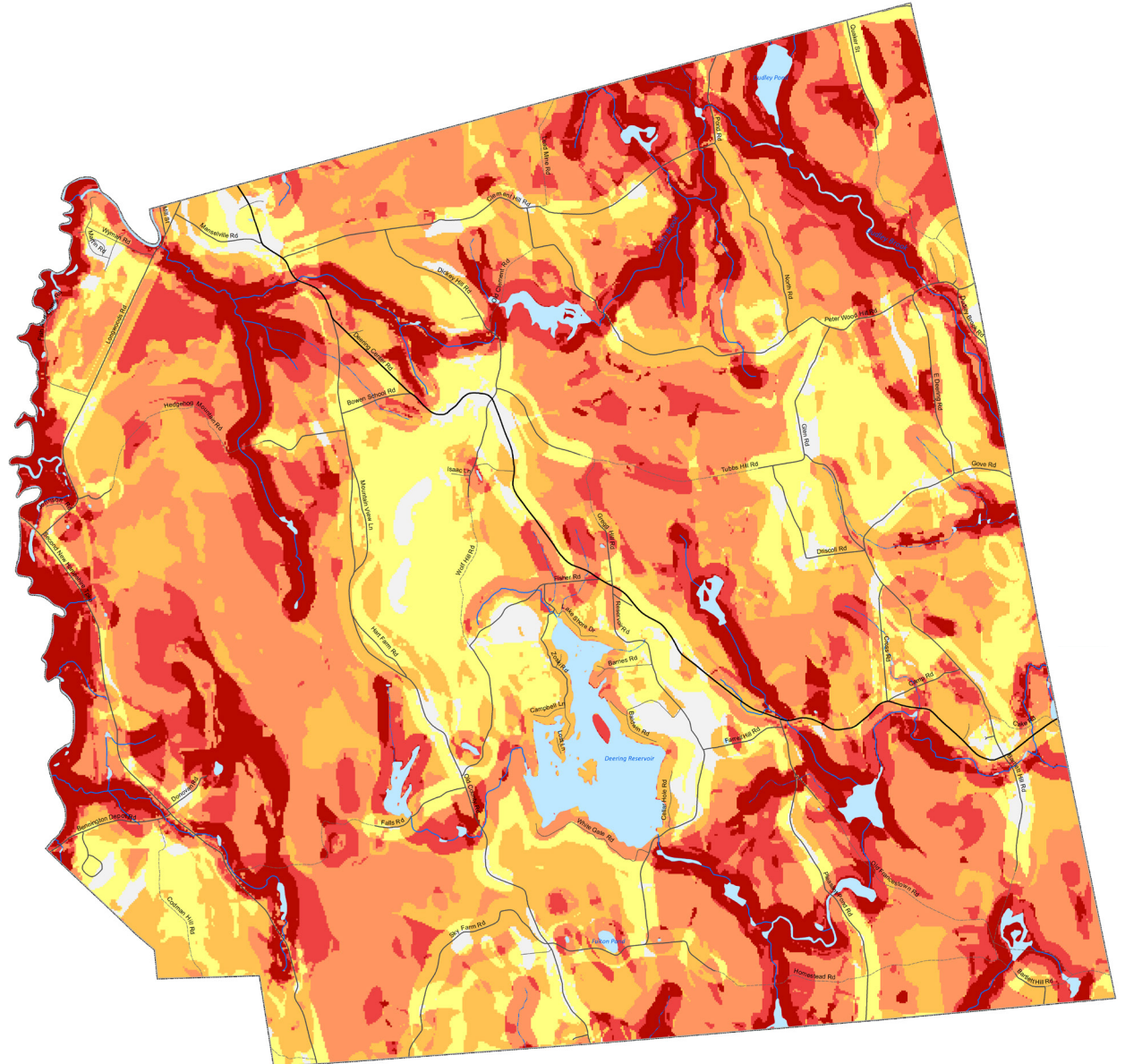




Natural Resource Inventory

Deering, NH



2023

Natural Resources Inventory and Assessment with Co-Occurrence Mapping Town of Deering, New Hampshire

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Deering Conservation Commission and Town of Deering*

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MAPS

Co-Occurrence Maps

Surface Water Weighting
Drinking Water Weighting
Agriculture Weighting
Cultural and Recreation Weighting
Wildlife Habitat Weighting
Weighted Co-Occurrence Analysis
Analysis and Conservation Land

Natural Resource Inventory Maps

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Big Trees
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Current Use
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Development Constraints
Forestry Soils
Gravel Pits
Hydric Soils
Land Use
Trails, Recreation Sites, Views
Topography
Unfragmented Lands
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Wetlands and Floodplains
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Introduction and Objectives

1

1 Introduction

The development and completion of the Deering Master Plan in 2017 highlighted the importance of a wide range of natural resources and services to the community. These resources serve the community both in terms of concrete benefits such as clean, safe drinking water or productive agricultural land, but also provide qualitative benefits including the enjoyment of natural beauty and defining landscapes that are cherished by residents.

Natural resources are essential to providing habitat for wildlife, preserving rare or sensitive species and ecosystems, ensuring the sustainability of agriculture, and providing a wide range of ecological services that support the Town of Deering over the long term. This NRI identifies, prioritizes, and maps these resources. The plan was informed by public input and collaboration with the Conservation Commission. The results will help inform land conservation priorities in Deering and other town practices that help sustain these natural resources and the benefits they bring.

1.1 Components of the NRI

This Natural Resource Inventory (NRI) document contains descriptions of various natural resources, maps of those resources, weightings of importance, and a description of the process undertaken in the development of the plan. A series of basic recommendations are also provided. An online interactive “StoryMap” version of the NRI is also available on the Deering Town Website.

Deering Master Plan 2017 Natural Resources Objectives

To continue to protect the Town's defining landscapes that are valued by residents and reflective of the rural character of Deering.

To educate Deering residents on the value of our land and water resources.

To encourage active stewardship of Town natural resources.

To continue to protect valuable wildlife habitat and biodiversity in the Town.

To look for opportunities to enhance access to public lands.

To engage the Town's younger population in protection of the natural environment.

Process

This Natural Resources Inventory document includes a weighted co-occurrence analysis in addition to its inventory of natural resources. The inventory portion of the document maps and describes a multitude of natural resources in Deering, including water resources, agricultural resources, cultural and recreational resources, and habitat resources. The weighted co-occurrence analysis is method of assigning relative value to the resources and the lands that support them.

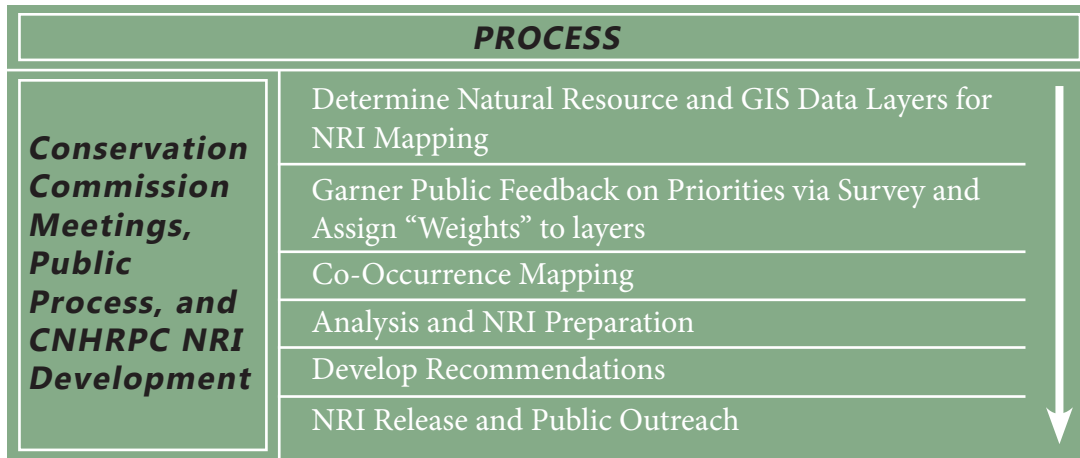
The first step, the inventory component, involved developing a list of natural resources in Deering, identifying the appropriate GIS data layers to display each resource, and mapping the resource. The result of this step was a set of maps that depict the current state of natural resources in Deering.

The next step involved assigning each natural resource layer a score that identified its relative importance to the town. This valuation was based on information gleaned from analyzing the set of natural resource maps, results of a public survey, knowledge and experience from the Conservation Commission, best practices, and advice from experts in the field. Natural resources with a higher value to the Town were given a greater weighted score, and resources with a relatively lower value were given a lower weighted score.

The third step was overlaying the weighted layers in a co-occurrence mapping exercise. The result were six co-occurrence maps that display areas of Town with the highest natural resource value and presumably the highest land conservation value for the Town. Five weighted co-occurrence maps showing natural resource score results for five different topic areas: Agriculture, Cultural and Recreational, Drinking Water, Surface Water, and Wildlife Habitat. The final co-occurrence map encompasses all five resource categories.

Then the last step in the process was constructing this NRI document which is equipped with an analysis of each of co-occurrence category and their inputs and recommendations based on the results. Additionally, a large map set including the natural resource and co-occurrence maps was developed, in both paper and digital format, and was provided to the Conservation Commission.

The NRI Working Group of the Conservation Commission was tightly involved in this process and reviewed and refined the maps, analysis, and recommendations. The NRI Survey was distributed online via Survey Monkey and was also available in print to obtain the public's opinions on the importance of various resources.



Recommendations

The priority conservation areas included in this document are developed based on the co-occurrence analysis and data obtained in the map set. In addition, general strategies for outreach, management, and regulatory action are included.

Intended Use

The information in this NRI is intended to inform and guide land conservation efforts in the Town of Deering. It provides information about specific habitats and resources - at both the site and Town-scale - that can support land use decisions and conservation priorities. This NRI provides a benchmark for observing short- and long-term changes, and it should be updated as conditions change and when new information is available. This baseline assessment may be refined through field investigations and gathering of ground truth data, further developing this document into a more comprehensive inventory and assessment. The NRI may be incorporated into the Town's Master Plan and other planning documents. It is intended to serve as an informational tool that may inform future changes in zoning, land use regulations, and policies. Additionally, Town staff, boards, residents, and other interested individuals can use the NRI document as a way to educate themselves or others on the importance and presence of natural resources in Deering.

NRI Objectives

Increase identification and understanding of the Town's natural resources.

Develop information that can inform decisions about balancing development and conservation.

Identify resources that are potentially at risk. Identify natural resources that interact as systems.

Provide a visual resource that can be used as a reference for collaboration among Town Commissions and Boards.

Capture a snapshot of the Town's natural resources for use as a baseline in tracking land use trends.

Compile preliminary information that may be used for a more comprehensive Open Space Plan.

Work towards improving and protecting water quality in the Merrimack River and Contoocook River watersheds.

Develop and promote educational conservation resources for the Town and the public to increase public awareness about the need to conserve at-risk resources for future use and knowledge of the criteria used to determine the most valuable sites.

Co-Occurrence Weightings

1.2 NRI Community Survey Results

An online survey of open space resources was taken by Deering residents to provide input for conservation priorities. There was a total of 40 responses received. Respondents answered 15 questions, some of which were in the format of multiple choice, check all that apply, and write-in responses.

1.3 Co-Occurrence Weighting

Each natural resource data layer has been assigned a value score. A higher score indicates a higher natural resource value to the Town, and a lower score indicates a lower relative value. These scores were assigned by averaging the scores from NRI Working Group members. Committee members based these scores on results of public input from the community survey, study of research and best practices, and experience and knowledge from the working group members. Thorough discussion on the issues resulted in multiple adjustments before coming to the final score.

The natural resource data layers were divided into five categories: Agriculture; Wildlife Habitat; Cultural and Recreational; Drinking Water; and Surface Water. Co-occurrence weighting maps were created for each of these five categories, as well as for a final co-occurrence weighted analysis map that includes all data inputs. The table lists each data layer representing a natural resource, and the value score assigned to it. These layers and values were the inputs for the GIS based co-occurrence analysis maps and add up to total 100. The 6 weighting maps, the full weighted analysis map, and a description of the input data layers, are included in the next section. Additional information on each natural resource is available throughout the document.

1.4 Co-Occurrence Results

A co-occurrence map was produced for each of the five categories. The data inputs and value scores for each of these maps are described in the corresponding chapter later in the document. The final Weighted Co-occurrence Map displayed here is described with the conclusions and recommendations.

Data Layer	Score
All Agriculture Lands	3.67
Additional Boost for Active Crop Land	4
Farm Soils - Prime	9.33
Farm Soils - Statewide Importance	5.33
Farm Soils - Local Importance	4
Forestry Soils - Group IA and IB	3.33
Agriculture Category Total	29.67
Conservation Land 1,000' Buffer	3.67
Wildlife Action Plan Highest Ranked Habitat in NH	8
Wildlife Action Plan Highest Ranked Habitat in Region	5.33
Wildlife Action Plan Supporting Landscapes	2
Unfragmented Blocks 500 - 1,000 acres	2
Unfragmented Blocks 1,000 - 1,500 acres	4.67
Unfragmented Blacks > 1,500 acres	7
Gravel Pits	1.67
Wildlife Habitat Category Total	34.33
Recreational Trails 400' Buffer	0.67
Recreational, Historic, and Cultural Sites 400' Buffer	0.67
Scenic Viewpoints 400' Buffer	1
Cultural and Recreational Category Total	2.33
Public Water Supply 400' Buffer	0.67
Stratified Drift Aquifers Transmissivity > 4,000 sq ft/day	7.33
Transmissivity 2,000 - 4,000 sq ft/day	4
Transmissivity 1,000 - 2,000 sq ft/day	1.67
Transmissivity < 1,000 sq ft/day	1
Drinking Water Category Total	14.67
Wetlands	6.33
Floodplains 0.5% Annual Chance (200-year)	1
Floodplains 1% Annual Chance (100-year)	3.33
Waterbodies, Rivers, Streams 400' Buffer	8.33
Surface Waters Category Total	19
TOTAL	100

Co-Occurrence Categories:

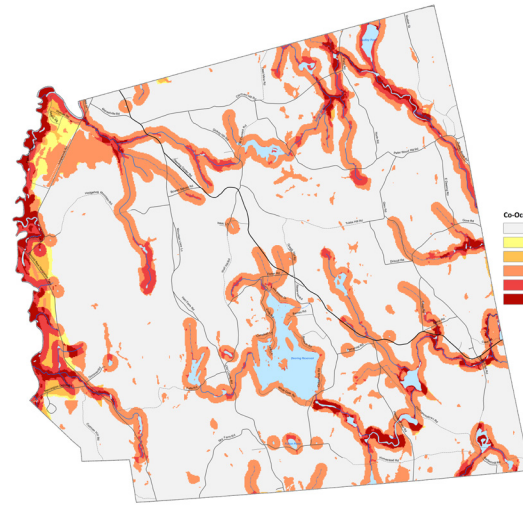
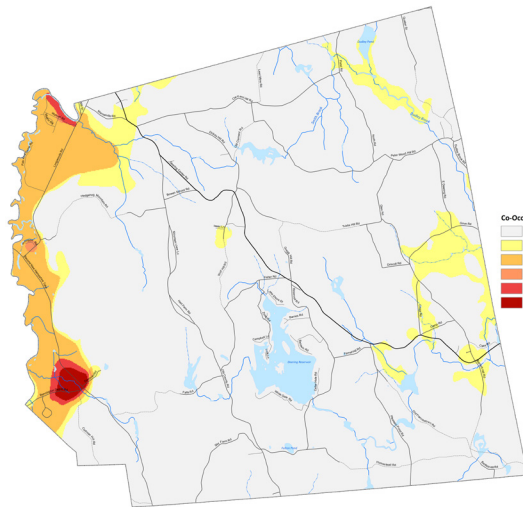
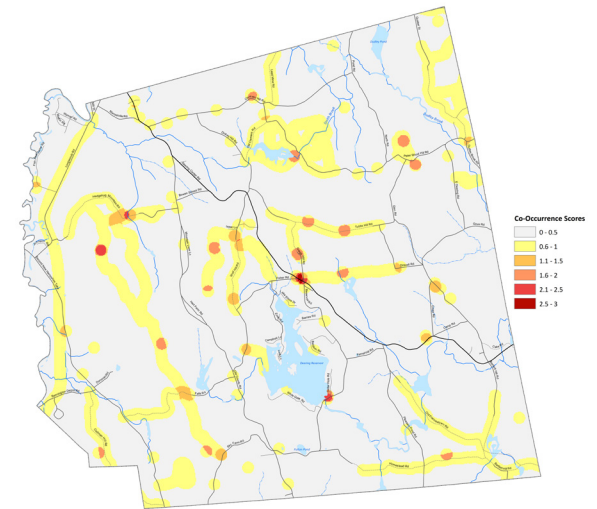
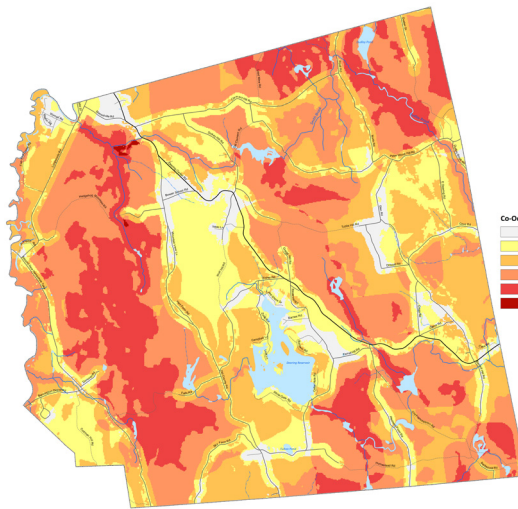
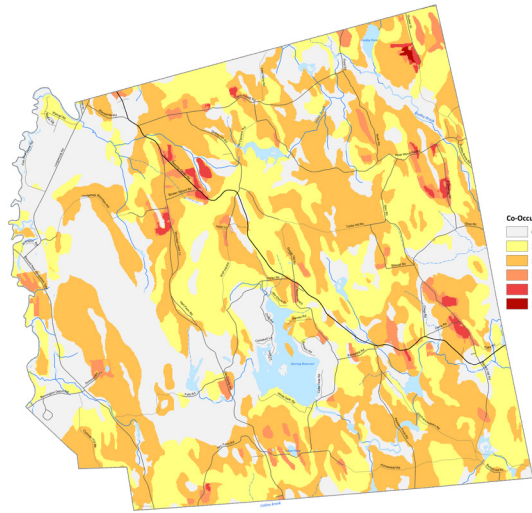
Agriculture

+

Wildlife Habitat

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Cultural and Recreation



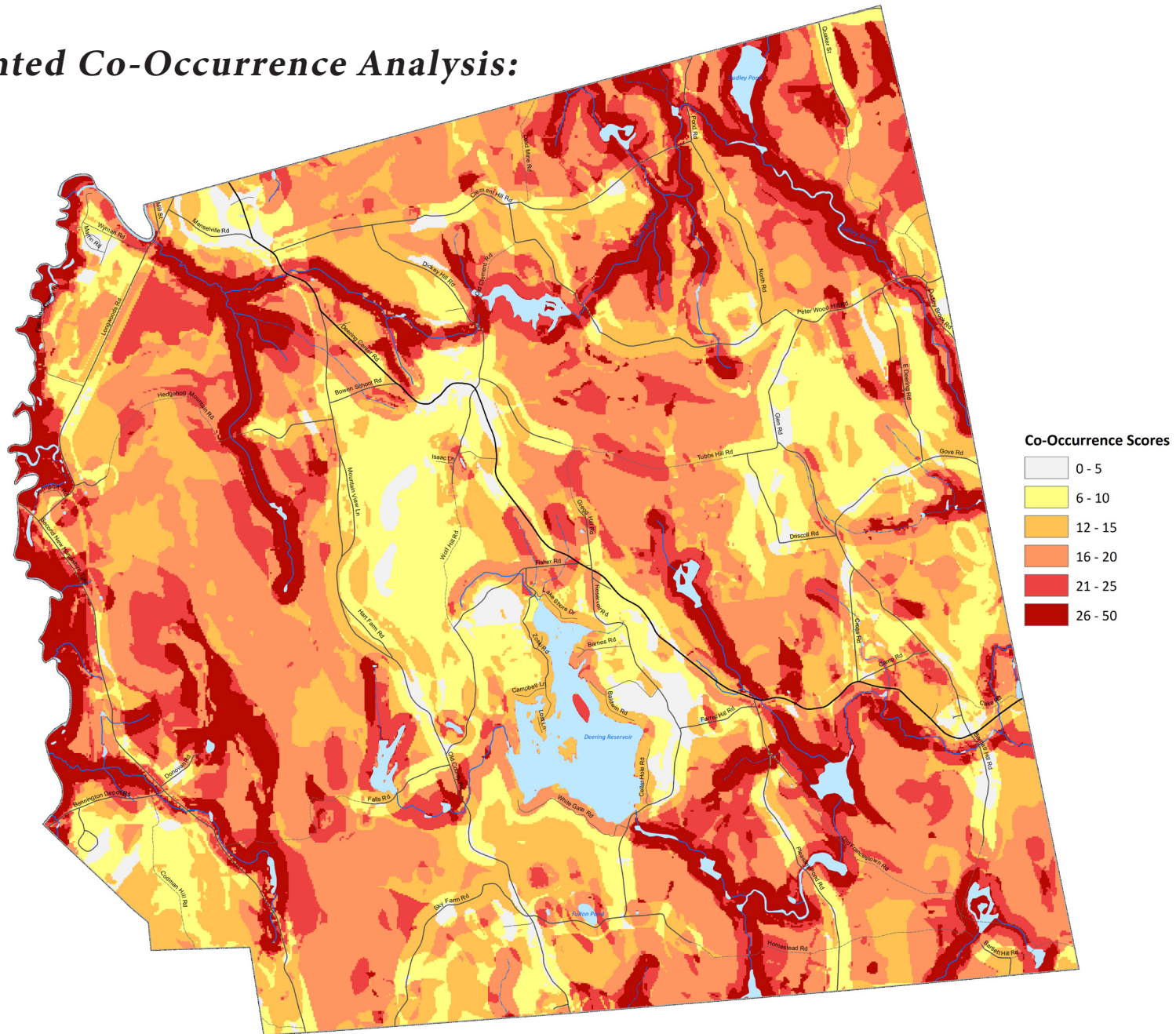
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Drinking Water

+

Surface Waters

= Weighted Co-Occurrence Analysis:



Water Resources

2

2 Introduction

Water resources are a critical asset in Deering, providing drinking water, recreational opportunities, flood storage, and habitat for wildlife. Comprising both surface water and groundwater resources, they represent some of the most fragile ecosystems and are particularly sensitive to certain types of land use. This section provides an overview of the watersheds, surface waters, floodplains, wetlands, water infrastructure, and aquifers in the Town as depicted on the NRI's Water Resources Map. For the purpose of the co-occurrence weighting, results are broken into a drinking water category, and surface water category.

2.1 Drinking Water Input Value Scores and Co-Occurrence Results

Public Water Supply 400' Buffer

While most residents have private wells, there are a few locations in Deering that are considered Public Water Supplies and produce water for drinking and potable uses. These locations scored a value of **0.67** of the total sum of 100 for all co-occurrence input layers.

Aquifers

Groundwater aquifers provide water that feeds into rivers, streams, and lakes, but also are the source of water for residential and commercial wells. The Town has many residential wells used for drinking water and other potable uses, as well as larger wells that supply water to larger facilities or communities such as a mobile home park. Many residential wells in Deering provide water through bedrock aquifers. Stratified drift aquifers are the most productive and highest quality aquifers, and filter water through deposits of sand and gravel. These stratified drift Aquifers were assigned increasing values based on their transmissivity, a measure of how much water the aquifer can move. Aquifers with a transmissivity less than 1,000 square feet squared per day received a value of only **1**, 1,000 to 2,000 a value of **1.67**, 2,000 to 4,000 a value of **4**, and those with the highest transmissivity (ability to move the most water) greater than 4,000 were scored highly with **7.33**. Because there are currently no large public water supply system in Deering, public water supply wells were not included in the co-occurrence analysis.

Drinking Water Co-Occurrence Results

The highest value lands for drinking water coincide with the highest value aquifers. A more detailed analysis of drinking water resources may be prudent for analyzing any future public water supply needs, however these aquifers are an ideal source for water.

Safe and secure drinking water resources are critically important to any town, including Deering. The category is worth a total of **14.67%** of the total scores for the Town.

2.2 Surface Waters Input Value Scores and Co-Occurrence Results

Water Bodies 400' Buffer

This layer includes rivers, streams, and water bodies (lakes and ponds), plus a 400' buffer around them. This layer was scored highly at **8.33**. Water bodies have several habitat, ecological, hydrological, and cultural values to the Town of Deering.

Wetlands

The wetlands identified in the National Wetlands Inventory were assigned a value score of **6.33** of the total sum of 100 for all co-occurrence input layers. Wetlands are important for clean surface waters, mitigating floods, and provide critical habitat for wildlife.

Floodplains

Areas with a 0.5% flood risk, also known as the 200-year floodplain, and 1% annual flood risk, or the 100-year floodplain, were assigned value scores of **1** and **3.33** respectively. Protecting floodplains can help reduce flood damage by keeping development out of flood prone areas. Floodplains also absorb and distribute floodwater, helping reduce the severity of flooding downstream. This data layer is from FEMA Digital Flood Insurance Rates (DFIRM) data.

Surface Water Co-Occurrence Results

The co-occurrence results of the Surface Water related layers highlights the Deering Reservoir and its associated wetland complex; Dudley Pond and Brook, and wetlands nearby, as well as the various branches of the Contoocook River that dip into Deering.

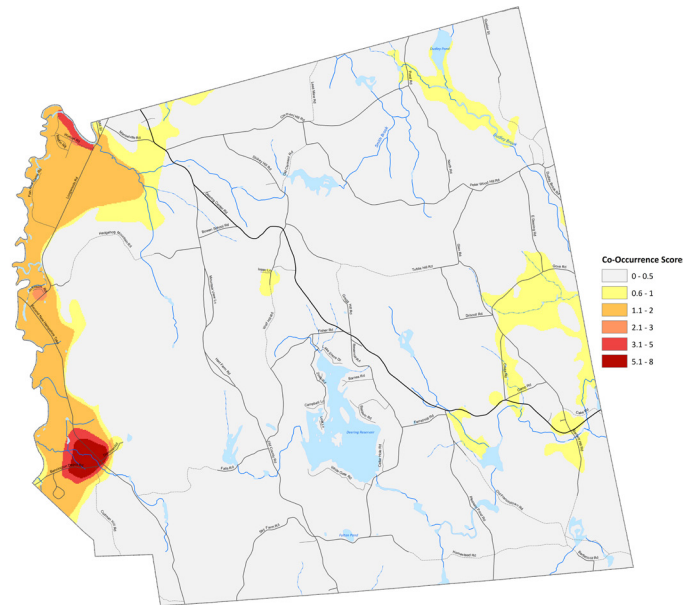
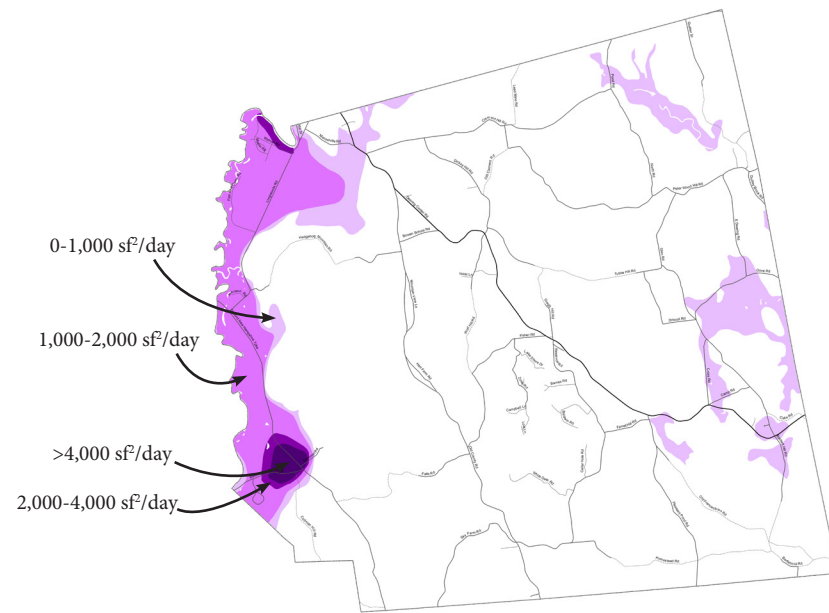
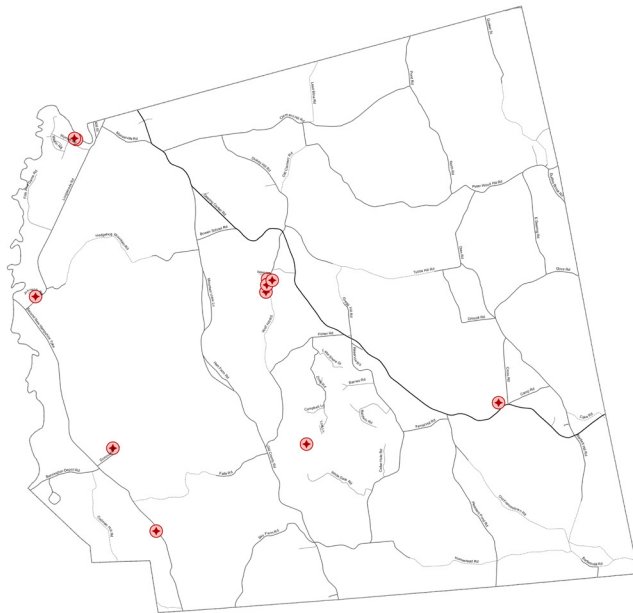
Survey results and Conservation Commission discussions indicated that clean healthy bodies of water were important to the Town of Deering. The Deering Reservoir is one of the most culturally important natural features in Town. The Surface Waters category makes up **19%** of the total co-occurrence score for Deering.

Rivers & Brooks	Size	Notes
Contoocook River	7.8 mi	Largest Drainage area in Deering
North Branch Piscataquog River	7.4 mi	Connects Deering and Weare Reservoirs
Collins Brook	0.4 mi	Joins with Dinsmore Brook and Shattuck Pond
Dudley Brook	2.8 mi	Joins Dudley Pond and North Branch Piscataquog River
Pattern Brook	1.4 mi	Joins Dudley Brook to Smith Brook
Smith Brook	1.9 mi	Joins Pattern Brook to Mud Pond
TOTAL	21.7 mi	
Lakes/Ponds	Size	Notes
Deering Reservoir	315 acres	Headwaters to the North Branch of the Piscataquog River
Black Fox Pond	36 acres	Controlled by small dam in Deering Wildlife Sanctuary
Central Rangeway Pond	20 acres	Contains a dam at north end
Clifton's Country Campground Pond	8 acres	Dammed
Dudley Pond	30 acres	Contains a NH Fish & Game owned dam and town owned right of way
Fish and Game Club Pond	<1 acre	Small trout pond for children stocked yearly by NH F&G
Mud Pond	8 acre	Natural
Oxbow Campground Pond	5 acres	Dammed
Hunter's Pond	24 Acres	Headwaters of a stream that drains into Deering Reservoir. Dammed
Johnson's Pond	25 Acres	Classifies as a swamp/marsh in National Wetlands Inventory
TOTAL	471 acres	

Public Water Supply 400' Buffer

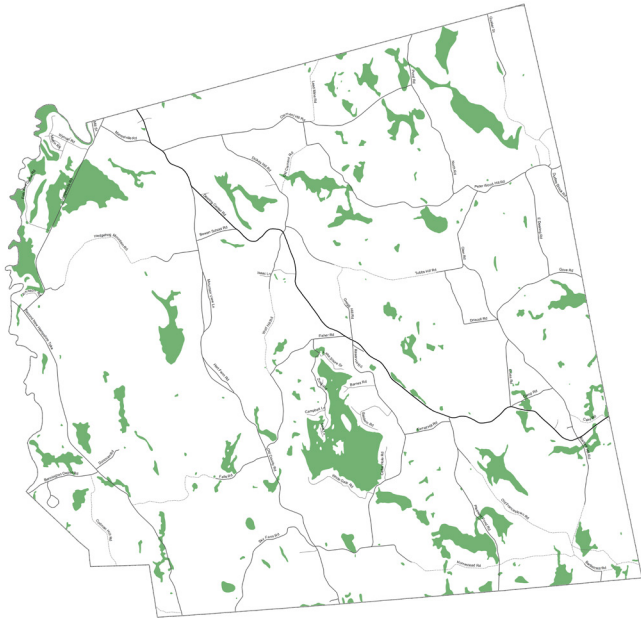
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Aquifers



= **Drinking Water Co-Occurrence**

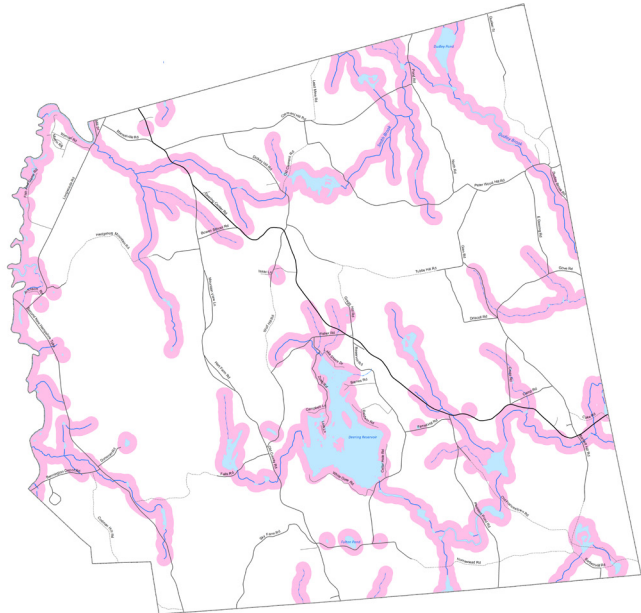
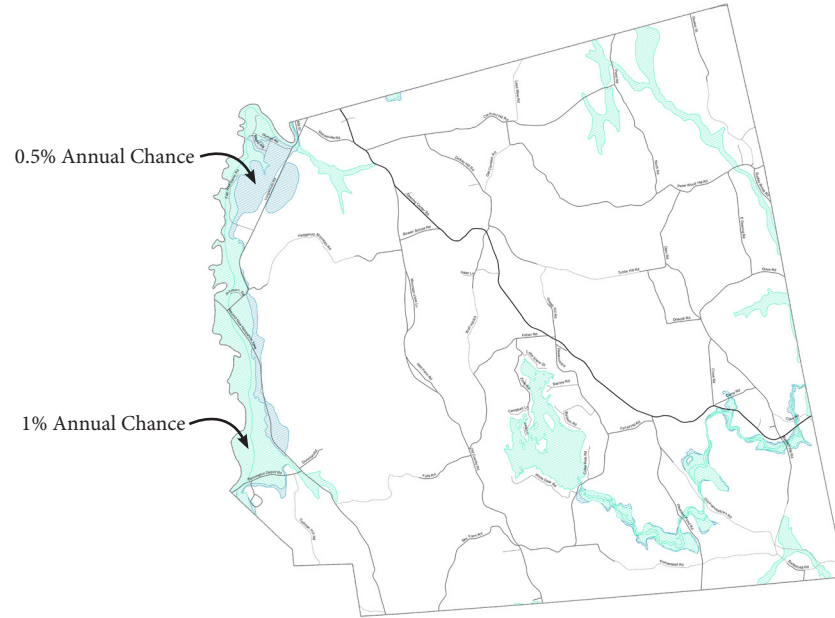
Wetlands



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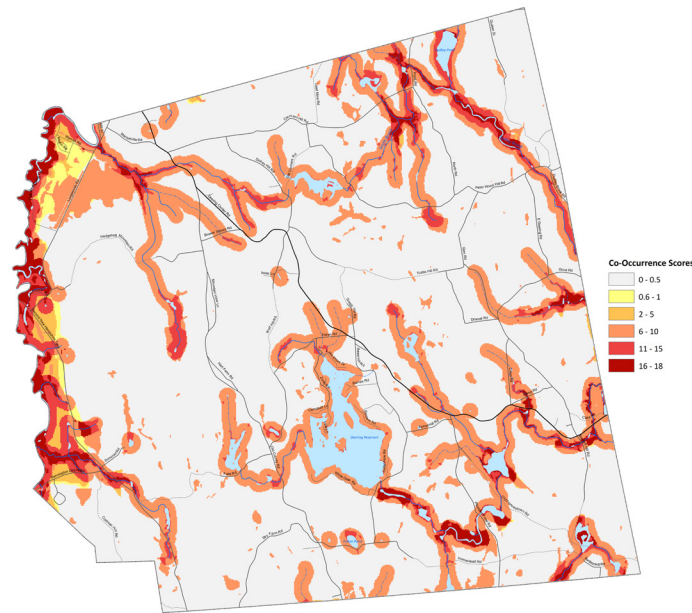
Floodplains

+



**Waterbodies, Rivers,
Streams 400' Buffer**

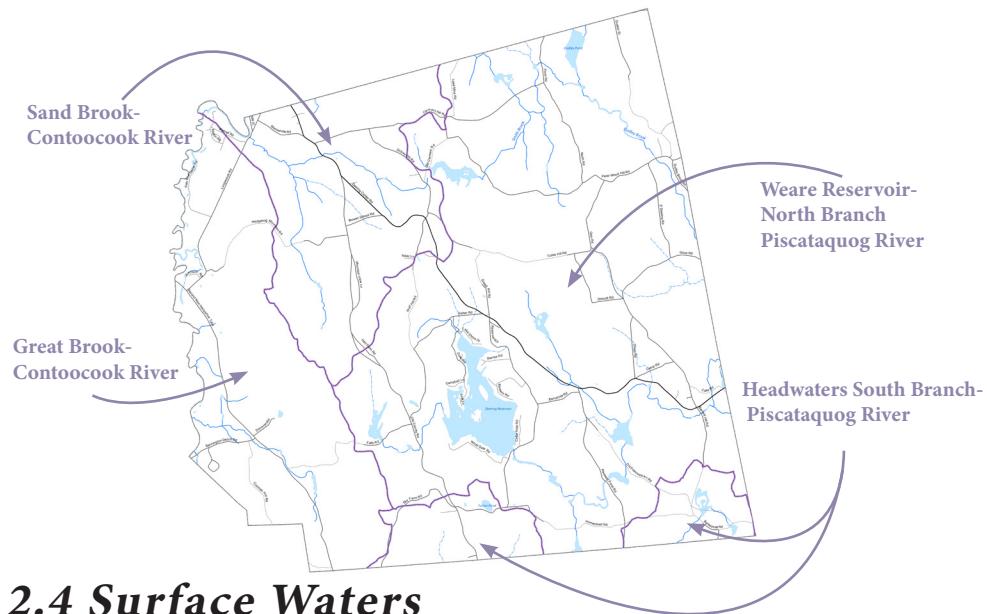
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Surface Waters Co-Occurrence

2.3 Watersheds

Deering is located within two main watersheds, the Contoocook River, and the Merrimack River watersheds, as well as multiple smaller local watersheds, including the Weare Reservoir- North Branch Piscataquog River, Sand Brook-Contoocook River, and the Great Brook-Contoocook River Subwatersheds. The notable divide of subwatersheds within the Town is the Hedgehog Mountain ridge. The Town has a watershed protection overlay zone, coinciding with the Deering Reservoir's



A watershed is an area of land that captures precipitation, surface water runoff, groundwater, etc. and drains into specific waterbodies.

2.4 Surface Waters

The primary water courses in Deering are the Contoocook River which separates Deering from Bennington, Antrim, and Hillsborough and flows north and east to the Merrimack River in Penacook, and the River which flows from the Deering Reservoir to the Weare Reservoir and on to the Merrimack in Manchester. These rivers together total over 15 miles in length in Deering. The Town hosts over 50 miles of smaller watercourses, the most prominent including over 4 miles of Dudley Brook, Smith Brook, and over 2 miles of Pattern Brook.

About 22 miles of named flowing brooks and rivers travel within and through Deering.

There are also numerous unnamed and perennial streams, brooks, as well as a lake and ponds located throughout Deering. The largest waterbody is the Deering Reservoir, covering 315 acres in the south-central area of town. The Deering Reservoir provides scenic beauty and recreation resources for residents and tourists, and was among the highest valued natural resources in Deering based on survey results and community feedback. Black Fox Pond at 36 acres and Dudley Pond at 30 acres are the largest ponds in Deering.

<i>Subwatersheds HUC 12</i>			
HUC#	Subwatershed	Location	Acres
1070006	Merrimack River Watershed		
10700060601	Weare Reservoir-North Branch Piscataquog River	Hedgehog Mountain -to- east side of Weare Reservoir	18,460
10700060604	South Branch-Piscataquog River	Sky Farm Rd in Deering -to- Blanchard Hill Rd in Greenfield	19,936
1070003	Contoocook River Watershed		
10700030301	Sand Brook-Contoocook River	Knights Hill in Bradford -to- Hedgehog Mountain	15,731
1070030603	Great Brook-Contoocook River	Willard Mountain in Antrim -to- Hedgehog Mountain	23,725

Source: NHDES Hydrologic Unit Codes 12 data

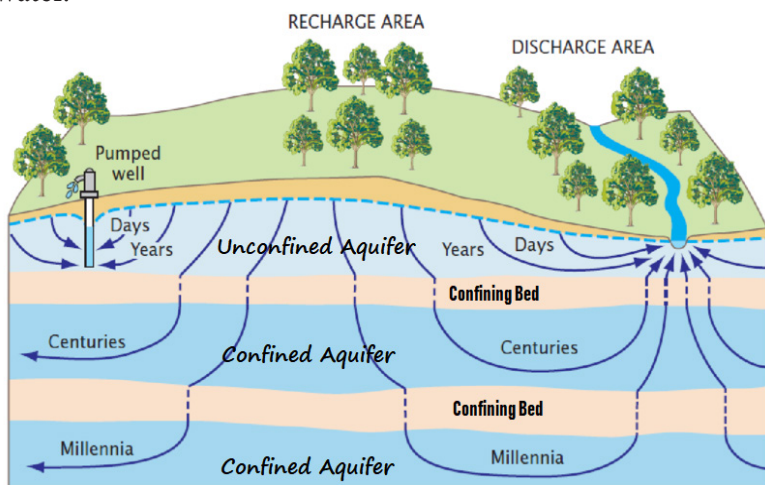
Riparian and Wetland Buffers

Riparian buffers are naturally vegetated areas along rivers and streams, and act as living filters that protect surface water quality, in turn helping to preserve the state's high-quality lakes and rivers. These riparian buffers are important for even smaller streams, as they will gather and feed the larger waterbodies in town and further downstream. The Town has a watershed protection overlay zone, coinciding with the Deering Reservoir's watershed.

2.5 Groundwater and Aquifer Types

There are two types of groundwater sources from which Deering obtains its water, bedrock aquifers and stratified drift aquifers. Most upland areas in town, and most private residential wells, are drilled into bedrock aquifers, water of which flows through lineaments, or cracks in the bedrock. Stratified drift aquifers are deposits of sand and gravel that can transmit and filter water efficiently, and are often the best locations for public water supply wells.

The stratified drift aquifers are portrayed below as the unconfined aquifer most easily accessed and recharged close to the earth's surface. The bedrock aquifers are portrayed as the confined aquifers which are more difficult to access and require centuries to millennia to recharge with water.



Source: USGS Conceptual Groundwater Flow Diagram as modified by CNHRPC

Bedrock Aquifers

The ability of varying bedrock types to yield drinking water supplies is irregular. This yield is referred to as “transmissivity.” Bedrock aquifer well yields are positively correlated with proximity to water and lineaments (cracks), and negatively to slope, elevation and the Plutonic bedrock group. Because much of Deering is elevated on steep slopes and is underlain by Plutonic Spaulding Tonalite bedrock, less water is available at these heights. These geological factors could contribute to any problems related to water quantity and pumping within rural areas outside of the stratified drift aquifers. Deering should be aware of the bedrock limitations in Town that can restrict easy access to water.

Stratified Drift Aquifers

Over the course of several thousand years, stratified drift aquifers were created layer upon layer from melt-waters during periods of ice age melting. These sometimes thick deposits of sand and gravel today are a resource known as stratified drift aquifers, which are valuable for their ability to sustain high quality and productive water wells.

The highest transmissivity areas in Deering are situated along the Contoocook River on the western boundary of town, as well as around Dudley Pond and Brook and sections of the North Branch Piscataquog from the Weare Reservoir. Only small portions of these areas have been placed under conservation, but much of the water throughout Deering is protected and preserved through aquifer, shoreline, and wetland protection.

The stratified drift aquifers in Deering have transmissivity rates that range from greater than 4,000 square feet squared per day (sf^2/day), decreasing to less than 1,000 sf^2/day . Overall, there is 6,191 acres of stratified drift aquifer in Town, covering about 31% of the Town's area. The highest yield ($>4,000 \text{ sf}^2/\text{day}$) totals a comparatively small acreage of 77 acres, while the second highest yield area (2,000- 4,000 sf^2/day) is 83 acres in size.

Stratified Drift Aquifer Transmissivity	
Yield Range in sf²/day	Acres in Deering
<1,000	4,533
1,000 - 2,000	1,455
2,000 - 4,000	83
> 4,000	77

Source: USGS Aquifer Transmissivity Data Layer

6,191 acres of stratified drift aquifer underlie 31% of the Town’s total area. The majority of Deering’s aquifers, 4,533 acres, transfer less than 1,000 square feet of water per day.

2.6 Floodplains

A floodplain is the low lying ground adjacent to rivers that is prone to flooding. Flood hazard areas that have a one percent chance of being inundated by a flood event in any given year are commonly referred to as the 100-year floodplain. The flood hazard areas with a 0.2% chance of annual flooding are often referred to as the 500-year floodplain. The Deering Hazard Mitigation Plan 2021 described the floodplain in detail, provided a series of recommendations, and developed a series of maps. The Town does have a Floodplain Development Ordinance which regulates development in these areas. The approximate assessment of existing structures in the floodplain, single family and non-residential buildings, totals over \$15 million.

Locations of 1% annual chance of flooding include large areas along the Contoocook River and sections of the Piscataquog River, as well as around Dudley Pond and along Dudley and Smith Brooks.

2.7 Wetlands

In New Hampshire, wetlands are defined as “an area that is inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and under normal conditions do support, a prevalence of vegetation typically adapted for life in saturated soils conditions.” Wetlands are not always wet, but they generally include familiar places such as marshes, wet meadows, beaver impoundments, swamps, fens, bogs, vernal pools and the surroundings of other surface water bodies. Wetlands perform a variety of ecological functions, such as providing significant habitats for wildlife and plants, maintaining good water quality, providing storage during a flood event, and as sources for recreation. Deering’s wetlands are depicted on the Water Resources Map.

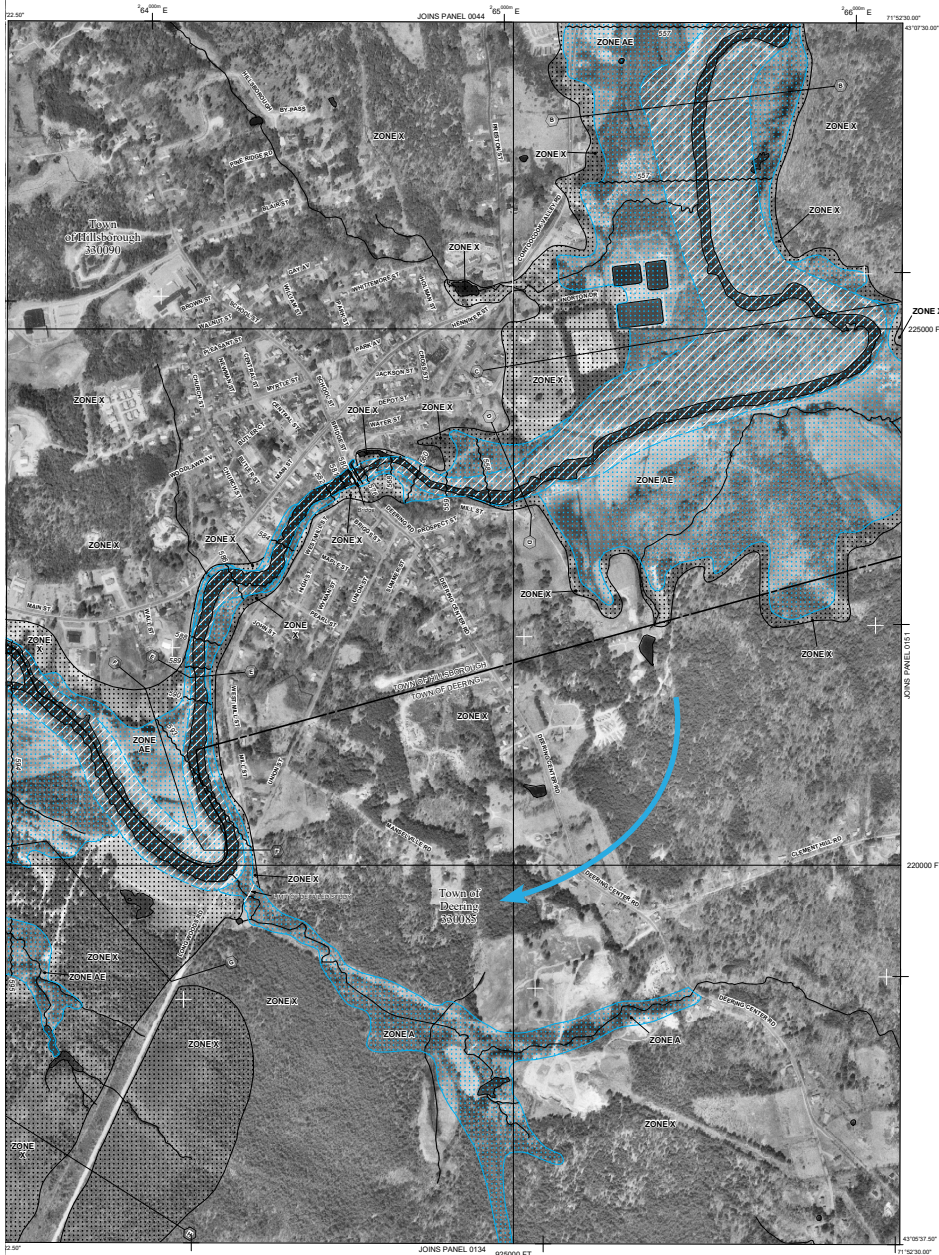
The US Fish and Wildlife Service’s National Wetland Inventory contains three classifications of wetlands, palustrine (marshes or swamps and trees), lacustrine (around lakes and of a shallow depth), and riverine (connected by rivers). Of Deering’s 19,988 total acres, 9.5% (1,897 acres) are wetlands.

Deering’s zoning requires a 50 foot setback from wetlands and its Watershed protection overlay zone requires a 75 foot wide buffer to be maintained along the edge of any wetlands associated with streams discharging into Deering Lake.

National Wetlands Inventory		
Class	Acreage	% of Town Area
Palustrine	1,501	7.5%
Lacustrine	385	1.9%
Riverine	11	0.05%
TOTAL	1,897	9.5%

Source: NWI Data Layer

NFIP Floodplains along Contoocook River at NH 149



Source: FEMA Digital Flood Rate Insurance Map #D33011C_0132 2010

2.8. Public Water Supplies

Deering has several public water supplies, including at Longwood's Mobile Home Park, Hedgehog Mountain Coop, The Wilds of New England, Robin Hill Farm/Blue House, His Mansion Dining Hall and New Beginnings. Just over 15% of Deering is served by public water systems, the remaining 85% of households or businesses get their water from wells. Some public water systems source water from groundwater the same as a well whereas others source from a larger waterbody.

Private and residential wells can also have similar pollutants, plus radon and arsenic from the bedrock. Private well owners are encouraged to test their wells every few years.

Wellhead Protection Areas (WHPA) are the locations under which groundwater flows to a producing well.



Black Fox Pond Audubon Nature Preserve, Gary Samuels



Smith Brook in Garland Conservation Easement, Gary Samuels

Agriculture and Forestry

3

3 Introduction

Deering is home to many productive agricultural farms, orchards, tree farms, hay fields, and nurseries that sell their products locally or to out-of-Town distribution centers. Through much of its history, the town has been an agricultural community rather than a commercial center. The Town's Conservation Commission and other boards can play a role in preserving farmlands and helping sustain local agriculture.

In the Agriculture Weighting Map, the highest value agriculture lands are located where active agricultural sites overlap with prime farm soil including in the northeast corner of town on Quaker Street, along Deering Center Road, scattered areas along the eastern boundary of town, and some areas near the Contoocook River. These are the primary existing locations with agricultural operations.

Survey results and Conservation Commission discussions revealed that agriculture, active farmland, and farms were very important to the Town of Deering. The agriculture category makes up **29.67%** of the total co-occurrence score for Deering.

3.1 Agriculture Input Value Scores and Co-Occurrence Results

Agricultural Soils

The Merrimack County Soils Survey identifies various soil types that are considered the best soils for agricultural purposes. Soils categorized as “Prime Farmland Soils” are scored the highest of any layer in the assessment with **9.33** points, “Soils of Statewide Importance” were scored **5.33** points, and “Soils of Local Importance” **4** points.

Forestry Soils

The Merrimack County Soils Survey also identifies soils that are most productive for forestry purposes. The best forestry soils, groups IA and IB soils, were assigned **3.33** points.

Active Agricultural Lands

The Central NH Regional Planning Commission maintains a Land Use layer for the Town of Deering, where all land is categorized into various land uses including residential, commercial, agricultural, and more. This land use layer depicts any agricultural land, maintained fields, and orchards in the Town of Deering. All lands associated with agriculture including developed areas, hay fields, grazing areas, stables, and more were assigned **3.67** points, but areas of active crop land were awarded an additional boost of **4** points giving these areas **7.67** total points.

Agriculture Co-Occurrence Results

The agriculture co-occurrence results highlight areas along Deering Center Road, Quaker Street, Peter Wood Hill Road, East Deering Road, Bartlett Hill Road, and some areas near the Contoocook River. These lands are likely to have a strong agricultural value and should be targeted for conservation if preserving agriculture and agricultural lands is a goal.

Agricultural Lands

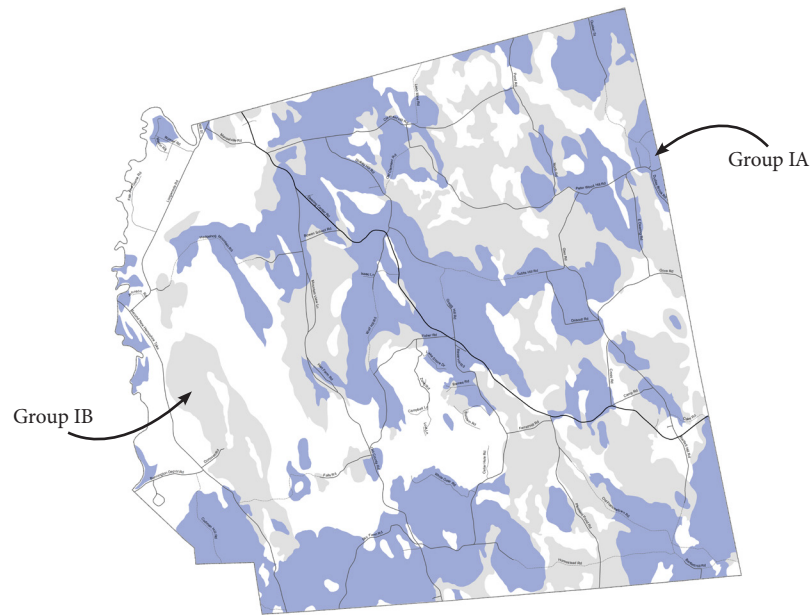
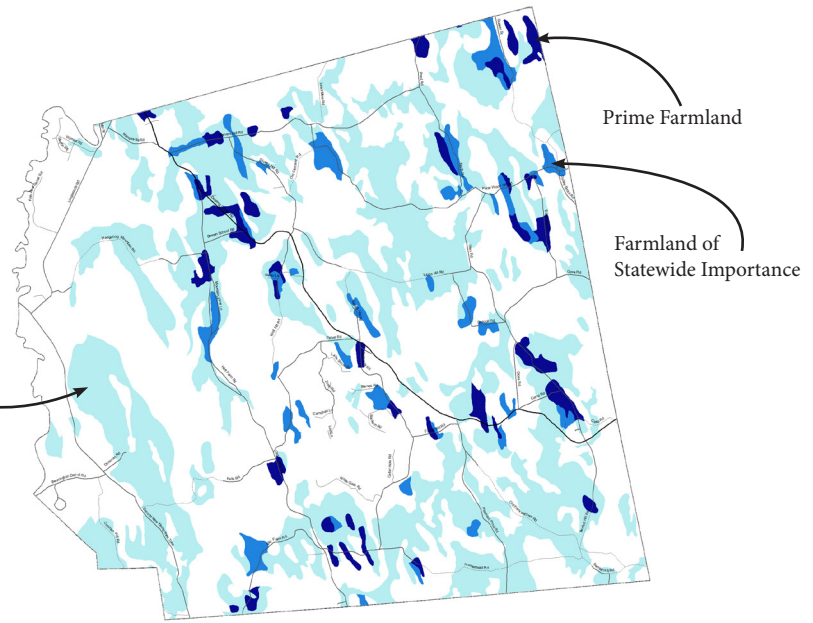
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Agricultural Soils

+



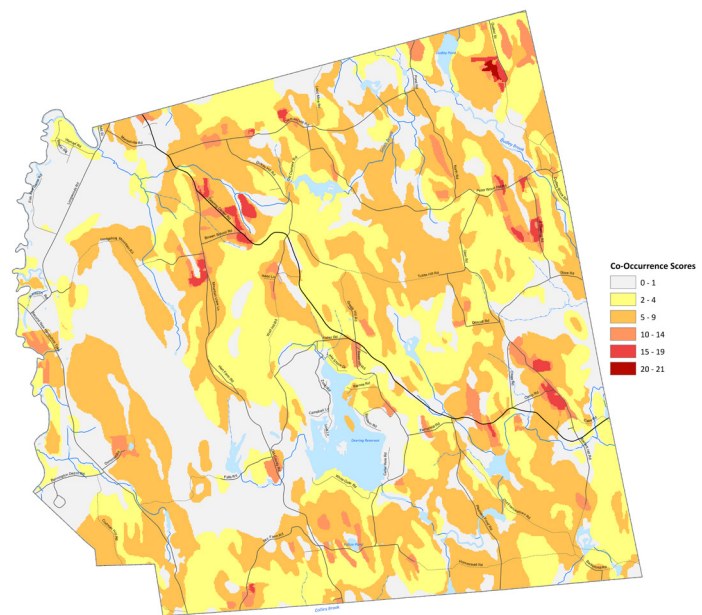
Farmland of Local Importance



Forestry Soils

=

Agriculture Co-Occurrence



3.2 Agricultural Operations

There are 6 agricultural operations which encompasses active farms, nurseries and orchards in Deering that cover about 154 acres. The types of farming include dairy, livestock, beef, corn, produce, eggs, flowers, horses, maple syrup, trees and shrubs, and hay fields. About 394 acres support other agriculturally related activities including hay fields, grazing, and developed farm operations. The Agricultural Soils and Sites map shows these farmlands, active fields and orchards overlaid with a layer showing agricultural soils.

2.7% (548 acres) of the Town is used for active agricultural purposes.

3.3 Farmland Soils

The Agricultural Soils and Sites Map displays the locations of the highest quality soil in Town. These areas are scattered throughout town and in many cases agriculture-related operations are situated within these most productive areas.

Approximately 3% (588 acres) of the soil in Deering are prime farmlands.

Prime farmland soils are the highest category of important farmlands and comprise nearly 3% of the Town. Farmland soil categorized of statewide importance are also located in Deering, adding another 3% (634 acres). The most productive agricultural operations are located within one of these soils' groupings, although operations can still occur in locally important soils.

Prime Farmland and Farmland of Statewide Importance Soils					
Map Symbol	Soil Name	Hydrologic Rating	Drain Class	Acreage	% of Town
76B	Marlow Loam, 3 to 8 percent slopes	Not Hydric	Well Drained	349	1.7%
76C	Marlow Loam, 8 to 15 percent slopes	Not Hydric	Well Drained	474	2.4%
142B	Monadnock Fine Sandy Loam, 3 to 8 percent slopes	Not Hydric	Well Drained	34	0.2%
142C	Monadnock Fine Sandy Loam, 8 to 15 percent slopes	Not Hydric	Well Drained	160	0.8%
101	Ondawa Fine Sandy Loam	Not Hydric	Well Drained	100	0.5%
78B	Peru Loam, 3 to 8 percent slopes	Not Hydric	Moderately Well Drained	12	0.06%
558B	Skerry Fine Sandy Loam, 3 to 8 percent slopes	Partially Hydric	Moderately Well Drained	124	0.6%
TOTAL				1,253	6.3%
<i>*If protected from flooding or not frequently flooded during the growing season</i>					

Source: Merrimack-Belknap County Soils Survey, 2017

Agriculture in Deering

Active agricultural operations include: Driscoll Hill Farm, PigBery Christmas Tree Farm, 3 Crow Organic Farm, Oneill Hill Mini Farm, Nazer’s Christmas Tree Farm, Dollar Shy Farm , PigBery Farm, River Run Farm, and others. There are also numerous open fields used for hay.

The actively producing farms, orchards, and nurseries cover **154 acres** of the Town

The open fields total **406 acres**

Together all agriculturally related lands total **560 acres** or **3%** of Town.

3.4 Forestry Soils

Of Deering’s 19,988 total acres, 5,998 acres are contained within about 185 lots which are used as wood lots. Of these properties, 1,550 acres and 19 lots are categorized as managed forest property according to assessing records. Most of the managed woodlands produce hard and soft wood timber and cordwood, although some are shared for hay crops. While the Town has about 1,311 total parcels, these 185 wood lots cover 30% of the Town; illustrating the importance of forestry in Deering and the rural nature of the community.

Soil types can support more than one kind of use, many soils are concurrent with agricultural and forestry soils. Over 72% of the Town’s soils are suitable for tree growth. The Forestry Soils Map displays the locations of Deering’s forest soils by forest groups. The dominant forest soils types are Group IA (38%) and Group IB (28%) which support hardwood varieties and Group IC (6%) which supports white pine.

<i>Forestry Soils</i>				
Forest Group	Definition	Types of Wood	Acreage	% of Town
Group IA	Deeper Loamy soils, moderately-to-well-drained	Prime northern hardwood	7,666	38%
Group IB	Sandy or loamy soils, moderately-to-well drained	Oak and Beech	5,600	28%
Group IC	Out-wash sands and gravel	White Pine	1,171	6%
Group IIA	1A and 1B with limitations (very steep, shallow, or rocky)	Northern Hardwood	2,456	12%
Group IIB	Poorly drained soils	Northern Spruce and Fir	1,396	7%
TOTAL			18,289	92%

Source: Hillsborough County Soil Survey, 2017

Cultural and Recreational Resources

4

4 Introduction

Inventories of the conservation lands, historic resources, and recreational resources can be found in the Deering Master Plan 2017. Trails, historic and cultural sites, and places important to the community are considered. The NRI includes information about what areas are most important to the community to assist town representatives make informed decisions about future preservation.

The Recreation and Cultural Resources Weighting Map helps highlight areas that contribute to the Town's recreational and cultural qualities. Survey results and Conservation Commission discussions indicated that while scenic, recreational, historic, and cultural significance was important to the Town, it was a small contributing factor rather than a primary driver in determining priorities for land conservation. The category makes up **2.33%** of the total co-occurrence score for Deering.

4.1 Cultural and Recreational Input Value Scores and Co-Occurrence Results

Recreational Trails

The survey and Conservation Commission feedback indicated trails are highly valued by Deering Residents. Deering is bisected along its western boundary by the Hillsborough Recreational Rail Trail which serves multiple recreational uses. The Hedgehog Mountain Trail is also a highly used and valued trail. There are quite a few other trails that residents and visitors enjoy, in addition to some class VI roads used for recreational purposes. A 400' buffer around all recreational trails were assigned a value score of **0.67** of the total sum of 100 for all co-occurrence input layers.

Recreational, Historic, and Cultural Sites

The presence of historic, recreational, or cultural sites often add appeal when considering locations to conserve. Using public input and past planning documents, a database of sites was developed and reviewed. A list of big trees were included in this category. A 400' buffer from these sites is included in the analysis and assigned a value score of **0.67**.

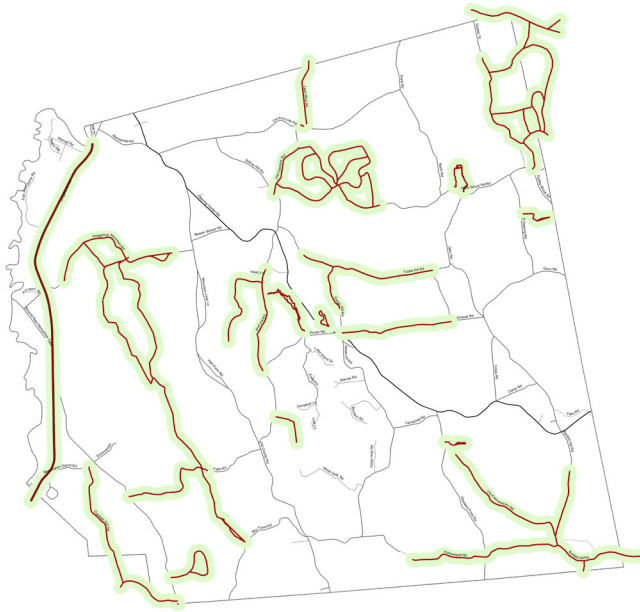
Scenic Viewpoints

Deering is a rural community with many hills, summits, and open spaces, resulting in plenty of scenic views. While a meaningful view can be subjective, the Town developed a telecommunication ordinance that identified scenic vistas of significance and a list was created in the Deering Master Plan 2017. Scenic resources can provide value to a town and be preserved through regulations and incentive-based approaches. Due to the subjective nature and difficulty of tracking all scenic views these points were given a low value score of **1**.

Cultural and Recreational Co-Occurrence Results

The co-occurrence results of the Cultural and Recreational layers highlight the trails and meaningful sites in Town. It has a small impact on the final co-occurrence scoring and map.

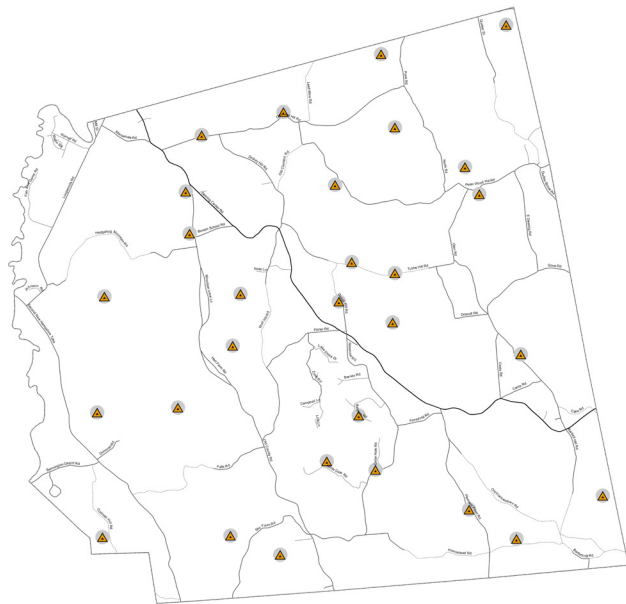
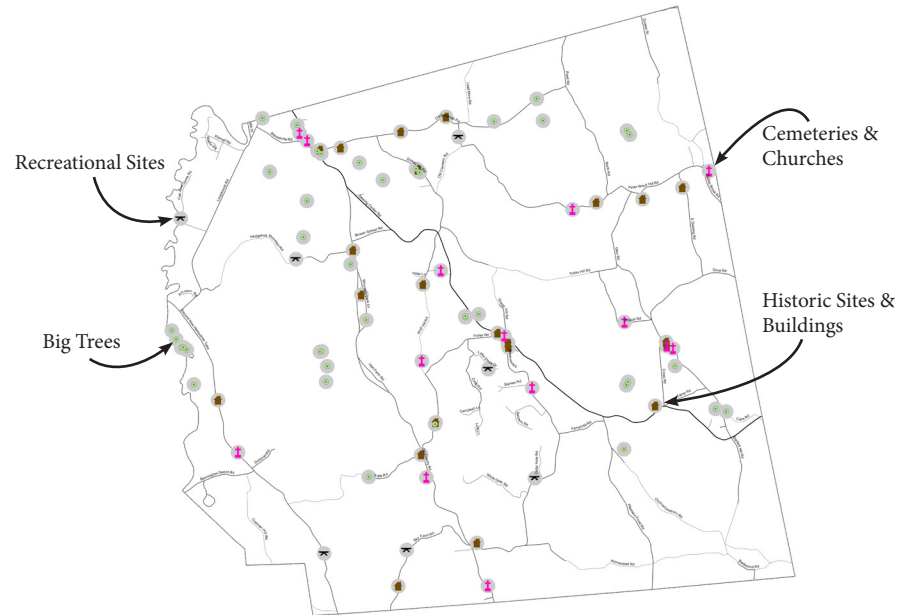
**Recreational Trails
400' Buffer**



+

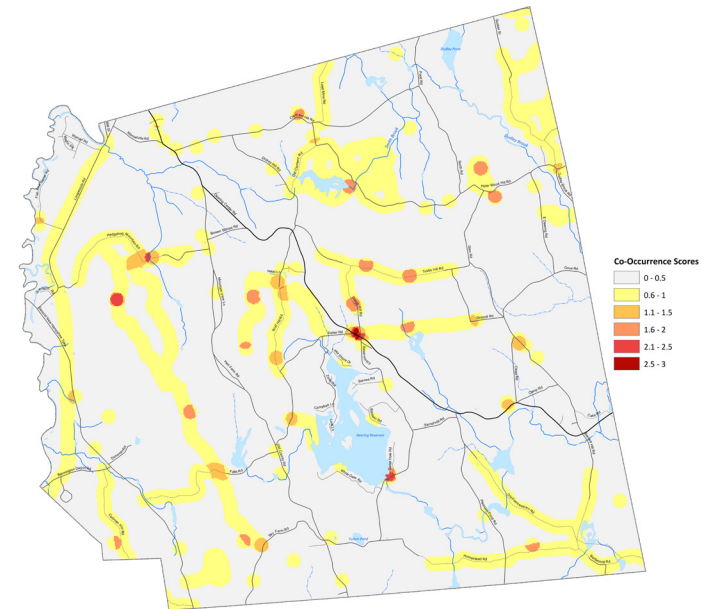
**Recreational, Historic, and
Cultural Sites 400' Buffer**

+



Scenic Viewpoints 400' Buffer

=



**Cultural and Recreational
Co-Occurrence Results**

4.2 Conservation and Public Lands

A conservation easement is a permanent legal restriction against future development and other activities on a parcel as specified in the conservation easement deed. There are over 80 conservation or public lands in Deering as displayed on the Conservation and Public Lands Map. These properties, which may or may not be permanently preserved, include conservation easements, deed restrictions, scenic easements, and open space. These areas are located throughout town, the largest connected areas being in the western and northeastern areas. There are some areas not conserved along important waterbodies such as the Contoocook river and the eastern side of the Deering Reservoir. Conservation lands (and 1000' buffers) are included in the co-occurrence analysis as part of the Wildlife Habitat category.

About 37% (7,351 acres) of the Town's land is considered under conservation.

4.3 Recreational Trails

Deering hosts local trails throughout town as well as a lengthy section of the Hillsborough Recreational Rail Trail, which is maintained by the NH State Parks and local trail advocates. Most of Deering's trails are displayed on the Trails Map, however GIS map data is not available for all public trails in Deering, and several informal trails on private property are also not mapped. Many Class VI roads in town also act as trails. The Hillsborough Recreational Rail trail can be accessed from Fish and Game Road off Long Woods Road. The trail travels north into Hillsborough and stretches far into Bennington to the south. Walkers, cyclists, cross country skiers, snowmobile users, and other recreationalists may be attracted by this eight-mile route.

The Hedgehog Mountain Forest, John and Anna King Forest, Tom Rush Forest, Vincent State Forest, Deering Preserve, and Deering Wildlife Sanctuary all have local trail networks and the Deering Trail network also connects to a wider transportation network.

4.4 Current Use

Current use provides a lower tax rate for land over 10 acres utilized for a non-residential purpose. Rules produced by the NH Department of Revenue Administration and assessment ranges change annually. Over the last decade in Deering from 2011 through 2021, the total acreage of land in current use has shown small fluctuations, with a net gain of 173 acres. In 2011, 14,359 acres (72% of the Town) were under current use whereas at the end of 2021, 14,532 acres (73% of the Town) were under current use. This indicates consistent development trends during the last decade, as more acres were placed under current use instead of removed from the program.

<i>Current Use (CU) Trends</i>		
Year	Total Acres in CU	% of Town
2011	14,359	72%
2012	14,599	73%
2013	14,541	73%
2014	14,473	73%
2015	14,475	72%
2016	14,470	72%
2017	14,522	73%
2018	14,520	73%
2019	14,512	73%
2020	14,506	73%
2021	14,532	73%

Source: CNHRPC Compiled Research From Town Reports

4.5 Historic and Cultural Sites

The Town has a rich history with important sites, features, buildings, or monuments throughout the community. As displayed and labeled on the Cultural Sites map, concentrations of sites are located along Deering Center Road at the northern end and in the Town center just north of the Deering reservoir. These locations were just as important for the Town's history as they are in today's life. They include cemeteries, parks, farms, boat ramps, public sites, old buildings, and big trees.

4.6 Steep Slopes and Ridgelines

Within its borders, Deering hosts a wide range of elevations, from under 600' at the low-lying Contoocook River to the Town's highest point on Wolf Hill at Clark Summit that is at 1,520' above sea level. The Town is host to many hills, some of which are in forested areas that can be climbed. There are ridgeline preservation and protection opportunities to be considered. Steep slopes are a development constraint and are often defined as between 15% to 25% or greater. Watershed runoff is exaggerated by the presence of steep slopes without proper management. The greatest acreages of slopes are found on the sides of the named hills.

Deering does not have steep slope or ridgeline regulations.

4.7 Scenic Views and Viewsheds

The Topography and Scenic Vistas Map display the promontories in Deering. At any of these locations, scenic viewsheds are identified in several directions. In addition, the roadside views of lowland areas also offer a rural, scenic beauty which could similarly be preserved for their scenic value. Summits and vistas are scattered throughout Town including Clark Summit, Gregg Hill, Hedgehog Mountain, Old County Road, Wilson Hill, Reservoir Road, the Marget Wood Memorial off of Peter Wood Hill Road, and plenty of other locations. There are many locations with great views important to residents, locally there is a location on the Lindquist Easement known simply as "The View."

The Sites, Views, and Trails map shows the topography of Deering, which can indicate the location of hillside views. There are scenic vistas of the bodies of water in town including multiple around the Deering Reservoir. These vistas help define Deering's identity.

<i>Hills with 1,000' of Elevation or More</i>		
Name	Elevation	Location
Clark Summit (Wolf Hill)	1,520'	Between Old County Rd North and Wolf Hill Rd
Wilson Hill	1,400'	West Skye Farm Rd
Hedgehog Mountain	1,340'	South of Hedgehog Mountain Rd
Gregg Hill	1,320'	East of Deering Center Rd to the north of the center of town
Sodom Hill	1,150'	Along the western end of Clement Hill Rd
Bartlett Hill	1,120'	East of Bartlett Hill Rd
Locke Hill	1,000'	Between Glen Rd and East Deering Rd

Source: Deering Master Plan 2017, CNHRPC compiled research from topographic maps

4.8 Big Trees

Deering's protected forests provide a refuge for many large, old trees. These old trees provide historical and natural significance to the Town because each tree contains information about the climate of the Town over hundreds of years. The trees' relevance to the environment and character of the Town makes them worthy of note and preservation. In 1980-1985 a group of Deering residents compiled a list of the Town's largest trees. Since, Conservation Commission members have found many of the trees listed while identifying more historic trees. The location and list of Big Trees can be seen on the accompanying Big Trees map and more information is available on the town website.



Lindquist Conservation Easement View, Gary Samuels

River Run Farm View, Gary Samuels





State Champion White Ash Summer, Gary Samuels



State Champion White Ash Winter, Gary Samuels

Wildlife Habitat

5

5 Introduction

As a rural community with a low population density and large blocks of undeveloped land, Deering contains natural communities and habitats, which are home to a wide variety of wildlife. The NH Fish and Game maintains a listing of species occurring in New Hampshire that are state- and federally-threatened and endangered, of special concern in the State, introduced species, and species of greatest conservation need. The species listing includes diadromous fish, freshwater fish, marine fish & marine invertebrates, mammals, reptiles, amphibians, mussels, insects, and birds. The NH Rare Plants, Animals, and Exemplary Natural Communities document was updated in May 2020 and contains town by town lists of species, including those for Deering. Threatened and endangered species as well as more common wildlife require a range of habitat types and scales.

5.1 Wildlife Habitat Input Value Scores and Co-Occurrence Results

Wildlife Action Plan

The Wildlife Action plan is a dataset developed by New Hampshire Fish and Game to show areas with the highest quality wildlife habitat. This layer is the most heavily weighted data layer in this category as it represents areas of important habitat better than any other layer. Three different categories in this data layer were scored, the highest being “Highest Ranked Habitat in NH” at **8**, then “Highest Ranked Habitat in Ecological Region” with **5.33**, and “Supporting Landscapes” scoring **2**. Additionally Gravel Pits, which offer habitat to a unique group of species were mapped and scored with a value of **1.67**.

Unfragmented Lands

This dataset developed by CNHRPC breaks Deering into blocks of land unfragmented by roads, development, or human activities. Large areas of land that are not broken up by roads or other human disturbances are important for a range of species and thus have a higher value than smaller blocks of undeveloped land. The unfragmented lands layers includes a 500’ impact buffer from all roads. Unfragmented blocks with 1,500 acres or more are assigned the highest value score of **7**, and blocks between 1,000-1,500 were assigned a lower score of **4.67**, and blocks of 500-1,000 acres were given the lowest score of **2**.

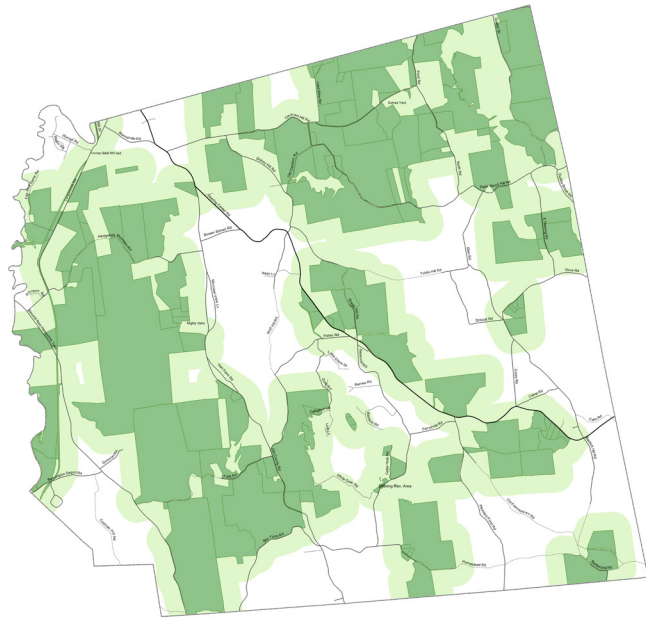
Conservation Land

Conservation lands and a 1,000’ buffer were assigned a value score of **3.67**. Having larger continuous areas of conserved space has a higher total habitat value than multiple fragmented open spaces. Some wildlife species require large areas of land undisturbed by human activities.

Wildlife Habitat Co-Occurrence Results

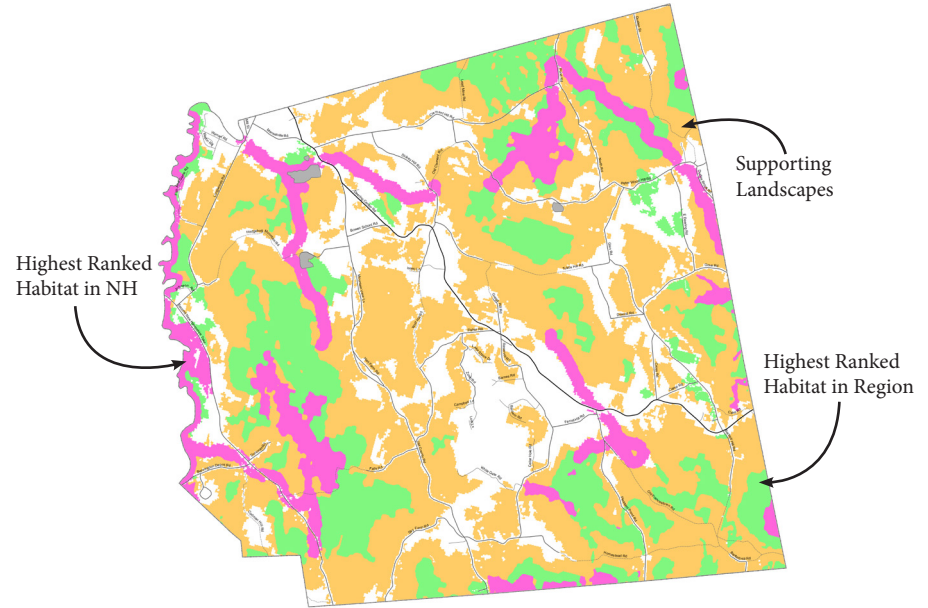
The co-occurrence results of the wildlife habitat related layers show high habitat value lands in the large, unbroken block of land in the west side of town, the northeast corner, and other scattered areas.

**Conservation Land
1,000' Buffer**



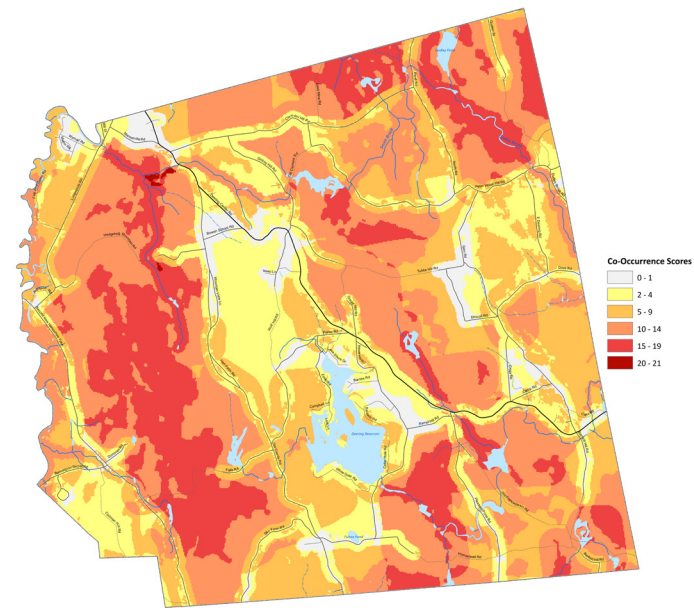
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**Wildlife Action Plan
& Gravel Pits**



Unfragmented Blocks

=



**Wildlife Habitat
Co-Occurrence
Results**

5.2 Unfragmented Blocks

The main factor influencing the use of forest lands for timber products and wildlife habitat range is the level of fragmentation on the landscape. Fragmenting features such as roads, residential development, commercial and industrial activity have been prevalent on the New Hampshire landscape since early settlement years. The location of unfragmented lands, the land blocks not separated by roads, houses, or other human development, was determined for Deering and the surrounding communities.

Deering is a rural community with most of its development concentrated along the main routes and Class V Town roads. By conducting a GIS operation of buffering publicly maintained roadways by 500', an unfragmented lands inventory was conducted. For this case, the operation excludes Class VI unmaintained roads. These large blocks extend regionally into surrounding communities. See the Unfragmented Lands Map for visual detail.

The largest unfragmented block totals 6,464 acres, however only 1,387 acres are within Deering. The largest block within the boundaries of the Town is 3,793 acres encompassing Hedgehog Mountain Forest extending from Second New Hampshire Turnpike east to Old County Road North and from Manselville Road south across all of Deering. The second largest unfragmented land block located within the boundaries of Deering is 1,906 acres located northeast of the Deering Town Center. There are three unfragmented blocks over 2,000 acres that are regionally significant located mostly within neighboring towns and occupying space along the northern and southern town lines.

Slightly over 28% (5,689 acres) of the Town is contained within the two largest blocks of local unfragmented lands.

Unfragmented Blocks		
Block Location: 500+ Acres Locally	Unfragmented Acres in Deering	Total Unfragmented Acres
Second NH Turnpike -to- Old County Rd	3,783	3,875
Deering Center Rd/Dickey Hill Rd -to- Clement Hill Rd	1,906	1,906
Pleasant Pond Rd -to- Deering Center Rd	1,387	6,464
North Rd/Dudley Pond Rd -to- Weare TL	1,021	2,477
Old County Rd North -to- Pleasant Pond Rd	976	2,003
Deering Center Rd -to- Dudley Pond Rd	799	2,462
Old County Rd North -to- Deering Center Rd	721	721
Deering Reservoir and Surrounding Area	681	681
Clement Hill Rd -to- North Rd	550	550
East Deering Rd -to- Weare TL	537	1,090
TOTALS	12,361	22,229

Source: CNHRPC GIS Calculations Using Road Buffers, 2023

5.3 Wildlife Action Plan (WAP) Habitat Types and Tiers

The NH Wildlife Action Plan 2020 (WAP) is an important component of the Deering NRI. Using the habitats identified in Town, the dominant hemlock-hardwood-pine forests support species such as bats, eagles, songbirds, snakes, moose, turtles, and salamanders. The Appalachian oak-pine forests host similar species. Covering nearly 77% of Deering’s land area, these two forest types also represent essential habitat for owls and large-roaming mammals such as bobcat, moose, fisher, coyote, black bear, deer, and others.

Wildlife Action Plan Tiers

Tier 1: Highest ranked habitat in NH by ecological condition

Tier 2: Highest ranked habitat in biological regions (ecoregions or watershed groups)

Tier 3: Supporting landscapes (other significant habitat, regional-scale)

The WAP utilized the newest available satellite imagery resources and techniques to determine the locations and acreages of priority habitat areas.

The locations of the highest priority habitat (Tier 1) are found along the Contoocook River and its tributaries, North Branch Piscataquog River, area in the Hedgehog Mountain Forest, along Dudley Brook, Smith Brook, and bordering Francestown. The Tier 2 locations are generally along the periphery of the Tier 1 habitats, with the largest swaths in the Hedgehog Mountain Forest and along the northern border of

Wildlife Action Plan Habitats		
Habitat	Acres	% of Town
Hemlock-hardwood-pine	11,169	56%
Appalachian oak-pine	4,140	21%
Marsh and shrub wetland	922	5%
Grassland	846	4%
Developed or Barren	778	4%
Water	613	3%
Peatland	228	1%
Floodplain forest	224	1%
Temperate swamp	167	<1%
Rocky ridge	104	<1%
Cliff and talus slope	86	<1%
Sand/Gravel	33	<1%
Northern swamp	40	<1%

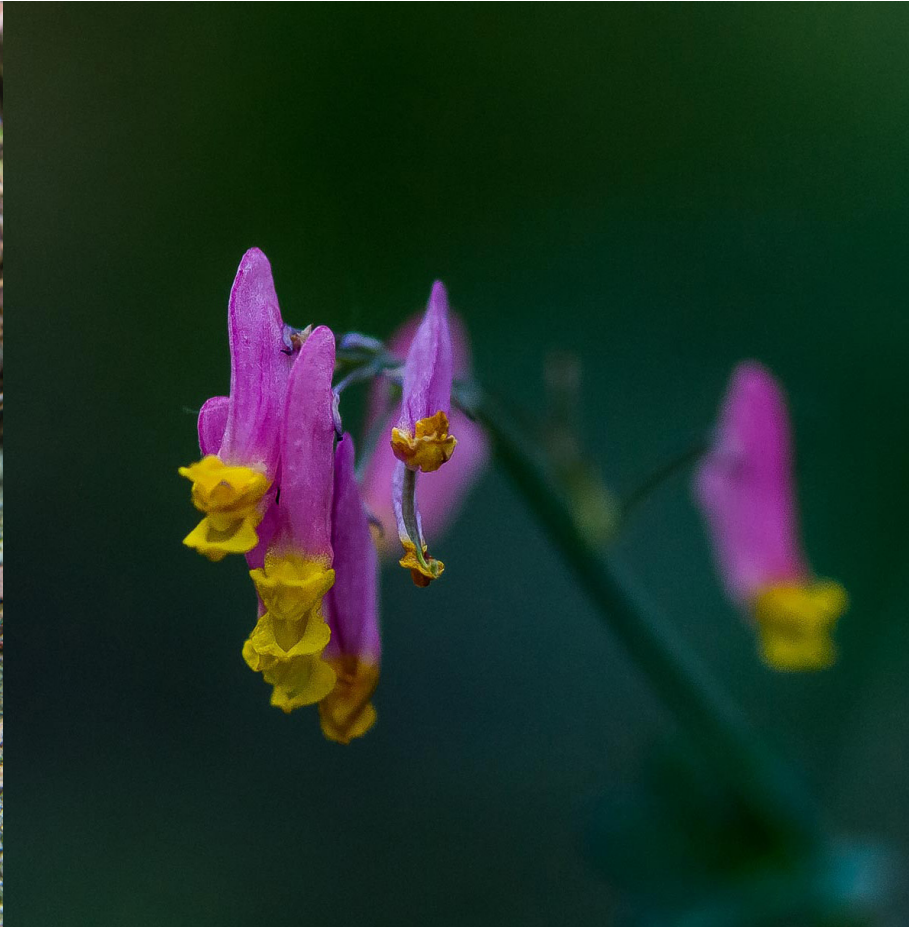
Wildlife Action Plan Habitat Priorities			
Tier Priority	Acres	% of Tier Protected	% of Town
Tier 1 Acres	2,071		10.4%
Tier 1 Acres Conserved	1,048	50.1%	
Tier 2 Acres	3,655		18.3%
Tier 2 Acres Conserved	1,783	48.8%	
Tier 3 Acres	9,128		45.7%
Tier 3 Acres Conserved	3,440	37.7%	
Total Tier	14,854		73.1%
Total Tier Habitat Protected Acreage	6,271	42.2%	

5.4 iNaturalist Citizen Data Collection

iNaturalist is a website and smartphone application that facilitates the crowd-sourcing of biological observations and identifications. Users can use the software to record their own observations, get help with identifications, collaborate with others to collect biodiversity information for a common purpose, or access the observational data collected by others. Residents of Deering actively contribute to iNaturalist which has created a lively and robust repository of the flora and fauna in Town. The use of iNaturalist in Deering helps promote biodiversity in Town through the practice of observing and sharing information.



Cortinarius Armillatus Mycorrhizal Mushroom, Gary Samuels



Capnoides Sempervirens, Gary Samuels

5.5 Wood Duck Nesting Box Program

The wood duck is a cavity nesting bird whose habitat includes the many wooded wetlands found throughout Deering. The migratory birds head south in the fall and return to Deering early in the spring to mate and lay eggs. Like many abundant waterfowl species, the wood duck was driven to the brink of extinction by the early 20th century due to unregulated hunting and the loss of suitable nesting habitat. The Migratory Bird Treaty Act of 1918 and the use of artificial nesting structures (wood duck boxes) allowed the population to recover. Deering's wood duck nesting box program was started in the mid-1980s and has expanded in coverage and number of nest boxes ever since. The forty-three nesting boxes scattered in 18 wetlands simulate cavities in trees with the added advantage of a predator guard providing safety to eggs and chicks. Deering's Conservation Commission and volunteers prepare each box prior to the return of the wood ducks. The average utilization of the nesting boxes over the past 29 years has been 42% with ducks often returning to the same box they inhabited the year prior.



Wood Duck Box #46, Gary Samuels



Black Bear, Driscoll Rd. Deering, NH, Mike Thomas



Common Loon, Deering Reservoir. Deering, NH, Mike Thomas

Conclusions and NRI Recommendations

6

6 Introduction

The NRI Maps and data have helped highlight lands that are likely to best meet the Town's conservation priorities or areas where development would be less disruptive to the natural character of Town. The details of the natural resources and their contributions to the Town of Deering also lead to a series of specialized recommendations.

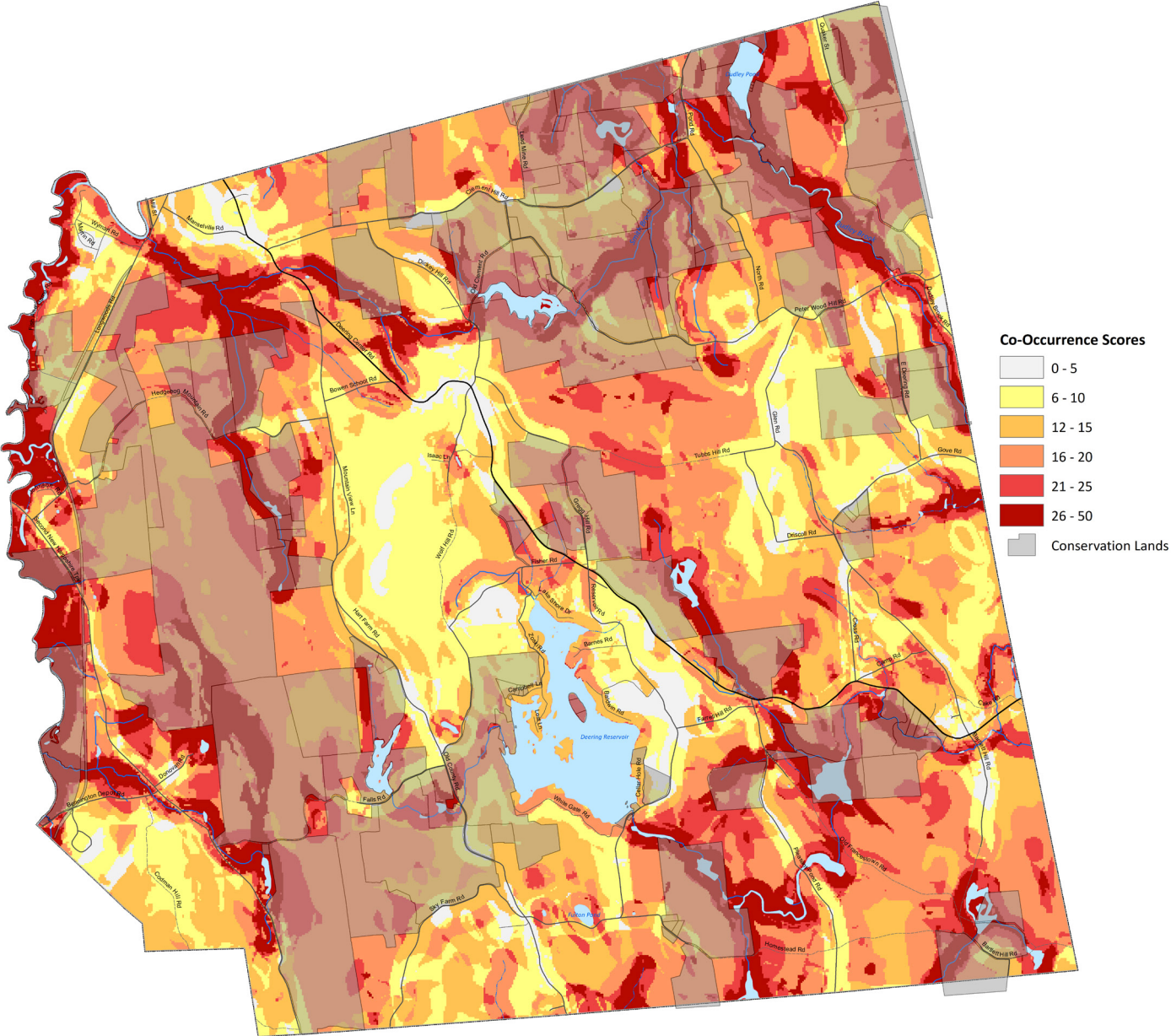
6.1 Weighted Co-Occurrence Analysis

The Weighted Co-Occurrence Map visually displays the highest priority natural resource locations in the community. The analysis found the most essential locations in Deering to protect for future generations include the best farm soils, Merrimack River corridor and areas along its tributaries, the North Branch Piscataquog River and ponds in its path, Dudley Pond and its surrounding area, Dudley and Smith Brook and their surrounding areas, and space in the unfragmented areas of Hedgehog Mountain Forest and northeast of Deering Center Road. When overlaid with existing conservation lands, it is revealed that much of the lands that support the highest natural resource value to the Town are presently conserved but more can be protected.

6.2 Recommendations

The set of recommendations included were developed from the results of this natural resource inventory. These recommendations are not a comprehensive list of all important tasks required to support the natural resources in town. For a more comprehensive list please reference the objectives listed in the Natural Features of the Deering Master Plan 2017.

Weighted Co-Occurrence Analysis and Conserved Land



Recommendation 1: Use this Natural Resources Inventory and the Co-Occurrence Analysis to inform decision making on natural resource protections, including future easement and conservation property purchases.

This NRI and Co-Occurrence Analysis is intended to be a tool to help the Conservation Commission and others make more informed decisions regarding the many natural resources in Deering. The Co-Occurrence Analysis Map and the individual category Weighting Maps roughly indicate which lands in Deering provide the highest resource value to the Town. This will help to prioritize the limited time and funding resources for securing additional conservation lands.

As an exercise, the Conservation Commission should develop a spreadsheet of properties that lie in parts of town that have the highest conservation value as shown by the Weighted Co-occurrence analysis. Efforts to acquire and protect land should make use of various grant opportunities.

Recommendation 2: Work with the Planning Board to cooperatively identify priority conservation land, and identify other lands better suited for meeting other community objectives, such as economic development, housing, or community facilities.

Conservation and natural resource protection are just some of many competing community objectives that every town must manage. At times, open space or the extraction of resources may be desired for meeting these community needs, including housing, recreation, business enterprises, and various economic development initiatives. It is clear the Conservation Commission should focus on protecting priority conservation land, but it may also play a role in discussing how, where, and to what extent development or other activities should occur. Likewise, all parts of Town government including the Planning Board should review the Town's Natural Resource priorities and needs to inform decisions on their wide ranging responsibilities.

Recommendation 3: Vigilantly protect the town's stratified drift aquifers, particularly along the Contoocook River.

Much of Deering is underlain by bedrock that limits the amount and quality of water that can be drawn from wells. The high transmissivity aquifers along the Contoocook are much better suited to meeting any future drinking water needs, but are susceptible to contamination. According to the Town's Master Plan, some contamination of parts of the aquifer has been documented. The town should vigilantly enforce the Aquifer Protection Ordinance and periodically testing water wells for contaminants including PFAS.

Recommendation 4: Maintain and update this NRI and associated data as needed, and consider developing an Open Space Plan to accompany it.

The natural conditions we see today may not be the same several years from now, and newer and higher quality data become available for consumption nearly each year. As such, occasional updates to this NRI are warranted. In addition, an Open Space Plan may assist the Conservation Commission and the Town in implementing strategies to protect natural resources and open space.

Recommendation 5: Routinely consider the anticipated impacts of climate change in all Conservation Commission actions and monitor and document changes through data collection.

Each year, more data and resources are available to help communities understand the present and future impacts of Climate change. The town must be prepared to adapt to these changes, and ensure the natural community has what it needs to be resilient in the face of change. In addition, Deering has a role to play in mitigating the effects of climate change through practices and policies that lower emissions and store carbon.

Recommendation 6: Continue actively participating with the Contoocook and North Branch Local Advisory Committee (CNBRLAC) and the Piscataquog River Local Advisory Committee (PRLAC) as part of the NHDES Rivers Management and Protection Program (RMPP).

The Contoocook River, which makes up Deering's western boundary, and the Piscataquog River, whose headwaters are in the western part of Deering, are two of New Hampshire's Designated Rivers. The CNBRLAC and PRLAC, as part of the NH Rivers Management and Protection Program, are partnerships between state government and local citizens. These committees play a vital role in protecting the river, their shore-lands, and contributing watersheds.

Recommendation 7: The planning board is encouraged to revise the Watershed Overlay Ordinance for the Deering Reservoir to ensure better clarity, the establishment of a conditional use permit process, and exploration of best practices.

The public input component of this NRI established the importance of the Deering Reservoir to Deering residents and visitors. Revisions to the ordinance to ensure consistency with applicable RSAs and case law, and consistency with best management practices can help ensure the Deering Reservoir remains healthy for people and wildlife.

Climate Adaptation Report

7

7 Introduction

Climate should not be confused with weather. In New Hampshire the weather varies greatly with each season transitioning from hot summers to freezing winters. Climate is the combination of daily weather averaged over an extended period. The makeup of Deering's environment, ecosystems, natural resource industries and infrastructure can be vulnerable to some impacts of a changing climate while being resilient to others.

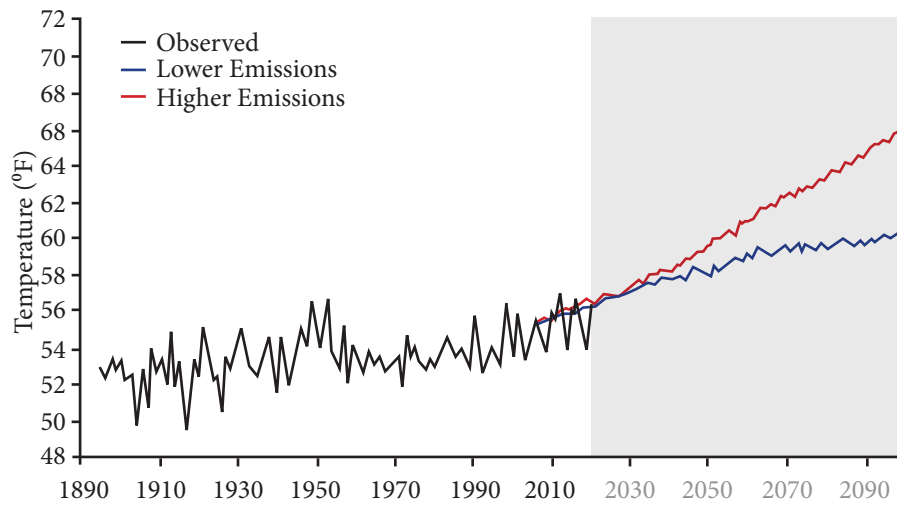
This section discusses the impacts of climate change on Deering and the surrounding region and provides analysis of resilient land in Town based on data from The Nature Conservancy. The 2022 report, *New Hampshire Climate Assessment*, written by University of New Hampshire researchers Mary Lemcke-Stampone, Cameron Wake, and Elizabeth Burakowski, provides much of the historical and projected climate data used in this section. The information and analysis can help the town anticipate and guide actions to mitigate changes to Deering's natural resources that may result from a changing climate.

7.1 Climate Change Effects

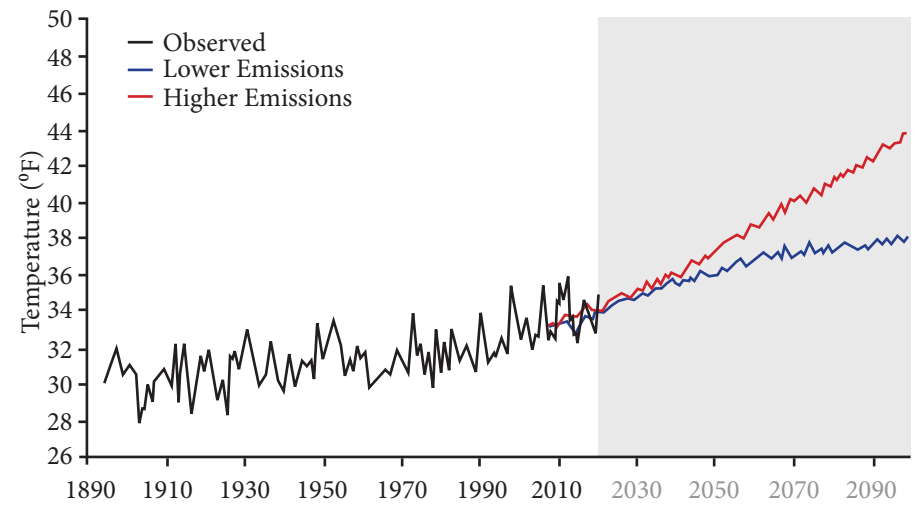
Temperature

Since 1895 temperatures in New Hampshire have had a recorded rise. The warming the State has experienced has been more dramatic during the winter seasons, with the minimum temperature increasing more than the maximum. The warming trend observed has become more significant in recent years, and the winter season is still warming at a much quicker rate than the summer. According to the New Hampshire Climate Projections (2010-2099) in the New Hampshire Climate Assessment, from 2010 to 2039 the average Winter Maximum temperature is expected to reach somewhere between 32.8 and 33.2 degrees Fahrenheit depending on levels of emissions. This maximum temperature increase would be up from the average of 30.7°F historically. The average minimum temperature over the same period during winter is also expected to increase to temperatures between 13.1°F and 13.6°F up from 10.3°F. The average annually is projected to increase by 2.2°F to 2.3°F for the maximum temperature and 2.2°F to 2.4°F for the minimum temperature. These rates are only expected to rise further in future decades as shown in the following graphs of mean annual minimum and maximum temperatures in New Hampshire.

New Hampshire Annual Maximum Temperature



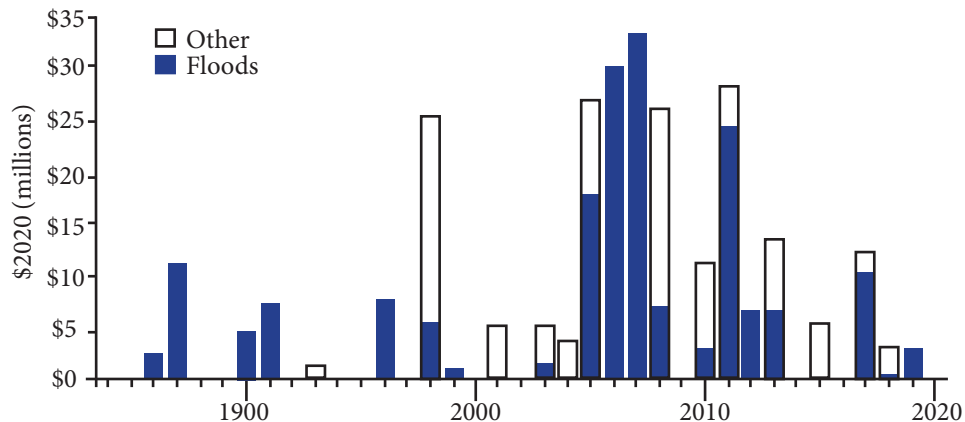
New Hampshire Annual Minimum Temperature



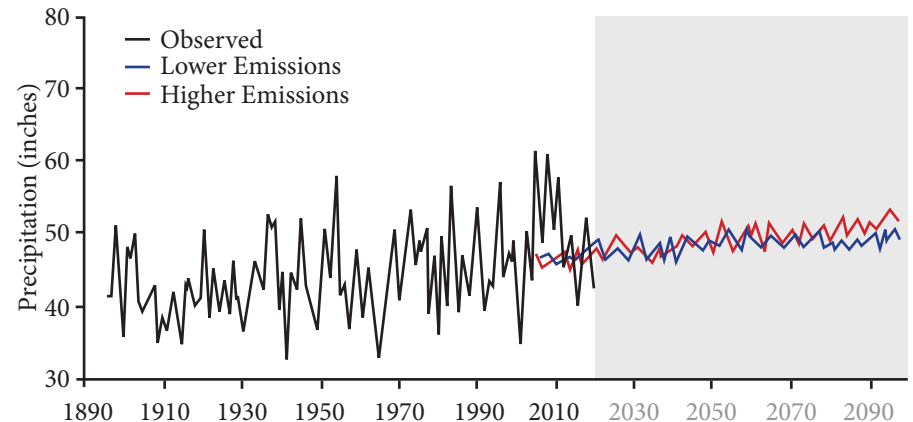
Precipitation

Annual precipitation varies greatly from year to year, but the trend is certainly increasing. Levels from 2005 to 2011 were especially high, driving averages up. While average annual rates are growing, more concerning is the increased frequency of extreme precipitation events in recent years. New Hampshire is projected to observe more of these events in the future, potentially straining infrastructure through flooding events. The impact disaster events can cause, especially floods, is illustrated by the FEMA funds spent on disasters. Before 2004 a single event, a flood, caused damages exceeding \$10 million in damages. Whereas from 2005 to 2012, a much shorter period, there were five disaster events exceeding the \$10 million damage threshold, four of them being floods. As these events become more frequent, damage and disaster response spending will also increase.

FEMA Disaster Funding New Hampshire



New Hampshire Annual Precipitation

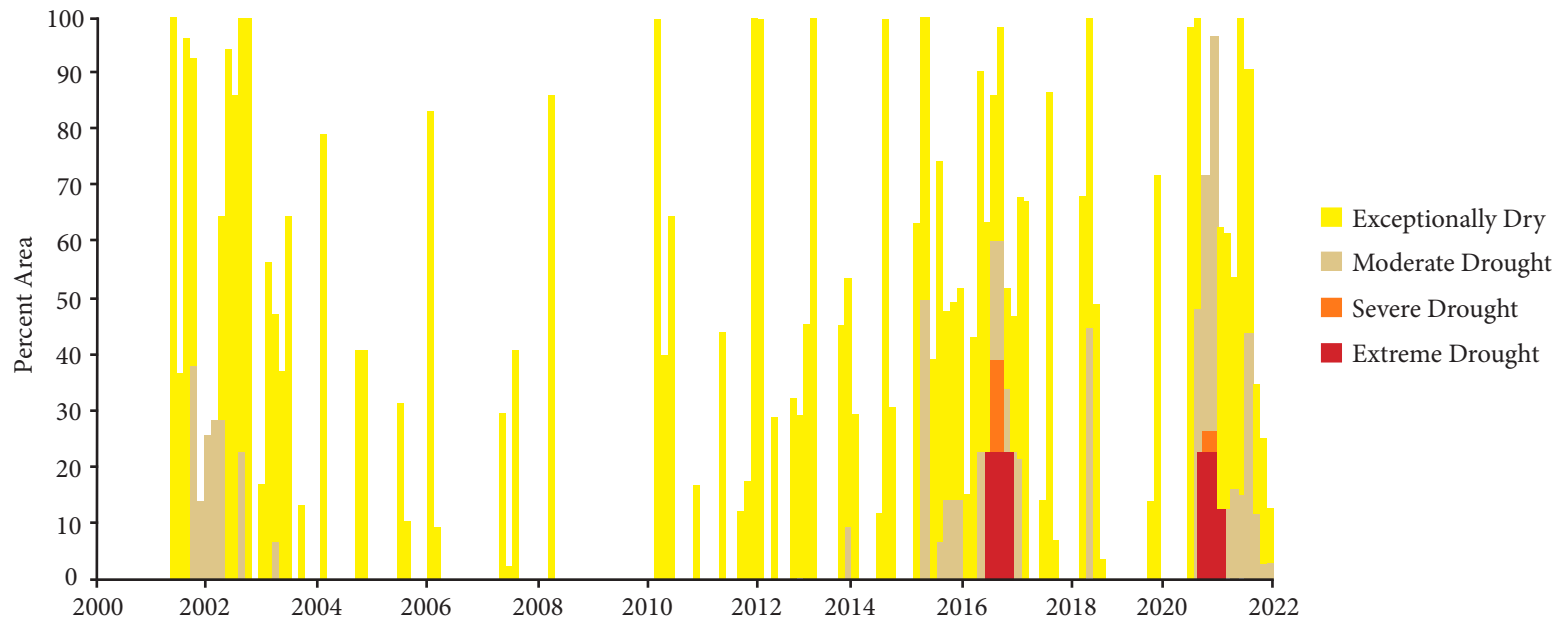


Source (all graphics on page): New Hampshire Climate Assessment, 2022

Droughts and Wildfires

New Hampshire experienced flash droughts in 2016, 2020, and 2021. Flash droughts are periods of warm very dry weather that develop over two to six weeks and can greatly impact the Town's environment and ecosystems. Droughts and flash droughts occur due to a lack of precipitation combined with other extreme weather conditions that cause increased evapotranspiration. Drought conditions severely hinder vegetation health, biodiversity, agriculture productivity, and greatly increase the risk of wildfires. As there are many remote vegetated areas in Deering the town is particularly at risk of any wildfire that could ignite. Due to the increasing temperature trends droughts and thus wildfires are expected to increase in regularity and severity.

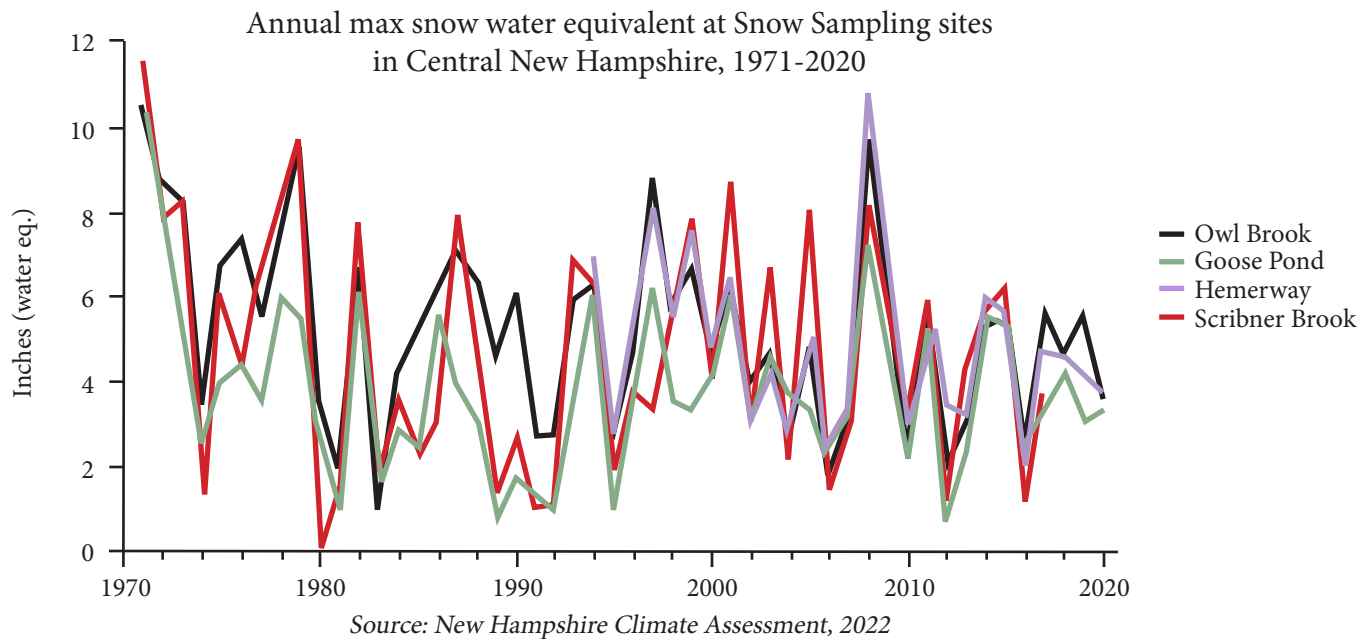
New Hampshire Percent Area in U.S. Drought Monitor Categories, 2000-2022



Source: U.S. Drought Monitor Comprehensive Statistics

Snow

Snowfall and snowpack are key characteristics of New Hampshire playing crucial roles in both the hydrologic cycle and the winter recreational economy. Across Central New Hampshire from 1971 to 2020 the amount of water stored in snowpack decreased between 59% to 91% depending on the area. Due to temperature variability and increased maximum temperatures during the winter it is increasingly more common for heavy snowfall to occur but melt before subsequent snowfalls. An even spread of snow storms and less variability in temperatures throughout the season is more conducive to recreation versus a boom and bust snow cycle.



Diminishing snow cover can be highly disruptive to ecosystems, plants, and animals. Snow is an effective insulator that keeps everything from tree roots to soil life warm in the coldest winters. Without this insulating cover, tree roots can be killed and animals like porcupines, salamanders, shrews, voles, and overwintering insects may struggle to survive. Snowshoe hares, mink, and weasels whose coloration turns white in winter could be affected by the camouflage mismatch from disappearing snow, increasing the risk of predation. As snow thaws and freezes more often, a crusty barrier forms, hindering the ability of predators like barred owls and red foxes to hunt prey and browsing animals to forage.

7.2 Impacts

Ecosystems

Changes in climate can have a wide range of ecosystem responses, in New Hampshire and Deering none are more easily apparent than earlier leaf-outs and blooming of trees. Other less recognizable ecosystem changes may also occur like the changes in performing species. In the case of trees, the warmer climate has partially aided in increased forest growth, but seasonal growth for native species has decreased. Native tamarack, balsam fir, and red spruce trees are at their southern climate limit in Deering. As the climate has warmed these species are becoming less prevalent and are expected to disappear entirely. The changing climate impacts many animals as well, for instance the decrease in snow can increase white-tailed deer populations who then have a negative impact on the native forest by over grazing. The overall availability of food sources for wildlife is a concern for a future with warmer climate. Plants that bear fruit often do not produce during drought conditions which can greatly impact local animal populations. A warming climate also prompts insects to hatch earlier than usual, putting them out of sync with migrant birds.



Snowshoe Hare, Driscoll Rd. Deering NH, Mike Thomas



White-tailed Deer, Driscoll Rd. Deering, NH, Mike Thomas

Pests and Invasives

Temperature changes impact the growing season, shifting and lengthening its time-frame. However, it also facilitates the earlier emergence of insects which can damage forest stock. The warmer temperatures allow for a broader range of pathogens and invasive plants, including hemlock woolly adelgid and emerald ash borer, which can be detrimental to forest health. First reported in Deering in 2017, the Emerald Ash borer has already killed many of the ash trees in town. The loss of ash trees will have a negative ecological impact on associated wildlife and will cause changes in the town's forest composition and structure. As winters in the region become milder, adult deer ticks are becoming more active at a time when they are normally dormant causing a bigger public health risk to Lyme disease and other tick-borne diseases. The proliferation of winter tick populations due to climate change is impacting the health and reproduction of the moose population.



Emerald Ash Borer, Mike Thomas

Agriculture

Changes in climate could have a benefit to agriculture yields in the short term because a lengthened growing season allows for more production time. However, as the trend continues more problems will arise. The increased intensity of weather events, especially heavy rain, can cause damage to the soil, overly wet soils, or increased nutrient runoff into nearby waterbodies. Early warming in the season can often be interrupted by re-frosting which could then cause more damage to premature blooms. The increased frequency of drought conditions has the potential to do the most damage to crop growth and agricultural production. Lastly, a shifting climate requires agriculturists to adapt in order to continue to produce their crop which in some cases may result in the increased use of herbicides and pesticides to regulate growing.

Tourism, Logging, and Maple Sugar Industries

The seasons in New Hampshire are important elements to the regional economy for recreation and natural resources. The decreasing levels of snowpack will likely reduce the number of winter visitors and will decrease the length of the winter recreation season. Additionally, popular natural resource based industries such as forestry and maple syrup production will have new challenges. Logging practices require frozen or snow-covered soil, without it poor access conditions could limit the timeframe for production. Furthermore the change in forest composition will require new targeted logging strategies to remain sustainable. Maple syrup production has already undergone a shift in seasonality that can limit the required quality sap production.

Infrastructure and Development

The impacts on climate will affect Deering's infrastructure and development. The potentially most severe impact will be on roads, culverts, and bridges as they undergo more frequent and intense precipitation and flood events. Also, the increase in flash droughts may impact resident's access to water. While New Hampshire is experiencing a change in climate, other regions in the country are experiencing more drastic changes, which could result in increased migration to New Hampshire. Any unexpected increases in population due to climate migration could further strain housing and resources in Deering which would require thoughtful planning and development to overcome.

7.3 Resilient Land

Introduction

When faced with a changing climate, the locations that support critical habitats and biodiversity today may not be able to sustain them in the future. There are, however, efforts to understand what lands may be best suited to help wild communities adjust or migrate so that they can persist as the climate changes. The Nature Conservancy developed a Resilient Land Mapping tool which depicts regional climate-resilient sites and landscape connectedness that can help sustain biodiversity and ecological functions under changing climate conditions.

The data collection for this map is conducted on a regional scale but with high enough resolution to be informative at a town-wide scale in Deering. The regional scale mapping shows how conservation efforts in Deering can contribute to a global effort to conserve resilient lands. The results of this dataset show that in Deering, lands most suited to adapting to future climate impacts are fairly similar to areas identified in the co-occurrence analysis as high value wildlife habitat.

Resilient Sites

The Resilience Sites for this analysis were identified based on physical characteristics that foster resilience. The makeup is a combination of geophysical settings, landscape diversity, and local connectedness. A higher resilience indicates a location's capacity to maintain species diversity and ecological function as the climate changes.

Geophysical Settings + Landscape Diversity + Local Connectedness = Resilient Sites

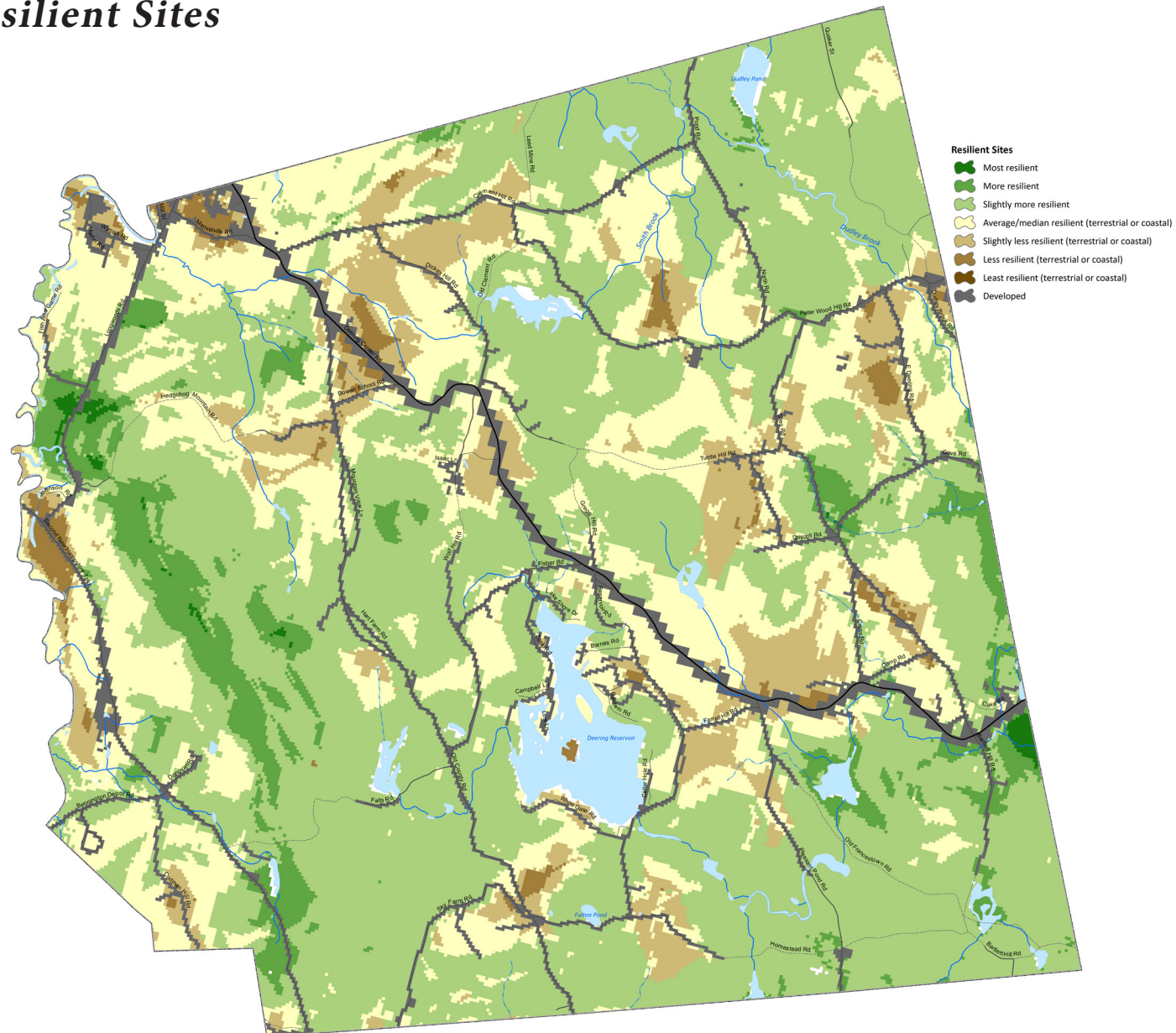
A **geophysical setting** is a landscape type that contains a variety of plants, animals and natural habitats that occur in comparable geologic environments (bedrock type, soil, and elevation zones). Geophysical variables account for most of the variation in species diversity in the eastern part of the United States, making it important to maintain a range of geophysical settings to support current and future biodiversity.

Landscape Diversity is the variation in landforms created by topography, the range of elevations, diversity of soil, and density and configuration of wetlands. Having a range of elevation gradients increases resilience by creating more temperature options that can act as a buffer from regional climate change slowing the warming effects. Areas with high landscape diversity promote more resilience as they offer microclimates for a range of species to thrive over time.

Local Connectedness is the number of barriers and level of fragmentation within an area. It is a measure of natural land cover and human-created barriers including major roads, developments, and agricultural land. A highly connected area promotes resilience by allowing populations to move and reorganize. Physical structures create resistance or interrupts movement potentially causing strain to populations.

Resilient Sites in Deering: There are blocks of the highest scoring “most resilient” sites along Long Woods Rd, within the Hedgehog Mountain Forest, and along Deering Center Rd at the eastern town line. A majority of the town is categorized as “slightly more resilient”, likely due to the large unfragmented and forested areas in Town.

Resilient Sites



Resilient and Connected Networks

This analysis represents a co-occurrence between resilient sites, high flow, and confirmed diversity. The map depicts areas with resiliency then categorizes if there is also flow and or diversity. These defined areas create a network designed to sustain biologic diversity in the face of climate change and have the pathways for species to shift over time.

Resilient Sites + Flow + Confirmed Diversity = Resilient and Connected Networks

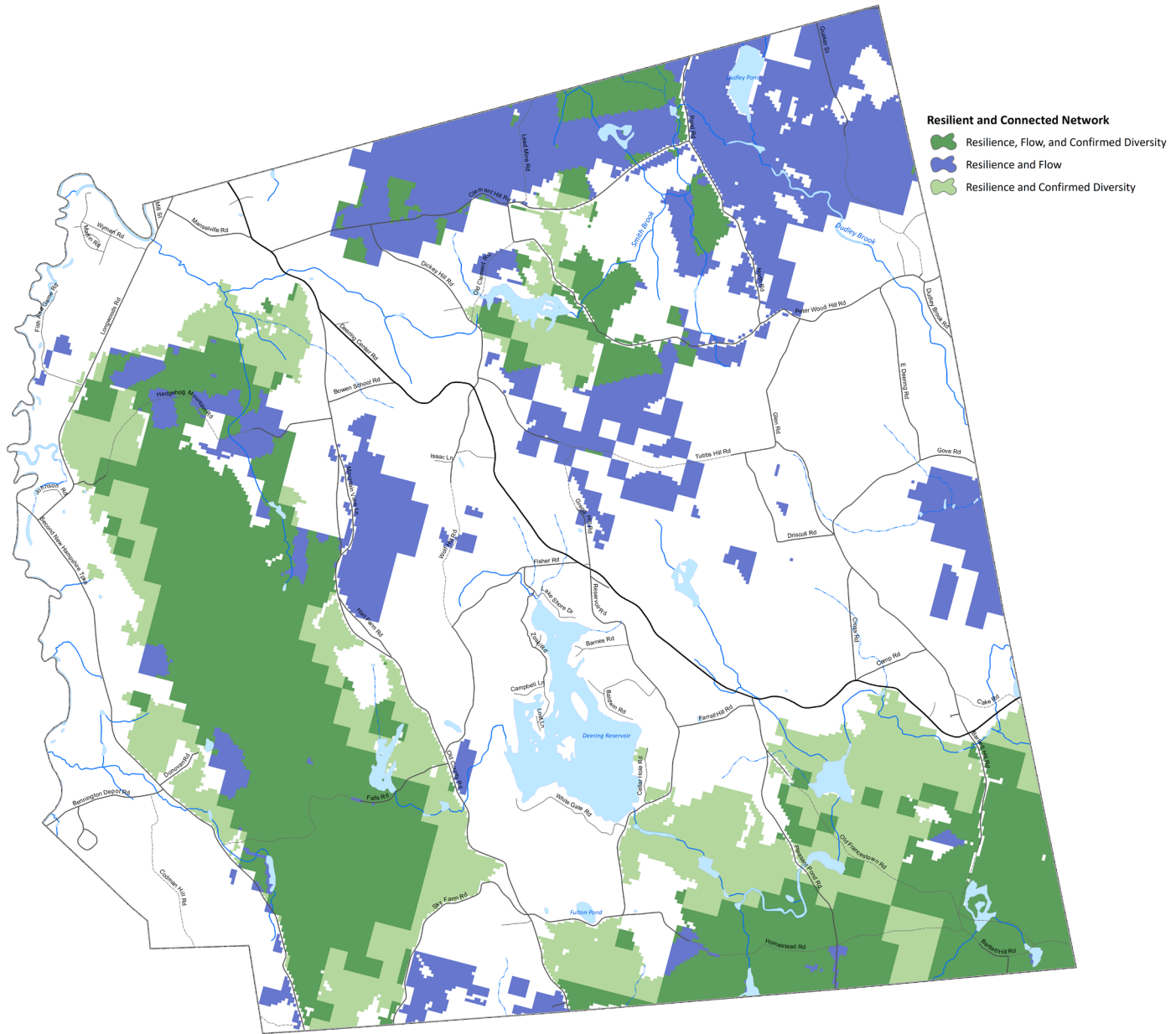
Resilient Sites as described on page 48

Flow is the movement of species populations over time as they respond to changes in climate. High flow are areas more conducive to free movement of species which are concentrated within climate corridors and climate flow zones. Corridors are narrow zones of highly concentrated flow usually following riparian corridors and ridgelines, whereas flow zones are more broad areas of high flow that are usually within unfragmented forested regions. Flow is essential for populations to thrive for many years, making areas categorized as having high flow important conservation targets.

Confirmed Diversity is an indication of an area with rare species or unique communities. The confirmation of diversity in a location is an indicator of beneficial natural characteristics that foster exemplary natural communities or strong habitat, making them particularly important for conservation.

Resilient and Connected Networks in Deering: The Hedgehog Mountain Forest area represents a large swath that is identified as having resilience, flow, and diversity. Similarly, areas in the southeastern corner and small blocks in the northeastern area of Town are identified as having all three classifications. Much of the northeast corner of town is identified as having high flow and resilience. There is only scattered connectedness spreading from Deering, it does not fit into a far-reaching network like what is found west of Deering and US 202. The development in and around Manchester and Concord limits some of the resilient and connected networks traveling east of Deering.

Resilient and Connected Networks



Regional Resilient and Connected Networks

