferns (cinnamon, royal, sensitive) and horsetail. Jack-in-the-pulpit grew in drier spots. Witch hazel grew in the shrub layer, along with the invasive glossy buckthorn. This wetland's size, 1.5 acres, makes it eligible for Class II designation.

A nearby low-gradient hillside also had wet soils and was thick with ferns, predominately cinnamon fern.

Three other Guilford wetlands have been surveyed by ecologists for other projects and are included in the VT NHI.

RED MAPLE-BLACK ASH SEEPAGE SWAMP (S3)

These variable wetlands typically occur in perched depressions that receive run-off but are isolated from the groundwater. Black ash, one of the defining trees of this community, is uncommon in Windham County. This tree is prized by basket-makers. Unfortunately, it is vulnerable to the emerald ash borer. Four of these wetlands have been found in Guilford, two small examples were found during this survey and two were inventoried previously. The two larger examples are State Significant. Read about the largest in the **East Mountain** description. Another State Significant RM-BASS straddles the border with Brattleboro. It was described by Marc Lapin in 1999 for a report on the hardwood swamps of Vermont:

> "Tucked in a landscape of rocky, forested hills and cleared, narrow valleys, this little patch of mature lowland vegetation was a pleasant surprise."

Owl's Head Mountain Hardwood Swamp.

The swamp is ten acres in size and has well-developed hummocks and hollows. The forest is approximately 100 years old and has both an overstory and an understory of red maple, black ash, and white pine. Dominant tall shrubs are speckled alder, winterberry, and on the margins, highbush blueberry and buttonbush.

A 1.5-acre Red Maple-Black Ash swamp was found along Route 5. This pocket wetland has a thicket of highbush blueberries and spicebush with red maple and black ash dominant in the canopy. Drainage ditches on the parcel to the north may alter the hydrology of this swamp. The fourth example is described in the **Roaring Brook** section.

RICH FEN (S2)

Fens are open peatlands that are dominated by sphagnum moss. They typically form in depressions with poor drainage and have very limited nutrient availability. The one fen that has been documented in Guilford has some mineral enrichment in the surface water, calcium from the Waits River bedrock, making it a Rich Fen community. This fen is State Significant and was surveyed in 1987 for the NHI and the US EPA.

The rich fen is dominated by shrubby cinquefoil and Hudson's Bay bullrush and includes such rich fen indicators as yellow sedge, fen sedge and grass-of-Parnassus. Other wetland plants include cattails and meadowsweet.

Note: All wetlands within a Highest Priority Landscape Feature block are considered Highest Priority Wetlands by Vermont Conservation Design.

RIPARIAN COMMUNITIES

Water Quality in Guilford is dependent to a large extent on the landscape directly influenced by the watercourse—the riparian area. The vegetation in a riparian area mitigates erosion and provides shade. Riparian areas also contribute leaves, fallen branches, and tree trunks to streams, providing important components of aquatic habitat.

Because of the dynamic nature of rivers and streams, riparian areas host a high diversity of plants, animals, and natural communities. These areas also serve as important travel corridors for wildlife.

The Vermont Natural Heritage Inventory includes descriptions of two State Significant natural communities within the riparian zone of the Green River, a Sugar Maple-Ostrich Fern Riverine Floodplain Forest and a River Cobble Shore. These communities are adjacent to the Green River Meadows, a floodplain area conserved by the Vermont River Conservancy. You can read more about them in the **Owl's Head Mountain/Belden Hill** section.

Most streams require a minimum of a 50 feet buffer of natural vegetation to protect the aquatic functions. However, to protect all of the wildlife functions along a stream corridor, a buffer up to 660 feet wide on each side would be ideal. Such a buffer would increase the connectivity of forest habitat in the most fragmented parts of town.

BEAVERS

Once upon a time, the wetland-scape of parts of Guilford would have been very different. Before European fur traders arrived, the floodplains along Broad Brook and Falls Brook would have been wide mosaics of wetland in shifting configurations, created and modified by beavers. The broad floodplains and deep organic soils they helped to create were among the places that were most attractive to European settlers.

Beaver wetlands are home to the many species that depend upon open water, marshlands, shrublands, and meadows. Further, nearly every vertebrate species in a forested area is attracted to these open wetlands during parts of the year.

In their ponds, the water slows, spreads out, and drops sediment. Phytoplankton thrives in the shallow, sun-warmed waters. These microplants feed the zooplankton, and up the food chain to the fish that feed the mink. An abundance of phytoplankton provides a boost of energy to the stream's food web.

By storing more water on the landscape, beaver ponds have been shown to buffer the summer water temperature spikes that impact cold-water fish species. In places where ponds raise the water table to create a groundwater and surface water exchange, water temperatures are cooled in the summer and warmed in the winter.

When beavers abandon a pond, the water level drops, and the succession of wetland communities begins. When enough woody vegetation has returned, so will beavers. As beavers return to a site repeatedly, silt and peat accumulate creating spongy hydric soils that lead to semi-permanent wetlands.

With a warming climate, wetlands play an increasingly important role by holding water on the landscape during times of drought and by absorbing and slowing the flow of water during floods.

Beaver wetland creation is hampered where their activities conflict with human land uses. In most cases, however, these conflicts can be remedied and the beavers can remain on site to do their important work. Where they dam culverts, a fence and pipe system can be installed that permits water to flow through the culvert. Such measures can add to wetland acreage while eliminating the time the road crew spends clearing culverts. Similar devices can be installed in beaver dams to limit the size of a pond. Important trees can be protected with simple fences.

VERNAL POOLS

Vernal pools are small, temporary wetlands that have an out-sized influence on forest communities. They host a number of species that are adapted to take advantage of ephemeral habitats. These very small wetlands are the nurseries for countless amphibians that disperse into the forest and become an important link in the food chain.

The most important vernal pools are in forested areas, are not connected to permanent water bodies, hold water for at least a couple of months in most years, and dry completely on occasion. These conditions prevent the predators of permanent water bodies from living in the pools.

In Guilford, the amphibians that prefer vernal pools for breeding are woodfrogs, spotted salamanders, Jefferson salamanders, blue-spotted salamanders, and the Jefferson complex, a group of hybrids resulting from crosses of Jefferson and blue-spotteds. All of these salamanders are considered Species of Greatest Conservation Need in Vermont. Jeffersons have a state ranking of S2 (rare; at high risk of extinction or extirpation). Blue-spotteds are S3 (uncommon; at moderate risk of extinction or extirpation).

Vernal pools encountered during field surveys were mapped and described. These pools were found after the amphibian breeding season. They were confirmed as vernal pools by the presence of fingernail clams. If no fingernail clams were found, they were noted as possible pools.

A forest buffer of 100 feet is needed to ensure the viability of the vernal pool. Many of the salamanders, especially juveniles, will be found in this zone. Tree cover shades the pool and slows evaporation. Leaf-litter forms the base of the vernal pool food web. An additional 750-foot life zone around each pool will provide the habitat needed for most of the vernal pool-breeding amphibians. (Calhoun and Klemens, 2002, Calhoun and deMayandier, 2004).

Five vernal pools were found on the parcels surveyed for this project, along with a likely sixth pool. An additional three pools have been documented by other surveyors. There are many more.

The long-term viability of vernal pool amphibians also depends upon habitat connections across the landscape.

Potential vernal pool, Sweet Pond block.

CONSERVATION CONSIDERATIONS

Buffers of largely undisturbed, natural vegetation should be established and/or maintained along the edges of all wetlands. Vermont Wetland Regulations require a minimum 50-foot buffer around wetlands, but the wider the better.

Creating naturally vegetated buffers along streams would aid habitat connectivity in the more developed and agricultural portions of town. The ideal buffer for wildlife is 660 feet on each side of the stream. (Adams, D. et. al. 2015)

Additional wetland survey work

- The National Wetlands Inventory estimates that they miss 82% of wetlands under 3 acres and 68% of those under 20 acres. Additional wetland survey work would increase the number of Class I or II wetlands.
- Community engagement is needed to identify more vernal pools. They are easiest to find between late March and early April when wood frogs are calling. Later in the spring, amphibian egg masses can be used to verify pools.

Forestry

- Heavy machinery can create deep ruts that change a wetland's hydrology. Because wetlands, especially seeps, do not freeze, it is recommended that machinery be kept out of these areas, and that a forested buffer of at least 100 feet be maintained with no logging or only selective thinning within it. (Thompson, E., Sorenson, E., 2005)

Beavers

- Encourage the Selectboard to develop a policy to manage beaver/culvert conflict sites on town roads to promote the development of new wetland sites and minimize the need for the road crew to manage beavers.
- Consider establishing a beaver conflict mitigation fund to help private landowners resolve conflicts and keep beavers in place.

"We can never return to the pre-settlement forest of Vermont. It no longer exists. The deep, rich soils that were present under old growth forests have been diminished and are less productive today. We only have the present and the future to work with, and our charge as landowners, foresters, and land managers must be to leave the forests of Vermont more resilient than we find them."

Creating and Maintaining Resilient Forests in Vermont: Adapting Forests to Climate Change

UNCOMMON SPECIES

While conserving large forest blocks and representatives of all natural communities would provide habitat for most of the species of Guilford, special attention must be given to species known to be rare, threatened, or endangered. The Vermont Department of Fish & Wildlife maintains the Vermont Natural Heritage Inventory, a database of all rare species. The location of these species is noted only generally in this report (**Tables 4A, 4B**), but is available to the Conservation Commission. Vermont's Wildlife Action Plan has also designated "Species of Greatest Conservation Need (SGCN)." While some of the species included are listed as Rare or Endangered, others may still be numerous but in decline. This designation is not statutory, so confers no protection.

While no listed species were found during this inventory, a number of uncommon plants (S3) were found. In addition, rare plants have been documented by botanist Mike Duffy of Guilford and the **Consortium of Northeastern Herbaria**. They are listed in **Table 5**.

A number of the species on the list depend upon undeveloped areas for survival. Wood turtles, for example, spend their lives near streams and rivers. Since these are often the same places where we put our roads, populations of wood turtles do best on streams in undeveloped areas. A number of other species thrive in forest interiors—they need core forest. The wood thrush, northern goshawk, bobcat, and river otter are in this group.

Moose need large, unfragmented forest areas. They also need cold temperatures. In Guilford, they are likely to disappear as the climate warms. Others, like scarlet oak and sassafrass are at the northern limit of their range and will likely increase as a result of climate change.

Table 4A. Vertebrate Species of Greatest Conservation Need in Guilford

Name	Scientific Name	Priority Level
Jefferson Salamander	*Ambystoma jeffersonianum and hybrids*	High
Blue-spotted Salamander	*Ambystoma laterale*	Medium
Spotted Salamander	*Ambystoma maculatum*	Medium
Four-toed Salamander	*Hemidactylium scutatum*	Medium
Wood Turtle	*Glyptemys insculpta*	High
DeKay's Brownsnake	*Storeria dekayi*	Medium
Smooth Greensnake	*Opheodrys vernalis*	Medium
Wood Thrush	*Hylocichla mustelina*	High
Great Blue Heron	*Ardea herodias*	Medium
Northern Goshawk	*Accipiter gentilis*	Medium
Ruffed Grouse	*Bonasa umbellus*	Medium
American Woodcock	*Scolopax minor*	Medium
Black-throated Blue Warbler	*Dendroica caerulescens*	Medium
Northern Flying Squirrel	*Glaucomys sabrinus*	Medium
Southern Flying Squirrel	*Glaucomys volans*	Medium
Muskrat	*Ondatra zibethicus*	Medium
Gray Fox	*Urocyon cinereoargenteus*	Medium
Long-tailed Weasel	*Mustela frenata*	Medium
Northern River Otter	*Lontra canadensis*	Medium
Bobcat	*Lynx rufus*	Medium
Moose	*Alces alces*	Medium
Big Brown Bat	*Eptesicus fuscus*	Medium

Wood Turtle: S3/SGCN.

Table 4B. Rare and Uncommon Animals of Guilford

Common Name	Scientific Name	State Rank	Global Rank	Habitat Block
American Eel	*Anguilla rostrata*	S2	G4	Green River, Weatherhead Hollow
Black Dash	*Euphyes conspicua (butterfly)*	S1	G4	Fort Dummer
Gray Hairstreak	*Strymon melinus (butterfly)*	S2/S3	G5	Fort Dummer
Spicebush Swallowtail	*Papilio troilus (butterfly)*	S1	G4	Fort Dummer
Jefferson Salamander	*Ambystoma Jeffersoniana*	S2	G4	Ashworth
Wood Turtle	*Glyptemys insculpta*	S3	G3	East Mountain, Ashworth, Roaring Brook

Source: Vermont Natural Heritage Inventory, Vermont Department of Fish & Wildlife, 2022.

WHAT THE RANKING NUMBERS MEAN

From the Vermont Department of Fish & Wildlife

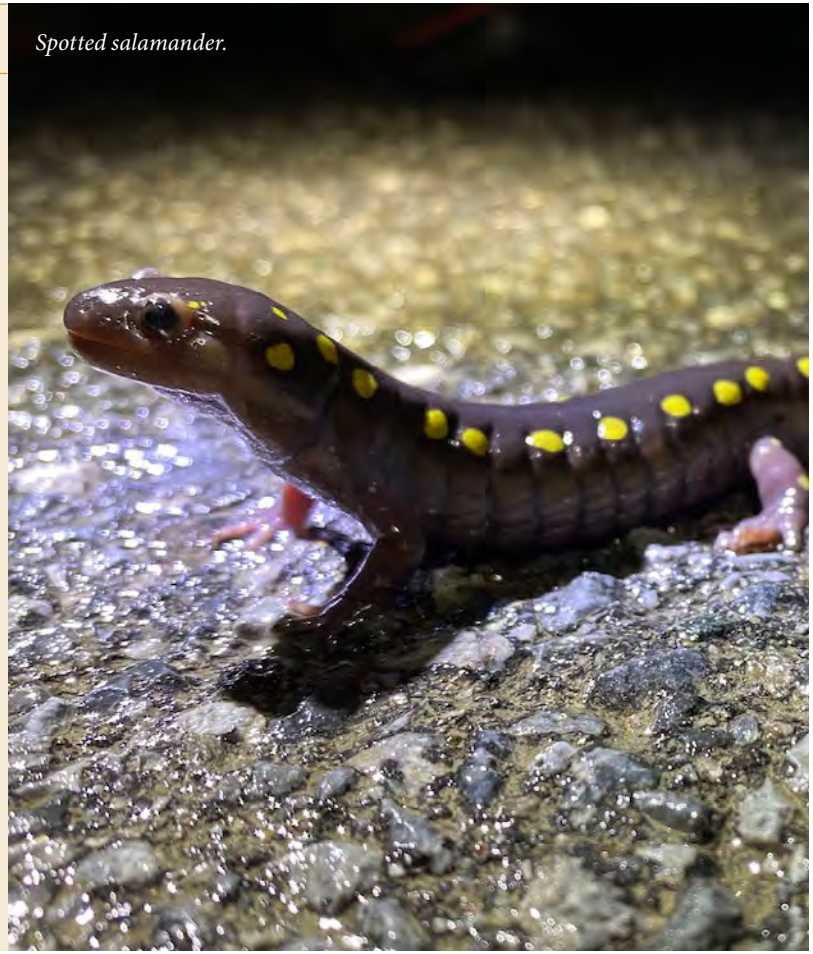
Vermont State Rank and Global Rank – The rarity (abundance) or endangerment of a native taxon within Vermont's geographic boundary or throughout its range, respectively. **S** denotes the State rank, **G** the Global rank. Ranks are as follows:

1 – Very rare (Critically imperiled):
At very high risk of extinction or extirpation due to extreme rarity (often 5 or fewer populations or occurrences), very steep declines, or other factors.

2 – Rare (Imperiled):
At high risk of extinction or extirpation due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.

3 – Uncommon (Vulnerable):
Moderate risk of extinction\extirpation due to restricted range, relatively few populations or occurrences (often 80 or fewer), recent and widespread declines, or other factors.

4 – Common to uncommon (Apparently secure):
Locally common or widely scattered to uncommon, but not rare; some cause for long-term concern due to declines or other factors; or stable over many decades and not threatened but of restricted distribution or other factors.



Spotted salamander.

Table 5. Uncommon, Rare, Threatened, and Endangered Plants of Guilford

Common Name	Scientific Name	State Rank	Global Rank	Source	Habitat Block
American chestnut	*Castanea dentata*	S3	G3	CNH	Fort Dummer
American ginseng	*Panax quinquefolius*	S3	G3/G4	PS, VNHI	Guilford
Autumn coralroot	*Corallorhiza odontorhiza var. odontorhiza*	S2	G5/T5	MD	Owl's Head
Broad beech fern	*Phegopteris hexagonoptera*	(S2/S3)	G5	PS	Governor's Mountain
Butternut	*Juglans cinerea*	S3?	G3	PS	Roaring Brook
Creeping selaginella	*Selaginella apoda*	S3	G5	PS ,MD	Roaring Brook, Wilken's Hill
Hills Pondweed	*Potamogeton hillii*	S3	G5	VNHI	Weatherhead Hollow
Large toothwort	*Cardamine maxima*	S2/S3	G5	CNH	Broad Brook
Liverwort	*Frullania plana*	S1	G4	VNHI	Roaring Brook
Marsh Mermaid-weed	*Proserpinaca palustris*	S2/S3	G5	VNHI	Sweet Pond
Moss	*Platydictya jungermannioides*	S1	G5	VNHI	Roaring Brook
Moss	*Schwetschkeopsis fabronia*	S1	G5	VNHI	Roaring Brook
Muehlenburg's slender beadgrass	*Paspalum setaceum var. muehlenbergii*	S3	G5	CNH	Broad Brook
Narrow-leaved glade fern	*Homalosorus pycnocarpos*	S3	G5	PS	Roaring Brook, Hinesburg
Nerveless Muehlenberg Sedge	*Carex muehlenbergii var. enervis*	S1	G5	VNHI	Algiers
Northeastern Sedge	*Carex cryptolepis*	S2/S3	G4/G5	VNHI	Sweet Pond
Perplexed tick-trefoil	*Desmodium perplexum*	S2	G5	CNH	Dry roadside near Vernon town line
Sassafrass	*Sassafras albidum*	S3	G5	CNH	Fort Dummer
Scarlet Oak	*Quercus coccinea*	S2	G5	VNHI	Fort Dummer
Silvery-flowered sedge	*Carex argyrantha*	S3	G5	CNH	Guilford
Slender cottongrass	*Eriophorum gracile*	S1	G5	CNH	Guilford
Small White Aster	*Symphyotrichum racemosum*	S2	G4/5	VNHI	Sweet Pond
Spotted pipsissiwa	*Chimaphila maculata*	S3	G5	MD	Owl's Head
Woodland muhly	*Muhlenbergia sylvatica*	S1	G5	CNH	Guilford

Sources: MD, Guilford botanist Mike Duffy; CNH, Consortium of Northeastern Herbaria; VNHI, Vermont Natural Heritage Inventory, Vermont Department of Fish & Wildlife; PS, Patti Smith for this report.

Three mole salamander species in Guilford are included on the SGCN list. These amphibians depend upon vernal pools and a wooded zone around them for survival. The rarest of these, Jefferson salamanders, may have an affiliation with calcium-enriched areas. They have been recorded (infrequently) at the two busiest salamander crossing sites in Guilford. They are often found in the towns north of Guilford at salamander crossing areas. Spring visits to vernal pools in Guilford would likely show that this species is present throughout the town.

Broad Beech Fern (S2/S3) was found in the Governor's Mountain block.

CONSERVATION CONSIDERATIONS

Maintain habitat

Maintaining forest interior habitat (see **Forest Block** recommendations) will help all species that need this habitat type. Forest interior habitat also benefits the species threatened by roads—wood turtles, Jefferson salamanders, and the other mole salamanders.

Habitat type declines

Some of the rare plants and animals live in habitat types that are in decline with return of forests to Vermont—grasslands and open shrub-forb habitats that were more abundant when fields were being abandoned.

Northern genetic pioneers

Plants and animals that are uncommon in Vermont because they are at the northern limits of their range may have genes that allowed them to be the northward pioneers. These individuals may be important as the populations shift with the warming climate. Sassafras and scarlet oak are in this category.

MAST PRODUCTION AREAS

"Mast" refers to seeds produced by trees and shrubs. Cherries, berries, and other fruits are considered "soft mast" while nuts are "hard mast." In Guilford, the tree species that produce important hard mast crops are American beech, red oak, and bitternut hickory. Many animals depend on hard mast to fatten for the winter, including turkeys, deer, squirrels, fishers, porcupines, mice, and bears.

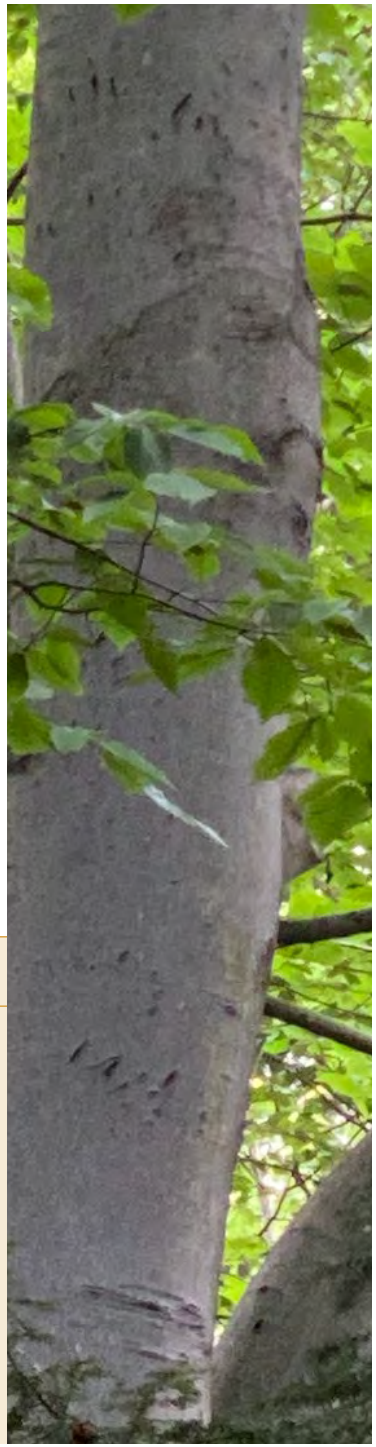
Beechnuts and red oak acorns have a similar fat content, but beechnuts have twice as much protein, making them the most coveted mast crop. Studies show a direct correlation between the beech mast crop and the numbers and survival rates of cubs in many parts of the black bears' range. A conservation plan that will ensure the survival of bears must include access to mast stands.

Not just any group of mast trees will do. In the fall, with leaves down, bears find little dense cover in hardwood forests. They preferentially seek out remote stands of beech and oak where they can feed without fear of human disturbance. A study of bear-clawed beech stands showed that bears need significant buffers to feed.

The same study found several beech stands that had been used heavily by bears in the past, but not since structures had been built nearby (Wolfson, D.L. 1992). The Vermont Department of Fish and Wildlife recommends a minimum one kilometer buffer around these essential features.

Significant mast production areas are those with bear claw scars on 15 trees or more. Only one such stand was found in Guilford during this survey. This stand spans the high areas in the **Roaring Brook** block. Some of the beeches in this area had smooth bark and might have some resistance to the beech blight disease. Bear scats filled with beech nut shells were found in this block.

It is possible that there are other mast production areas, though many of the most likely places were included in the inventory. There are, however, beech production areas just outside the borders of Guilford—in Halifax in the Roaring Brook block and the Hinesburg block. Maintaining connectivity to these areas will be much appreciated by bears as well as other consumers of beech nuts.



CONSERVATION CONSIDERATIONS

The **Roaring Brook** mast production area is one of the most valuable habitat areas in town. Maintaining a one kilometer undeveloped buffer around it should be a conservation priority.

The Vermont Agency of Natural Resources has developed forest management recommendations for enhancing the production of beechnuts. These recommendations take into account the beech bark disease that has afflicted the beeches of Vermont.

You can learn more from these two publications:

VT ANR Management Guidelines for Optimizing Mast Yields in Beech Mast Production Areas (Paul L. Hamelin, 2011).

A Landowner's Guide: Wildlife Habitat Management for Lands in Vermont, Part 9, Beech Mast Production Management (D. Adams, et. al. 2015).

FOREST BLOCKS

Read on for a closer look at the 10 largest forest blocks and the features that make each unique.

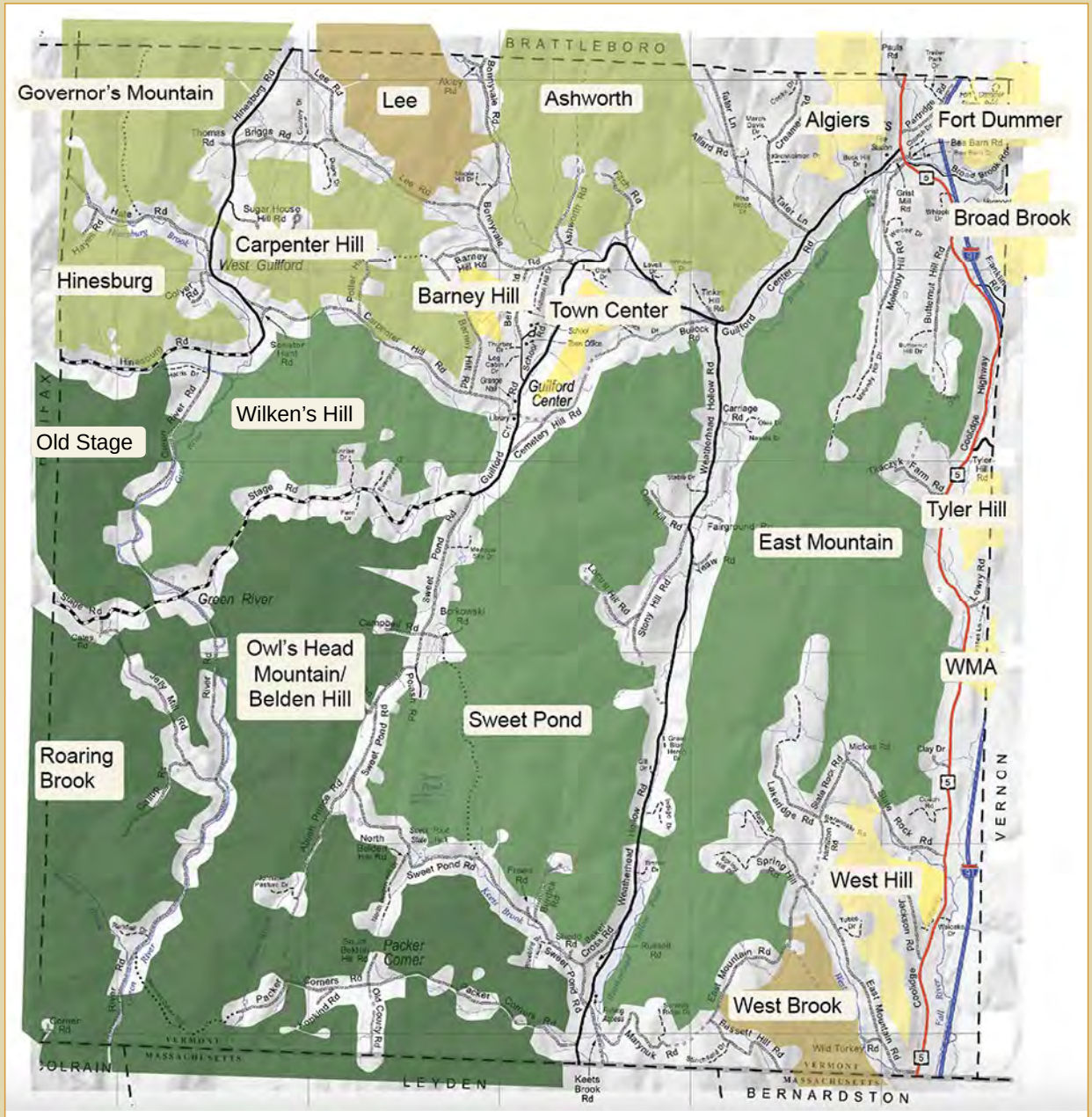
Please note, most of the parcels surveyed and described are privately owned.

This forest block map is of the unfragmented forest blocks of Guilford. Where undeveloped road frontage exceeds 500', the habitat blocks meet at the roads to show potential crossing zones. The blocks are ranked by color for their importance as unfragmented forest and for connectivity.

Most important

Least important

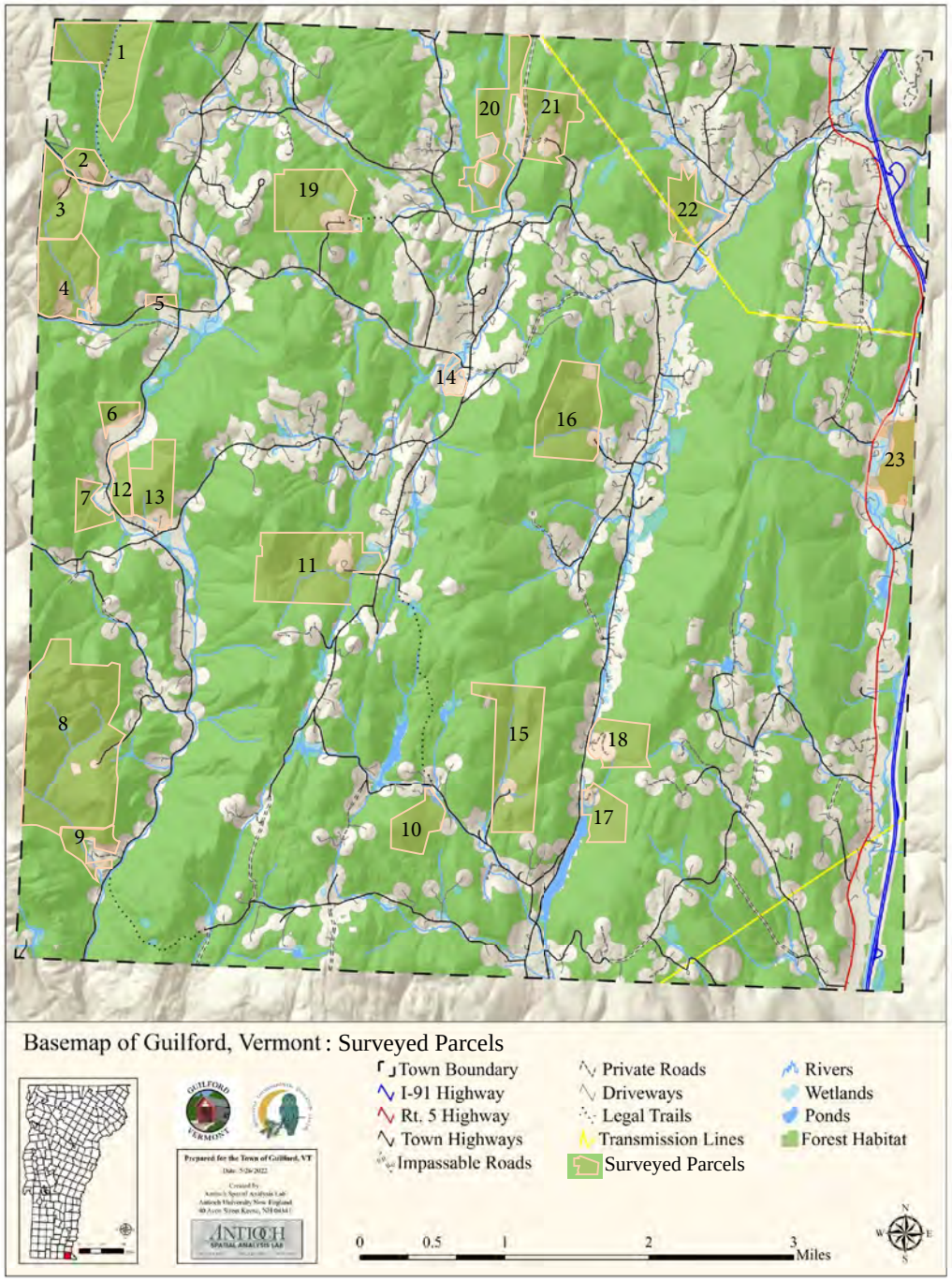
Map 8. Forest Blocks



Forest blocks layer: P. Smith

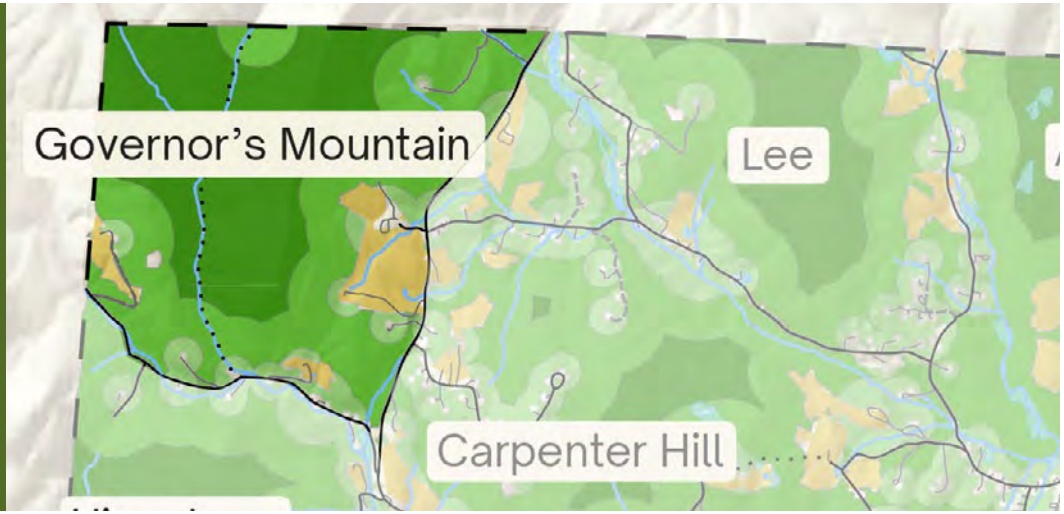
VCGI | VTANR | VTANRGIS | VTANR GIS |

Map 9. Land Parcels Map

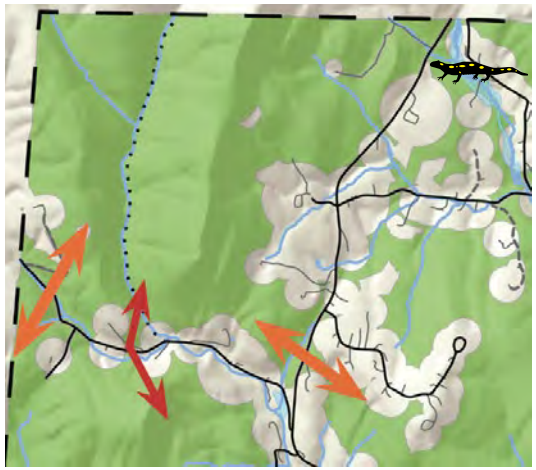


Governor's Mountain

Block Size	3,130 acres
State Significant Communities	2
Locally Significant Communities	1
Undeveloped Stream	1.6 miles
Uncommon Species	2



Road Crossings



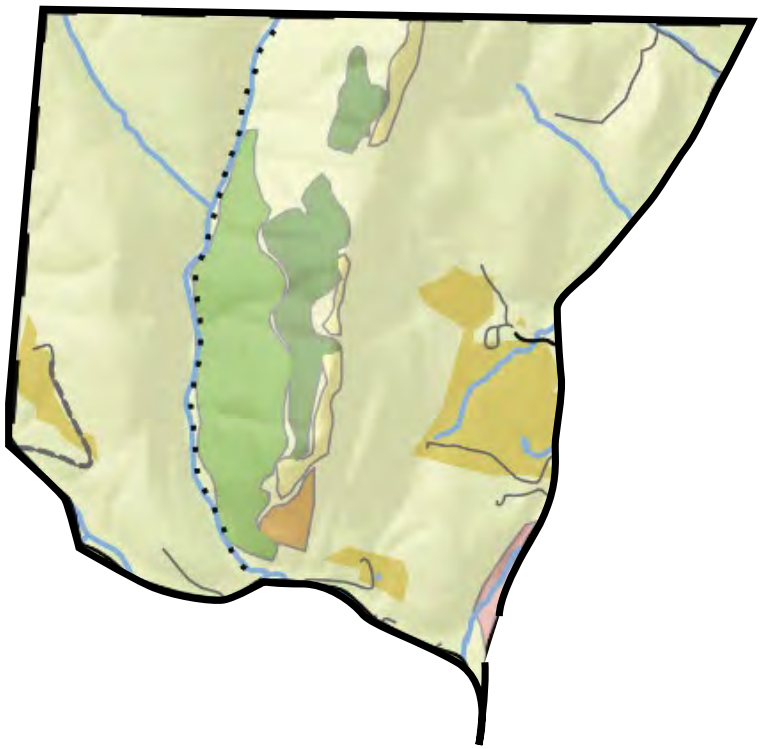
Narrow crossing linking ridgelines or riparian areas

Undeveloped* crossing

Salamander crossing zone

**500' or more between structures.*

Natural Communities & Habitat



- Mesic Maple-Ash-Oak-Hickory
- Dry Transition Hemlock
- Dry Oak-Maple Limestone
- Dry Oak-Hickory-Hophornbeam
- Hemlock-Northern Hardwood
- Temperate Calcareous Cliffs
- Agricultural Land

LANDSCAPE FEATURES

With 3,130 acres of unfragmented forest, this block ranks fifth in size for blocks wholly or partially within the town (1,336 acres are in Guilford). The forested area that is outside of Guilford is narrow and has many partial incursions, so the core habitat is relatively small, just 1,283 acres.

Most of the forested area in Guilford is in three large parcels, one of which has a conservation easement.

At 1,630 feet, Governor's Mountain is the high point in town.

Waits River Formation is the foundation for the most of this block. Governor's Mountain itself is a remnant of the Guilford Dome, a mountain that once rose above the center of Guilford and extended north of Black Mountain in Dummerston. Harder components of the carbonate rich Waits River bedrock run in wide bands up the center of this block; a quartzite-rich band follows the summit ridge. On either side are bands metamorphosed from materials deeper in the earth's crust that contain more magnesium and iron. Blocks of quartz with crystals of epidote, a pretty mineral, are found in this band on Governor's Mountain. The northwestern corner of the block is Northfield Formation bedrock, which has fewer calcareous interbeds.

CONNECTIVITY

This block is bounded to the west and south by quiet Hale Road. Busier and more developed roads are found to the north and east. Governor's Mountain and the stream that flows along its base are travel corridors through this block. The ridge and the brook converge in the south at the most developed portion of Hale Road, making this a suboptimal crossing area, though bridges and good forest cover make riparian crossings possible, as does the low traffic volume. Wide crossings are available to the west in Halifax.

Spotted salamanders migrate across Hinesburg Road each spring to reach wetlands near the intersection with Lee Road.

UPLAND COMMUNITIES

The exemplary community for this forest block is the State Significant Dry Oak-Hickory-Hophornbeam Forest on the summit of Governor's Mountain. No better example of this community type was found during this project.

Alex Bell provides scale for giant hop hornbeam.

Quartz with crystals of epidote.

The summit community was surveyed by Eric Sorenson in 2016 and was described thus:

> *"This amazing ridgeline forest occurs in a narrow band along the north-to-south-running summit of Governor's Mountain. The community is exceptionally undisturbed, with no evidence of invasive plants or past management. Red oak dominates the canopy, and is joined by sugar maple, white ash, and many small hop-hornbeam. Pennsylvania sedge carpets the forest floor with all its leaves lying to the east; it looks somewhat like combed hair."*

On the steep south side of the mountain, the canopy remains open. Here a Dry Oak-Maple Limestone Forest occurs on bedrock with some calcium enrichment. Red oak mixes with sugar maple, bitternut hickory, and basswood in the canopy. Hophornbeam and mountain maple grow in the shrub layer. On rock outcroppings were such rich-site indicators as fragrant bedstraw, bottlebrush grass, broad-leaved goldenrod, fragile fern, white bear sedge and broad-leaved sedge. Two exotics, European barberry and common buckthorn were present as very mature plants and did not appear to be invading.

The steep western side of Governors Mountain is a shady Dry Transition Hemlock Forest grading into a Hemlock Northern Hardwood Forest. The Dry Transition Hemlock Forest, also State Significant, was surveyed in 2016 and described:

> *"This dense forest (95-100% cover) is strongly dominated by eastern hemlock. Red oak occasionally joins hemlock in the canopy. There is little understory. No invasive plants were observed."*

The rich soils of the benches and gentler slopes on the east side of the mountain grow tall sugar maples. Small bedrock exposures on the steepest slopes host rich-site plants, as do the ledges visible from Hinesburg Road. These are small patches of Temperate Calcareous Cliff community.

WETLANDS & VERNAL POOLS

No wetlands were documented in this habitat block, nor do any appear on the NWI map. There is a possible vernal pool, though small in size, near Hinesburg Road.

RIPARIAN HABITAT

A forked tributary of the Hinesburg Brook flows through the valley on the west side of Governors Mountain. This perennial stream is well-shaded, undeveloped and has a cobble bottom—nice habitat conditions for aquatic organisms. There are 1.6 miles of undeveloped stream in the Guilford portion of this block.

UNCOMMON SPECIES

Broad beech fern (S2/S3) was found. Jefferson salamanders (S2,SGCN) have been observed crossing Hinesburg Road from this block.

DEER WINTERING AREAS

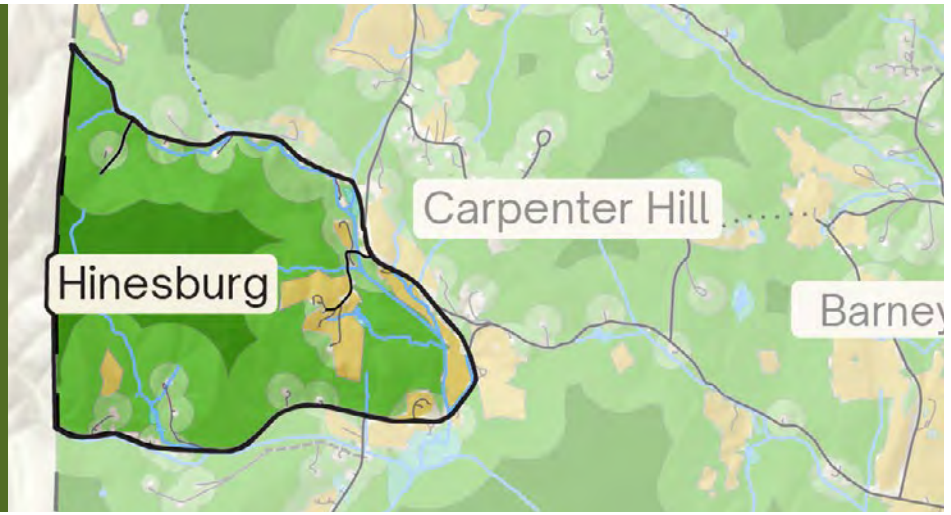
The dense hemlock forest on the west side of Governor's Mountain has many deer trails and shows evidence of use as a deer yard.

Only one bear-clawed beech was found on the west side of the mountain. The oaks along the summit ridge, however, are likely to be a food resource for bears, as well as the many other creatures that feast on acorns.

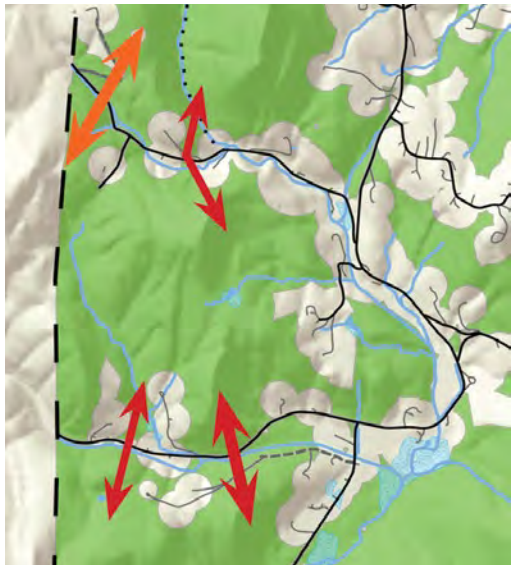
Hinesburg Brook.

Hinesburg

Block Size	2,875 acres
VCD Connectivity	Highest Priority
Locally Significant Communities	2



Road Crossings



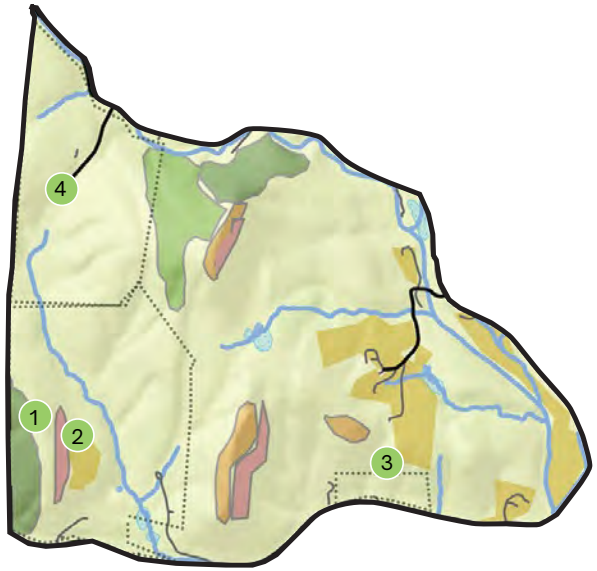
Undeveloped* crossing linking ridgelines or riparian areas

Narrow crossing linking ridgelines or riparian areas

Undeveloped* crossing

**500 feet or more with no structures*

Natural Communities & Habitat



- Mesic Maple-Ash-Oak-Hickory
- Dry Transition Hemlock
- Hemlock-Northern Hardwood
- Dry Oak-Hickory-Hophornbeam
- Temperate Calcareous Cliffs
- Agricultural Land
- Surveyed Parcels

Described Areas

1. Hemlock Forest
2. Rich Ledges
3. Mature Oaks
4. Rich Ledges

LANDSCAPE FEATURES

Only 524 acres of this east/west oriented block are in Guilford. This block is tenth in size for blocks of unfragmented forest within the town.

Waits River Formation is the bedrock here, with bands of the quartzite and mafic components running through the center of the block.

CONNECTIVITY

VCD ranks this block as a highest priority for connectivity. Species moving north and south to larger forest blocks pass through this one, especially to the west in Halifax and Marlboro.

UPLAND COMMUNITIES

Four parcels were surveyed during this project. These surveys largely confirmed the Nature Conservancy predictions for this area. East facing ledges hosted calcium-loving plants, with white ash, sugar maples, red oak, and bitternut hickories growing in the surrounding forest. Northern and western slopes grew hemlocks.

I went out to explore a 10-acre parcel with parcel 5. This parcel featured a mature forest with many large red oaks and provided an inspiring example of the forest type that might occur on many Guilford sites that are permitted to grow old.

To the west, parcel 4 showed the variable nature of this forest based upon soil depth and moisture. A band of ledge hosted a Temperate Calcareous Cliff Community embedded in a rich example of the Mesic Maple-Ash-Oak-Hickory forest. Indicators of richness included maidenhair fern, maidenhair spleenwort, herb Robert, and wild ginger.

A few nice legacy oaks and sugar maples were found on these parcels as well as a bear-clawed beech tree.

Several small seeps and wooded swamps were explored on these parcels. No vernal pools were found.

Parcel 3 on the north side of this block had a wonderful Temperate Calcareous Cliff community and rich forest, but they occur on the Halifax side of the property. I mention this because the Guilford portion of the property has similar potential, but had been logged recently. Many invasives had come up in the large openings created.

Young forests had black cherry, bigtooth aspen, and black birch, mixed in with sugar maple and beech. On richer sites, a few mature basswoods and bitternut hickories were found. Where bedrock was exposed, familiar rich site plants herbs were seen. Added to the mix were Goldie's fern and narrow-leaved glade fern, both uncommon ferns.

A small Dry Oak-Hickory-Hophornbeam community occurred on the highpoint.

Old sugar maple on a rich ledge.

Wild ginger on Calcareous Cliff site.

Two small first order streams drained this block and both had a few seepy areas at their origins and in level spots along their descent. The headwater seep on the large stream would be eligible for designation as a Class II wetland.

DEER WINTERING AREAS

Much sign of deer traffic was seen on a winter visit to the Dry Transitional Hemlock Forest on the southwest corner of this block.

The snow was not deep enough to force deer to congregate, but this would be a likely yarding site.

MAST STANDS

A beech mast stand is located just across the Halifax boundary in this block. A few bear scarred beech were seen on the Guilford side.

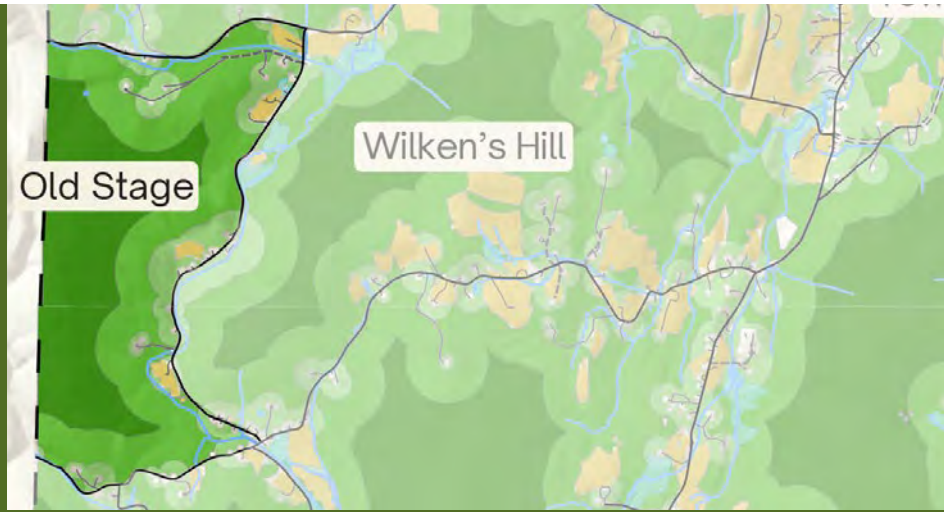
Young oaks in maturing forest.

Bonnie Goodman by one of her big oaks.

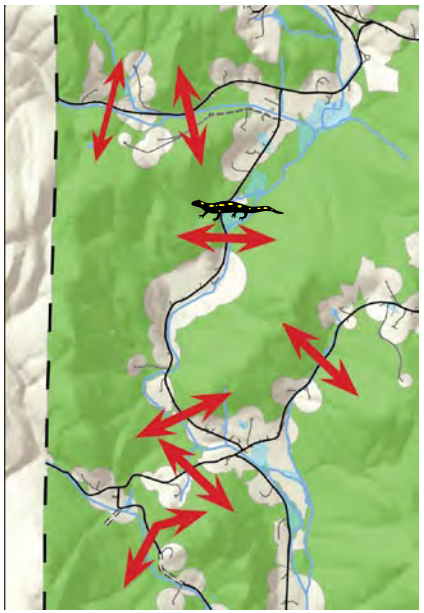
Bank of maidenhair fern.

Old Stage

Block Size	3,911 acres
VCD Interior Forest	Highest Priority
VCD Connectivity	Highest Priority
Locally Significant Communities	1
Uncommon Species	1



Road Crossings



Undeveloped* crossing linking ridgelines or riparian areas

Narrow crossing linking ridgelines or riparian areas

Salamander crossing zone

**500' or more between structures.*

Natural Communities & Habitat

Mesic Maple-Ash-Oak-Hickory

Dry Transition Hemlock

Hemlock-Northen Hardwood

Dry Oak-Hickory-Hophornbeam

Temperate Calcareous Cliffs

Agricultural Land

Surveyed Parcels

Wetlands Mapped by GRWPA

Wooded Swamp

Coniferous Swamp

Described Areas

1 Hemlock Forest

2 Rich Forest

LANDSCAPE FEATURES

The total size of this block is 3,911 acres, only 627 of which are in Guilford, making this the ninth largest in town. VCD ranks this block as Highest Priority for both Interior Forest and Connectivity. Vermont Habitat Blocks & Wildlife Corridors gives this block a very high score of 7. While only a small part of this block is in Guilford, this part is important to species on the move.

In the rumpled Green River watershed, this block has high landscape diversity. Waits River Formation is the bedrock, with bands of the quartzite and mafic components, the Guilford Dome, crossing the northeast portion.

CONNECTIVITY

This large block is surrounded by quiet dirt roads with a low density of development. Green River Road to the east is the busiest and most developed, but overall permeability is excellent. A busy amphibian crossing zone is located in this area. Salamanders cross from the forested uplands to the setback along the Green River. Hundreds of spotted salamanders have been counted on rainy nights in April. One Jefferson salamander (S2,SGCN) has been documented here.

The Halifax portion of this habitat block has many important features. Maintaining the connectivity in Guilford will benefit all.

UPLAND COMMUNITIES

Two parcels were surveyed, parcels 6 and 7. On one, the forest was much more dominated by hemlock than suggested by the landscape. The old sugar maples scattered throughout suggest that this might be a successional fluke, but one that might persist given the deep shade cast by these trees. The understory was bare in most places, though rich site plants were found on bedrock outcroppings.

On the second parcel, an exceptional rich example of the matrix community was found on deep, moist soils. This well-managed forest site was the only location where many rich site herbs were found well away from steep ledges. The forest floor was blanketed in ferns, ranging from the woodland standards to those that indicate sweet soils. In the seeps and swales, ferns that like wet feet grew in profusion.

The canopy, dominated by sugar maple and white ash, also had the rich site indicators basswood and bitternut hickory. Among the herbs were blue cohosh, miterwort, rattlesnake fern, ginger, and wild leeks. This site showcases the potential of these forests if they are carefully managed. Invasives—Japanese barberry and honeysuckles—hover around the edges of this parcel and have made incursions. The parcel to the west had many invasives on the border with this one.

Unsurveyed parcels in this block seem likely to have rich ledge sites.

The Green River.

WETLANDS & VERNAL POOLS

Two small wooded swamps were mapped in this block by the Green River Watershed Protection Alliance.
No vernal pools were documented.

UNCOMMON SPECIES

Jefferson salamanders (S2, SGCN) have been found crossing the road from this block to their spring breeding habitat.

MAST STANDS

A large beech mast stand is located in the Halifax portion of this block.

Deluxe porcupine den.

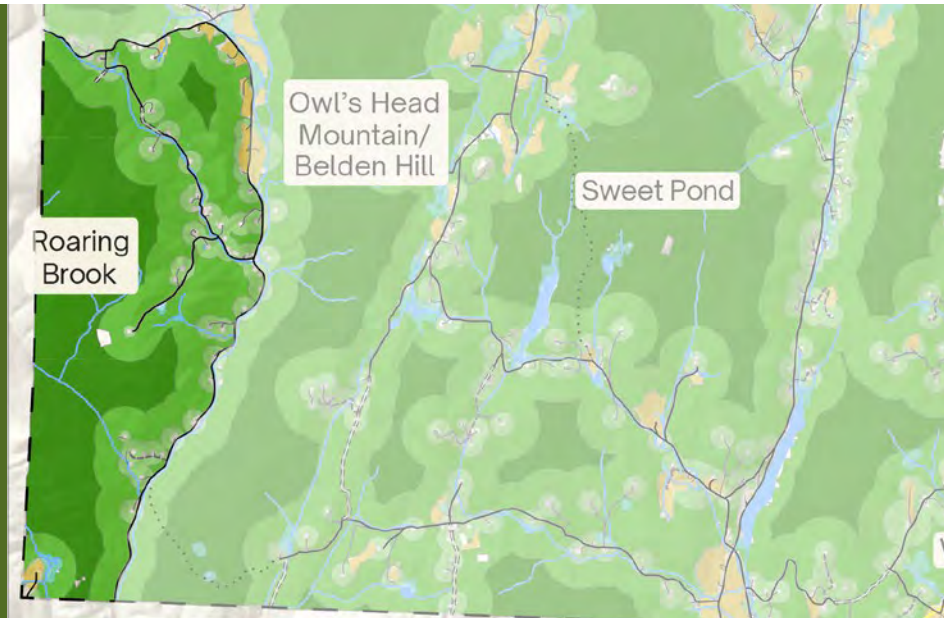
Remains of sugar maple in hemlock forest.

Long-spurred violets and long beech ferns in rich forest site.

Bloodroot in rich forest site.

Roaring Brook

Block Size	2,681 acres
VCD Interior Forest	Priority
VCD Connectivity	Highest Priority
State Significant Communities	1
Locally Significant Communities	3
Wetlands	4
Undeveloped Streams	2 miles
Uncommon Species	2
Vernal Pools	1
Mast Stand	1



Road Crossings

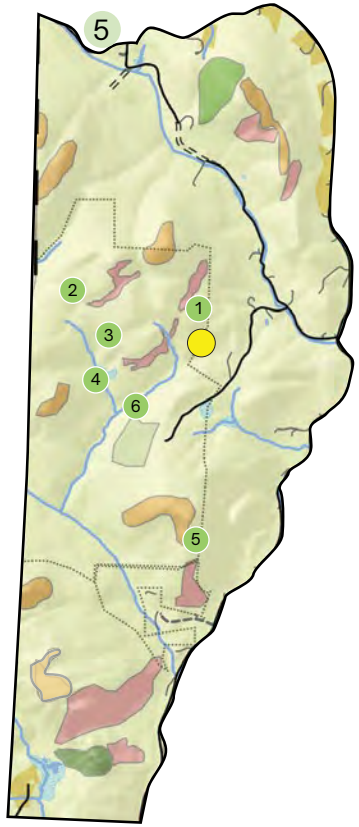
Undeveloped* crossing linking ridgelines or riparian areas

Narrow crossing linking ridgelines or riparian areas

Undeveloped* crossing

**500' or more between structures.*

Natural Communities & Habitat



- Mesic Maple-Ash-Oak-Hickory
- Dry Transition Hemlock
- Hemlock-Northern Hardwood
- Dry Oak-Hickory-Hophornbeam
- Temperate Calcareous Cliffs
- Agricultural Land
- Surveyed Parcels
- 1 Spicebush Swamp and Black Ash-Red Maple Seepage Swamp
- 2 Mast Production Area
- 3 Hemlock-Cinnamon Fern Swamp
- 4 Basin Shrub Swamp
- 5 Temperate Calcareous Cliffs, Dry
- 6 Old Orchard, Early Successional
- Vernal Pool

LANDSCAPE FEATURES

The 1,400 acres of this block in Guilford make it the fourth largest forest block in town. Much of this block has far above average landscape diversity. French Hill, at 1,552 feet in elevation, is the highpoint, with its summit just across the town line in Halifax.

Waits River Formation, calcium-rich bedrock, provides the stage for the action in this block, with a strip of the iron/magnesium-rich mafic member crossing east-west.

CONNECTIVITY

This block is bounded on the east by Green River Road and by small, quiet roads on the north and west. Roaring Brook and the ridge to the west provide travel corridors for mammals on the move.

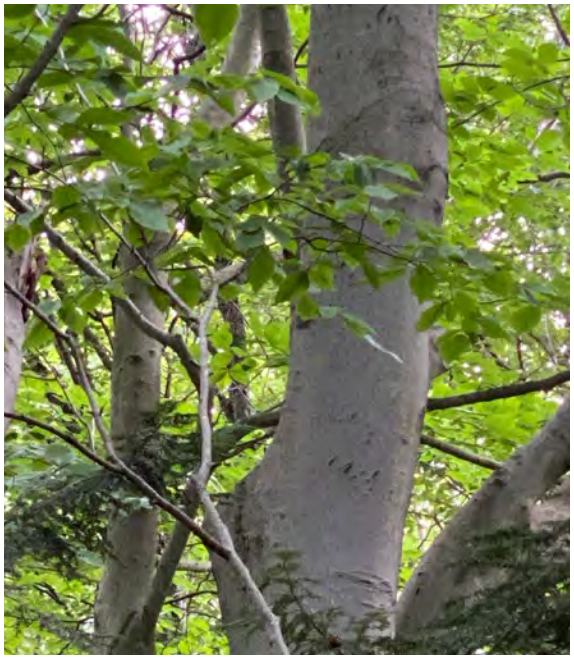
NATURAL COMMUNITIES

Parcel 8 (463 acres) at the end of Gallup Road showcased the abundance of community types and habitat features that result from high landscape diversity. The matrix forests had more of the character of the Northern Hardwood Forest than sites to the east, with fewer red oaks and more beech and yellow birch. I visited the parcel on three occasions. On the first visit, I explored the knoll in the center of the west side. Aerial imagery from 1942 and 1962 show this part of the parcel has been forested with hardwoods for much of the past century. I suspect his rich hillside was used as a sugarbush. The hill had recently been logged, but some legacy sugar maples remained, including a few decaying hulks on the forest floor. Such trees add to the richness and moisture of the soil and to habitat complexity. Unfortunately, invasive plants, especially Japanese barberry, had colonized the openings created by the logging.

Swamp milkweed.

Cinnamon Fern-Hemlock swamp.

Moose scat by cinnamon fern swamp.



Bear-scarred beech trees.

The summit of the hill had a small dry hickory-hophornbeam community, which had a few large, multi-trunked black birches. A few bear scarred beeches and several bear scats were found on this summit.

The forests on the northern half of this parcel included a moist cove that could develop into a Rich Northern Hardwood community given enough time. More hemlock was present on the less-sunny slopes. Moist ledges in this area hosted rich cliff/forest flora. Among the indicator plants were narrow-leaved spleenwort (S3), red baneberry, Goldie's fern, rattlesnake fern, and fragile fern.

This forest block has a number of old butternuts, an indicator of rich sites. This tree, with its delicious nuts, has largely disappeared as a result of a fungal disease and is an S3 species.

The wetlands in this parcel were found in small pockets at the base of slopes and the seepy headwaters of streams. A few of those explored during this survey were noteworthy. In one of these, a one-acre marsh, spicebush was the dominant shrub. This is the only place I surveyed where spicebush was abundant. This wetland shrub has leaves that are sweetly spicy when crushed. It is a favorite food for many herbivores, including the caterpillars of the beautiful spicebush swallowtail and the Promethea silk moth.

This swamp also had places dominated by cattails and herbaceous vegetation like spotted Joe-pye weed, swamp milkweed, grasses, sedges, and ferns. The invasive grass Phragmites has established itself and may push out the cattails and other herbs.

The eastern end of this small basin has a very small (.2 acre) Red Maple-Black Ash Seepage Swamp, one of four places where black ash has been found in Guilford. Black ash, the tree favored by basket makers, is uncommon in Windham County. Like white ash, it is threatened by the emerald ash borer.

A Basin Shrub Swamp higher on the slope had shrubby cinquefoil as a dominant shrub, with islands of willow and invasive honeysuckle. This wetland also has a population of swamp milkweed. This swamp is 2.3 acres in size.

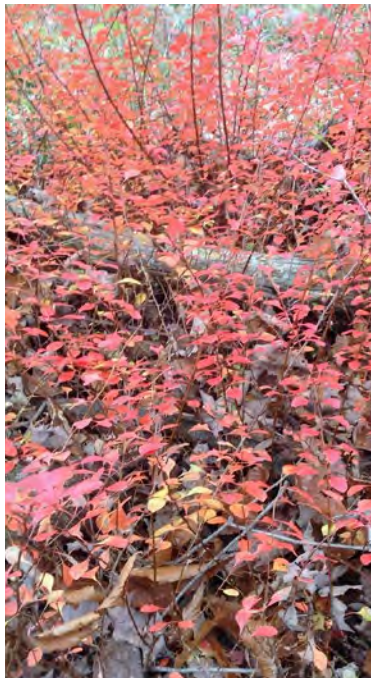
The final noteworthy wetland visited during this survey was a 2.5-acre Hemlock-Sphagnum Basin Swamp where cinnamon fern grew to the exclusion of nearly every other herbaceous plant. This swamp lacked the sphagnum development typically associated with this wetland community, but was situated in a headwaters basin, so might one day develop into a peatier wetland.

Moose scat and beds were found adjacent to each of these wetlands. In one, a bear had been grazing to add fresh greens to its fall nut foraging.

On parcel 9, trees grew straight and tall in the mature forest. Hemlock dominated the canopy in the shaded valley along the Roaring Brook. Beaked hazel, striped maple, and beech grew in the shrub layer. Interrupted fern, Christmas fern and long beech fern

Red baneberry.

Bobcat scratching post.



Invasive barberry.

Narrow-leaved glade fern (S3).

grew in profusion along the stream. Rich site indicators in the understory were widely scattered but present.

On the northeast side of this parcel, a dry Temperate Calcareous Cliff site had the only shagbark hickory that was found during this survey. Rich indicator plants included bottlebrush grass, bloodroot, columbine, and a hillside draped very prettily in white bear sedge (S3). Above the ledges, hophornbeam grew among the sugar maples, white ash, and bitternut hickory.

VERNAL POOLS

One vernal pool, a nice example of a classic woodland pool, was confirmed in this block. While the survey did not take place during amphibian season, fingernail clams were found there.

EARLY SUCCESSIONAL/ SHRUB-SCRUB HABITAT

An 11-acre abandoned orchard provides exceptional early successional habitat and a bonanza for wildlife. The trees are old and many are covered in invasive bittersweet and multiflora rose, but while they persist and continue to produce fruit, this site will be a destination for nearly every creature, feathered or furred. Who doesn't love apples? Well, goshawk and ermine—but where will they find excellent hunting? The invasive thicket below the trees, while not as beneficial for wildlife as a thicket of native plants, still provides wonderful cover for shrub-nesting birds and such early-successional/ shrub-adapted species as ruffed grouse, woodcock, and golden-winged warblers. A winter visit to this site is likely to turn up robins, bluebirds, and cedar waxwing flocks, as well as bobcat, fox, and weasels hunting the bumper crop of voles that must thrive in this habitat. Such places were a large part of the landscape sixty years ago, but are a rare and ephemeral habitat type now.

Old orchard, early successional/shrub-scrub.

Bear scat full of beechnuts.

Shrubby cinquefoil in basin shrub swamp.

RIPARIAN HABITAT

The Guilford section of Roaring Brook has two miles of undeveloped riparian habitat. Roaring Brook is a perennial stream, forested along its entire length, that provides good cold-water aquatic habitat.

MAST STAND

A large mast stand with many smooth-barked beeches was found in this block. These trees may be resistant to the beech bark disease. Bear scat was frequently encountered in the center of this block, especially on hilltops and in the spicebush wetland.

A bobcat scratching post and a napping porcupine were seen in the mast stand during a visit.

RARE SPECIES

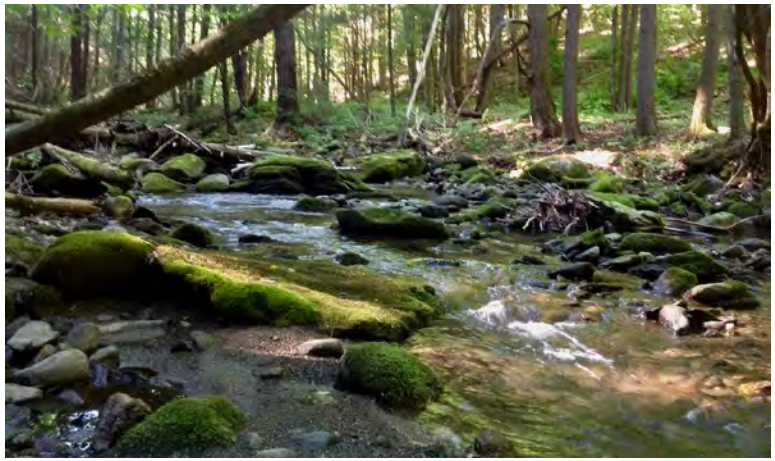
The rich ledgy sites host two S3 species.

TURTLE HABITAT

The undeveloped streams in this block provide a haven for wood turtles. A wood turtle (S3) has been documented in the Halifax portion of this block.

Roaring Brook area in 1942. (Aerial imagery from the VCGI.)

Basin shrub swamp.



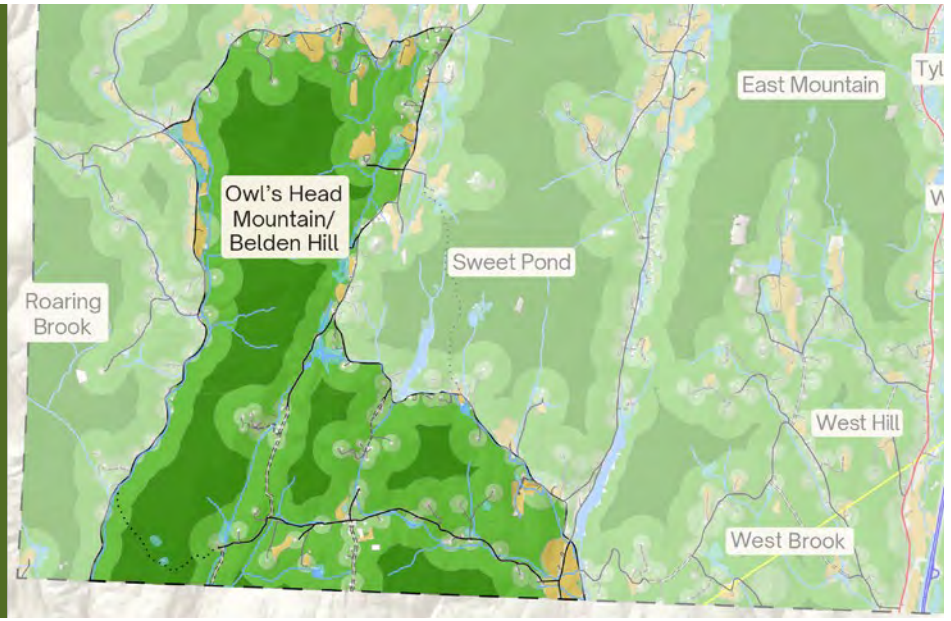
Roaring Brook.

Bishop's cap.

Porcupine den.

Owl's Head/Belden Hill

Block Size	3,361 acres
Core Acres	1,277 acres
VCD Interior Forest	Priority
VCD Connectivity	Highest Priority
State Significant Communities	2
Undeveloped Stream	5 miles
Uncommon Species	1



Road Crossings

Undeveloped* crossing linking ridgelines or riparian areas

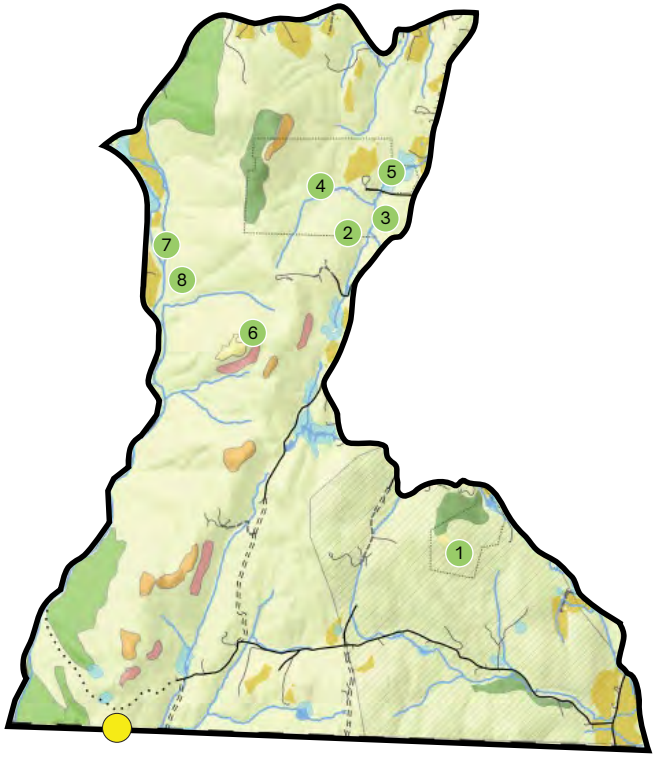
Narrow crossing linking ridgelines or riparian areas

Undeveloped* crossing

Narrow crossing

**500' or more between structures.*

Natural Communities & Habitat



- Mesic Maple-Ash-Oak-Hickory
- Northern Hardwood Forest
- Dry Transition Hemlock
- Dry Oak-Hickory-Hophornbeam
- Hemlock-Northern Hardwood
- Temperate Calcareous Cliffs
- Agricultural Land
- Surveyed Parcels
- 1 Belden Hill
- 2 Transition Hardwoods Limestone Forest
- 3 Ash-Cinnamon Fern Swamp
- 4 Cinnamon Fern Hillside seep
- 5 Big Marsh
- 6 Dry Oak-Hickory-Hophornbeam Forest
- 7 Sugar Maple-Ostrich Fern Riverine Floodplain Forest
- 8 River Cobble Shore
- Vernal Pool

Beaver marsh mosaic.

Rich Maple-Ash-Oak Hickory Forest.

LANDSCAPE FEATURES

This block has the second largest acreage in Guilford. Packer's Corner Road, Abijah Prince Road, and Belden Hill Road partially fragment the foot of this boot-shaped block, so core forest is in several smaller acreages.

The north-south ridge of Owl's Head Mountain is on rich Waits River Formation bedrock. This block is at the south end of the Guilford Dome and is crossed by the bands of amphibolite and mafic rock that define it. Belden Hill is composed of Giles Mountain Slate, so hosts a forest with less calcium enrichment.

The southern portion of the Owl's Head ridgeline has very high landscape diversity.

CONNECTIVITY

Good road crossings persist around much of this block. Owl's Head Mountain provides a natural travel route for some species and is well connected to large habitat blocks to the west.

NATURAL COMMUNITIES

Two parcels were surveyed the first, #10, during this inventory. The first included the north side and the summit of Belden Hill. The lower slope hosted a Dry-Transition Hemlock Forest. White pine, yellow birch and beech were interspersed in the canopy. The forest floor had occasional clusters of marginal woodfern. Noteworthy was the unusual abundance of checkered rattlesnake plantain,

American burr-reed.

and an orchid. Hemlocks transitioned into a young Northern Hardwood Forest with a sparse herb layer that included evergreen woodfern and Christmas fern. The dry summit had a sparse understory of Pennsylvania sedge. A few hophornbeam grew among the sugar maple and red oak. As expected, there were few indicators of enrichment at this site. A small beech stand grew near the summit. These trees were in poor health and no evidence of bear claw marks was found.

The second parcel surveyed, #11, was a large parcel on the east side of Owl's Head Mountain. The survey began in a 12-acre beaver mosaic marsh. While the open marsh remains diverse and rich in native flora, it is ringed by a dense thicket of glossy buckthorn. This unfortunate circumstance makes the site far less attractive to beavers, so their work to maintain this wetland complex may be hindered. The aerial photo from 1942 shows the area as a wet swale in a pasture/hayfield. The 1962 aerial photo shows that shrubs had grown up in the former open wetland, an invitation for beavers to return. This area has a mix of wetland types, Shallow Emergent Marsh, Sedge Meadow, and Cattail Marsh, with some open water areas remaining. The wetland plants include Virgin's bower, broad-leaved cattail, boneset, Allegheny monkeyflower, awl-fruited sedge, burr reed, vervain, spotted Joe-pye weed, and marsh St Johnswort. A few native shrubs grew in clumps in the marsh or held on amid the thicket of buckthorn. These included maleberry, winterberry holly, and a few willows.

The upstream portion of this marsh, where the stream entered from the south, showed more recent sign of beaver activity, though none within several years. There was more standing water and a few standing dead trees in this area.

On the other side of Campbell Road, the wetland became a Northern Hardwood Seepage Swamp. The herb layer included zones of ferns in shifting dominance—royal fern, sensitive fern, and cinnamon fern. Horsetail and Jack-in-the-pulpit were also present. Barbed wire was found in a row of old fence line white ash trees next to the small meandering stream. A closed canopy of young trees included white ash, sugar maple, basswood, and white pine. Witch hazel grew in the shrub layer, along with the invasive glossy buckthorn. This wetland's size, 1.5 acres, makes it eligible for Class II designation.

On the east facing hillside above this swamp was a very nice rich example of Maple-Ash-Oak-Hickory Forest. Low on the slope, ash and sugar maple were dominant in the canopy. More oak, including a few fine legacy oaks, grew farther up the slope. Maidenhair fern, plantain-leaved sedge, Jack-in-the pulpit, and silvery glade fern also indicated the richness of the soil.

In the center of this parcel were a number of seeps, including a headwaters seep and a large hillside seep with cinnamon fern the dominant herb beneath a canopy of white ash. This was a very nice open wet forest. Moose tracks and scat were seen in these swampy areas.

White Ash hillside seep.

Joe-pye weed and bumblebees.

The highest portion of this parcel, an east facing hillside, was not surveyed. This slope, with shallow bedrock and hardwood cover, is a likely site for a continuation of exemplary mesic rich forest.

Elsewhere in this block, the Vermont Land Trust surveyed a parcel and documented a State Significant occurrence of Dry Oak-Hickory-Hophornbeam Forest. This 7-acre community is on the steep west- and southwest-facing slopes just below Owl's Head Mountain, and included the wooded summit area. Red oak and hophornbeam were dominant, but enrichment indicators such as sugar maple and basswood were found. Surveyor Hohn reports, "The understory is a classic 'lawn' of Pennsylvania sedge, with silver sedge, Christmas fern, marginal wood fern, early saxifrage, columbine, Solomon's seal, and other herbs also commonly occurring."

During the same survey, a 4-acre example of a Sugar Maple-Ostrich Fern Riverine Floodplain Forest was documented.

> "Though small, showing some signs of disturbance and including many non-native invasive plants, this occurrence is State Significant. Sugar maple dominates the overstory, which also includes white ash, black cherry, American basswood, yellow birch, black ash, and hophornbeam. Musclewood is a common midstory tree. Shrubs include maple-leaf viburnum and several non-native invasive plants that are sadly common in floodplain forests: Japanese knotweed, Japanese barberry, multiflora rose, and non-native honeysuckles. The understory includes ostrich fern, sensitive fern in the lower spots, poison ivy, Virginia creeper, tall meadow rue, false hellebore, toothwort, and false Solomons seal among other plants. Woody and flood debris are abundant."

Adjacent to this community, along the shore of the Green River, a State Significant example of the rare River Cobble Shore community was recorded. This riparian community features cobble embedded in finer sands and gravels and hosts plants adapted to live in this very dynamic environment. Among the plants found in this survey were boneset, bog goldenrod, spotted Joe-pye weed, shallow sedge, reed canary grass, St Johnswort, bronze sedge, fox sedge, and swamp candles. The invasive Japanese knotweed was also found at this site.

UNCOMMON SPECIES

Spotted wintergreen (S2/S3)

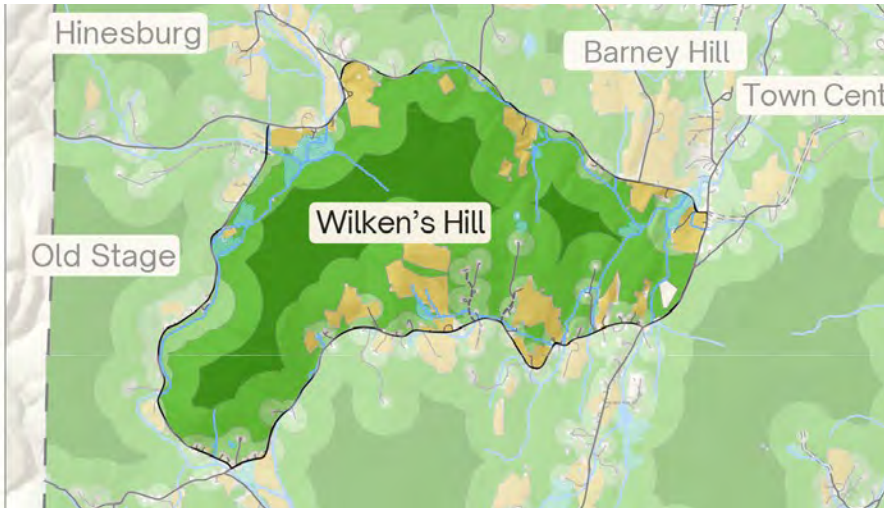
Grass rush (S3)

White Ash-Cinnamon fern swamp.

Jack-in-the-pulpit, silvery glade fern, and maidenhair fern.

Wilken's Hill

Block Size	1,133 acres
VCD Interior Forest	Highest Priority
VCD Connectivity	Priority
Physical Landscape Diversity	Highest Priority
Uncommon Species	1



Road Crossings

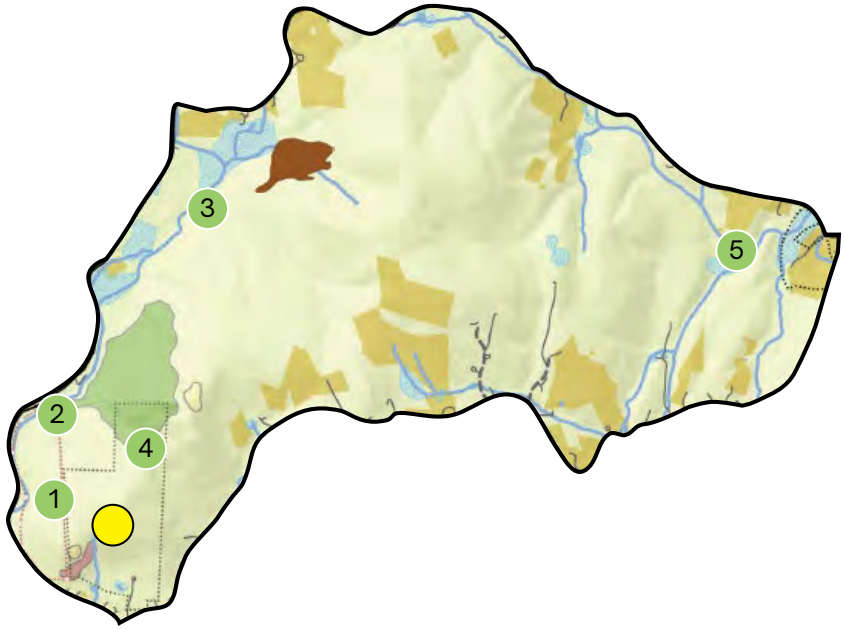
Undeveloped* crossing linking ridgelines or riparian areas

Narrow crossing linking ridgelines or riparian areas

Undeveloped* crossing

**500' or more between structures.*

Natural Communities & Habitat



- Mesic Maple-Ash-Oak-Hickory
- Dry Transition Hemlock
- Hemlock-Northern Hardwood
- Agricultural Land
- 1 Dwarf Scouring Rush Seep
- 2 Floodplain Swamp
- 3 Floodplain Mosaic
- 4 Red Pine Stand
- 5 Water- & Ice-Deposited Glacial Sediments Along Major Rivers
- Vernal Pool
- Beaver mosaic wetlands

LANDSCAPE FEATURES

Bookended by the villages of Guilford Center and Green River, this modestly-sized block (sixth largest in town) receives the highest ANR score in town—a seven. This score is shared with its neighboring Stage Road block. Among the features that raise the score are high landscape diversity, a high percentage of conserved land, and a lack of Class 4 roads. The east side of this block has a VCD Highest Priority Physical Landscape feature—Water- & Ice-Deposited Glacial Sediments Along Major Rivers. Much of this is on the 175-acre Week's Forest, which has a conservation easement from the New England Forestry Foundation.

Waits River Formation is the bedrock here, with bands of the quartzite and mafic components running north/south across each end.

CONNECTIVITY

VCD ranks this block as a priority for interior forest and landscape diversity.

UPLAND COMMUNITIES

Three parcels in this block were surveyed. One of the parcels had been recently logged. Invasive plants were making incursions in the openings. A few rich-site herbs were mixed in, including white snakeroot. Two abutting parcels were surveyed to the north of Green River Village. Aerial photos from 1942 show them just beginning to return to forest. The south facing ledges had a few rich site indicators.

Beech tree.

Floodplain forest.

Bear-clawed red pine.

WETLANDS

The logged parcel was along the Green River and had a couple of noteworthy wetlands. The first was a small hillside seep with a patch of the unusual dwarf scouring rush, distinguished by its wavy growth form.

A small floodplain forest was found along the river. The forest was young, a mix of white ash, sugar maple, hemlock, and birch. Herbaceous plants included spikenard, wood nettle, blue cohosh, interrupted fern, sensitive fern, royal fern, and swamp saxifrage. The invasives Japanese knotweed and multiflora rose were well established.

Where the Green River makes its acute turn to the south there is a wide floodplain. This area was not surveyed, but is known to be a site where beavers are active. This area is likely to contain State Significant examples of River Cobble Shore communities and the communities typical of beaver-created wetlands, like Emergent Marsh and Alder Swamp.

Mountain laurel.

VERNAL POOL

A classic woodland basin vernal pool occurs in this block. The pool was dry on the visit, but fingernail clams were abundant.

UNCOMMON SPECIES

Mountain Laurel (S3) was found in one place along the river.

WILDLIFE SIGNS

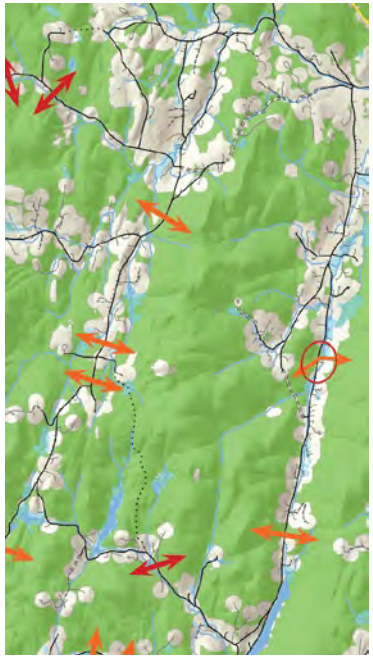
A few red pines had been used as sign posts by black bears.

Dwarf scouring rush in seep.

Sweet Pond

Block Size	**3,243 acres**
Core Acres	**1,297 acres**
VCD Interior Forest	**Priority**
VCD Connectivity	**Highest Priority**
Vernal Pools	**1–5**
Uncommon Species	**4**

Road Crossings



Undeveloped* crossing linking ridgelines or riparian areas

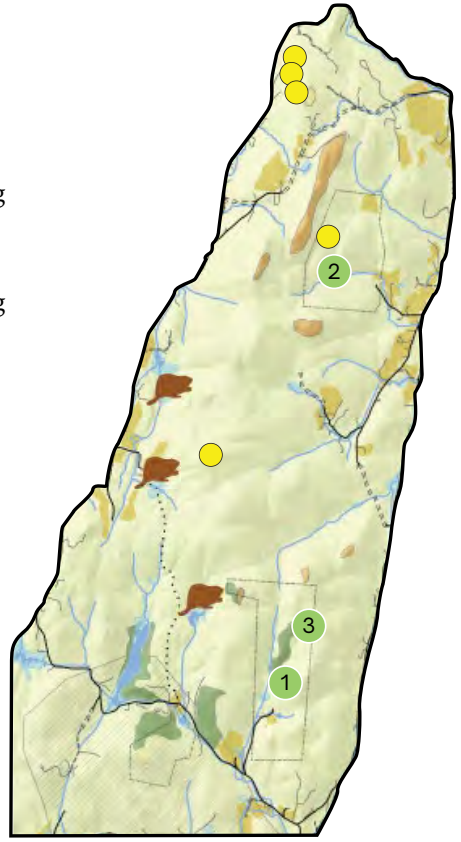
Undeveloped* crossing

Narrow crossing

Isolated linkage in developed area

**500' or more between structures.*

Natural Communities & Habitat



Mesic Maple-Ash-Oak-Hickory

Dry Transition Hemlock

Dry Oak -Hickory-Hophornbeam

Agricultural Land

1 Future Old Growth

2 Barradale Woods

3 Vernal Pool

Beaver mosaic wetlands

Potential vernal pools (mapped by Vermont Vernal Pool Mapping Project)

LANDSCAPE FEATURES

This is the third largest block of forest in Guilford. It is underlain by Waits River Formation bedrock. The landscape diversity is lower than the more rugged hills to the west.

CONNECTIVITY

Wildlife moving north/south have a fairly easy time moving across the southern part of this block. No good crossings exist to the north, however, and the east/west crossing over Weatherhead Hollow is poor. Special attention should be given to the crossing zones that remain. Better linkages remain to the parcels to the west.

UPLAND COMMUNITIES

Two parcels were surveyed in this block, parcel 16 along the ridge and parcel 15 to the south. Both of these forests had stands of tall, mature trees. Parcel 15 has a conservation easement held by the Northeast Wilderness Trust. This is a "forever wild" easement that ensures that the forest will be unmanaged and will one day become old growth. The trees include basswood, sugar maple, bitternut hickory and white ash. Beech, red oak, hemlock, black birch and black cherry also occurred. Trees in the most mature sections of this forest were 70-90 years old. As is common in Guilford, the high point on the parcel had hophornbeam, red oak, and bitternut hickory. On this site they mixed with hemlock.

There was little shrub or understory development in most of the forest stands on this parcel, with the exception of one lush stand to the west of the farm buildings with a canopy of young sugar maple, ash, beech, and bitternut hickory.

Dry Transition Hemlock Forest grew on the west-facing slopes. This community had very little understory growth.

Parcel 16, 2020.

Black Locust stand.

Parcel 16 possible vernal pool.

Given enough time, the forests on this parcel will acquire the characteristics of old growth: large trees, standing dead trees, large rotting logs on the forest floor, many layers of canopy, and openings created when old trees fall. The soils will be deeper, moister, and will host a richer community of fungi and microbes. There will be a more diverse and lush forest floor community, fewer invasive plants, and more species diversity.

The size of this parcel, 191 acres, is too small to achieve and maintain all of the qualities of an ancient forest. VCD recommends a minimum of 1,000 acres to meet all old forest values. However, no parcel is too small to be without value.

The second parcel, parcel 16, has been meticulously managed and is a very pleasing forest to walk through, with tall, straight red oaks, sugar maples, and bitternut hickory. Many legacy trees remain, including some sugar maples that are beginning to die. These contribute to habitat diversity and are relatively scarce elements in the working landscape. This forest is a potentially State Significant example of the Mesic Maple-Oak-Ash-Hickory community type. More survey work would be needed to determine its size.

A stand of black locust, native to the southern states, grew on one hillside. Locust were often planted because they make rot resistant fence posts. Indeed, this remote hill farm, with its old cabin sitting in isolation in a field, evokes the early days of Guilford's settlement.

Hemlocks mixed with the matrix community along the riparian area by the small stream that crosses this parcel. A porcupine had been feeding in one of these trees. The invasive insect, hemlock woolly adelgid, was found in abundance in both of the parcels surveyed. This was one of the few invasives encountered on parcel 16.

Freshwater bryozoa and water smartweed.

Sweet Pond.

WETLANDS

No significant wetlands were found on the parcels surveyed, but there are a few places in this block where beavers have been active and have created wetland complexes. These include a 4-acre pond and wetland and a 7-acre wetland complex on the west side of the block. Sweet Pond and its adjoining marsh and shrub swamp are 27 acres in size. All of these are considered a Highest Priority Aquatic Features by VCD.

VERNAL POOLS

One vernal pool was documented on the parcel 15. This is a classic woodland depression pool with a leaf litter substrate. There was water in the pool during a December visit to the site. Fingernail clams were found as confirmation. A spring visit to look for amphibian egg masses could provide information on the species that breed there.

A possible pool was found on the Barradale parcel. This pool is small (.02 acres) and shallow, but it had water in it in December—quite frozen. No wetland plants grew in or near the pool.

The **Vermont Vernal Pool Mapping Project** has mapped five possible pools on other parcels in this block.

RARE SPECIES

Marsh Mermaid-weed, *Proserpinaca palustris* (S2/S3), Small white aster, *Symphyotrichum racemosum* (S2, SGCN), and northeastern sedge, *Carex cryptolepis* (S2/S3) have been documented in this block (Popp, 2013, NHIP).

Parcel 16 summit forest.

East Mountain

Block Size	4,161 acres
VCD Interior Forest	Priority
VCD Connectivity	Highest Priority
Vernal Pool	1–3
Uncommon Species	4

Road Crossings

Undeveloped* crossing linking ridgelines or riparian areas

Narrow crossing linking ridgelines or riparian areas

Undeveloped* crossing

Narrow crossing

Isolated linkage in developed area

**500' or more between structures.*

Natural Communities & Habitat

Mesic Maple-Ash-Oak-Hickory

Northern Hardwood Forest

Dry Red Oak-White Pine Forest

Hemlock-Northen Hardwood

Temperate Calcareous Cliffs

Agricultural Land

1 Exemplary Mesic Maple-Ash-Oak-Hickory

2 Vernal Pool

3 Weatherhead Hollow marsh

4 Red Maple-Black Ash Seepage Swamp

Beaver mosaic wetlands

Potential vernal pools

LANDSCAPE FEATURES

This is the largest habitat block in town, but also the one most threatened by fragmentation. Five roads with diffuse residential development stretch into it.

At the northeastern end of the block, VCD has mapped both a Rare and a Representative Landscape. The rare feature, Water- & Ice-Deposited Glacial Sediments Along Major Rivers, occurs on the northwest slope of the ridge. Below it, and extending down past the fairgrounds, is a band of Coarse Sediments on Wet Flats, a high quality example of this landscape type.

This block has a narrow band of Waits River bedrock along the west. The rest is underlain by Giles Mountain slate, which contributes to a more acidic soil.

CONNECTIVITY

While this block is a Highest Priority Connectivity Block, the connectivity is imperiled. This important block is surrounded by the busiest roads in town, including I-91 and Route 5. While a few potential crossings of these major roads exist, there is likely to be fencing along the interstate that creates a barrier.

The long, north-south ridgeline of this block is a corridor for wildlife on the move and remains unfragmented. Maintaining this is important for wildlife within town and for regional connectivity.

The VELCO powerline is a travel route used by some wide-ranging species. A local landowner has documented many animals crossing Guilford Center Road at where the powerline crosses, including bears.

The Weatherhead Hollow branch of the Broad Brook crosses a number of agricultural lands. Riparian buffers vary from very wide to non-existent. Encouraging buffers along streams in these fields will help improve wildlife access to the scattered wetland areas along the brook.

UPLAND COMMUNITIES

Three parcels were surveyed during this project. We first explored a streamside marsh along the west side. This narrow band along Weatherhead Hollow Road was hemmed in by the roadbed to the west and the bedrock to the east. During our fall visit, it was populated by ostrich fern, goldenrods, virgin's bower, and cattails, with their woody associates, willows and alders.

The bedrock on that side of the block was Waits River, and ledges along the wetland hosted their usual entourage of rich site herbs, including bloodroot, sharp-lobed hepatica, Jack-in-the pulpit, and blue cohosh.

From there we headed up to the forested hillside. A timber harvest had happened recently, but a number of legacy trees showed the richness of the soil. There were large, beautiful sugar maples, white ash, and bitternut hickories.

Parcel #18's big oaks.

Sharp-lobed hepatica.

One small rocky slope was a cascade of broad-leaved sedge, a signal of enrichment. In moist soil pockets and near outcroppings of bedrock, other rich-site indicators were found, including silvery glade fern, maidenhair fern, ginger, Robert's geranium, elderberry, white wood nettle, broad-leaved sedge, and maidenhair spleenwort.

This enriched Mesic Maple-Ash-Oak-Hickory forest is the likely matrix forest on the entire lower slopes of the western side of East Mountain in places without deep deposits of sandy soil.

The forest along the ridge on slate bedrock had fewer ash and hickory. More red maple, black birch, and bigtooth aspen mixed with sugar maple and beech in the canopy. Christmas fern, marginal woodfern, and evergreen woodfern were sparsely represented in the understory. Hophornbeam grew in the drier ridgetop soils, but the site was not dry enough to form an Oak-Hickory-Hophornbeam community.

The third parcel, #17, included the slope above Weatherhead Hollow Pond, which had shallow soils and mix of hemlock and red oak. There was very little understory growth, but rich-site indicator plants grew on bedrock exposures.

On the kame terrace on the northwest side of this block, the predicted community was **Dry Red Oak-White Pine** forest. A windshield survey of that portion of the block did indeed indicate a very piney, oaky forest.

Weatherhead Hollow Pond cattail marsh.

Weatherhead Hollow Pond marsh.

WETLANDS

A State Significant Red Maple-Black Ash Seepage Swamp was surveyed in this block in 2000. This is the largest such swamp known in the town (14 acres). An uncommon shrub, spicebush, was abundant. The canopy trees were red maple, yellow birch, black ash, and hemlock. Cinnamon fern, poison ivy, and dwarf raspberry were dense in the herb layer. The peat was measured at 1.5 meters deep in one spot. Beavers had occupied the southern end of this swamp before the survey, but were not in evidence at the time (Lew-Smith, M. 2000, VNHI).

A four-acre wetland that shifts from Emergent Marsh to Cattail Marsh occurs at the north end of Weatherhead Hollow Pond. Wetland plants included shrubby cinquefoil, red ozier dogwood, spotted Joe-pye weed, arrowwood, willows, and virgin's bower.

Aerial photography from 1962 shows that beavers were still absent from their former haunts along Weatherhead Hollow, though residual wetlands from their former works still persisted. Because of good habitat, beaver activity persists intermittently along this stream.

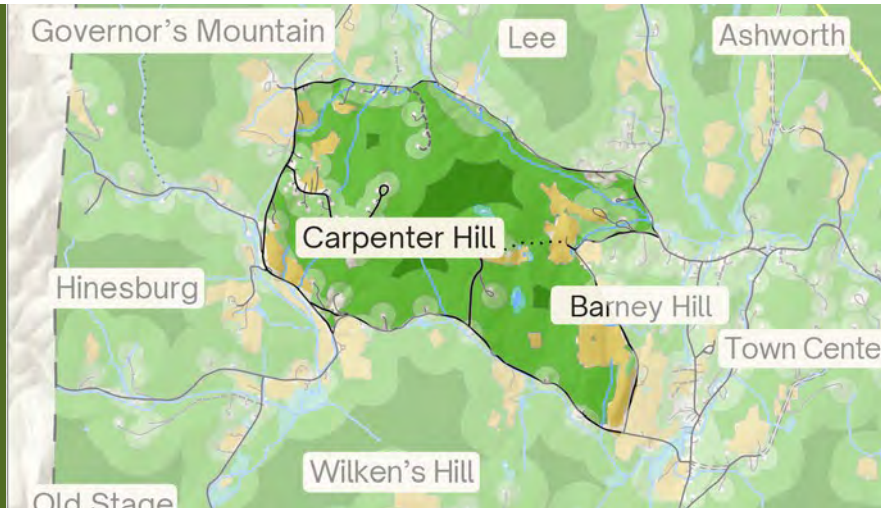
UNCOMMON SPECIES

The following species have been recorded in this block: Hill's Pondweed (S3), American Eel (S2, SGCN), Pursh's Bulrush, (S3), and Wood Turtle (SGCN).

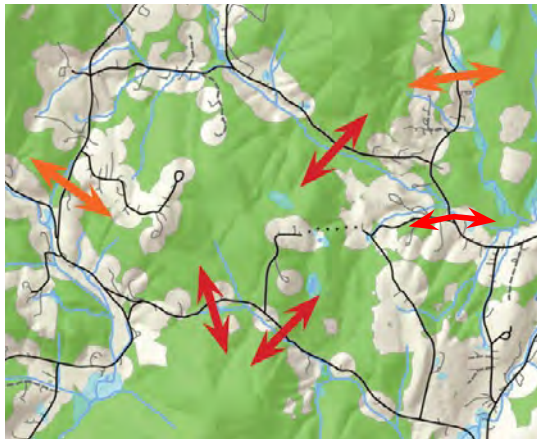
Legacy Bitternut hickory.

Carpenter Hill

Block Size	741 acres
VCD Interior Forest	Priority
VCD Connectivity	Highest Priority
VCD Landscape	Highest Priority
Locally Significant Communities	2
Uncommon Species	1



Road Crossings



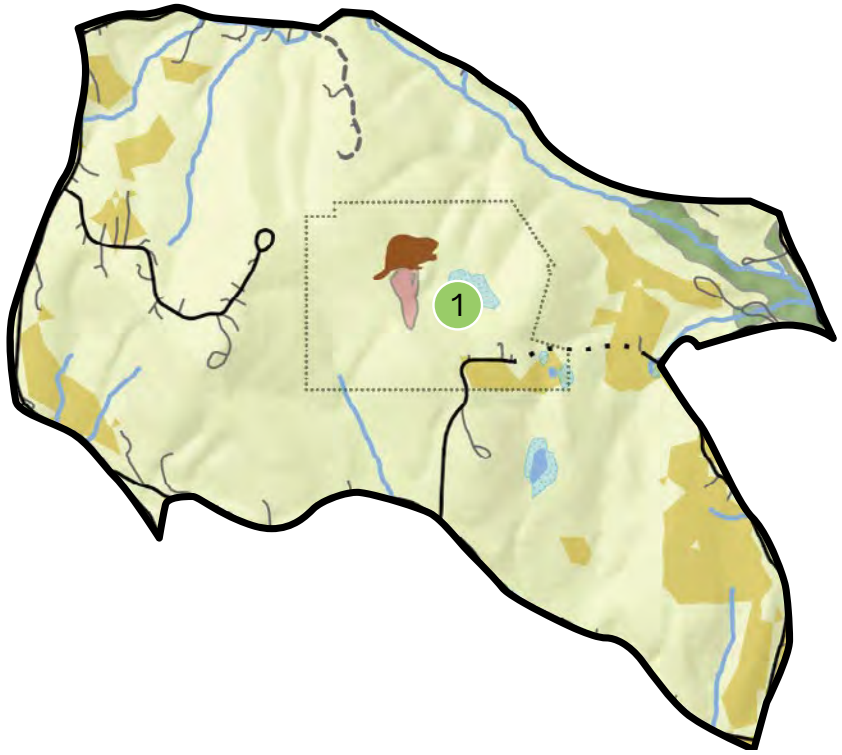
Crossing linking habitat features*

Narrow crossing linking habitat features

Narrow crossing

**500' or more between structures.*

Natural Communities & Habitat



Mesic Maple-Ash-Oak-Hickory

Dry Transition Hemlock

Limestone Forest

Agricultural Land

1 Cattail Marsh

Small beaver wetland mosaic

LANDSCAPE FEATURES

Although this small block is quite fragmented, Carpenter Hill is considered a priority by VCD. It has the uncommon designation Highest Priority Landscape block because it has landscape features that are under-represented in other areas targeted for conservation by VCD. It shares this designation with neighboring blocks in the north-central part of town.

CONNECTIVITY

VCD ranks this block as a highest priority for connectivity. Species moving north and south to larger forest blocks pass through this block. The one connection to Governors Mountain could be imperiled if development occurs on the east side of Hinesburg Road. The west side is too steep.

UPLAND COMMUNITIES

One parcel, #19, was surveyed in this block, a diverse site with a couple of wetlands. Historical imagery shows much of this parcel still in agricultural use in the 1960s, but one hillside has been wooded since the first set of aerial photos taken in 1942. This hillside was likely sugarbush and woodlot, but none of the trees in this mixed age stand were particularly large or old, suggesting regular harvests have been occurring. This hillside, with small bedrock exposures, was an excellent example of a rich Maple-Ash-Oak-Hickory Forest. Bitternut hickory, white ash, and sugar maple were canopy trees. The herb layer included broad-leaved sedge, plantain-leaved sedge, maidenhair fern, maidenhair spleenwort, Goldie's fern, white bear sedge(S3), and late blue cohosh. This small patch had no invasive plants. While too small to be State Significant, this is a locally significant example of this community type.

Two wetlands were explored on this parcel. The first, a 2-acre Cattail Marsh, had open water in the center dominated by burr reed.

The second small (.75 acre) wetland is at the headwaters of a small stream. It has been enhanced by beavers on occasion, but their interest in the site has been limited by the small amount of water available. The invasive grass phragmites is encroaching on the native vegetation in this marsh. The open water that remains here probably serves as amphibian breeding habitat in the spring.

WILDLIFE SIGNS

Two species of stream salamanders, dusky and two-lined, were photographed on this parcel. They are likely to be abundant throughout town.

Cattail marsh.

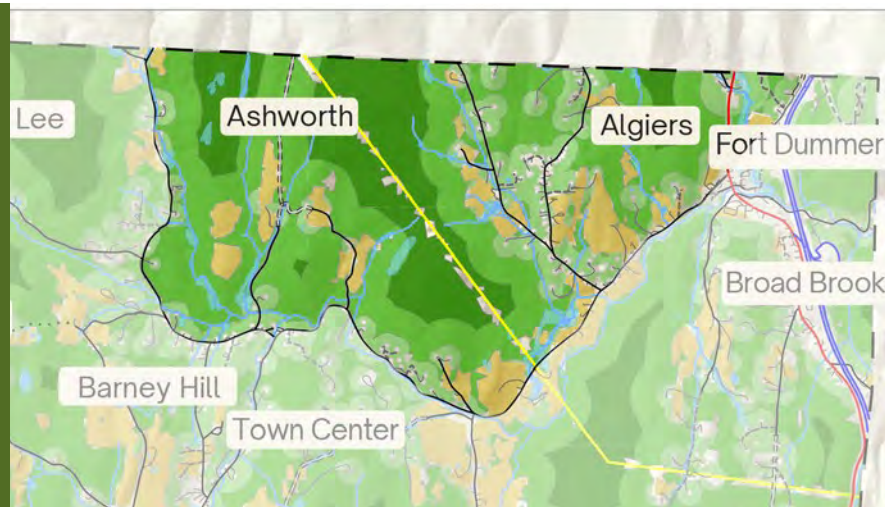
Two-lined salamander (left) and dusky salamander (right).

Plantain-leaved sedge and maidenhair fern.

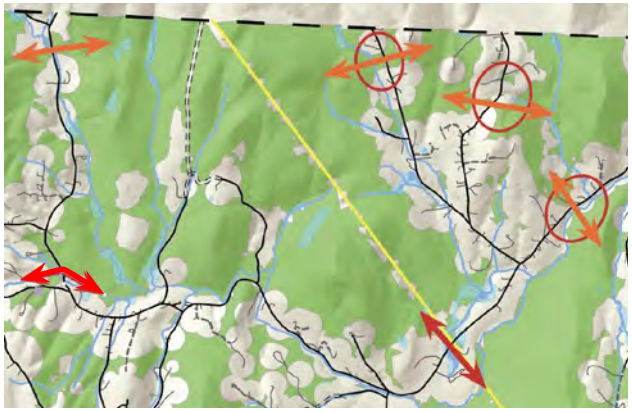
Mesic hillside.

Ashworth

Block Size	1,869 acres
VCD Interior Forest	Priority
VCD Connectivity	Priority
VCD Physical Landscape	Highest Priority
Vernal Pools	3
Uncommon Species	1



Road Crossings

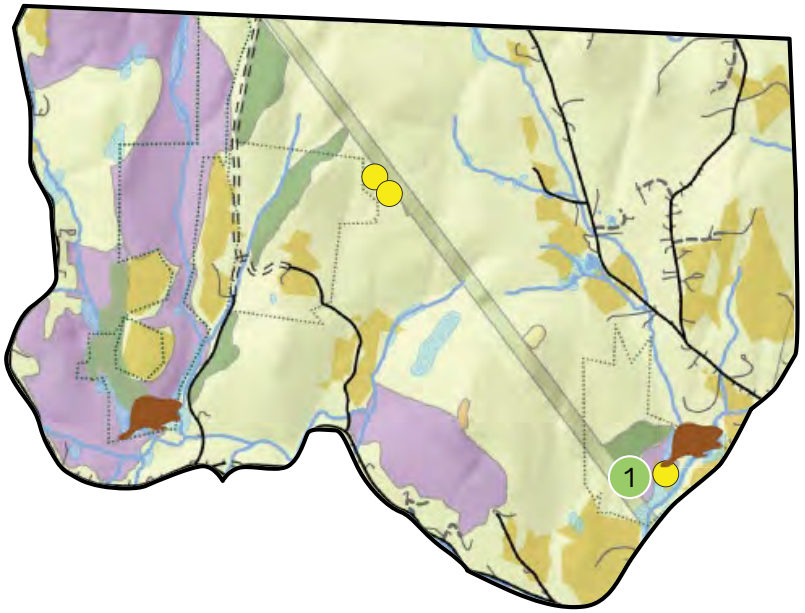


Narrow crossing linking habitat features

Narrow crossing

Isolated linkage in developed area

Natural Communities & Habitat



Mesic Maple-Ash-Oak-Hickory

Dry Transition Hemlock

Dry Red Oak-White Pine Forest

Agricultural Land

1 Red pines and babysitter tree

Vernal pools

Beaver mosaic wetlands

LANDSCAPE FEATURES

This is the sixth largest unfragmented block in Guilford, with 1,199 acres in the town.

Waits River Formation is the bedrock beneath this block, most of it the calcium rich phyllite, with less-rich bands of the Guilford dome running north/south through its center. A glacial deposit of sand and gravel (a kame terrace) is the substrate beneath much of the western half of this block. This combination of soils and landforms makes this block important as part of a statewide conservation plan. The VCD rank it as a Highest Priority Physical Landscape—a landscape type that is under-represented in other conservation priority areas.

CONNECTIVITY

Bounding Brattleboro and the village of Algiers, this block is not well connected to other large blocks. The few road crossing zones that remain are critical for the wildlife that uses this block. The VELCO powerline is used for travel by some species (see East Hill).

Bear sign was observed near the riparian crossing zone by the Bonnyvale/Barney Hill intersection.

NATURAL COMMUNITIES

The first parcel surveyed in this block was the 72-acre parcel 22 along Guilford Center Road. This land has an unusual mix of wetlands and well-drained soils. The VELCO power lines add diversity to the site with their open shrub-scrub habitat. The powerlines had many native shrubs, including willows and winterberry in the wetlands. Staghorn sumac, blackberries and raspberries were abundant on the upland sites.

Use of the powerlines by bears was evident. Near a small shrub swamp, a large white pine appeared to have been used as a babysitter tree, that tree cubs are sent up when their mother needs to eat. This tree had cub-sized claw marks and trees nearby were used as sign-posts by an adult bear. An old apple tree in the powerline also had bear claw marks. Deer tracks were seen throughout.

The glacial kame deposit on this parcel was forested primarily by white pine, and will likely mature into a Dry Red Oak-White Pine Forest. A portion of the terrace had been planted in red pines, a favorite marking tree for black bears. The landowner has many wonderful trail cam videos of black bears leaving messages there.

A concrete dam has created a pond in an area that would have been historically dammed by beavers. This has helped build an 8 acre wetland mosaic that beavers have re-inhabited. The landowner reports seeing mink, muskrat, and otter in the pond as well the beavers. The birds he has photographed at the pond include red-shouldered hawks, northern harriers, and great blue herons. Included in this complex are a cattail marsh, and a shrub swamp that is rich in willows, alder, and red-osier dogwood.

Ghost plant, also known as ghost pipes or Indian pipes.

Lacquered bracket fungi and polypody ferns in Dry Transitional Hemlock Forest.

There are few invasive plants in the wetland, but the woods around the wetland are thick with glossy buckthorn. The invasive grass Phragmites is encroaching on the cattails in the marsh.

A very small vernal pool is on this parcel. The site visit did not occur during the active season, but the pool held some water. The landowner hears wood frogs calling from this pool.

The second parcel surveyed in this block, the westernmost, was also partially on the gravelly kame terrace deposit. The natural communities map predicted a large patch of Dry Red Oak-White Pine Forest on this site. A survey of the site found that there was a small example of this community type and that white pine were abundant in the canopy in the mixed forest that predominated elsewhere on the parcel.

Broad Brook flows through the west side, and a Dry Transition Hemlock Forest grew along the sides of the brook. Though the brook was clear and well-shaded, the substrate was very silty, perhaps the result of flowing through a low gradient valley with soft-soiled banks. A silty bottom has fewer refuges for aquatic organisms.

Where Broad Brook tributaries converge at the southern end of Ashworth Road, there is a 2.5 acre marsh with a nice diversity of native wetland vegetation, including Joe-pye weed, boneset, willows, sensitive fern, and cattails. Beavers are sometimes active in this marsh.

On a steep, west-facing slope on the central parcel there is a perfect example of a Dry Transition Hemlock Forest. This parcel also had the only white oak seen during this survey, a seedling. Much of this parcel had been recently logged. The large openings created featured an abundance of mostly native early-successional growth, a habitat type that benefits many species, and demonstrated that careful management of a logging operation can mimic natural disturbances without creating an invasive plant wasteland.

Sandy soil of kame terrace.

Silty-bottomed Broad Brook.

Remains of white pine in Dry Red Oak-White Pine Forest.

UNCOMMON SPECIES

Jefferson salamanders, S2, SGCN, have been documented in this block.

WILDLIFE SIGNS

A black bear straddled a glossy buckthorn and walked it down to feed on the berries.

Signs of a black bear feeding on buckthorn.

Bear-marked pine sapling.

APPENDIX 1:

GUILFORD PLANT LIST

This list includes many of the plants that were observed during the survey and the plants that were mentioned in this report.

Trees and Shrubs

Box elder	*Acer negundo*
Red maple	*Acer rubrum*
Sugar maple	*Acer saccharum*
Mountain maple	*Acer spicatum*
Striped Maple	*Acer pennsyvanicum*
Speckled alder	*Alnus incana ssp. rugosa*
Shadbush	*Amelanchier sp.*
Yellow birch	*Betula alleghaniensis*
Black birch	*Betula lenta*
Paper birch	*Betula papyrifera*
Gray birch	*Betula populifolia*
Blue beech	*Carpinus caroliniana*
Bitternut hickory	*Carya cordiformis*
Shagbark hickory	*Carya ovata*
Alternate-leaved dogwood	*Cornus alterniflora*
Beaked hazelnut	*Corylus cornuta ssp. cornuta*
American beech	*Fagus grandifolia*
White ash	*Fraxinus americanus*
Black ash	*Fraxinus nigra*
Winterberry holly	*Ilex verticillata*
Northern spicebush	*Lindera benzoin*
Hop hornbeam	*Ostrya virginiana*
Red spruce	*Picea rubens*
White pine	*Pinus strobus*
Big tooth aspen	*Populus grandidentata*
Quaking aspen	*Populus tremuloides*
Pin cherry	*Prunus pensylvanica*
Black cherry	*Prunus serotina*
Red oak	*Quercus rubra*
Black oak	*Quercus velutina*
Pussy willow	*Salix discolor*
Red elderberry	*Sambucus racemosa*
Basswood	*Tilia americana*
Eastern hemlock	*Tsuga canadense*
Smooth arrowwood	*Viburnum dentatum*

Woody Plants

Japanese barberry*	*Berberis thunbergii*
Asiatic bittersweet*	*Celastrus orbiculatus*
Partridgeberry	*Mitchella repens*
Virginia creeper	*Parthenocissus quinquefolia*
European buckthorn*	*Rhamnus cathartica*
Multiflora rose*	*Rosa multiflora*
Black raspberry	*Rubus occidentalis*
Purple-flowering raspberry	*Rubus odoratus*
Dwarf raspberry	*Rubus pubescens*
Poison ivy	*Toxicodendron radicans*
Meadowsweet	*Spiraea alba var. latifolia*
Steeplebush	*Spiraea tomentosa*
Lowbush blueberry	*Vaccinium angustifolium*
Maple leaf viburnum	*Viburnum acerifolium*
Summer grape	*Vitis aestivalis*

** Non-native invasive*

Ferns, Clubmosses and Horsetails

Walking fern	*Asplenium rhizophyllum*
Maidenhair spleenwort	*Asplenium trichomanes*
Northern lady fern	*Athyrium angustum*
Dissected grapefern	*Botrychium dissectum*
Rattlesnake fern	*Botrychium virginianum*
Northern maidenhair	*Adiantum pedatum*
Bulblet fragile fern	*Cystopteris bulbifera*
Fragile fern	*Cystopteris fragilis*
Prickly tree-clubmoss	*Dendrolycopodium dendroideum*
Flat-branched tree-clubmoss	*Dendrolycopodium obscurum*
Hay-scented fern	*Dennstaedtia punctilobula*
Silvery glade fern	*Deparia acrostichoides*
Crested wood fern	*Dryopteris cristata*
Intermediate wood fern	*Dryopteris intermedia*
Marginal wood fern	*Dryopteris marginalis*
Goldie's fern	*Dryopteris goldiana*
Mountain wood fern	*Dryopteris campyloptera*

Narrow-leaved spleenwort	*Diplazium pycnocarpon*
Ostrich fern	*Matteuccia struthiopteris*
Sensitive fern	*Onoclea sensibilis*
Cinnamon fern	*Osmunda cinnamomea*
Interrupted fern	*Osmunda claytoniana*
Royal fern	*Osmunda regalis*
New York fern	*Parathelypteris noveboracensis*
Long beech fern	*Phegopteris connectilis*
Broad beech fern	*Phegopteris hexagonoptera*
Rock polypody	*Polypodium virginianum*
Christmas fern	*Polystichum acrostichoides*
Bracken fern	*Pteridium aquilinum*
Shining club moss	*Huperzia lucidula*
Marsh fern	*Thelypteris palustris*
Field horsetail	*Equisetum arvense*
Wood horsetail	*Equisetum sylvaticum*
Dwarf scouring rush	*Equisetum scirpoides*

Grasses and Sedges

White bear sedge (S3)	*Carex albursina*
Fibrous-rooted sedge	*Carex communis*
Star sedge	*Carex echinata*
Yellow sedge	*Carex flava*
Graceful sedge	*Carex gracillima*
Nodding sedge	*Carex gynandra*
Fen sedge	*Carex interior*
Greater bladder sedge	*Carex intumescens*
Nerveless woodland sedge	*Carex leptonervia*
Hop sedge	*Carex lupulina*
Long-stalked sedge	*Carex pedunculata*
Pennsylvania sedge	*Carex pennsylvanica*
Plantain-leaved sedge	*Carex plantaginea*
Broad-leaved sedge	*Carex platyphylla*
Leek-colored sedge	*Carex prasina*
Necklace sedge	*Carex projecta*
Eastern rough sedge	*Carex scabrata*
Awl-fruited sedge	*Carex stipata*
Fox sedge	*Carex vulpinnoidea*
Common oatgrass	*Danthonia spicata*
Three-way sedge	*Dulichium arundinaceum*
Tawny cottongrass	*Eriophorum virginicum*
Bottlebrush grass	*Elymus hystrix*
Grass rush	*Juncus marginatus*
Path rush	*Juncus tenuis*
Roughleaf ricegrass	*Oryzopsis asperifolia*
American burr reed	*Sparganium americanum*

Herbaceous Flowering Plants

White baneberry	*Actaea pachypoda*
Red baneberry	*Actaea rubra*
White snakeroot	*Ageratina altissima*
Roadside agrimony	*Agrimonia striata*
Ramps, wild leek	*Allium tricoccum*
Common ragweed	*Ambrosia artemisiifolia*
American hog-peanut	*Amphicarpaea bracteata*
Tall anemone	*Anemone virginiana*
Columbine	*Aquilegia canadensis*
Wild sarsaparilla	*Aralia nudicaulis*
Jack-in-the-pulpit	*Arisaema triphyllum*
Wild ginger	*Asarum canadense*
Two-leaved toothwort	*Cardamine diphylla*
Carolina spring beauty	*Claytonia caroliniana*
Blue cohosh	*Caulophyllum thalictroides*
Spotted pipsissiwa	*Chimaphila maculata*
Golden saxifrage	*Chrysosplenium americanum*
Virginia virgin's bower	*Clematis virginiana*
Squirrelcorn	*Dicentra canadensis*
Dutchman's britches	*Dicentra cucullaria*
Round-leaved sundew	*Drosera rotundifolia*
Beech drops	*Epifagus virginiana*
Broad-leaved helleborine	*Epipactis helleborine*
Boneset	*Eupatorium perfoliatum*
Large-leaved aster	*Eurybia macrophylla*
Grass-leaved goldenrod	*Euthamia graminifolia*
Spotted Joe-Pye weed	*Eutrochium maculatum*
White wood aster	*Eurybia divaricata*
Showy orchis	*Galearis spectabilis*
Licorice bedstraw	*Galium circaezans*
Fragrant bedstraw	*Galium triflorum*
Herb Robert	*Geranium robertianum*
Checkered rattlesnake plantain	*Goodyera tesselata*
American water pennywort	*Hydrocotyle americana*

Jewelweed	*Impatiens capensis*
Pale Jewellweed	*Impatiens pallida*
Canada wood nettle	*Laportea canadensis*
Indian tobacco	*Lobelia inflata*
Canada mayflower	*Maianthemum canadense*
Solomon's plume	*Maianthemum racemosum*
Swamp saxifrage	*Micranthes pensylvanica*
Allegheny monkey flower	*Mimulus ringens*
Early saxifrage	*Micranthes virginiensis*
Miterwort	*Mitella diphylla*
Ghost pipe	*Monotropa uniflora*
Whorled wood aster	*Oclemena acuminata*
Sweet cicely	*Osmorhiza claytonii*
Dwarf ginseng	*Panax trifolius*
Grass-of-parnassus	*Parnassia glauca*
Water smartweed	*Persicaria amphibia*
Canada clearweed	*Pilea pumila*
Solomon's seal	*Polygonatum pubescens*
Kidney leaf crowfoot	*Ranunculus abortivus*
Hooked crowfoot	*Ranunculus recurvatus*
Dwarf raspberry	*Rubus pubescens*
Blue-stemmed goldenrod	*Solidago caesia*
Tall goldenrod	*Solidago altissima*
Silverrod	*Solidago bicolor*
Canada goldenrod	*Solidago canadensis*
Zig-zag goldenrod	*Solidago flexicaulis*
Smooth goldenrod	*Solidago gigantea*
Large-leaved goldenrod	*Solidago macrophylla*
Rough goldenrod	*Solidago rugosa*
Heart-leaved aster	*Symphyotrichum cordifolium*
Calico aster	*Symphyotrichum lateriflorum*
Purple-stemmed aster	*Symphyotrichum puniceum*
Foamflower	*Tiarella cordifolia*
Red trillium	*Trillium erectum*
Broad-leaved cattail	*Typha latifolia*
Wild oats	*Uvularia sessilifolia*
Sweet white violet	*Viola blanda*
Canada white violet	*Viola canadensis*
Blue marsh violet	*Viola cucullata*
Yellow forest violet	*Viola pubescens*
Long-spurred violet	*Viola rostrata*
Round-leaved violet	*Viola rotundifolia*

APPENDIX 2:
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APPENDIX 3:
GLOSSARY

Many of the definitions in the glossary were adapted, with kind permission of the authors, from Thompson, Sorenson, Zaino, *Wetland, Woodland, Wildland: a guide to the natural communities of Vermont, 2nd edition (2019).*

biological diversity (biodiversity): The complexity of life at all levels of organization, including genetic variability within species, species interactions, ecological processes, and the distribution of species and natural communities across the landscape.

ecosystem: A general term describing an interactive community of organisms and their environment. An ecosystem can occur at many different levels—from an individual rotting log to a large region like a hardwood forest. Natural communities are ecosystems.

fen: A peat-accumulating open wetland that gets minerals from groundwater that is weakly acidic to slightly basic. Fens are dominated by sedges and mosses.

kame: A mound or ridge primarily of sand or gravel deposited at or near the edge of glacier.

large patch community: A natural community type that occurs on a scale of 50 to 1,000acres, usually associated with a single dominant ecological process or environmental condition such as fire or hydrology.

marsh: A wetland dominated by herbaceous plants.

matrix community: A natural community type that is dominant in the landscape, occupying 1,000 to 100,00 contiguous acres.

mesic: Having a moderate amount of moisture—neither excessively wet nor excessively dry.

natural community: An interacting assemblage of organisms, their physical environment, and the natural processes that affect them. A natural community refers to an actual occurrence on the ground.

natural community type: An assemblage of plants and animals that is found recurring across the landscape under similar environmental conditions where natural processes, rather than human disturbances, prevail. A natural community type is a composite description summarizing the characteristics of all known examples of that type.

old forest: A biologically mature forest in which human disturbance has been limited to small-scale windthrow events or natural death of trees.

outcrop: A portion of bedrock that is exposed and protruding through the soil layer.

small patch community: A natural community that occurs in the landscape as small discreet areas typically less than 50 acres, and for some types, consistently under an acre in size.

Small patch communities occur where several ecological processes and environmental conditions come together in a very precise way.

succession: The natural changes in species composition within a community over time.

swamp: A wetland dominated by woody plants, either trees or shrubs.

riparian: The transition zone between fully terrestrial and fully aquatic systems. These areas characteristically have high water tables and are subject to periodic flooding.

upland: An area of the landscape that has moist to well-drained soils or exposed bedrock and that supports plants adapted to growing in moist to well-drained soil.

vernal pool: Seasonal depressional wetlands covered by shallow water for variable periods from winter to spring, but may be completely dry for most of the summer and fall.

wetland: An area of landscape that is saturated or inundated with water for varying amounts of time during the growing season, with soils that have developed under wet conditions, and vegetation that is adapted to life in saturated soils.

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Learn more about the Guilford Conservation Commission on Guilford's town website:
https://guilfordvt.gov/boards-and-commissions/conservation-commission

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