

# **TOWN RANDOLPH, NEW HAMPSHIRE**

## **NATURAL RESOURCES INVENTORY**

August 2018



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## **ACKNOWLEDGEMENTS**

This report has involved hard work by many people in Randolph. Involvement of volunteers has greatly increased the amount of data collected on natural resource features throughout Town.

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### **Funding for this Project Provided by**

Conservation Fund of the Randolph Conservation Commission, Town of Randolph, NH

Cover Photo of Jim Town Road beaver pond system, courtesy of Watershed to Wildlife, Inc.

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## GLOSSARY

**ArcMap Software** – ArcMap is a geospatial processing computer program that is primarily used to view, edit, create, and analyze geospatial data. ArcMap allows the user to explore data within a data set, symbolize features accordingly, and create maps.

**BMP – Best Management Practices** – The term Best management practice was coined nearly 40 years ago to describe acceptable practices that can be implemented to protect water quality, air quality, and promote soil conservation. The New Hampshire Department of Environmental Services has published several BMP documents related to air quality, waste management, and water quality. They can be found online at:

([https://www.des.nh.gov/organization/commissioner/pip/publications/bmps\\_guides.htm](https://www.des.nh.gov/organization/commissioner/pip/publications/bmps_guides.htm))

**Forb** – A forb is an herbaceous flowering plant that is not a grass, sedge or rush. The term is used in biology and in vegetation ecology, especially in relation to permanent openings, grasslands, and understory.

**GIS - Geographic Information System** – GIS is a system designed to capture, store, manipulate, analyze, manage, and present spatial or geographic data. ArcMap software, described previously, is one type of GIS software.

**GPS – Global Positional System** – Global Positioning System is a constellation of approximately 30 well-spaced satellites that orbit the Earth and make it possible for people with ground receivers to pinpoint their geographic location. The location of accuracy is anywhere from 100 to 10 meters for most equipment. See **PDOP** below for additional information on accuracy.

**GRANIT – Geographically Referenced Analysis and Information Transfer System** – New Hampshire GRANIT is a cooperative project to create, maintain, and make available a statewide geographic data base serving the information needs of state, regional, and professionals. It is a collaborative effort between the University of New Hampshire, and the New Hampshire Office of Strategic Initiatives, and is housed at the University of New Hampshire Institute for the Study of Earth, Oceans, and Space in Durham, NH.

**HUC – Hydrologic Unit Codes** – A watershed is defined as the geographic area within the boundary of a drainage divide. The HUC is a sequence of numbers or letters that identify a hydrological feature like a river, lake or drainage basin. The higher the HUC number, the smaller the sub-watershed area.

**Hydrophytic vegetation** – Wetland plants or hydrophytic (water loving) vegetation, are those plants which have adapted to growing in the low-oxygen conditions associated with prolonged saturation or flooding. Plant species vary in their tolerance of wetland conditions. For example,

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cattails require very wet conditions, whereas red maple trees can survive in a wider range of wet conditions.

**NH NHB – New Hampshire Natural Heritage Bureau** – The New Hampshire Natural Heritage Bureau finds, tracks, and facilitates the protection of New Hampshire’s rare plants and exemplary natural communities (types of forests, wetlands, grasslands, etc.). It is a bureau within the Division of Forests and Lands. The Bureau works with landowners and land managers to help them protect the State’s natural heritage while meeting their land-use needs.

**NH State Plane Coordinates, NAD83** – The standard geographic information system required data standards are referenced to the New Hampshire State Plane Feet, North American Datum 1983 (NAD83). Using a standard mapping reference coordinate system allows multiple mapping layers (topographic maps, wetlands, dense softwood, aquifers, rivers and streams, etc) to easily overlay in the same mapping space.

**NRCS – Natural Resource Conservation Service** – Formerly known as the Soil Conservation Service, the NRCS is an agency of the United States Department of Agriculture that provides technical assistance to farmers, and other private landowners and managers. The NRCS has detailed data on soils throughout the country.

**NRI – Natural Resource Inventory** – A Natural resource inventory identifies and describes natural resources in a given locale (municipality, watershed area, property). Examples of natural resources are soils, wetlands, forest habitats, water, plants and wildlife.

**NWI – National Wetlands Inventory** – The National Wetlands Inventory was established by the United States Fish and Wildlife Service to conduct a nationwide inventory of US wetlands. This inventory provides biologists and others with information on the distribution and type of wetlands to aid in conservation efforts.

**Palustrine Wetlands** –Palustrine wetlands includes all nontidal wetlands dominated by trees, shrubs, low growing herbaceous plants, mosses and/or lichens. This group of wetlands are also called marshes, swamps, bogs, fens, and small ponds.

**PDOP – Position Dilution of Precision** – Positional or geometric dilution of precision is a term used in satellite navigation and geomatics engineering to specify the additional multiplicative effect of navigation satellite geometry on positional measurement precision. As the PDOP value increases, both the horizontal and vertical precision (guidance accuracy) of data points decreases.

**Permanent Openings** – Permanent openings – also called permanent wildlife openings - are dominated by grasses, forbs (see definition above), wild flowers, brambles and some shrubs. They are valuable for many wildlife species in a landscape dominated by forested areas.

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**PCS – Potential Contamination Source** – Potential sources of contamination are those facilities, sites, and activities that have the potential to affect the underlying ground water aquifers or nearby surface waters used for public drinking water supply.

**RCC - Randolph Conservation Commission** – New Hampshire rule: Chapter 36-A, Section 36-A:2 states that a city or town may establish a conservation commission for the proper utilization and protection of natural resources and for the protection of watershed resources. The Conservation Commission is responsible for this natural resource inventory, two wetland studies, water quality testing, education, and several other projects in Town.

**RCF – Randolph Community Forest** – The Randolph Community Forest is a 10,000+ -acre tract of wooded lands owned and managed by the Town of Randolph. It is located in the northern-third of Town. The Randolph Forest Commission manages the Community Forest and maintains a website ([randolphforest.org](http://randolphforest.org)).

**Transmissivity** – Transmissivity is the rate at which groundwater flows horizontally through an aquifer.

**WAP – Wildlife Action Plan** – The New Hampshire Wildlife Action Plan is created by the Fish and Game Department and several contributing partners. It provides a base tool for restoring and maintaining critical habitats and populations of the state’s species of concern and their habitat.

**WMNF – White Mountain National Forest** – The White Mountain National Forest is conserved land owned by the United States Forest Service. It is in eastern New Hampshire and western Maine ranges from mountainous hardwood forests to alpine peaks. Over 16,245 acres (53.9%) of Randolph is part of the WMNF.

## **EXECUTIVE SUMMARY**

The Town of Randolph is committed to protecting and sustaining its quality of diverse natural resources. One of the goals of this project is to provide a natural resource inventory (NRI), as required in New Hampshire State Laws, with recommendations for future studies and management of natural resources throughout Town. Another goal of the project is to integrate all existing data for Randolph with new data created from this project, including wetlands, dense softwood stands, and permanent openings. This produces a seamless overlay of natural resources and can be used as an educational and planning tool.

This project has compiled natural resource data into a digital database in Geographic Information System (GIS) format and produced a written report for use in the Town of Randolph. It contains a database with a comprehensive, updatable, digital inventory of the entire Town. The data from this project is compatible for integration with the existing Town GIS mapping software. Efforts from this project will aid in future work and inventories, as well as provide data to guide future development decisions in Randolph.

Based on results from this study, Elise Lawson and the Randolph Conservation Commission (RCC) offer the following recommendations:

1. **Continued Wetland Conservation** – The Randolph Conservation Commission recognizes the importance of wetland protection and has undertaken two wetland studies in Town: one in 2012 and one in 2017. These studies identified, assessed and ranked wetlands throughout Israel’s and Moose River watershed areas, focusing on non-conserved lands. It is hoped that the Town will continue to pursue ways to further conserve the functionality and protect the vulnerability of these wetlands. The wetland studies can be updated and strengthened over time. The Town of Randolph can continue to work with willing landowners to conserve some of these valuable wetland resources.
2. **Surface Water Protection** - Many of Randolph’s residents obtain drinking water from private drilled or dug wells. Maintaining good water quality is one of the highest priorities for the Randolph Conservation Commission. Fortunately, water quality in these streams and rivers is in excellent condition. Water quality should continue to be addressed not only in the largest two rivers, but also in the headwater streams and brooks that feed into these rivers coming out of the Randolph Community Forest and the White Mountain National Forest.
3. **Aquifer Protection** - Based on the locations and relatively small size of the underlying aquifers in Randolph, it is important to protect the quality of groundwater, brooks, streams, and aquifers in Town. Future water supplies are a very valuable natural resource, for Randolph and the abutting municipalities - proven by the drinking water systems already in use.
4. **Hillside and Viewshed Protection** - Randolph’s mountainous topography is directly related to the Town’s tourism industry, scenic beauty, and assortment of natural resources (wetlands, streams and rivers, wildlife, plants, soils, etc.). Research and considerations should be made towards evaluating and possibly updating the zoning ordinance in

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Randolph to conserve viewsheds as an important feature and tourist attraction to the area, while continuing to consider landowner rights.

5. **Dense Softwood Stand Protection** - Based on results from this project, there are a few areas with adequate acreage of dense softwood stands scattered throughout Town. These areas are important wintering areas beneficial for many wildlife species. This has been addressed in the Randolph Community Forest Stewardship Plans, but further town-wide consideration is recommended.
6. **Interagency Cooperation** - It is recommended that Randolph continue to work with neighboring towns, organizations, and State and Federal agencies throughout the region to share future data as it becomes available. This will avoid an all too common problem of separate entities replicating work. Natural resource features do not end at Town boundaries. A watershed approach to conserving them is recommended. All the surrounding towns have completed or are in the process of completing Natural Resource Inventories, and all the data between the towns and Randolph should be compatible in GIS format.

Long-term uses of this project could include, but are not limited to:

- Assist the Town and others in determining “least-impact” sites for future development
- Refine future Master Plan updates based on natural resource features
- Promote protection plans for water quality, wetlands, and aquifers under portions of the Town
- Continue to identify of land for purchase or easements for protection into the future

Furthermore, Randolph should consider requesting that all future development plans be delivered in digital format, which would build upon the existing database and assist in updating tax maps for assessment at little cost to the Town.

## **INTRODUCTION, HISTORY, AND OBJECTIVES**

The Town of Randolph, New Hampshire contains approximately 47.1 square miles (30,142.3 acres) of mostly forested land, with 84.5 acres of ponds and open water. The Town's geography is generally mountainous. The south side of the town includes the northern slopes of the Presidentials. The north side of the town includes four main mountains: Mount Crescent, Black Crescent Mountain, Mount Randolph, and Pond Hill. The highest point in Randolph is in the town's southern border, a 3,950-foot knob on Howker Ridge, a spur of Mount Madison. Out of 47.1 square miles of land, approximately 40.1 square miles are conserved lands – 85%.

The land within the Town of Randolph has a long and rich history based on natural resources, dating back to use by Native Americans living in the White Mountain region. The eastern part of Randolph contains the largest Paleoindian site in New England to date at approximately 3 acres. The site dates from about 12,500 to 11,000 years ago and has been studied by Dr. Richard Boisvert, New Hampshire's State Archeologist. The latest field school studies were done onsite in 2008.

Randolph was incorporated in 1824, after being originally granted as "Durand" in 1772. In the charter of 1772, this territory was granted to John Durand, his son John, and Edward Parry, Thomas Brown, and Charles Henzell. The town was named Durand, for John Durand, who was a member of the London Board of Trade and an associate of Governor John Wentworth. In 1824, Governor Levi Woodbury renamed it Randolph, in honor of his friend John Randolph of Virginia. Randolph was a long-time member of the House of Representatives, an advocate of states' rights, and a descendant of Pocahontas (Town of Randolph, 2016).

In each master plan survey of residents, overwhelmingly, respondents stated that they want the Town to preserve its rural character and favor conservation of its woodlands. One of the largest conservation efforts was the purchase of land in Randolph and Jefferson and the subsequent formation of the Randolph Community Forest. The commitment and cooperation between town, state, federal and non-profit agencies made this happen, driven by Randolph residents. The Randolph Community Forest was officially established in 2001, but it continues to grow as private landowners donate parcels to the forest.

This project provides a Natural Resource Inventory (NRI) with the addition of data to the existing Randolph Geographic Information System (GIS) database that can integrate other studies and future data. For example, newly digitized data from this project, such as permanent wildlife openings and dense softwood cover, is projected in NH State Plane Coordinates, NAD 83 and compatible with existing GRANIT Randolph GIS data.

One of the goals of this project is to provide an inventory, management recommendations, and further planning tools for the Town of Randolph. This produces overlays of natural resources over the comprehensive Town-wide composite and provides an educational and planning tool. It promotes conservation of riparian habitat, wetlands, and unique co-existing natural resource features throughout the Town.

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The Town of Randolph as it was 122 years ago on this 1896 Historic USGS topographic map.

Measurable objectives of this project include the following:

1. Provide the Town of Randolph with new, accurate, standardized coverages that can be integrated into the existing GIS database.
2. Incorporate natural resources, scenic vistas, cultural/historical resources, and other related elements for comprehensive planning.
3. Create a document that can be incorporated into future updates of Randolph's Master Plan.

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4. Increase awareness of the values of the characteristics of Randolph including scenic view areas, recreation areas, riparian buffer habitat, and wetlands with associated wildlife habitat through a public presentation and discussion.
5. Provide the Town with the ability to continue to build upon and update the natural resources digital database.



Overview of Randolph, NH

## METHODOLOGY

Roberta Arbree and Bruce Kirmmse of the Randolph Conservation Commission were the main contacts for consultant, Elise Lawson. This town-wide Natural Resource Inventory uses a combination of existing mapping data and previous field work to complete an overall base NRI for Randolph, NH.

### ***Field Work***

No field work was done solely for this NRI. However, information and data gathered from previous studies including two wetlands studies and work on the Randolph Community Forest was used for this project. Members of the Randolph Conservation Commission, also generated and gathered data on natural and cultural resources over many years.

### ***Gather Existing Digital Data***

Existing maps and data for the Town of Randolph were collected. The following table shows which maps were obtained, their scale, and the national mapping standard accuracy measure. Since many decisions are based on parcels as they relate to rivers, roads, trails, ponds, wetlands and other features, it is important to point out the working accuracies of these data sources. Combining these sources in various overlays provides an excellent overview and planning tool but does not replace the need to perform site-specific investigations for many

subdivision requests. Please refer to the following table to better understand some of these accuracy issues.

### **Accuracies of Existing Maps**

<b>Data</b>	<b>Source</b>	<b>Ratio</b>	<b>Scale</b>	<b>National Mapping Standard Accuracy</b>
2009 Aerial Photographs	GRANIT - .sid version	1:5,000	1" = 416.7'	Acceptable accuracy within 12.48 feet
Topographic Maps	GRANIT	1:24,000	1" = 2,000'	Acceptable accuracy within 60 feet
Roads and Trails, Power Lines, Watershed Boundaries, Hydrology, and Conservation Lands	GRANIT	1:24,000	1" = 2,000'	Acceptable accuracy within 60 feet
Soils	Natural Resource Conservation Service (NRCS)	1:20,000	1" = 1,667'	Acceptable accuracy within 50 feet
Aquifers	USGS & NH –Dept. of Environ. Services	1:24,000	1" = 2,000'	Acceptable accuracy within 60 feet
National Wetland Inventory	U.S. Fish and Wildlife Service	1:24,000	1" = 2,000'	Acceptable accuracy within 60 feet
GPS Points	Garmin GPSMAP 76CSx	N/A	N/A	Generally, within 30' but dependent upon satellite availability, PDOP, refraction, and topology.

### ***Compile Existing Data into Arcview and ArcGIS***

GIS analyses were conducted by Elise Lawson. Digital data were gathered from the Town of Randolph, GRANIT, Natural Resource Conservation Service (NRCS), the US Fish and Wildlife Service, and the NH Natural Heritage Bureau. These data include the following:

1. Aerial photography – Also called DOQs (Digital Orthophoto Quadrangle)
2. Topographic maps – Also called DRG (Digital Raster Graphic)
3. Hydrology (rivers, streams, lakes and ponds)
4. Roads and trails
5. Power lines and rail roads
6. Conservation lands
7. National Wetlands Inventory
8. Soil Information

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### 9. Aquifers and Subwatersheds

### 10. Documented Rare or Endangered Plant and/or animal species

Existing available maps were then integrated using ArcMAP software. Using 2009 aerial photography, topographic maps, and soil map features were digitized and overlaid onto a base map. These include: permanent wildlife openings, dense softwood stands, and wetlands. Potentially significant wildlife habitat areas were noted.

**Wetlands** – Wetlands were reviewed and analyzed using the aerial photos, National Wetland Inventory (NWI), Natural Resource Conservation Service (NRCS) soils maps (displaying hydric soil map units), and fieldwork from wetland studies in the Israel’s River and Moose River/Moose Brook watersheds. New Hampshire state laws require that three parameters be met for classification as a jurisdictional wetland: the presence of hydric soil (very poorly and poorly drained soils); sufficient hydrology; and hydrophytic<sup>1</sup> vegetation. When soils maps alone are used, they could potentially over-estimate the number of wetlands throughout the Town. This is particularly true given that up to 35% of a soil classification can be inclusions (for example, upland areas within NRCS hydric soil units or wetland areas within NRCS upland units). On the other hand, examining the NWI data alone would under-represent the number of wetlands, due to the U.S. Fish and Wildlife Service’s method of using aerial photography to identify wetlands. Open water, emergent, and scrub-shrub wetlands can readily be identified using aerial photography alone, but forested wetlands are often missed. Some types of wetland delineations require extensive fieldwork beyond the scope of this project. Despite differences and potential errors, data provided from these sources are important tools, and can be built-upon in future studies.

**Farmland Soils** – Prime farmland, farmland of statewide importance, and farmland of local importance throughout Randolph were determined using the NRCS soils map data. Data were displayed in ArcView and queried so only those soils classified as important farmland were displayed in the Town. Because NRCS did not map soils throughout much of the White Mountain National Forest, the percentages of area statistics are used for only those sections of town mapped. For instance, Randolph is 30,142.3 acres total. Of that the NRCS has mapped 20,153.9 acres, leaving 9,988.4 acres not mapped by the NRCS. For all NRCS soils data, percentage of town area is not based on the entire town, but on the portion of town where soils were mapped.

Land utilized for pasture, forestry, recreation, or land uses other than urban, built or disturbed areas can still qualify as prime farmland, farmland of statewide importance, or farmland of local importance. The rationale for this approach is that land not already committed to irreversible (urban) uses is still available for cropping. Three categories of important farmlands have been described by the NRCS and they are:

1. Prime Farmland Soils as defined by the U.S. Department of Agriculture is the land that is best suited for food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban and built-up land or water

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<sup>1</sup> Hydrophytic vegetation are plants that grow in water or on a substrate that is at least partially deficient in oxygen because of excess water. They are a variety of plants that grow in different wetland types.

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areas. The soil qualities, growing season, and moisture supply are those needed for a well-managed soil to produce a sustained yield of crops in an economic manner. These soils are generally flat and relatively free of stones.

2. Farmland soils of statewide importance are lands, in addition to prime farmland, that are of statewide importance for the production of food, fiber, forage and oilseed crops. Criteria used to define this agricultural land were determined by State and local agencies in New Hampshire. The soils on the list are important to agriculture in New Hampshire, yet they exhibit some properties that exclude them from prime farmland. These soils can be farmed satisfactorily by greater inputs of fertilizer, soils amendments and erosion control practices than those necessary for prime agricultural farmland. They produce fair to good crop yields when managed properly.
3. Farmland of local importance is land, in addition to prime and statewide farmland, that is of local importance for the production of food, fiber, forage and oilseed crops. The criteria used to define this farmland were determined by local agencies in Coos County.

Permanent openings (areas dominated by grasses, forbs, brambles, or shrubs) were digitized from the aerial photographs. The regions digitized include only those openings managed as permanent opening habitat. They do not include clear-cuts where the intent is for timber harvesting and regeneration for future logging. Dense softwood (or conifer) cover areas were also digitized from the aerial photographs. These areas have been recognized as significant wildlife habitat and could be deer and moose wintering areas.

Steep slopes were determined using the NRCS soils maps. Data was displayed in Arc View and queried so only those soils map units with 15% slope and greater were displayed in Arc View.

Maps were created at the end of this project with the features described above. All information gathered, compiled, and mapped for this report was delivered to the Town of Randolph in digital format.

### ***Public Information Presentation***

A public information meeting will be held on August 17, 2018 to explain results from the NRI. The goal of this meeting is to increase public awareness of the importance of the natural resource inventory including scenic and recreation areas, riparian habitat, dense softwood stands, wetlands, and associated wildlife habitat. In addition, work done for this project will be displayed for public viewing at the meeting. All digital information belongs to Randolph and was delivered on a memory stick with hardcopy formats where appropriate.

## **RESULTS**

### ***Rivers, Streams, and Ponds (Maps #1 to #4 at end of report)***

There are over 134 miles of perennial streams and rivers that flow through Randolph. The two largest rivers (Moose and Israel's) are near Route 2 and flow in opposite directions. The Moose River begins on the northern slopes of Mount Adams in the Presidential Range of the

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White Mountains just south of Randolph's Town Boundary. It enters Randolph south of Bowman and flows east parallel to Route 2 through Randolph for 6.58 miles. Many perennial stream tributaries enter the Moose River from the North (Randolph Community Forest) and the South (White Mountain National Forest). From its headwaters, the Moose River runs approximately 11.7 miles in a general east and then northeast direction, traversing the towns of Randolph and Gorham, before its confluence with the Androscoggin River in Gorham, NH. The River has several wetland types associated with it. Beaver activities along the river are dynamic and ongoing. Beaver enhance the diversity of wildlife habitat and make this river one of the most diverse river/wetland complex systems in Randolph.



The Moose River adjacent to an old growth forest on the Moose River Phase II conservation land.

Israel's River begins near the base of Mount Adams in the Presidential Range of the White Mountains just south of Randolph's Town Boundaries. It begins with the joining of the Mystic, Cascade and Castle Brooks, which form along the side of Mount Adams and Mount Jefferson. It enters Randolph south of Bowman and flows west parallel to Route 2. From its headwaters, the Israel's River runs approximately 24 miles in a general northwest direction, traversing the towns of Randolph, Jefferson, and Lancaster, before its confluence with the Connecticut River in Lancaster. Within the Town of Randolph, the Israel's River flows for 2.90 miles before entering Jefferson. Like the Moose River, Israel's River contains a series of beaver ponds, wetlands, and riparian habitat. Beaver use the area and help create excellent habitat throughout. Presently the water quality is very good.

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Israel's River flows towards the west. The iron frames along the banks of the river are evidence of agricultural days when the frames of cars and farm equipment were used to stabilize the river bank. This photo is taken on the Farrar Farm Tract in the Randolph Community Forest.

The table below is a list of named Rivers and Brooks within Randolph.

River/Stream Waterfalls	Length in Randolph (miles)	Direction of flow	Watershed Area in Randolph	River Confluences
Moose River (Rollo Fall)	6.58	East	Moose River/Moose Brook	Androscoggin River
Israel's River	2.90	West	Mystic/South Branch	Connecticut River
Moose Brook	1.76	Southeast	Moose River/Moose Brook	Androscoggin River
Upper Ammonoosuc River	4.56	North	Headwaters Branches Upper Ammonoosuc	Connecticut River (Starts by Pond of Safety)
Keenan Brook	2.44	North	Headwaters Branches Upper Ammonoosuc	Upper Ammonoosuc River and Connecticut River
Stag Hollow Brook	3.71	West	Israel's River at Jefferson	Israel's River and Connecticut River
Carlton Brook	2.60	South	Moose River/Moose Brook	Moose River and Androscoggin River
Cold Brook (Cold Brook Fall and Coldspur Ledges)	1.84	North	Moose River/Moose Brook	Moose River and Androscoggin River

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River/Stream Waterfalls	Length in Randolph (miles)	Direction of flow	Watershed Area in Randolph	River Confluences
Snyder Brook (Gordon Fall, Upper and Lower Salroc Falls, and Tama Falls)	1.89	North	Moose River/Moose Brook	Moose River and Androscoggin River
Bumpus Brook (Stairs Fall and Hitchcock Fall)	2.21	North	Moose River/Moose Brook	Moose River and Androscoggin River
Townline Brook (Triple Falls)	0.86	North	Moose River/Moose Brook	Moose River and Androscoggin River

Pond of Safety is the largest pond in Randolph at nearly 18 acres. It is in the WMNF, Pond of Safety Tract, and is surrounded by diverse wildlife habitat including dense softwood stands used as wintering areas, as well as forested, scrub shrub, emergent, riparian wetland areas. Durand Lake is a well-known man-made pond between Route 2 and Durand Road. It is a shallow pond with a diverse, beaver impacted wetland at the outlet and downstream.



Pond of Safety is the largest open water pond in Randolph. The pond has diverse, rich wildlife habitat, with a series of wetlands and beaver ponds adjacent to it. It is a remote recreation destination, with a recent upgrade in access to the shore. If you look closely, you see a cow, calf and bull moose along the edge of Pond of Safety. They walked along the shore as John Severance and Elise Lawson watched from kayaks.

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There are several smaller unnamed ponds found in Randolph, most of which are dependent on beaver activities. These ponds can be any size from no open water to a ponded area several acres. The size can vary year to year.



The photo on the left was taken in June 2011, and on the right, May 2012. A large storm destroyed the large beaver dam. Visiting sites such as this one over several years, tells more stories about what is happening to rivers, wetlands and habitats over time.

All rivers and water bodies offer recreational and wildlife value for Randolph, and the entire region. Swimming, kayaking, canoeing, bird-watching, hiking, skiing, fishing and hunting are all common activities in Randolph. Tourism accounts for a large portion of income for northern New Hampshire and these waterbodies are significant components. There are many unnamed small streams located throughout Randolph with high value habitat where adequate to good buffers have been retained. These areas provide high value plant and wildlife habitat and connectivity to forest, wetlands, and other habitat types.

### ***Sub-Watersheds (Map #4 at end of report)***

The ability to view the landscape from a watershed or sub-watershed perspective helps to understand drainages, flows, and associated habitat throughout the Town. Sub-watersheds do not stop at municipal boundaries; highlighting the fact that all things downstream are affected by land management upstream, particularly in the headwaters. The State of NH does not breakdown the watershed beyond the Hydrologic Unit Code (HUC) 12 level, but most towns and cities contain more than one subwatershed determined by topography and ridgelines.

Randolph contains pieces of seven sub-watersheds when broken down to the level 12 HUC listings. The largest subwatershed in Randolph is Moose River- Moose Brook subwatershed which covers south central and eastern portions of Randolph and contains 14,096 acres. It drains Moose River and Moose Brook, both of which enter the Androscoggin River in Gorham. The Headwaters Branches subwatershed is the next largest in Randolph covering 8,817 acres and is in the northern part of town. The Upper Ammonoosuc River and Keenan Brook are the main streams in this watershed and they eventually flow into the Connecticut River. The subwatersheds in Randolph are listed and described in the following table.

**Table 1: List and descriptions of watersheds in Randolph, NH**

<b>HU 12 Name - subwatershed</b>	<b>Acres in Randolph</b>	<b>HU 6 Name – larger watershed Area</b>	<b>Acres in Randolph</b>
Headwater Branches	8,817.42	Upper Connecticut River	15,605.39
Israel’s River at Jefferson	4,457.77	Upper Connecticut River	
The Mystic-South Branch	2,313.59	Upper Connecticut River	
Garland Brook	16.61	Upper Connecticut River	
Moose River-Moose Brook	14,095.85	Androscoggin River	14,536.88
Berlin Tributaries	378.40	Androscoggin River	
Upper Peabody River	62.63	Androscoggin River	

Please refer to the subwatershed map at the back of this report.

### ***Riparian Zones and Floodplains***

A riparian zone or riparian area is the interface between land and a stream or river. Riparian zones are important habitat because of their role in soil conservation, their biodiversity, and the influence they have on aquatic ecosystems. Riparian habitats occur in many forms including grassland, woodland, wetland, floodplains, or a combination of features. A floodplain is flat or nearly level land adjacent to a stream or river that experiences occasional, seasonal, or periodic flooding. Floodplains are a category of riparian zones and can support rich, diverse ecosystems. Fortunately, Randolph contains a diverse amount of riparian and flood plain areas. Although some portions of Randolph streams have been impacted by development, most areas have not, and there are a few opportunities for maintenance of adjacent riparian habitat and creation of additional buffers.



Forested flood plain between Durand Lake and the Moose River. The floodplain area has rich vegetation with many drainages channels used during times of high water and flooding.



Forested floodplain and riparian habitat adjacent to the Israel's River. This section of floodplain has several mature trees including black cherry, balsam fir, red maple and yellow birch. Photo taken in 2015 in a floodplain forest just east of the Farrar Farm Tract.

Throughout both the Israel's and Moose River watershed areas, particularly on the Farrar Farm Tract (and the parcel to the east), there are excellent examples of mature floodplain forests. All areas examined had a network of wildlife trails, along with mature black cherry, balsam fir, yellow birch, and red maple. Floodplains are home to a diversity of wildlife. The rich soils create excellent insect and amphibian breeding habitats, and these species in turn become prey for birds such as woodcock and barred owl, for mammals such as mink and raccoon, and for reptiles such as smooth green snake and wood turtle. They provide corridors that allow wildlife to move from one habitat to another. Intact riparian areas are essential for creating and maintaining a healthy aquatic system. Overhanging vegetation such as shrubs and trees provide important shade to aquatic habitats allowing them to maintain cooler water temperatures and adequate amounts of dissolved oxygen. This is particularly important for trout and other salmonid species. The root systems of the riparian vegetation are also important for reducing the amount of erosion that the constant moving water and flooding situations could potentially cause. By reducing erosion, the stream bank is more stable, and there is less sedimentation in the water flowing downstream. Riparian habitats also slow and hold floodwaters reducing shoreline damage and can work as a filtration system removing nutrients and toxins from the water, thus assisting in maintenance of water quality. Riparian vegetation can also provide habitat structure to aquatic systems through dead or broken limbs (or sometimes whole trees) that fall into the water.

Logging these forested floodplains is generally not recommended due to proximity to the rivers and wetlands. Because some areas contain mature tree species, it will also offer excellent

recreational opportunities and trails will be relatively easy to construct and maintain. If timber is harvested in these areas, it should occur during the winter months when the ground is completely frozen.



The Israel's River - photo on the left shows areas with little to no riparian buffer, and the photo on the right illustrates excellent riparian buffer on both sides.

*For all these reasons and more, conserving or expanding riparian areas and shoreland buffers is a vital part of conserving Randolph natural resources. Adherence to New Hampshire's Shoreland Protect Program will help maintain existing riparian habitat, providing wildlife travel corridors and good water quality.*

### **Wetlands and Hydric Soils (Maps #1 and #4 at end of report)**

Wetlands are an essential habitat type for most plant and animal species in New Hampshire. Wetlands are extremely diverse depending on the hydrology, soils, topography, and climate of an area. In addition to the rivers, lakes, and ponds, there are four general types of Palustrine<sup>2</sup> wetlands: marsh, swamp, bog, and fen, with additional sub-types within each of these categories. This diversity extends into each individual wetland where diverse plant and wildlife species and water regimes co-exist. In addition, the edge habitats within and around wetlands are frequently used by a great deal of wildlife species. It is estimated that riparian areas and wetlands are used by over 90% of the region's wildlife species and provide preferred habitat for over 40% of local species. For these reasons wetlands provide plentiful wildlife viewing and hunting opportunities.

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<sup>2</sup> Palustrine wetlands are a group of vegetated wetlands traditionally called marshes, swamps, bogs, fens. They also include the small, shallow, permanent or intermittent water bodies often called ponds.



The “Hidden Gem” wetland was inventoried and assessed during the 2017 wetland study throughout the Moose River Watershed area. The “Hidden Gem” had very high functional ranking and is adjacent to the Randolph Community Forest (to the North).

Along with providing important plant, wildlife, and fish habitat, wetlands are also an important protector of water sources. Because they often contain hydrophytic vegetation (plants adapted to living in water and/or wet conditions) and poorly drained soils, wetlands store significant amounts flood and/or run-off water, minimizing serious damage in times of high water. They are important contributors to groundwater recharge. This ability to retain water allows wetlands to act as a filtration source. As moving water is slowed and stored in wetlands, suspended sediments and particles settle to the mucky substrate and plant roots are given a chance to absorb excess nutrients, toxicants, pollutants, and contaminants. These functions make wetlands an important source for maintaining the health of aquatic systems.

Wetland areas are dynamic and constantly changing. The general trend without severe weather or other outside influences is for wetlands to slowly fill in over time. The process begins with open water and as time passes, submerged plants appear. Floating-leafed plants, such as water lilies, eventually follow. Then further emergent plants such as reeds, sedges, and wetland grasses begin to flourish. Shrubs such as high bush cranberry (*Viburnum trilobum*), sweet gale (*Myrica gale*), and bog rosemary (*Andromeda glaucophylla*) begin to appear and heaths such as leatherleaf (*Chamaedaphne calyculata*) and labrador tea (*Ledum groenlandicum*) surface among the shrubs. Trees such as red maple (*Acer rubrum*) and gray birch (*Betula populifolia*) subsequently emerge. This natural successional process is often referred to as lakefill.

On the other hand, there are several environmental and human-induced reasons for wetlands to increase in size. Some examples of these include:

- Human development including damming or excavation such as the mining of gravel and sand could increase wetland sizes and often create new wetlands

## Natural Resource Inventory for Randolph, NH

- Severe weather changes – an increase in rain will increase the wetland area, whereas a drought may diminish the area
- The cyclic movements of beaver as hardwood saplings regenerate in early succession. In Randolph there is abundant sign of beaver activities in most of the wetland complexes throughout Town
- Human activities such as logging and landscape alteration can dredge out wetland areas or increase the amount of runoff into wetlands



Beaver were very active when this site was visited in May 2010. The Beaver enhanced the forested area in the Randolph Community Forest - adjacent to Jim Town Road - creating a series of beaver ponds of varying sizes. A diversity of wildlife species uses the area including moose, black bear, painted turtles, woodpeckers, song birds, broad winged hawks, wood frogs, and yellow spotted salamanders.

The Randolph Conservation Commission completed two wetland studies: The Israel's River in 2012; and the Moose River in 2017 (Watershed to Wildlife, 2012 and Lawson 2017). This report builds upon those studies. A total of 60 wetlands, totaling 444.8 acres (1.5% of the land area), are mapped throughout Randolph. They range in size from less than an acre to 37.3 acres and are a variety of wetland habitats including forested, scrub shrub, emergent, and open water wetlands.

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Of the hydric soils mapped throughout Randolph<sup>3</sup>, 1,284.8 acres are classified as poorly drained and 240.3 acres are very poorly drained – with a total of 1,525.1 (7.6%) hydric soils throughout Randolph. Poorly drained soils are defined as soils where water is removed from the soil so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. In very poorly drained soils, water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Hydric soils are scattered throughout the Town with some of the larger areas listed below. Because of the mountainous topography throughout Randolph, there are relatively fewer wetlands compared with other towns with a flatter topography. The largest wetlands are found in flatter areas including the Israel's and Moose River corridors, Pond of Safety, and Stag Hollow Brook areas. These wetlands are fed by many perennial streams coming off the mountains.



Several colonies of sundews (*Drosera rotundifolia*) were found in wetlands adjacent to Israel's River. The leaves are covered with gland-tipped hairs whose secretion of sticky fluid traps insects, which are then digested by enzymes. This plant's ability to extract nutrition from insects helps it survive in nutrient-poor emergent wetlands.

***With maintaining and enhancing water quality being a priority for Randolph, working to protect and maintain all types of wetlands throughout the Town should continue to be a high priority.***

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<sup>3</sup> NRCS soils are not mapped in the White Mountain National Forest. The figures noted underrepresent the total amount of poorly and very poorly drained soils in Randolph. Therefore, percentages are based on the land area of Randolph where NRCS soils are mapped (20,153.9 acres – about 2/3 of the Town's total area), rather than the entire town area.

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Water from this large wetland complex flows into the Israel's River. When beaver lived in this wetland, the whole area was a pond.



Diverse wetland adjacent to Pond of Safety. It is a combination of Palustrine Emergent, Scrub Shrub and Forested, Perennial Stream wetland types.

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**Vernal Pools** – Unique often isolated and important wetland types are vernal pools. Vernal pools provide essential breeding habitat for certain amphibians and invertebrates such as wood frogs (*Rana sylvatica*), spring peepers (*Pseudacris crucifer*), yellow spotted salamanders (*Ambystoma maculatum*), and fairy shrimp (*Branchinecta lynchi*). These creatures depend on vernal pools as breeding sites because they are only temporary water bodies preventing fish and other aquatic predators from taking up residency. Reptiles such as painted turtles (*Chrysemys picta*) also rely on vernal pools as important feeding areas in early spring. Vernal pools fill annually from precipitation, runoff, and rising groundwater in the fall and spring. By mid-summer, however, these wetlands are typically dry, making them a dynamic system inhabitable to specifically adapted plant and wildlife species. For this reason, many unique, rare, threatened, and endangered species are linked to this wetland type. The State of New Hampshire (Fish and Game Department and Wetlands Bureau) recognizes their value as important habitat and give them special attention. Thirteen (13) vernal pools have been documented in Randolph. There has not been a specific vernal pool study in Town, but they were documented during previous field work for the Community Forest and wetland studies. Undoubtedly there are more throughout Town. Refer to the “Wetlands, Hydric Soil, and Aquifer” map at the end of the report for locations of known vernal pools throughout Randolph.



A vernal pool in the Randolph Community Forest. In May, it is used by wood frogs and yellow spotted salamanders for breeding. There are several species of insects. The pool is surrounded by forest and only a few hundred feet off Vernal Pool Road.

### ***Permanent Wildlife Openings<sup>4</sup> (Map #2 at the end of report)***

Permanent wildlife openings are dominated by grasses, forbs, wild flowers, brambles and fruiting shrubs. These include hay land, pastureland, cropland, brush-hogged fields, and mechanically maintained transmission lines. It is estimated that they provide required habitat for about 22% of New England's wildlife species and are seasonally important for nearly 70% of species. White-tailed deer, black bear, rodents, such as deer mice, meadow voles, shrews, and woodchucks, commonly feed on the vegetation present in these habitats, and carnivores from weasels to coyotes in turn feed on these species. Permanent wildlife openings are heavily used by bird species as feeding and nesting sites, specifically by the eastern bluebird, bobolink, woodcock, and northern harrier, which are species of concern in New Hampshire. They also create important edge habitat. Wherever an open area meets the forest, the area of transition will attract the largest diversity of species, both plant and animal. Generally, there will be species adapted to permanent wildlife openings, those adapted to forested habitat, and those who specialize in the transition zone area, who will frequent these edge habitats. For example, many bird species that feed in openings are known to nest within the edge habitat because there is typically more structural diversity and cover.

Though the positives of former farming landscapes far outweigh the negatives, it is often overlooked that vestigial unused fencing can be prohibitive to some wildlife travel and occasionally cause harm to wildlife. ***When possible, it is a good practice to remove non-functioning fencing, such as barb wire and woven sheep fence.***



Permanent wildlife openings like this field on the Farrar Farm Tract, is mowed yearly to maintain a field. It is adjacent to the Israel's River and a large forested flood plain with mature stand of trees.

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<sup>4</sup> Permanent wildlife openings are those that are and will continue to be maintained as herbaceous openings. They are valuable for many wildlife species in a landscape dominated by forested areas.

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Currently, Randolph has 319.3 acres maintained as permanent wildlife openings which make up 1% of the Town's area. This percentage is less than the New Hampshire's State average of 10% permanent wildlife openings. A total of 88 different openings were documented during this project ranging in size from 0.3 acres to approximately 74 acres. The largest opening is the narrow ROW used for transmission lines. Diversity in sizes is a good feature to maintain in permanent wildlife openings because varying sizes are preferred by different species. For example, northern harriers – a predatory bird or raptor - prefer larger openings while feeding, yet snowshoe hare are more likely to feed in smaller openings where cover is more readily available. There are other permanent wildlife openings throughout Randolph that are too small to be mapped into the Town's overall acreage of permanent wildlife openings, such as lawns near homes and seeded woods roads. These openings, especially those in more isolated parts of the Town, are still important habitat and help maintain Randolph's plant and wildlife diversity. ***A goal to retain, and ideally increase, permanent wildlife openings would be beneficial to the diversity of wildlife and vegetation throughout Randolph. This is currently being recommended and implemented as part of the Stewardship Plan on the Randolph Community Forest.***



This 3.5-acre field is along the Pond of Safety Road. It was created on the Randolph Community Forest for wildlife. It is mowed regularly to maintain it as a permanent opening.

### ***Forested Lands (Map #2 at the end of report)***

Most land in Randolph is forested and conserved by the White Mountain National Forest (WMNF), The Randolph Community Forest (RCF), and private conservation easements. There are several different forest types, typical for this part of northern New Hampshire including:

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- Northern hardwood
  - Sugar maple, beech, ash
- Aspen-birch
- Spruce-northern hardwood
- Pine
- Spruce-fir

The age of forests throughout Randolph is diverse, ranging from newly regenerating forest, to mature hardwood forests found both in the RCF and along the floodplain areas of the Israel's and Moose Rivers.



Left photo – Bob Potter stands next to a mature Eastern Hemlock in an old growth flood plain forest adjacent to the Moose River. Right Photo – Roberta Arbree is in the same forest stand by a mature Yellow Birch.

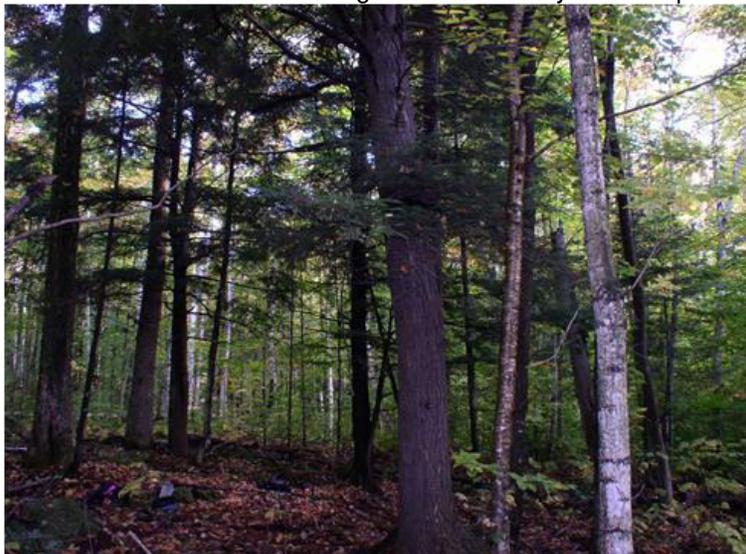
Approximately 912 acres of forested land, approximately 3.0% of Randolph are dense softwood stands, primarily eastern hemlock, balsam fir, and/or spruce. These stands range in size from 3.0 to over 93 acres. Throughout the Town, softwood stands are found in a variety of soil types ranging from the flat, very poorly drained soils such as Peacham and Pondicherry Mucks, to well-drained soils on steep or very steep hillsides (Lyman-Tunbridge and Monadnock-Herman associations). Some of these dense softwood stands are found along rivers, streams and wetland complexes offering proximity to good cover and a diversity of habitat types. Many of the softwoods stands in Randolph are isolated, but a few are connected allowing for excellent winter cover and travel corridors for wildlife. Dense softwood stands are an important habitat type to many wildlife species. They provide important cover and foraging habitat during harsh winter conditions by reducing snow accumulations and wind speeds. Therefore, animals such as red squirrels, snowshoe hare, ruffed grouse, white-tailed deer, and moose are often found

## Natural Resource Inventory for Randolph, NH

utilizing them during the winter months. White-tailed deer are not well adapted for traveling in and dealing with deep snow conditions and require dense softwood stands to survive New Hampshire's harsher winters. When they congregate in areas of dense softwoods, the stands are referred to as winter deer yards. For the stand to be considered deer yard two basic elements must be met: (1) A core area is identified by concentrations of dense softwoods, and (2) Mixed hardwood and softwoods adjacent to, or within the core area will provide accessible forage. ***Deer yards cover only about 3% of the land base in New Hampshire so their identification and management are an important part of conserving the entire State's natural resources.***



The spruce/fir forest adjacent to the "Hidden Gem" wetland in Randolph provides good cover for wildlife. This stand is excellent wintering habitat for many wildlife species.



A small softwood stand found throughout a mature hardwood stand. During field work for the first Stewardship Plan, signs of bear, deer, moose, woodpeckers, and snowshoe hare were found in this stand.

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Randolph has several species of trees that are considered important because of their mast production. These include beech, maple, hemlock, black cherry, white ash, and pine. Mast are the fruits produced by woody stemmed plants and can be either hard (seeds and nuts) or soft (fruits and berries). Wildlife species from nuthatches, chickadees, squirrels, and eastern chipmunks to white-tailed deer, black bears, turkeys, and wood ducks rely heavily on mast as a source of feed. Hard mast produced by beech and some shrubs such as beaked hazelnut, is considered extremely important because it can persist for a longer amount of time than soft mast and therefore is accessible to wildlife during times of the year when other food sources are limited.



The bear claw marks on this American Beech indicate that it is a good mast tree in the RCF (left photo). During site visits, several of these trees were found scattered throughout Randolph. On the right, Bob Potter shows how high black bear have reached to mark this red pine on his and Roberta Arbre's property.

### ***Geology (Randolph Community Forest Stewardship Plan, 2003)***

Geologic events that occurred thousands and millions of years ago still influence the management of the forest today. Parent bedrock material that was formed millions and hundreds of million years ago provide the nutrients for vegetation today and to some extent determine which species will grow where on the forest. The last glacier broke apart, transported and dumped or deposited the material in a way that has an even stronger influence in what species will grow where on the forest. The glacier also has an influence on the management options that are available today.

An era of granitic intrusions in this area occurred around five hundred million years ago. This was followed by a period of sedimentation and then plate tectonic shifts that metamorphized this material forming a rock, Olivarian granite, that would weather relatively easily and break down into soil particles. During a period one to two hundred million years ago another granitic intrusion, the White Mountain magma series occurred. This material was not metamorphized

and due to the way it formed and cooled, formed quartz particles that resist weathering and breaking down. The oldest bedrock is found in the middle and west portion of the RCF, compartments 1A&B, 2A&B, 3A. The more recent material is found near Mt. Crescent and the Pilot Range to the north. The Olivarian granite contains calcium, magnesium and phosphorus and provides these nutrients to the soil primarily on the west half of the Town. The granite formed during the White Mountain magma series breaks down and weathers into a coarser soil that does not provide as much nutrients as the soils on the west half of Town.

Fifty thousand years ago the Wisconsin stage of glaciation began. This glacier ground and transported bedrock and soil material in its path in a southeasterly direction from its origin. It also homogenized bedrock material somewhat, mixing the various materials together. It transported the rock and soil material, till, approximately 3-5 miles, 10-20 miles at most. According to a glacial drift model developed by Dr. Scott Bailey, a geologist at the Northeast Forest Experiment Station, Hubbard Brook, the ridge of high ground from Lookout Ledge to Mt. Randolph and on northward marks a divide between a higher index of calcium, 2.0-2.4, to the west, and less calcium, 1.7-2.0 to the east. This is apparently due to the calcium that is available from bedrock material.

Approximately 10,000 to 15,000 years ago the glacier began to recede. Over the area of the forest, the glacier simply dumped much of its material in place. There was not any sorting or rearrangement of soil or rock, it simply melted down to the bedrock beneath it. This is described as a fine till that contains a mix of particle sizes from rock fragments to sand and silt particles (Leak, 1978). Over much of the forest area the fine till was deposited on top of a hard-platy layer or hardpan. The hardpan is often impervious to water draining through it or tree roots growing into it. Dry compact till habitat forms a rolling, ridge-like, or convex topography. This supports the northern hardwood cover type of sugar maple, beech and yellow birch. A wet compact till that forms a flat or depressed topography is also present especially in the Stag Hollow Brook drainage. It is this area where spruce-fir type grows.

Along Stag Hollow Brook, glacial melt waters sorted soil particles into different layers according to size. This is one of two areas of outwash habitat on the forest. The other is along the upper reaches of Great Ledge Brook. This too supports a spruce-fir cover type.

The final habitat type attributed to the glacier is the washed till habitat. This was till rinsed by water causing much of the fine soil particles to be carried away by glacial melt-water. Some of this habitat is found on the lower slopes of the forest. Beech, red maple and paper birch are found on this type.

In summary, the bedrock and resultant soil formed during past geologic periods together with the transport and deposition of this material by the glacier is a strong influence on the trees, shrubs and herbaceous vegetation that grows on the forest. The most influential is the type of till or outwash that was deposited, and whether the till lies on top of a hard pan layer. Sugar maple, beech and yellow birch grow on the fine till and dry compact till soil; beech, paper birch and red maple grow on the washed till; spruce-fir grows on the outwash and wet compact till sites. These are the species best suited to these respective habitats and whose regeneration and growth will be promoted.

## **Soils**

The nature of soil has a profound effect on plant growth. Whether it is rich with organic material, very poorly drained, or sandy, these characteristics will affect the type of vegetation adapted to grow in those conditions, thus affecting the type of wildlife in the area. Scientists can learn much about the soil type by examining the vegetation. At the same time, examining the soil will predict the type of vegetation that can grow in the area. Because soils affect the vegetation that will grow in an area, they also influence the habitat types and therefore the wildlife species that will occur. As a result, understanding soil conditions and characteristics can be indicators of critical areas such as wetlands, agricultural lands, forestlands, and wildlife habitat. In descriptions of soil types, the NRCS evaluates soils according to their capacity for agriculture, woodland, community development, recreation, and wildlife habitat. Certain soils are better suited for certain land uses such as agriculture or residential development. For example, residential development should be located away from areas with unstable soil conditions such as high-water tables, and slow percolation rates, due to constraints for building foundations and septic system placement.

Several factors exert a major influence on soil development. These include climate, time, topography, parent material, biota, and human activities. Studying soil can also lead to an understanding of how that soil was formed. For example, deep, rich, organic soils found in many wetlands were formed by lack of oxygen and slow decaying of plant and animal material. Recently a cooperative effort called “Dirt to Trees to Wildlife” is a partnership with NH Granit, UNH Cooperative Extension, US Forest Service, and the Randolph Community Forest. The cooperation offers an online mapping tool for New Hampshire that identifies potential forest types leading to wildlife habitats based on characteristics of underlying soils. The RCF is a test site to further develop the program.

### ***Farmland Soils (Map #3 at the end of report)***

As true with many New England towns and cities, Randolph had several family farms in the 1800’s and early 1900s. During the mid-1900s, small family farms were caught in the struggle of adjusting to a transition to commercial dairy activities within the larger regional markets.

As stated in the methodology section, prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It is land that still has the potential to serve agricultural uses and can be cultivated land, pasture, or woodland. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well-managed soil to produce the highest sustainable yields with minimal inputs of resources while at the same time generating the least possible damage to the environment. Farmlands that hold state and local importance may not be as ideal for producing the highest possible sustainable yield as prime farmlands, but these soil types have been determined to be of agricultural importance on a more localized scale.

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The Farrar Farm Tract is now part of the Randolph Community Forest. It had been used for agriculture in the past and is adjacent to Israel's River. The fields allow for scenic views as well as benefit wildlife in a town primarily forested.

Although there is one parcel of land in Randolph used for hay production, and there are private and commercial maple sugaring operations, there are no commercial farms in Randolph (Randolph Master Plan, 2016). Out of the 20,153.9 acres of land within Randolph mapped by the NRCS, 81 acres (0.4%) of land have been classified as USDA prime farmland soils, 19 acres (0.09%) have been classified as farmland soils of statewide importance, and 1,094.9 acres (5.4%) have been classified as farmland soils of local importance. Most of the soils that make up the agricultural classification are found along Israel's and Moose River floodplain areas, along with the Randolph Hill part of Town. Very few agricultural soils are conserved. Like the White Mountains, the Randolph Community Forest was not well suited for farming, but was, and still is excellent for timber harvesting.



The soils in this wetland adjacent to Route 2 and Pinkham B Road are classified as Prime Agricultural Soils. The fields on the other side of Pinkham B Road are also Prime.

*As mentioned in the “Permanent wildlife openings” section, areas which had been used for agriculture, but are now abandoned, could be maintained as permanent opening habitat to benefit many wildlife species.*

### **Stratified-Drift Aquifers (Maps #1 and #4 at the end of report)**

An aquifer is an underground layer of water-bearing permeable rock or unconsolidated materials (gravel, sand, silt, or clay) from which groundwater can be pumped for drinking. Groundwater is a critical natural resource for the State of New Hampshire. Approximately 98% of public water systems rely on groundwater. There are three types of groundwater aquifers: stratified-drift, till, and bedrock. Stratified drift and till aquifers are composed of unconsolidated glacial deposits (loose earth materials), while bedrock aquifers are fractured rock. In stratified drift aquifers, the materials are sorted sand and gravel. In till aquifers, the material is a gravel, sand, silt and clay mixture. In bedrock aquifers, the material is rock with fractures.

Stratified-drift aquifers are an important source of groundwater for commercial, industrial, domestic, and public-water supplies in the State of New Hampshire. They typically are the most productive sources of groundwater and therefore the highest yielding public water supply wells tap these aquifers. Stratified-drift or overburden aquifers are most directly influenced by surface waters and land-use activities. They are therefore, perhaps most susceptible to contamination. Approximately 14% of land surface in the State is underlain with stratified-drift aquifers. In Randolph 766 acres (2.5%) of the land area contains an aquifer. The two largest are under the Moose and Israel’s Rivers and adjacent areas. They both extend beyond town boundaries into larger aquifer regions.

The largest aquifer in Randolph along the Moose River begins just east of Randolph Spring Wayside Area and is between Durand Road and Route 2. It extends into Gorham and runs along the Androscoggin River.



The area under Durand Lake and beyond contains the largest aquifer in Randolph (left photo). The second largest aquifer in Town is under the Israel’s River and associated wetlands (right photo).

Stratified drift aquifers consisting of sand materials, such as those in Randolph tend to be more porous and have a higher potential for quicker transmissivity and recharge. This also raises

the risk of contamination with sources that require a region approach, working with neighboring towns. *Although most people in Randolph get water from drilled or dug wells, these aquifers could be important water sources for use in the future. Whenever possible, these aquifers should be protected from contamination (impervious surfaces, point and non-point source pollution sources, development) to insure their future water quality and availability for the Town.*

## **Slope**

Slope is an important component of an area's landform and influences the plants and animals living there. Soils tend to be shallower on steeper slopes, the volume and amount of surface water runoff is higher, and the erosion potential is greater compared to flatter areas. These conditions create a unique habitat where in some cases plants and wildlife have special adaptations for dealing with the limitations associated with steep slopes.

Slopes provide opportunities for panoramic views and for this reason tend to be sought for residential development. Slope has several limitations for building, such as structural problems and a greater chance of erosion. The consequences of erosion are loss of soil resulting in sedimentation of surface waters, loss of the productive capability of the land, and in severe cases, visual scars that can be seen from far away. Slope is traditionally expressed as a percent and represents the amount of rise or fall in feet for a given horizontal distance. For example, a 15% slope means that for a 100-foot horizontal distance, the rise or fall in height is 15 feet. As slope becomes steeper the expenses associated with building increase. In general, slopes between 15% and 25% are considered areas where development would be very difficult and slopes greater than 25% are considered too steep to provide adequate sites for structures such as roads, homes, and septic systems.

NRCS soil data was used to determine areas in Randolph with slopes equal to and greater than 15%. With its proximity to the Presidential Range of the White Mountains to the south and the Pliny and Crescent Ranges to the North of Route 2, a large portion of Randolph contains steep slopes. Using NRCS data, 7,617.5 acres or 49.0% of the land in Randolph contains slopes that are over 15%. Of that, 2,276 acres or about 11.3% of Randolph's land mass contains slopes over 25%. Compared to many other NH towns, these are high percentages. Steep slope areas often provide unique habitats for plant and wildlife species. They also contribute to the Town's tourism industry, creating hiking and skiing opportunities with beautiful views.

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Many of the roads throughout the Randolph Community Forest have excellent views towards the Presidential Range to the south thanks to the rugged, mountainous terrain.



Excellent views of Randolph taken from the Presidential Range, WMNF.

## ***Rare Species and Exemplary Natural Communities***

The Town of Randolph has documented occurrences of rare species and communities. They are listed by the NH Natural Heritage Bureau (NHB), the State agency that houses all reported occurrences. It is highly likely that future studies would document additional rare species and communities.

New Hampshire is home to more than 500 species of vertebrate animals. Many of these animals live in Randolph and the surrounding towns. The number would be considerably larger if a complete list of invertebrates (insects, crustaceans, clams and snails) were included. About 75% are nongame wildlife species – not hunted, fished or trapped. Twenty-nine species are endangered and 22 are threatened in the state. The New Hampshire Fish and Game Department maintains lists of Endangered or Threatened animal species in New Hampshire, which are shown on pages 37 and 38. Minimal information is available relative to their occurrence in Randolph, but their habitats, when identified, should be protected.

A new program called “Dirt to Trees to Wildlife” is working on the RCF to help combine science from three disciplines (soil, forest types, wildlife) to help landowners, foresters and biologists enhance and restore wildlife habitats. By examining soil information, people will identify what types of vegetation will grow in a particular area. Each specific forest type provides specific habitat needs for wildlife. This allows landowners and professionals to determine the potential for forest growth and management, as well as to manage for either a diversity of wildlife species or target a specific wildlife species.

Randolph has large tracts of land that are unfragmented and conserved. These contain a diversity of habitat types and thus, Randolph has potential for containing many rare and endangered plant and wildlife species beyond those currently recorded.



This spruce grouse was seen during a montane elevation inventory on the Randolph Community Forest. Spruce grouse live in boreal and higher elevation forests in NH including Coos County and the White Mountain National Forest.



This vernal pool was documented during the montane (above 2500') inventory on the Randolph Community Forest. Although vernal pools are not rare, finding them at elevation in mountainous areas is uncommon.

The NH Fish and Game Department defines **Endangered Wildlife** as those native species whose prospects for survival in New Hampshire are in danger because of a loss or change in habitat, over-exploitation, predation, competition, disease, disturbance or contamination. Assistance is needed to ensure continued existence as a viable component of the state's wildlife community. **Threatened Wildlife** are those species which may become endangered if conditions surrounding them begin, or continue, to decline. **Wildlife species of Special Concern** are those species of wildlife that either could become Threatened in the foreseeable future or were recently delisted from the NH Endangered and Threatened species.

To learn more about threatened or endangered species or unique communities, contact the New Hampshire Natural Heritage Bureau office of NH Division of Forest and Lands for plant species 603-271-2214 website – <https://www.nhdf.org/reports/Exemplary-Natural-Communities>), or the Nongame and Endangered Species Program of the NH Fish and Game Department (603-271-2461 website – <https://wildlife.state.nh.us/nongame/endangered-list.html>).

NH Natural Heritage Bureau Listing for Randolph<sup>5</sup>



Town Flag	Species or Community Name	Listed?		# reported last 20 yrs	
		Federal	State	Town	State
<b>Randolph</b>					
<b>Natural Communities - Terrestrial</b>					
***	Hemlock - spruce - northern hardwood forest	--	--	1	17
***	High-elevation spruce - fir forest system	--	--	2	10
**	Montane - subalpine acidic cliff	--	--	1	6
**	Montane - subalpine circumneutral cliff	--	--	2	15
**	Northern hardwood - spruce - fir forest	--	--	2	12
***	Subalpine cold-air talus shrubland	--	--	1	5
<b>Natural Communities - Palustrine</b>					
**	High-gradient rocky riverbank system	--	--	1	9
<b>Plants</b>					
	Auricled Twayblade ( <i>Neottia auriculata</i> )	--	E	Historical	8
***	Broad-leaved Twayblade ( <i>Neottia convallarioides</i> )	--	T	1	23
*	dwarf birch ( <i>Betula minor</i> )	--	T	1	12
	dwarf blueberry ( <i>Vaccinium cespitosum</i> )	--	T	Historical	16
**	fragrant wood fern ( <i>Dryopteris fragrans</i> )	--	T	1	15
	green adder's-mouth ( <i>Malaxis unifolia</i> )	--	T	Historical	56
	Heart-leaved Twayblade ( <i>Neottia cordata</i> )	--	T	Historical	23
**	Homemann's willow-herb ( <i>Epilobium homemannii</i> )	--	T	1	14
	Mountain Firmoss ( <i>Huperzia appressa</i> )	--	E	Historical	14
**	mountain sweet-cicely ( <i>Osmorhiza berteroi</i> )	--	E	2	22
	northern arrowhead ( <i>Sagittaria cuneata</i> )	--	E	Historical	12
	ovoid spikesedge ( <i>Eleocharis ovata</i> )	--	E	Historical	12
	parasol sedge ( <i>Carex umbellata</i> )	--	E	Historical	12
	Philadelphia panicgrass ( <i>Panicum philadelphicum</i> )	--	E	Historical	8
	round-leaved orchid ( <i>Amerorchis rotundifolia</i> )	--	E	Historical	1
	spiked wood rush ( <i>Luzula spicata</i> )	--	E	Historical	8
	wavy blue grass ( <i>Poa laxa</i> ssp. <i>femaldiana</i> )	--	E	Historical	7
<b>Vertebrates - Mammals</b>					
**	American Marten ( <i>Martes americana</i> )	--	T	2	144
<b>Invertebrates - Butterflies &amp; Moths</b>					
	A Noctuid Moth ( <i>Xestia homogena</i> )	--	--	Historical	2
	A Noctuid Moth ( <i>Xestia speciosa</i> )	--	--	Historical	1
	Boomerang Dart Moth ( <i>Xestia perquiritata</i> )	--	--	Historical	3

Listed? E = Endangered T = Threatened W = Species of concern (watch list) M = Monitored

Flags \*\*\*\* = Highest importance  
 \*\*\* = Extremely high importance  
 \*\* = Very high importance  
 \* = High importance

(These flags are based on a combination of (1) how rare the species or community is and (2) how large or healthy its examples are in that Town. Please contact the Natural Heritage Bureau (603) 271-2214 to learn more about approaches to setting priorities.)

<sup>5</sup> In addition to the species listed, Canada Lynx have been identified in Randolph but are not listed here.

**Endangered and Threatened Wildlife in New Hampshire  
(list effective on March 24, 2017)**

**ENDANGERED**

<b>Common Name</b>	<b>Scientific Name</b>
<b>MAMMALS</b>	
Canada lynx*	<i>Lynx canadensis</i>
Gray wolf**	<i>Canis lupus</i>
New England cottontail	<i>Sylvilagus transitionalis</i>
Little brown bat	<i>Myotis lucifugus</i>
Northern long-eared bat	<i>Myotis septentrionalis</i>
Small-footed bat	<i>Myotis leibii</i>
<b>BIRDS</b>	
Northern harrier	<i>Circus cyaneus</i>
Golden eagle	<i>Aquila chrysaetos</i>
Common nighthawk	<i>Chordeiles minor</i>
Piping plover*	<i>Charadrius melodus</i>
Upland sandpiper	<i>Bartramia longicauda</i>
Roseate tern**	<i>Sterna dougallii</i>
Least tern	<i>Sterna antillarum</i>
<b>FISH</b>	
American brook lamprey	<i>Lampetra bifrenatus</i>
Shortnose sturgeon**	<i>Acipenser brevirostrum</i>
<b>REPTILES</b>	
Blanding's turtle	<i>Emydoidea blandingii</i>
Eastern hognose snake	<i>Heterodon platirhinos</i>
Timber rattlesnake	<i>Crotalus horridus</i>
Eastern box turtle	<i>Terrapene carolina</i>
<b>AMPHIBIANS</b>	
Marbled salamander	<i>Ambystoma opacum</i>
<b>INVERTEBRATES</b>	
Dwarf wedge mussel	<i>Alasmidonta heterodon</i>
Brook floater	<i>Alasmidonta varicose</i>
Frosted elfin butterfly	<i>Incisalia irus</i>
Karner blue butterfly*	<i>Lycaeides Melissa samuelis</i>
Persius dusky wing skipper	<i>Erynnis persius persius</i>
Ringed boghauter dragonfly	<i>Williamsonia lintneri</i>
Cobblestone tiger beetle	<i>Cicindela marginipennis</i>
Puritan tiger beetle	<i>Cicindela puritana*</i>
White Mountain fritillary	<i>Erynnis persius</i>

\* = Federally Threatened

\*\* = Federally Endangered

**THREATENED**

<b>Common Name</b>	<b>Scientific Name</b>
<b>MAMMALS</b>	
American marten	<i>Martes Americana</i>
<b>BIRDS</b>	
Common loon	<i>Gavia immer</i>
Pied-billed grebe	<i>Podilymbus podiceps</i>
Red knot	<i>Calidris canutus*</i>
Peregrine falcon	<i>Falco peregrinus</i>
Common tern	<i>Sterna hirundo</i>
Purple martin	<i>Progne subis</i>
Grasshopper sparrow	<i>Ammodramus savannarum</i>
Cliff swallow	<i>Petrochelidon pyrrhonota</i>
Cerulean warbler	<i>Setophaga cerulea</i>
Eastern meadowlark	<i>Sturnella magna</i>
<b>REPTILES</b>	
Spotted turtle	<i>Clemmys guttata</i>
Black racer	<i>Coluber constrictor</i>
<b>INVERTEBRATES</b>	
Pine pinion moth	<i>Lithophane lepida lepida</i>
White Mountain arctic	<i>Oeneis Melissa semidea</i>
Eastern pond mussel	<i>Ligumia nasuta</i>
Ringed boghaunter	<i>Williamsonia lintneri</i>
Hessel's hairstreak	<i>Callophrys hesseli</i>
<b>FISH</b>	
Bridle shiner	<i>Notropis bifrenatus</i>
Atlantic sturgeon	<i>Acipenser oxyrinchus</i>
Round whitefish	<i>Prosopium cylindraceum</i>
<b>AMPHIBIANS</b>	
Fowler's toad	<i>Anaxyrus fowleri</i>

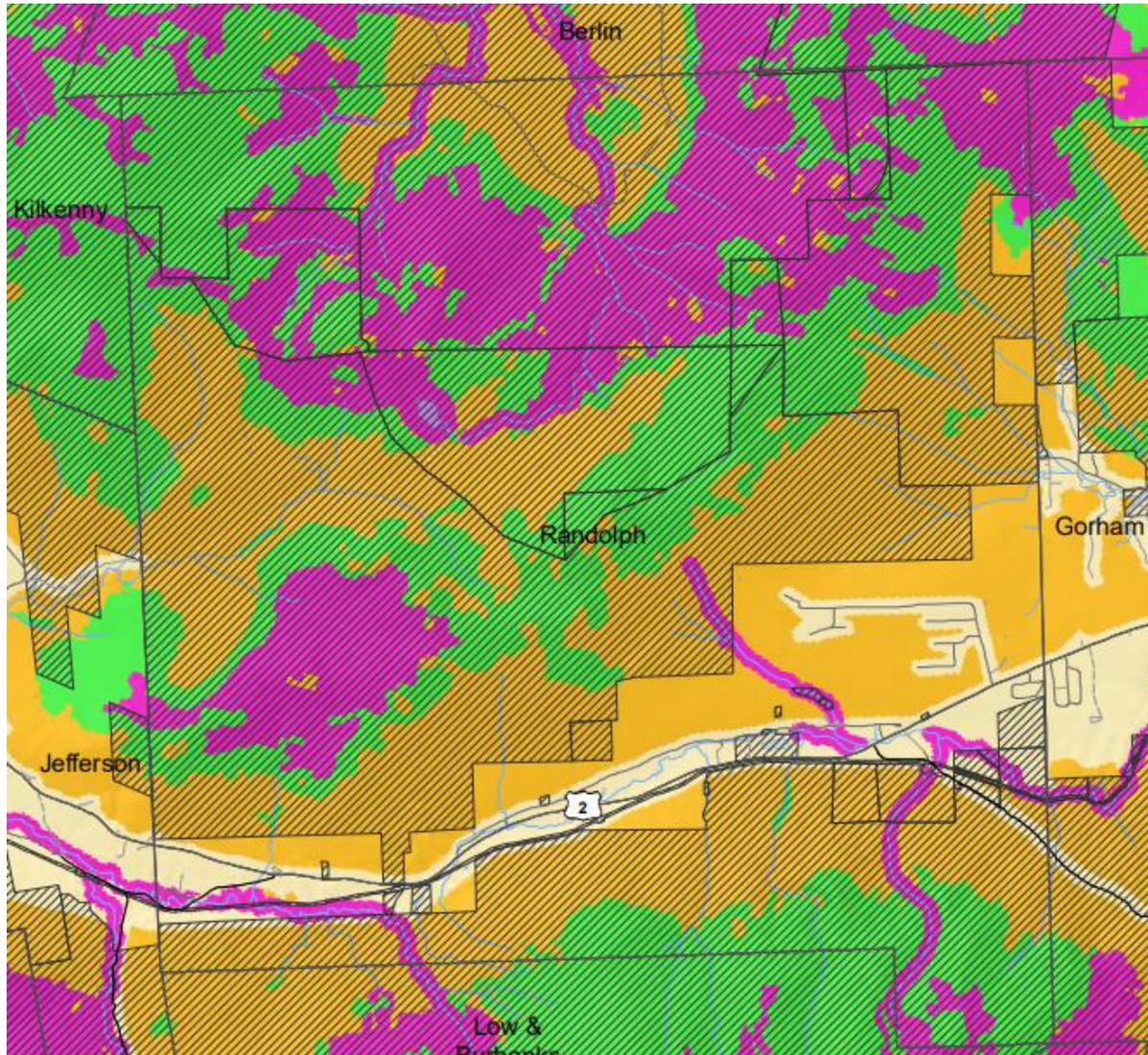
**Wildlife Action Plan (Map #5 at the end of the report)**

The New Hampshire Fish and Game Department worked together with select partners in the conservation community to create the state's first Wildlife Action Plan (WAP). The plan, which was mandated and funded by the federal government through the State Wildlife Grants program, provides a base tool for restoring and maintaining critical habitats and populations of the state's species of concern and their habitat. New Hampshire Fish and Game states that it is a first step on a statewide scale to work towards helping keep species off the rare species lists. The NH Wildlife Action Plan was submitted to the U.S. Fish and Wildlife Service on October 1, 2005 and was approved in the spring of 2006. It was then revised in 2015.

In the GIS phase of the Wildlife Action Plan, biologists and GIS technicians conducted co-occurrence analyses using a variety of digitized natural resource features such as wetlands, riparian habitat, unique rock outcrops, dense softwood stands, alpine areas, etc. This analysis

## Natural Resource Inventory for Randolph, NH

identified and ranked areas of conservation priorities throughout the state and at a statewide level.



Randolph has large areas classified as Highest Ranked Habitat in New Hampshire (pink), Highest Ranked Habitat in the Biological Region (green), as well as Supporting Landscapes (orange). Fortunately, most areas are conserved thanks to the RCF, WMNF and private landowners. Parts of Israel's and Moose Rivers along Route 2 are ranked highest in the state and not protected.

***Randolph contains a considerably large area classified as “Highest Rank Habitat in NH” as well as Highest Ranked Habitat in the Biological Region.*** Areas classified as with these two categories include the following:

- The Crescent Range
- Carlton Brook and area where it enters the Moose River
- The northern third of Randolph in the RCF and WMNF beginning at Pond of Safety, which includes the surrounding wetlands and streams
- The central to southwestern portion of the RCF north of Route 2
- The southern part of Randolph in the WMNF
- The entire Israel's River corridor through Randolph

## Natural Resource Inventory for Randolph, NH

- Bumpus Brook to where it enters the Moose River
- The Moose River from Carlton Brook through the east part of Randolph

Future work, including this NRI, detailed work on the RCF, and wetland studies, can be shared with Fish and Game and incorporated into the Wildlife Action Plan to build upon and improve data and habitat analyses.

For more details on the Wildlife Action Plan visit the NH Fish and Game's website at: <https://wildlife.state.nh.us/wildlife/wap.html>. The plan and associated maps can be downloaded and viewed. Fish and Game also keeps record of updates and on how the Plan is being used and updated. There is also an opportunity to sign up for regular WAP e-mails.

### ***Scenic Resources***

With a very hilly and mountainous topography, small ponds and rivers, Randolph has many scenic views and viewsheds throughout the entire Town. There are currently several scenic roads in Randolph. Most offer scenic views overlooking rivers, streams, hillsides, and the White Mountains. Many of these views extend into abutting towns. Almost every road in Randolph has exceptional views including:

- Randolph Hill Road
- Valley Road
- Durand Road
- Pinkham B Road
- U.S. Route 2



View across Durand Lake towards the White Mountains to the south.

## Natural Resource Inventory for Randolph, NH

In addition, most roads throughout the Randolph Community Forest offer excellent views not only across Route 2 into the Presidential Range, but also across the Community Forest itself.

The Randolph Mountain Club (RMC) was officially founded in August 1910. The RMC maintains a network of over 100 miles of hiking trails throughout the WMNF as well as the Crescent Range in Randolph. The trails offer residents and visitors the ability to hike on trails of different lengths, all of which have stunning panoramic vistas. Some of the key lookout places found in Randolph are:

- Lookout Ledge on Mount Randolph
- Eye of the Needle on Mt. Randolph
- Mt. Crescent – North and South lookouts
- Mount Adams – Dome Rock, Overlook, and White Cliff, Along-the-Brink, Ladderback Trails
- Pond of Safety
- The Rail Trail running roughly parallel to Route 2

Closely associated with scenic views are the fields and permanent wildlife openings in Randolph. People experience scenic views in all directions while driving, biking or walking along the roads in the Town, particularly where fields and permanent wildlife openings are maintained. *Continuing to maintain permanent wildlife openings will retain views throughout Randolph.*



This beaver pond off Wetland Road on the RCF offers not only a scenic view of the wetland and hills of the Community Forest beyond, but also a great opportunity to view wildlife.



Maintaining this permanent opening for wildlife habitat also enhances the view towards Mt. Randolph to the east and Cherry Mountain (Owls Head and Mt. Martha) to the west.

In recent years, development and population growth throughout the State and region have caused people to increase their appreciation of the natural scenery New Hampshire has to offer. As with many other towns and cities in NH, there are potential threats to viewsheds. Several communities are struggling with the concern of future development on the ridgelines and tops of hills. In many communities there have been extensive debates over wind towers, cell towers, and houses built on ridgelines because of their detrimental effect on viewsheds. Randolph is fortunate to have not only most of its land area conserved, but also because views towards the White Mountains to the south will be conserved by the US Forest Service.

### ***Conservation Land (Map #2 at the end of report)***

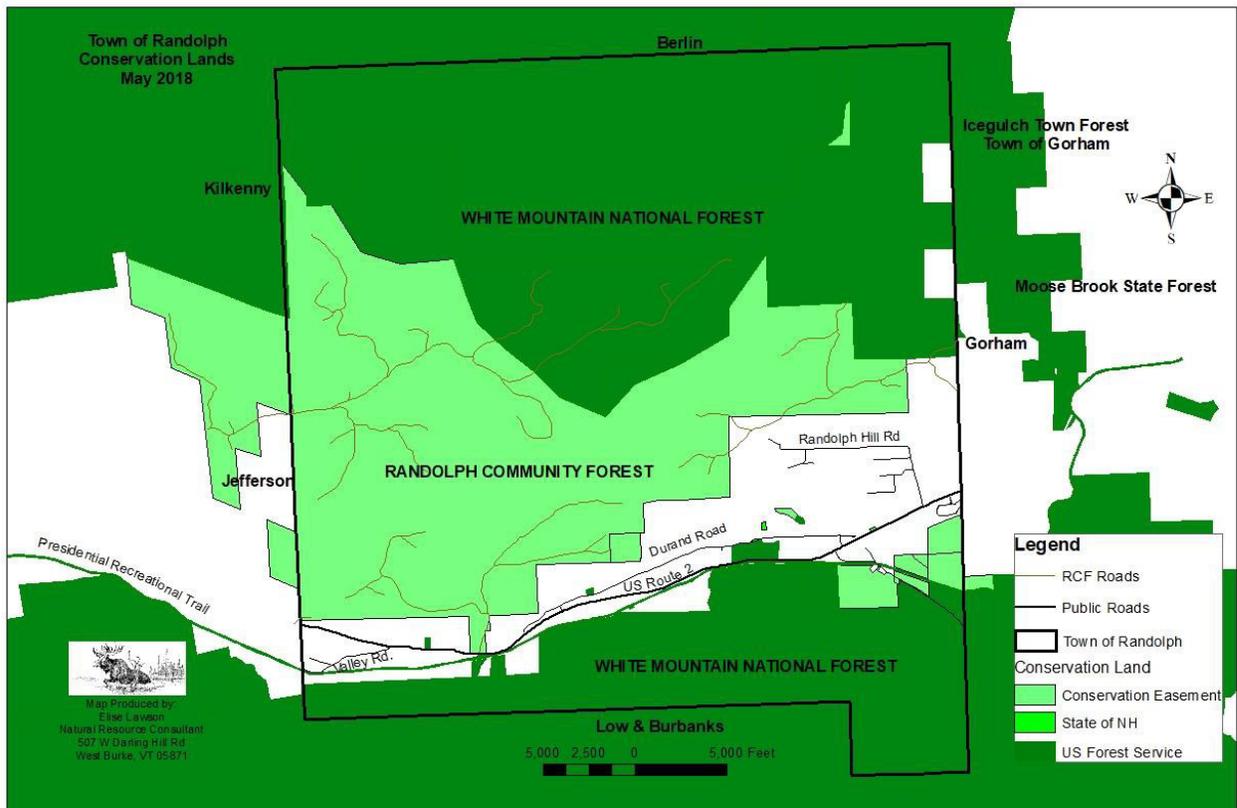
Over 25,683 acres equaling 85.2% of Randolph is land conserved by governmental ownership or conservation easements and is protected as conserved land. Of these:

1. 16,245 acres (53.9%) of the town is land owned by the US. Forest Service – White Mountain National Forest.
2. 9,433.1 acres (31.3%) is land under conservation easement: approximately 9,000 acres being the Randolph Community Forest.
3. 4.7 acres (0.02%) land owned by the State of NH
  - a. Crystal Spring
  - b. The Former Ravine House Site
  - c. Peek Park

As noted above, over half of the land area in Randolph is protected by the USFS. In addition, in December 2001, Randolph residents voted to become the owner of the largest town forest in New Hampshire – nearly 1/3 of the Town area. An excellent background, history and description

## Natural Resource Inventory for Randolph, NH

of how a town of approximately 300 residents became owners of such a large tract of land is described by David Willcox (2008) in a Building on Local Stewardship publication. Since the purchase of the RCF, momentum has continued. Several private landowners have placed their land into Conservation Easements as well as purchased land and donated it to the RCF. This is truly a model in land conservation as well as an example of proactive dedication to protection of valuable natural resources. Many of the private land easements and areas of RCF expansion have helped bridge a gap along the Route 2 corridor. This allows for movement of wildlife from the WMNF in the northern part of Randolph to the Presidential Range of the WMNF south of Route 2.



Land Conservation Areas throughout the Town of Randolph, extending into neighboring Towns.



View towards the North of the RCF and WMNF beyond. Patches in the forest (middle of photograph) show the Randolph Hill area as well as timber harvesting near Jim Town Road in the RCF.

There are several ways to conserve land. Many lands are owned by federal, state, and local governments (national forests, state parks, and state/town forests for example). A conservation easement on private land is another means to protect property. It creates a legally enforceable land preservation agreement between a landowner and a municipality or a qualified land protection organization or trust. It restricts real estate development, commercial and industrial uses, and certain other activities on a property to a mutually agreed upon level. The decision to place a conservation easement on a property is strictly a voluntary one in which the easement is sold or donated. The restrictions, once set in place, are binding on all future landowners. The restrictions are spelled out in a legal document that is recorded in the local land records, and the easement becomes a part of the chain of title for the property. The landowner who gives up these development rights continues to privately own and manage the land and may receive significant state and federal tax advantages with their land for future generations. The easement holder has a responsibility to monitor future uses of the land to ensure compliance with the terms of the easement and to enforce the terms if a violation occurs.

### ***Cultural Resources***

The Town of Randolph has an exceptionally rich history of land use changes and cultural features from its original settlement to current times. The southern parts of Randolph along the Israel's and Moose Rivers contain Paleoindian sites. The largest one is in the southeastern part of town. It is the largest Paleoindian site discovered thus far in New England at approximately 3 acres. The site dates from about 12,500 to 11,000 years ago and has been studied by Dr. Richard

## Natural Resource Inventory for Randolph, NH

Boisvert, New Hampshire's State Archeologist. The latest field school studies were done onsite in 2008 and 2009.

European settlers and later entrepreneurs were drawn to Randolph due to its forested, mountain topography, rivers along what is now the Route 2 corridor, and timbering opportunities. Randolph was, and still is, a land of abundant opportunity thanks to its natural resources.

A few significant cultural places to note include the following.

1. The Snyder Brook bridge is significant as the last surviving wooden railroad track pony truss bridge in the United States. "It retains integrity of design, location, setting, materials, workmanship, feeling, and association," writes James Garvin, former NH state historian in the NH Division of Historical Resources inventory. Randolph's pony truss bridge, a "boxed Howe truss," was built in 1918 by the railroad company, and continued to support freight trains until the Berlin branch was discontinued in 1996. By 2013 it was in dire need of stabilization and repair. The NH Bureau of Trails developed a plan and obtained the funding. The project was completed in 2015.
2. The quartz crystal mine, located on the Randolph Community Forest, was worked by the General Electric Corporation during World War II. Alan Lowe is quoted as saying that GE was hauling ox carts full of crystals out of it for radios as part of the war effort. After the war, and after radio technology had moved on, the mine was abandoned. Currently the Randolph Forest Commission has a maintained trail to the crystal mine. People are encouraged to leave the crystals onsite.



The pink flags shown here mark the location of the archeological digs done in 2008 and 2009, and the location of the Paleoindian site to the west of Wetland #9. It is the largest site in New England and is about 3 acres.



This stone culvert under a former railway bed is still in excellent shape.



This historic culvert under a former road, was made with granite slabs, and although it has partially deteriorated, it is still functioning.



A hollow yellow birch has been in place for many years in the Randolph Community Forest. Historically, large hollow trees were stored and used as culverts along logging and main roads. This one was found on High Road in the Forest and is surprisingly, still functional.

### ***Invasive Plant Species***

There is an increase in public awareness and concern about the rapid growth of invasive species in NH and throughout New England. Invasive species are plant and wildlife species that are not native to an area but take up residency and can out-compete native species. These species tend to be more common in wet areas such as lakes, wetlands, riparian habitats, and areas of recent disturbance including roadsides. They can also be found at old farm sites where people have planted various fruiting and ornamental plants for agricultural purposes.

During field work over several years, a few invasive species were documented. Some found include:

- Japanese knotweed (*Polygonum cuspidatum*) was documented in the old gravel pit which is part of the Farrar Tract. At the time it was documented (2015), there were only a few plants.
- Purple loosestrife (*Lythrum salicaria*) was noted in a few roadside wetlands and disturbed areas. The few noted in the RCF were pulled, bagged and taken offsite.



A few small colonies of Japanese knotweed are shown in the middle of the photograph, on the access road to the former gravel pit – Farrar Tract. This type of area is vulnerable to invasion of non-native invasive species with exposed soil and proximity to Route 2.

This NRI was not designed to be an all-inclusive search and documentation of invasive species in Randolph. Undoubtedly, other species and locations where invasive species occur in Randolph have been or will be documented. The Town of Randolph should continue efforts to help identify and eradicate these invasive species and may want to seek assistance from the Invasive Plant Atlas of New England (IPANE), New England Wild Flower Society, and other organizations that have begun programs to control or eradicate invasive species. For further information on invasive species, and an update of the list of these species, review the IPANE website: <http://www.eddmaps.org/ipane>.

***Habitat Area Summary Table***

The table displayed below is a summary of different habitat areas in acres and square miles.

<b>Habitat Type</b>	<b>Number of Acres</b>	<b>Number of Square Miles</b>	<b>Percentage of Town Land Mass</b>
Randolph Town Boundary	30,142.3	47.1	100%
Conservation Land	25,683.3	40.1	85.2%
Ponds and Open Water	84.5	0.13	0.3%
Wetland Complexes (from National Wetland Inventory data & field work)	444.8	0.7	1.5%
Hydric Soils	1,525.1	2.4	5.0%
Aquifers	766.0	1.2	2.5%
Dense Softwood Cover	912.0	1.4	3.0%
Permanent Wildlife Openings	319.3	0.5	1.1%
Farmland Soils – prime, statewide and local importance	1,121.9	1.8	3.7%
Steep slopes – 15% and greater	9,893.5	15.5	32.8%
Steep slopes – 25% and greater	2,276.0	3.6	7.6%

## **DISCUSSION – FUTURE APPLICATIONS AND BENEFITS**

This project has compiled natural resource data into a digital database in Geographic Information System (ArcMap) format and produced a written report for use by the Town of Randolph. It contains a database with a comprehensive, updatable, digital inventory of the entire Town. The data from this project are compatible for integration with the existing Town GIS mapping software. Efforts from this project will aid in future work and inventories, as well as provide data to guide future development and conservation decisions in Randolph.

It is anticipated that results from this study will help the Town of Randolph in many ways. Town-wide zones based on habitat and vegetation can be assessed and modified. Data gathered from this work will also assist the Conservation Commission, Planning and Zoning Boards, and Select Board, in foreseeing possible conflicts with future development. Perhaps the most powerful advantage of this project is that future studies and work can be easily integrated to build upon this database indefinitely.

Based on results from this study, Elise Lawson and the Randolph Conservation Commission offer the following specific recommendations:

1. **Continued Wetland Conservation**– The Randolph Conservation Commission recognizes the importance of wetland protection and has undertaken two wetland studies in Town (2012 and 2017). These studies identified, assessed and ranked wetlands throughout Israel’s and Moose River watershed areas, focusing on non-conserved lands. It is hoped that the Town will continue to pursue ways to further conserve the functionality and protect the vulnerability of these wetlands. The wetland studies can be updated and strengthened over time. The Town of Randolph can continue to work with willing landowners to conserve some of these valuable wetland resources.
  - a. An in-depth inventory of vernal pools throughout Randolph would also enable the Conservation Commission, Planning Board, and Select Board to critique and adjust future subdivision proposals if vernal pools are likely to be impacted.
  - b. Monitor stormwater runoff and associated drainage immediately after storm events whenever possible. Treatment devices for stormwater structures should be installed and maintained; particularly within 150 feet of rivers and wetlands.
  
2. **Surface Water Protection** - Many of Randolph’s residents obtain drinking water from private drilled or dug wells. Maintaining good water quality is one of the highest priorities for the Randolph Conservation Commission. Fortunately, water quality in these streams and rivers is in excellent condition. Water quality should continue to be addressed not only in the largest two rivers, but also in the headwater streams and brooks that feed into these rivers coming out of the Randolph Community Forest and the White Mountain National Forest.
  - a. Where possible, work to conserve riparian habitat adjacent to headwater streams and brooks. The wetland setback should also apply to all riverine wetlands including perennial and intermittent streams.

## Natural Resource Inventory for Randolph, NH

- b. Continue to monitor water quality not only in the larger rivers (Israel's and Moose), but also in the smaller feeder streams in town.
  - c. Update potential contamination source (PCS) location inventory at least on an annual basis and ensure that compliance (secondary containment structures, and spill kits) are in place.
3. **Aquifer Protection** - Based on the locations and relatively small size of the underlying aquifers in Randolph, it is important to protect the quality of groundwater, brooks, streams, and aquifers in Town. Future water supplies are a very valuable natural resource, for Randolph and the abutting municipalities as is proven by the drinking water systems already in use. They are:
  - a. Implement Best Management Practices (BMPs) within aquifer areas. An extensive list of Best Management Practice publications for all types of surface and ground water can be found on the New Hampshire Department of Environmental Services website ([https://www.des.nh.gov/organization/commissioner/pip/publications/bmps\\_guides.htm](https://www.des.nh.gov/organization/commissioner/pip/publications/bmps_guides.htm)).
  - b. Monitor septic system plumes with a focus on parcels adjacent to rivers, wetlands, and aquifers.
  - c. Monitor the placement of future septic systems, keeping in mind the typically high permeability of many of Randolph's soils.
  - d. Develop Town-wide ordinances to help protect aquifers, including restriction of impervious surface development and the dumping of waste on top of aquifers, particularly those with high productivity and flow.
4. **Hillside and Viewshed Protection** - Randolph's mountainous topography is directly related to the Town's tourism industry, scenic beauty, and diversity of natural resources (wetlands, streams and rivers, wildlife, plants, soils, etc.). Research and consider updating the zoning ordinance in Randolph in order to conserve viewsheds as an important feature and tourist attraction to the area, while continuing to consider landowner rights.
  - a. Scenic View Conservation - The potential for continued population increase throughout the Town makes it wise for landowners to sustainably conserve their land. By taking a proactive approach to deal with future development pressures, the scenic vistas and beauty will remain as impressive (or even better) tomorrow as they are today. Scenic easements are types of conservation easements that make protection of scenic resources possible.
  - b. Ridge-line Development Criteria - Several municipalities throughout the State have developed ridge-line ordinances to protect ridgeline views. Randolph may want to review some of these and explore the possibility of implementation.
  - c. Steep Slope Development Criteria – Develop Town-wide ordinances to restrict future development and road construction at sites with over 25% slopes and limit development on slopes between 15% and 25%.

5. **Dense Softwood Stand Protection** - Based on results from this project, there are a few areas that contain adequate acreage of dense softwood stands scattered throughout Town. These areas are beneficial to many wildlife species for cover as well as important wintering areas. This has been addressed in the Randolph Community Forest Stewardship Plans, but further town-wide consideration is recommended.
  - a. Improve connectivity between softwood stands and travel corridors.
  - b. Maintain existing stands for the benefit of the deer, moose and other wildlife populations is very important.
  - c. Where possible, consider extending existing softwood areas and connecting patches of softwood into a continuum. Investigate if there are willing landowners to participate, particularly those properties with wetlands and/or riparian buffers.
  
6. **Interagency Cooperation** – Currently, interagency cooperation between Randolph, adjacent municipalities, and state and federal agencies is impressive. It is recommended that Randolph continue to work with neighboring towns, organizations, and State and Federal agencies throughout the region to share future data as it becomes available. This will avoid an all too common problem of separate entities replicating work. Natural resource features do not end at Town boundaries. A watershed approach to conservation is recommended. Most surrounding towns have completed or are in the process of completing a Natural Resource Inventory, and all the data between the towns and Randolph should be compatible in GIS format.
  - a. Work with regional planning commissions, who have developed several templates for town-wide ordinances on topics from wetland and shoreline setbacks, to development restrictions on steep slopes and ridgelines.

Long-term uses of this project could include, but are not limited to:

- Assisting the Town and others in determining “least-impact” sites for future development
- Locating ideal locations for telecommunication towers or wind farms
- Refining future Master Plan updates based on natural resource features
- Promoting protection plans for water quality, wetlands, and aquifers under portions of the Town
- Continuing to identify of land for purchase or easements for future conservation

Furthermore, Randolph officials should consider requesting that all future development plans be delivered in digital format, which would build upon the existing database and assist in updating tax maps for assessment at little cost to the Town.

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## MAPS

### ***Map #1: Wetlands, Hydric Soils, Aquifers***

Map Data Sources:

- Town Boundary, Roads, Aquifers, Railroads, Open Water, Streams, obtained from GRANIT
- Vernal Pool locations taken using a handheld GPS unit (Garmin GPSmap 76CSx) during field work by Elise Lawson and/or John Severance over several years of field work
- National Wetlands Inventory wetlands obtained from U.S. Fish and Wildlife Service and GRANIT
- Additional Wetlands were field verified by Elise Lawson, John Severance, and/or digitized using 2009 aerial photographs (obtained from GRANIT)
- Poorly and Very Poorly Drained Soils obtained from the Natural Resource Conservation Service

### ***Map #2: Dense Softwoods, Permanent Wildlife Openings, Conservation Land***

Map Data Sources:

- Town Boundary, Roads, Open Water, and Streams obtained from GRANIT
- Dense Softwood Stands and Permanent Wildlife Openings digitized by Elise Lawson 2017 using the 2009 aerial photographs
- Conservation Lands obtained from GRANIT and the Town of Randolph

### ***Map #3: Steep Slopes and Farmland Soil***

Map Data Sources:

- Town Boundary, Roads, Open Water, Streams obtained from GRANIT
- Soil data obtained from Natural Resource Conservation Service and queried to display farmland soils and soils with steep slopes

### ***Map #4: Subwatersheds, Wetlands, Hydric Soils, and Aquifers***

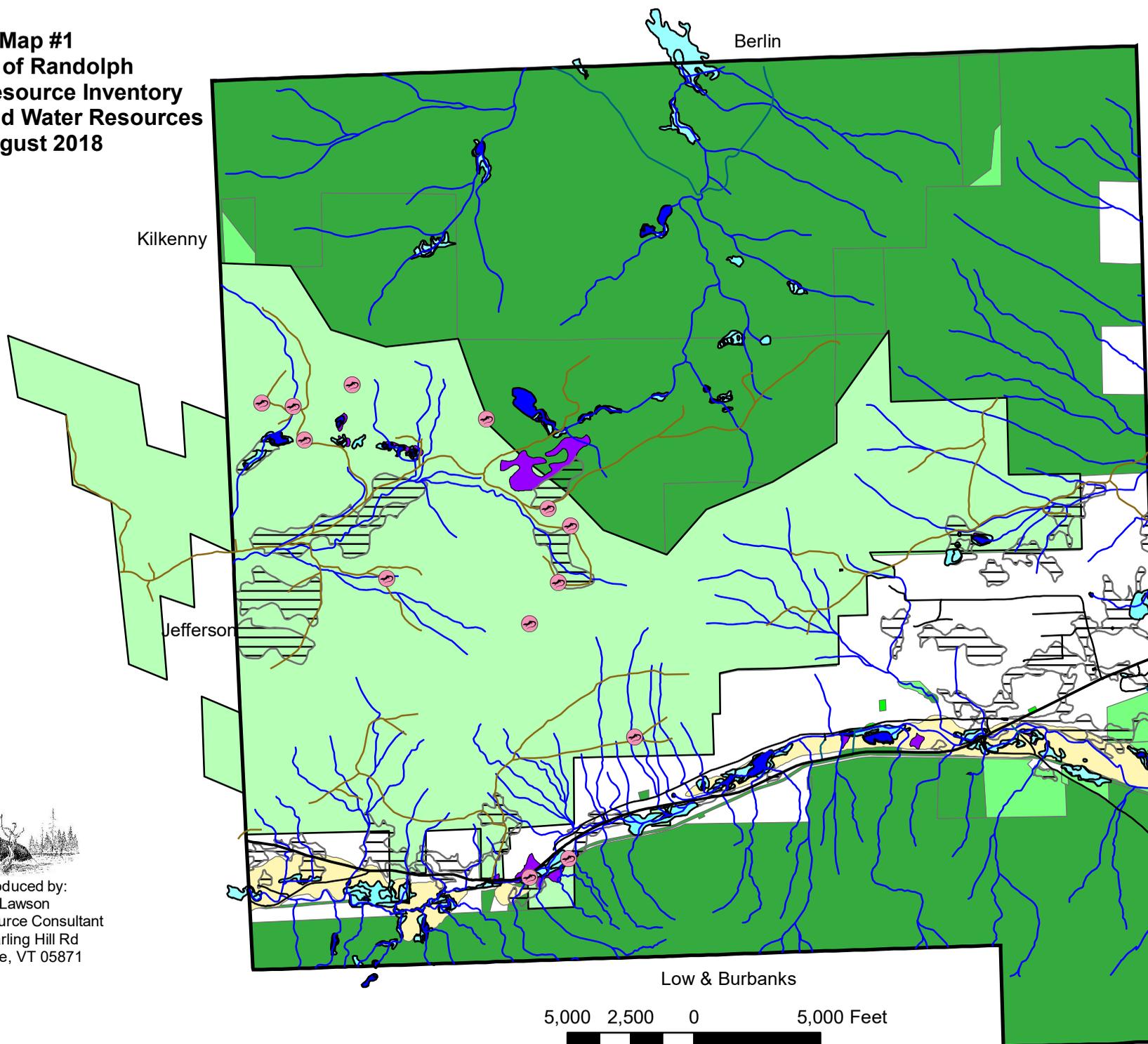
Map Data Sources:

- Town Boundary, Roads, Railroads, Open Water, Streams obtained from GRANIT
- Subwatershed Units (NH DES HUC 12 Names) obtained from GRANIT

### ***Map #5: Wildlife Action Plan***

Map Data Source: New Hampshire Fish and Game Department

**Map #1  
Town of Randolph  
Natural Resource Inventory  
Wetlands and Water Resources  
August 2018**



**Legend**

-  Vernal Pools
-  RCF/WMNF Roads
-  Roads
-  Perennial Streams
-  RCF Boundary 2013
-  Town Boundary
-  Wetlands
-  Aquifers
-  White Mountain Nat. For.
-  Poorly drained soil
-  Very poorly drained soil
-  Open Water

  
Map Produced by:  
Elise Lawson  
Natural Resource Consultant  
507 W Darling Hill Rd  
West Burke, VT 05871

**Map #1 (close-up)  
Town of Randolph  
Natural Resource Inventory  
Wetlands and Water Resources  
August 2018**

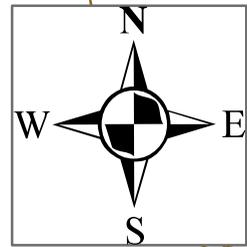


- Legend**
- Vernal Pools
  - RCF/WMNF Roads
  - Roads
  - Perennial Streams
  - RCF Boundary 2013
  - Town Boundary
  - Wetlands
  - Aquifers
  - White Mountain Nat. For.
  - Poorly drained soil
  - Very poorly drained soil
  - Open Water



Map Produced by:  
Elise Lawson  
Natural Resource Consultant  
507 W Darling Hill Rd  
West Burke, VT 05871

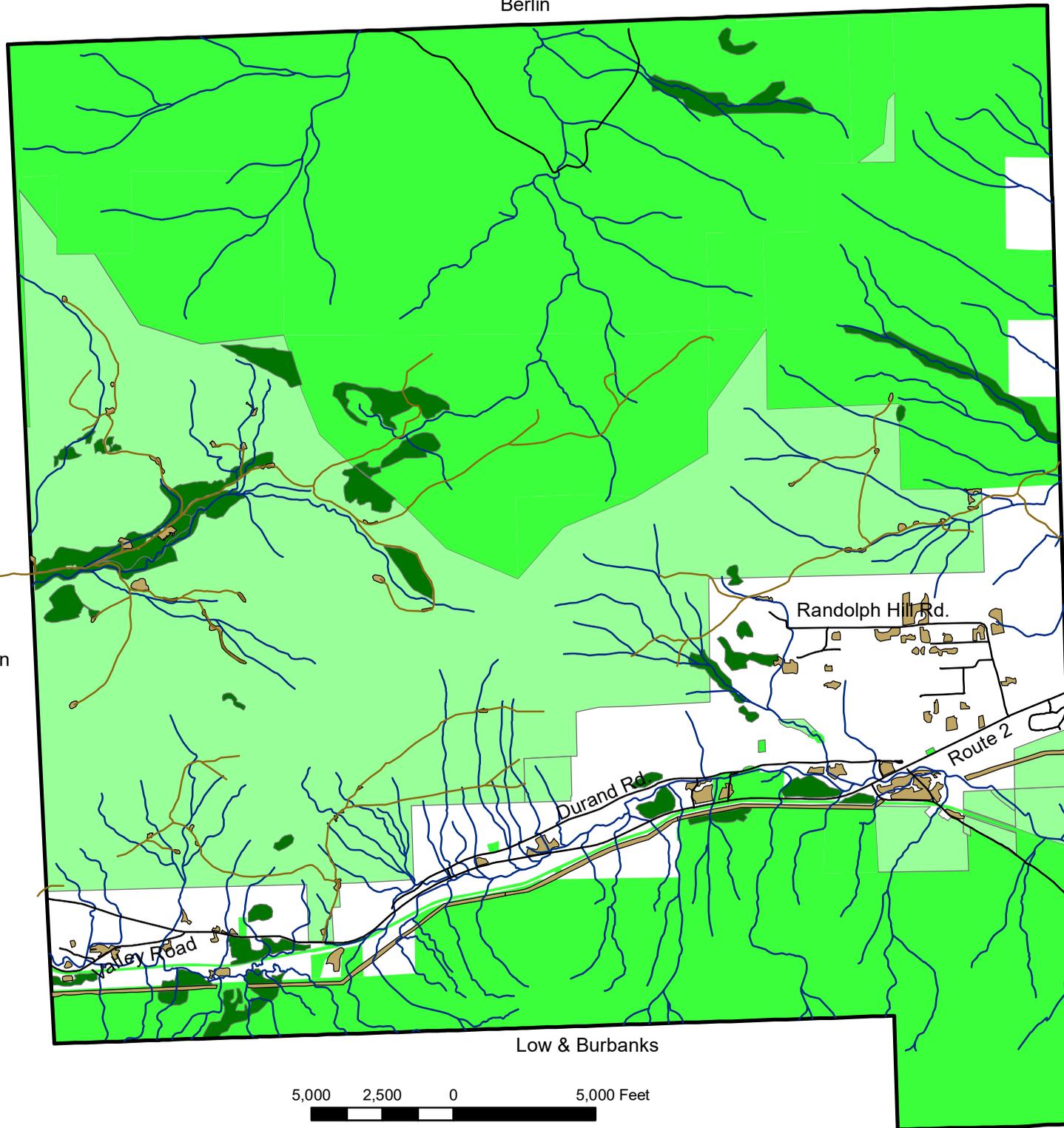
**Map #2  
Town of Randolph  
Natural Resource Inventory  
Dense Softwoods and  
Permanent Openings  
August 2018**



Kilkenny

Jefferson

Berlin



**Legend**

- Roads
- Streams
- Permanent Openings
- Town Boundary
- Dense Softwood
- Randolph Town Conservation Areas
- White Mountain Nat. For.

Gorham



Map Produced by:  
Elise Lawson  
Natural Resource Consultant  
507 W Darling Hill Rd  
West Burke, VT 05871

Low & Burbanks

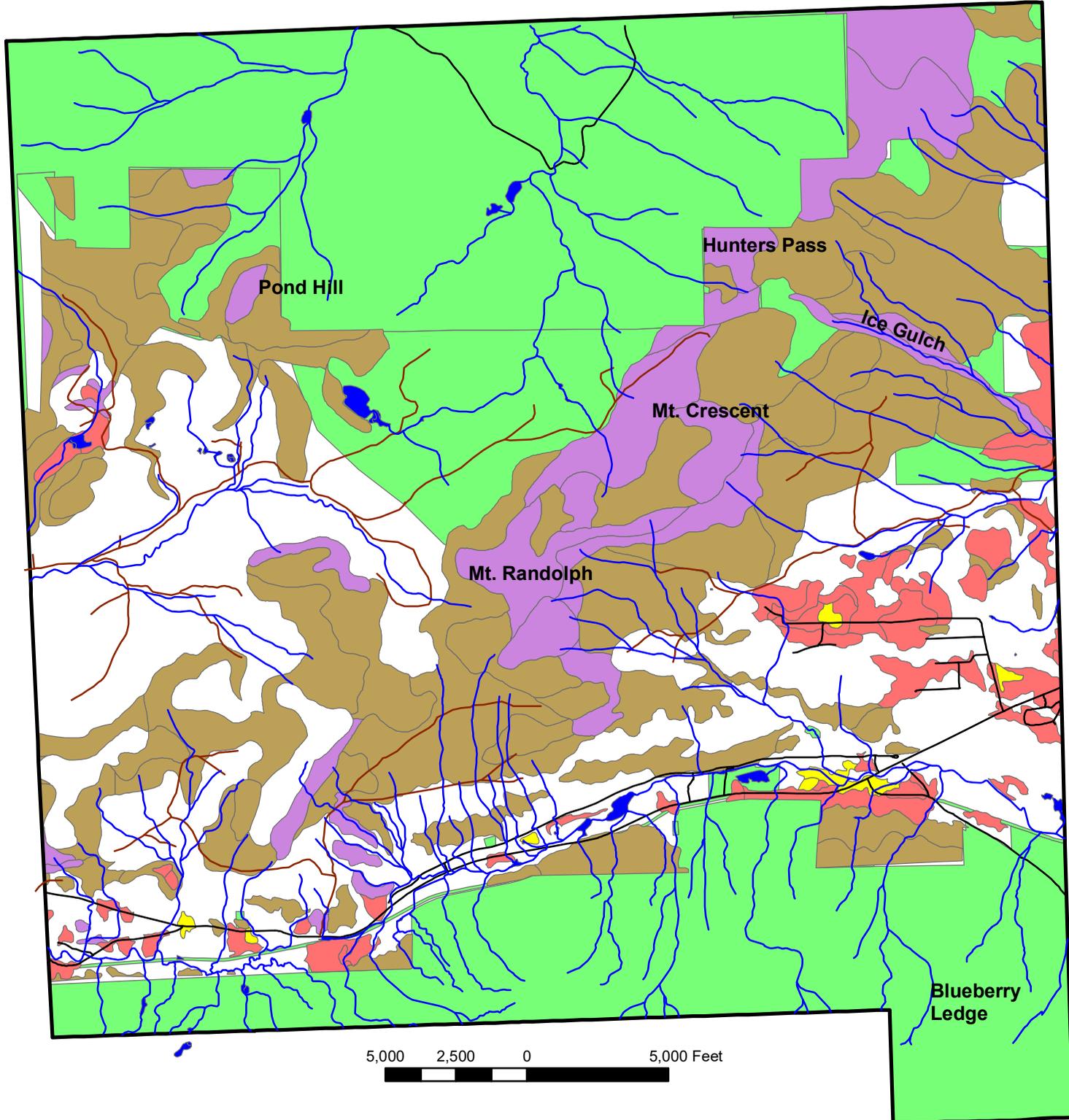
5,000 2,500 0 5,000 Feet



Map #3  
 Town of Randolph  
 Natural Resource Inventory  
 Steep Slopes and Agricultural Land  
 August 2018

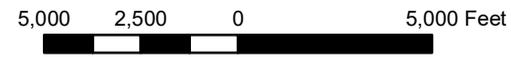


Map Produced by:  
 Elise Lawson  
 Natural Resource Consultant  
 507 W Darling Hill Rd  
 West Burke, VT 05871



**Legend**

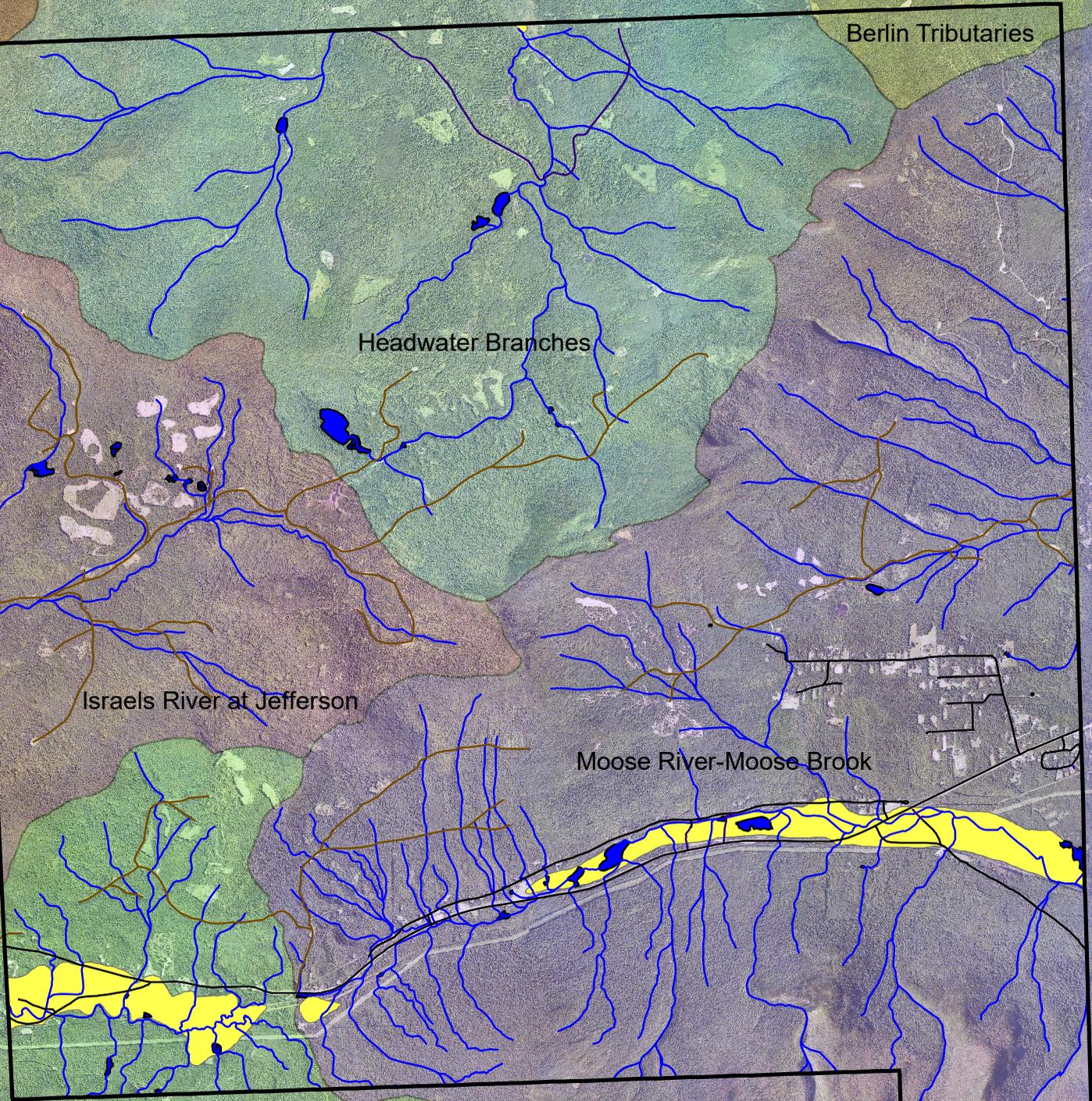
-  Streams and Rivers
-  RCF Roads
-  Public Roads
-  Open Water and Ponds
-  Town Boundary
-  Prime Farmland Soils
-  Farmland of local importance
-  Steep Slopes (15-25%)
-  Very Steep Slopes (>25%)
-  White Mountain Nat. For.



Map #4  
 Town of Randolph  
 Natural Resource Inventory  
 Subwatersheds  
 August 2018



Map Produced by:  
 Elise Lawson  
 Natural Resource Consultant  
 507 W Darling Hill Rd  
 West Burke, VT 05871



**Legend**

- Town Boundary
- RCF Roads
- Public Roads
- Streams and Rivers
- Ponds
- Aquifers
- Berlin Tributaries
- Moose River-Moose Brook
- Israels River at Jefferson
- Headwaters Branches
- The Mystic-South Branch
- Upper Peabody River
- Garland Brook

# 2015 HIGHEST RANKED WILDLIFE HABITAT BY ECOLOGICAL CONDITION

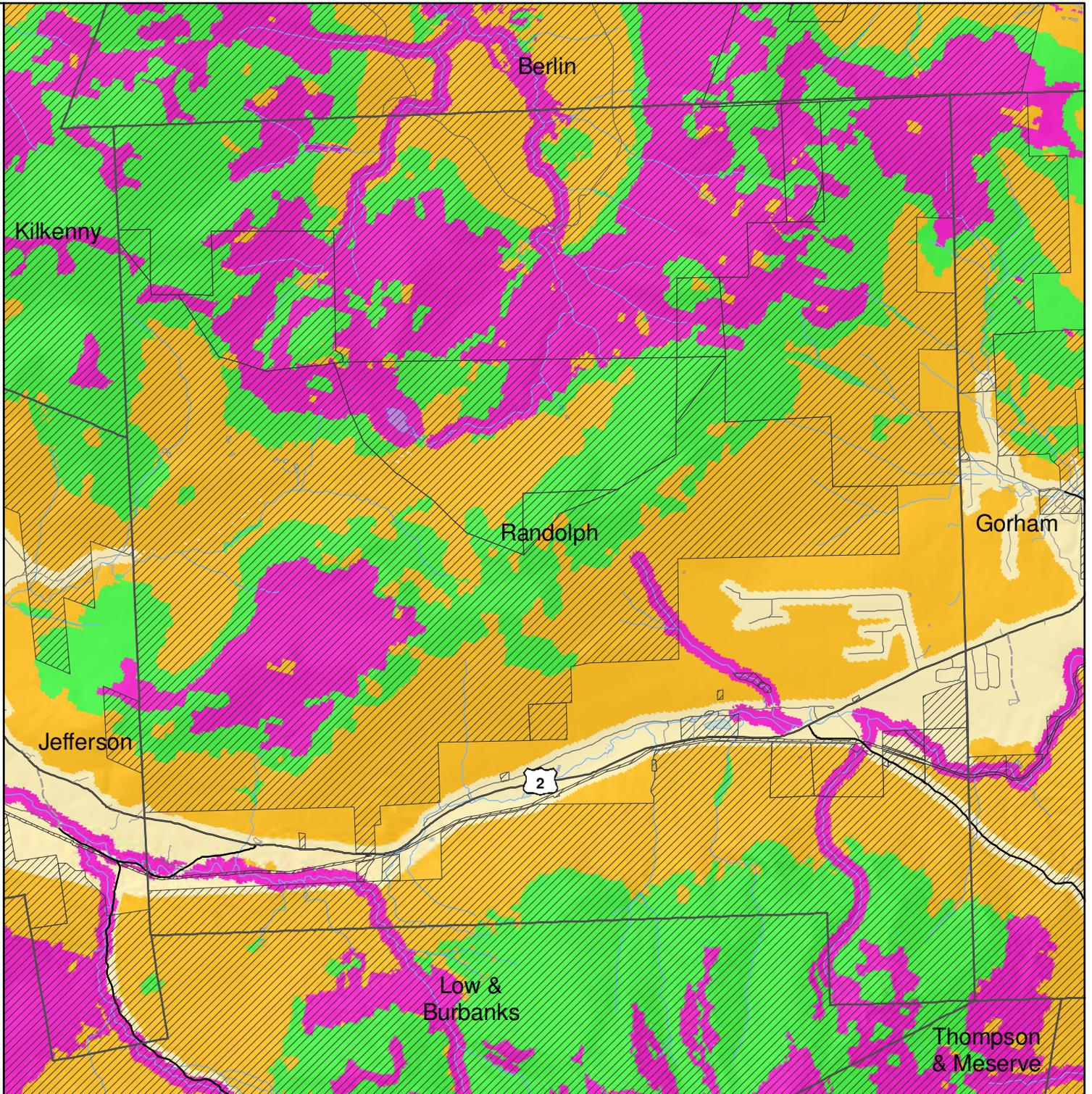
 Highest Ranked Habitat in New Hampshire

 Highest Ranked Habitat in the Biological Region

Biological region = TNC ecoregional subsection for terrestrial habitats or Aquatic Resource Mitigation region for wetlands and floodplain forest.

 Supporting Landscapes

 Conservation or public



Base map data provided by NH GRANIT (2015)  
Not intended for legal use.



NEW HAMPSHIRE  
**Wildlife Action Plan**

September 2015

0 1 2  
Kilometers

0 1 2  
Miles