New Hampshire's Wildlife Habitat Conditions

Abstract

Wildlife habitat condition was assessed for all 27 habitat types. NHFG developed a methodology to assess the relative ecological condition of habitats through the use of statewide GIS data that represent species diversity, landscape context, and human impacts. Habitats were then ranked to identify priority conservation targets across all habitat types. These maps and the underlying data are used for species recovery, land conservation, and habitat restoration efforts.

Overview

Identifying high quality wildlife habitat locations is key to protecting both rare and common wildlife. In Chapter 2, NH's wildlife habitats were identified and described in detail. Chapter 3 summarizes methodologies for mapping NH's wildlife habitats and assessing the condition of those habitats using available datasets, presents results of habitat-based condition assessments, and prioritizes habitat maps using these datasets.

Maps of wildlife habitat types and an analysis of habitat conditions were created and revised during the development and implementation of the 2005 Wildlife Action Plan. These maps and the underlying data have been used for species recovery efforts, land conservation, and habitat restoration. The revision of these habitat maps and the application of regional geospatial condition assessment data was a major undertaking that will benefit conservation, planning, and resource management organizations throughout New Hampshire.

This chapter and associated habitat profiles (Appendix B) also address the requirement of the USFWS Element 2 of the NAAT Guidelines that each state provide "descriptions of locations and relative conditions of key habitats and community types essential to conservation of species identified in element 1."

Step 1: Mapping wildlife habitats

The first step in assessing the condition of New Hampshire's wildlife habitats was to map their locations. The baseline for the revised habitat map is the Northeast Terrestrial and Aquatic Habitat Classifications developed by The Nature Conservancy (TNC), replacing the habitat maps that were used in NH over the past 10 years. TNC and its partners—the Association of Northeast Fish and Wildlife Agencies, NatureServe, state Natural Heritage Programs, and the US Fish and Wildlife Service's North Atlantic Landscape Conservation Cooperative—have made huge strides in creating a common language for the conservation of our shared natural habitats. The terrestrial and aquatic regional maps and datasets provide a common base for characterizing wildlife habitats across states in the Northeast and Mid-Atlantic. These products are intended to promote an understanding of terrestrial and aquatic biodiversity

patterns across the region and facilitate interstate communication about habitats, not to replace or override state classifications.

The Northeast Terrestrial Habitat map is based on the ecological systems classification created by NatureServe, and used over 70,000 inventory points contributed by the State Natural Heritage programs and the USDA Forest Service FIA program to create an accurate model of where these habitats occur. New Hampshire refined this map by incorporating recent National Wetlands Inventory data and NH Natural Heritage Bureau mapped natural communities. Habitat classes in the regional dataset were then cross-walked with the NH Wildlife Action Plan habitat classes to group the data; however, the initial TNC attributes were retained so that New Hampshire's data could still be used in regional analyses. The result is the New Hampshire Habitat Land cover map (Figure 3-1). Individual habitat maps and information are also shown in the habitat profiles. Because of limited information and very limited predictability, maps were not created for Vernal Pools and Shrublands.

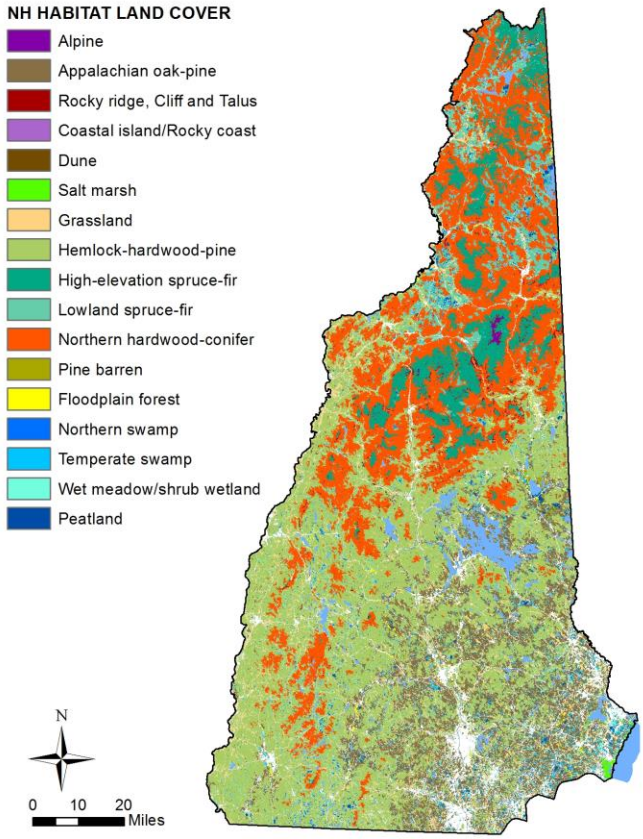

Figure 3-1. New Hampshire Habitat Landcover. All WAP habitat types were mapped using best available current data, except shrubland and vernal pools due to model limitations.

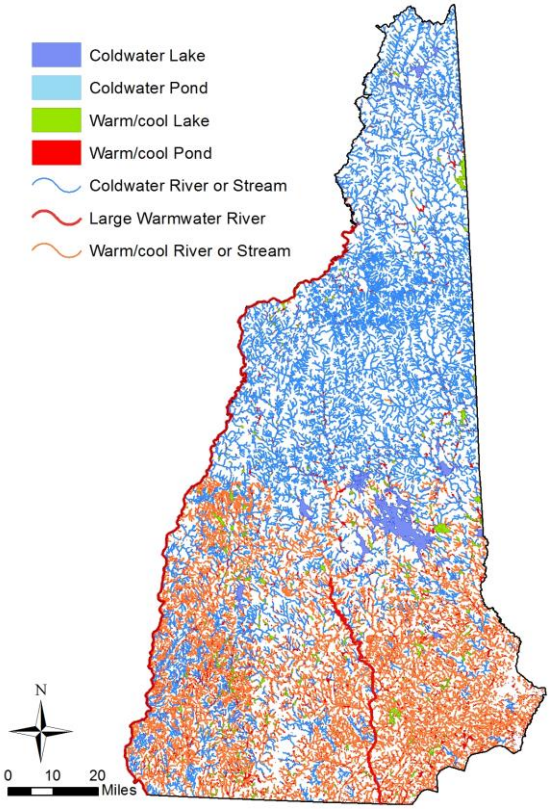

Figure 3-2. River and Stream classification by NH Department of Environmental Services. Lake and Pond classification by NHFG.

The Northeast Aquatic Habitat Classification System presents a standard aquatic classification and GIS map for 13 northeastern states and the District of Columbia. The classification and GIS dataset focus on freshwater streams and rivers, with a basic layer for lakes and ponds. New Hampshire modified the stream and river classification using a cold water streams model developed by the NH Department of Environmental Services (Figure 3-2). A refined lake and pond classification is in development and will be available from TNC early in 2016.

Step 2: Assessing Condition within Habitats

The ability of wildlife to use habitats can be affected by many features of a particular place. The size of the habitat patch, proximity to other habitat types, other preferred habitats patches or developed areas, flood regime, pollutants, habitat structure and other factors all play a role. Some factors are specific to a particular species, but there are many factors that affect multiple species. NHFG developed a method to assess the relative ecological condition of habitats through the use of statewide GIS data that represents species diversity, landscape context and human impacts. This data was first developed in 2006, revised in 2010 and revised again in 2015. In each revision, new datasets that more accurately reflected the existing conditions and effects of these factors was substituted for older data. For 2015, several regional datasets were used.

Preliminary habitat condition analysis provided basic data including acres and long-term protection status of habitats in the state (Table 3-1).

For each habitat class, GIS data were gathered from existing sources about the known risk factors with the greatest influence on wildlife health. Variables were assigned to one of three condition categories: biological diversity (BIO), landscape context (LAND), and impacts of human activities (HUMAN). These categories and selected data variables are described below. Data was normalized to a 0-100 point scale. Within each category, the scores for each type of data variable were averaged to develop one score. The three resulting scores were then averaged to create a condition score (COND). This information was then used to rank habitats across the state and within biological regions, defined as ecoregions for terrestrial habitats and watersheds for aquatic habitats. This information provides quantitative data to augment the qualitative information developed by experts in risk assessments (Chapter 4).

Variables used for Condition Analysis

The types of data generally used to assess condition in each category are described below. Appendix B and metadata provided with the wildlife habitat condition data layer provide a more thorough description of variables chosen for each condition category, for each habitat.

Table 3-1. Summary of preliminary terrestrial and wetland habitat condition analysis results. Not all results are reported here.

	WAP Habitat Type	Acres	% NH Area	Acres Protected	% Protected
Matrix Forests	Appalachian Oak-Pine	688,106	11.6	116,978	17
	Hemlock-Hardwood-Pine	2,039,406	34.3	387,487	19
	Northern Hardwood-Conifer	1,263,512	21.3	694,932	55
	Lowland Spruce-Fir	219,054	3.7	81,050	37
	High-elevation Spruce-Fir	351,537	5.9	312,868	89
Other Terrestrial	Pine Barren	8,099	0.1	3,240	40
	Alpine	4,158	0.1	4,158	100
	Cliff, Talus and Rocky Ridge	100,863	1.7	68,587	68
	Grassland	255,980	4.3	30,718	12
Wetlands	Floodplain Habitats	23,201	0.4	7,656	33
	Marsh and Shrub Wetlands	154,340	2.6	41,672	27
	Peatland	55,889	0.9	20,120	36
	Northern Swamp	36,143	0.6	12,289	34
	Temperate Swamp	92,333	1.6	20,313	22
	Lakes and Ponds	188,082	3.2	n/a	n/a
Coastal and Marine	Salt marsh	7,009	0.1	1,612	23
	Coastal Island/Rocky Shore	335	0.01	77	23
	Dune	694	0.01	285	41
	Estuarine	11,300	0.2	n/a	n/a
	Marine	51,495	0.9	n/a	n/a

Biological Diversity

Information about the diversity of plants and animals in a given location is very limited. Some monitoring programs provide data about certain groups of wildlife, and many rare wildlife are tracked by NHFG and NHNHB. NHNHB conducted analyses to assess information about tracked plants, animals, and natural communities (Table 3-2). One caveat pertaining to data summarizing tracked plant, animal, and exemplary natural community records is that it is difficult or impossible to know whether the absence of records in a given location is an indication that surveys yielded no observations or whether no surveys were conducted. In addition, recorded observations of rare plants, animals, and natural communities do not consistently represent structured surveys. Because of this, other data must be used to assess the ability of habitats to provide for the needs of wildlife.

The biodiversity indicators used for habitat included species richness of rare wildlife, species richness of rare wildlife within their dispersal distances (as determined by NHNHB and NatureServe), species richness of rare plants and richness of exemplary natural communities. For matrix forests, vertebrate species richness (GAP) dataset was used as an indicator of common species richness.

Table 3-2. Summary of potential biodiversity indicators. Indicators should be interpreted cautiously. Recorded observations of rare plants, animals, and natural communities do not consistently represent structured surveys. Absence of survey information and null observations are both potential causes for low indicator levels, but no information is available to discern which is true.

WAP HABITAT	Average Species Richness of Rare Animals	Average Species Richness of Rare Animals within dispersal distance	Average Species Richness of Rare Plants	Average Proportion Rare or Exemplary Natural Community
Appalachian oak-pine	6	30	4	0.4
Hemlock-hardwood-pine	7	29	4	0.6
Northern hardwood-conifer	3	10	7	1.1
Lowland spruce-fir	3	10	2	0.8
High-elevation spruce-fir	2	10	1	43
Pine barren	10	29	2	44.9
Alpine	2	9	12	78.5
Cliff/Talus and Rocky ridge	2	17	10	24
Grassland	3	29	4	0.1
Floodplain forest	2	29	3	25.6
Wet meadow/shrub wetland	6	29	6	3.8
Peatland	4	29	6	21.1
Northern swamp	3	11	3	3.5
Temperate swamp	6	29	4	3.1
Salt marsh	2	17	2	77.7
Coastal island/Rocky shore	2	19	2	4.6
Dune	1	17	2	12.5
Lakes and Ponds	3	29	3	3.4

Landscape Context

Information about Landscape Context was calculated directly from the spatial arrangement among and between habitats. Variables that describe landscape context help describe predicted interactions among habitat patches, such as the dispersal of wildlife and abundance of habitat in terms of area and intactness. Landscape context variables that NHFG has analyzed include: total area, wetland area, distance to and identity of nearest neighbor and other landscape features, similarity of neighboring habitat types.

Several regional geospatial condition assessments completed by The Nature Conservancy and the University of Massachusetts-Amherst were also applied. Landscape complexity provided an estimate of the number of micro-climates in a 100 acre area surrounding each cell of habitat, based on the variety of landforms, the elevation range, and the density of wetlands. Local connectedness estimates the degree of permeability (how easy it is for wildlife to move through a given area) surrounding each cell.

Impacts of Human Activities

Impacts of human activities on habitats include the effects of development, roads and utility corridors, pollutants, direct habitat alteration that changes the type of habitat (clearcutting producing shrublands for instance), and many others. Gathering statewide GIS data to show these impacts is not often possible. For human impacts, we chose data that, as best as possible, cover a variety of impacts.

Human development and infrastructure may have a variety of effects on wildlife, including reduced landscape connectivity, introduction of invasive species, contaminants, and modified local climate. To evaluate edge effects associated with fragmenting features on the landscape, UMass developed an Index of Ecological Integrity (IEI). IEI is a measure of relative intactness (i.e., freedom from human modifications and disturbance) and resiliency to environmental change (e.g., as caused by disturbance and climate change). Ecological integrity is defined as the ability of an area (e.g., local site or landscape) to sustain important ecological functions over the long term. These functions are primarily the ability to support biodiversity and the ecosystem processes necessary to sustain biodiversity. Various metrics are applied to the landscape and then integrated in weighted linear combinations as models for predicting ecological integrity.

Recreational influences on wildlife are difficult to assess. Although trails are often well marked on the land and new technology makes it easy to map them, most trails remain undocumented. Trails data as available was used on alpine, cliff, talus and rocky ridges to assess impacts of recreation.

Broad patterns of air and water quality influence the quality of wildlife habitats, even if they are protected from local impacts such as development. Many aspects of broad environmental quality issues are beyond the scope of the WAP. For some issues, air and water quality indicators may have relevance for wildlife. For example, NHDES monitors stream invertebrate populations to measure contaminant levels and the Biodiversity Research Institute measures levels of mercury in many wildlife species. Lacking statewide data, these were not used for the condition analysis.

Step 3: Comparing Conditions Across the Landscape

In order to use the condition data in a meaningful way, a system was created to rank habitats between and amongst each other. For each habitat type, the top ranking habitats are combined across the state and titled Highest Ranked Wildlife Habitat in New Hampshire. (Figure 3-3).

Highest Ranked Habitat in the State includes the top 15% of all terrestrial and wetland habitats with the following exceptions: 100% of rare habitats: alpine, dune, coastal islands and rocky shores, and salt marsh. Highest ranked aquatic habitat is a 100-meter buffer of Highest Ranked rivers and streams, plus 200-meter buffer of the top 50 most intact lakes and ponds in each temperature class.

Recognizing that NH has a wide range of conditions, both natural and human altered, the state was divided into biological regions. When evaluating the condition of terrestrial habitats, the state was split into ecological regions – TNC Ecoregional Subsections (Figure 3-4). Wetland habitats were ranked within watersheds using the NH Department of Environmental Services Aquatic Resource Mitigation Regions (Figure 3-5). Highest Ranked Habitat in Biological Region includes the top 30 % of all

terrestrial and wetland habitats with the following exceptions: 100% of high elevation spruce-fir and floodplain habitats based on their ecological importance and rarity. Aquatic habitats are only ranked statewide and not ranked in this category.

The condition of a top-ranked habitat patch may deteriorate if the surrounding area is degraded so a third tier of supporting landscape was identified by including the top 50% of all habitats in the biological region, and top-ranked forest blocks identified by The Nature Conservancy.

In order to capture occurrences of specialist species with imperiled populations, a select set of wildlife Element Occurrences (areas known to support populations of rare species) from the Natural Heritage Bureau database was used either to elevate underlying habitat polygons to the highest rank in NH or to buffer locations within an already high ranked matrix forest. For species where there has been regional work through Competitive State Wildlife Grants and/or the NE Regional Conservation Needs Program to identify core population areas (e.g. New England Cottontails. Blanding's turtles, wood turtles), this data was used instead of Element Occurrences. Significant ecological features identified by NH Natural Heritage Bureau were elevated to the highest ranked in their biological region. The results of habitat condition analyses represent the entire breadth of biodiversity contained within the state, from large-ranging forest mammals to the smallest-ranging stream invertebrates.

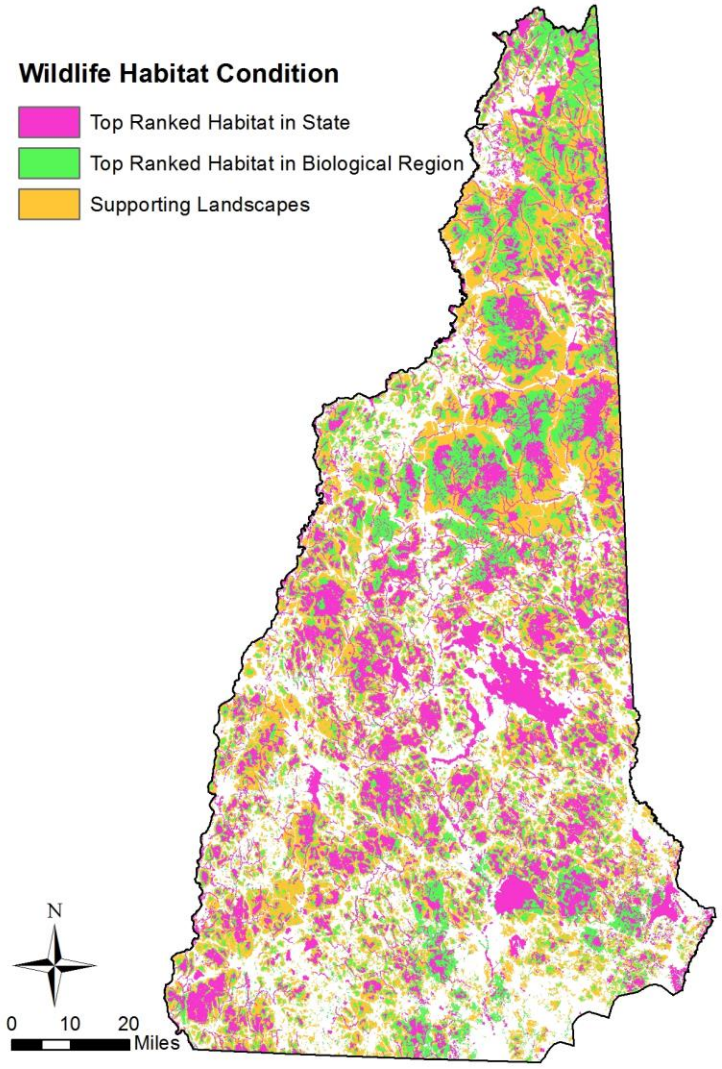

Figure 3-3. Highest Ranked Wildlife Habitat by Ecological Condition in New Hampshire

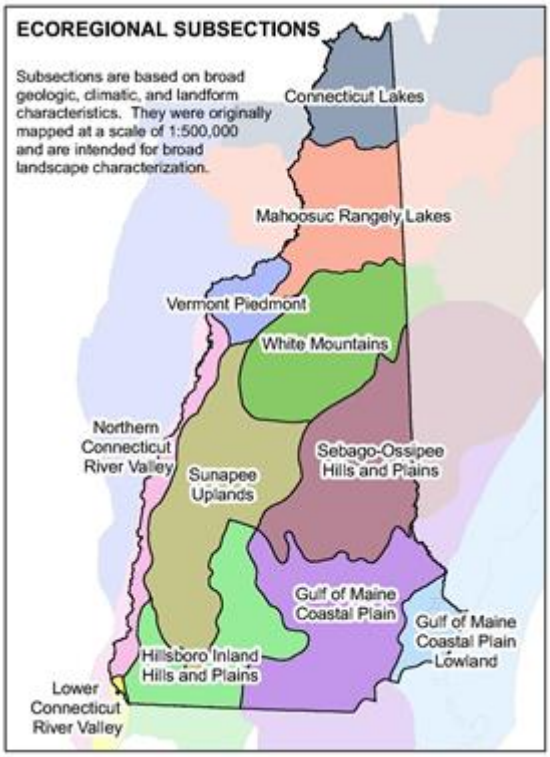

Figure 3-4. The Ecoregional Subsections classification was based on land formations, geology, topography, regional climate, and dominant natural vegetation.

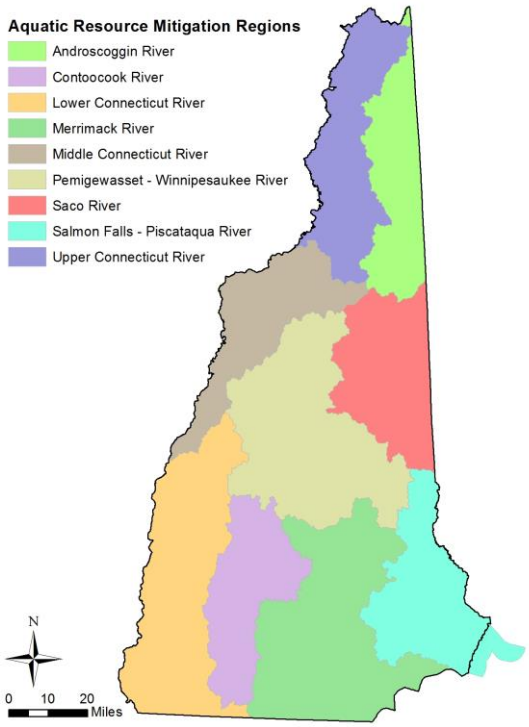

Figure 3-5. Aquatic Resource Mitigation Regions developed by NHDES and based on major watersheds.

Literature

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Disclaimer

Most data represent stock data sets obtained from NH GRANIT, at Complex Systems Research Center, UNH. CSRC, under contract to the NH Office of Energy and Planning (NHOEP), and in consultation with cooperating agencies, maintains a continuing program to identify and correct errors in these data. NHOEP, CSRC, NHFG and the cooperating agencies make no claim as to the validity or reliability or to any implied uses of these data.