

Vermont and New Hampshire Gap Analysis Project

Compiled from Final Project Report

Introduction

The Vermont–New Hampshire Gap Analysis Project (VT/NH-GAP) began in 1991 as part of what was intended to be a Gap Analysis of New England. The New England project was subsequently divided into three projects—the current project, and one each for Maine and Southern New England (Massachusetts, Connecticut, and Rhode Island)—with each project assuming some regional responsibility for aspects of the other two.

Land Cover

We first developed a land cover map by classifying Landsat Thematic Mapper satellite imagery into general land cover types and incorporating ancillary data (e.g., National Wetlands Inventory maps) where possible. The complete land cover map for VT/NH-GAP features eight general land cover types. The VT/NH-GAP classification uses broad land cover types that reflect modeling requirements, heterogeneity of our study area, and the cost and difficulty of accurately mapping this heterogeneity. A forest shaped largely by extensive human disturbance covered the majority of VT/NH-GAP in the early 1990s. Rather than attempting to map numerous forest types distributed at a very fine scale we classified forest into three broad types. Similarly, many non-forested upland types were lumped together in a class containing many human-altered cover types that change quickly under the influence of natural forces (e.g., succession) or human activity (e.g., agricultural rotation). The eight types in our final classification should crosswalk easily with systems used by other Northeast Gap Analysis projects and with the National Vegetation Classification System (NVCS).

An additional four-class map was developed for use with animals specializing on habitats restricted to the Atlantic coast of New Hampshire. Comparison of mapped cover types with truth data acquired from aerial videography yielded an assessed accuracy of 80.4 percent.

Results

Including forested wetlands, forest cover types accounted for 75.4 percent of Vermont and 82.6 percent of New Hampshire (Table 1). Deciduous forest covers one-half of Vermont and nearly one-half of New Hampshire. Water totals include a small amount of coastal water in New Hampshire, and part of Lake Champlain in Vermont. Additionally, U.S. Geological Survey (USGS) wetlands data were used to add information for coastal habitat types in New Hampshire. Estuarine emergent and shrub wetlands accounted for 28.5 km² of non-forested wetlands in coastal New Hampshire; brackish forested wetlands totaled 3.3 km². A coastal beach cover type amounting to 1.1 km² was substituted, according to habitat modeling needs, for mainly developed/barren but also non-forested and water/wetland cover types along the coast. The USGS data were also used to delineate Isles of Shoals, a cluster of off-shore islands in the Atlantic Ocean. A separate analysis using elevation and distance to roads indicated that 0.5 percent of the developed/barren cover type could be distinguished as remote rock outcrops or similar undeveloped barren cover.

Table 1. Land cover types mapped, their area mapped in the state in square kilometers, and the percent of the states' total area represented by the mapped type.

[Multiply square kilometers by 100 for hectares or 270 for acres]

Cover type	Vermont		New Hampshire	
	Area	Percent	Area	Percent
Non-forested upland	4,690.7	18.8	2,384.2	9.9
Developed/barren	91.2	0.4	306.5	1.3
Coniferous forest	1,677	6.7	2,764.2	11.5
Deciduous forest	12,624.9	50.6	10,688.7	44.5
Mixed forest	3,904.8	15.7	5,250.1	21.8
Water	948.9	3.8	803	3.3
Non-forested wetland	397.2	1.6	700.1	2.9
Forested wetland	599	2.4	1,148.3	4.8
Total	24,933.8	100	24,045	100

Accuracy Assessment

Overall accuracy for the superclass map is 94.0 percent. Overall map accuracy decreased to 80.4 percent when three forest classes are considered separately.

Terrestrial Vertebrate Distributions

Species occurrence records supported the existence of 297 native species in VT–NH at the initiation of the project—196 birds, 56 mammals, 23 amphibians, and 22 reptiles. We created range maps by attributing species to subsection polygons of the National Hierarchical Framework of Ecological Units (ECOMAP 1993). Attributions were made on the basis of occurrence records from species atlases, the Breeding Bird Survey, and state databases. Experts checked and occasionally corrected our draft range maps.

Wildlife habitat relationship models necessary to predict distributions were compiled from an existing database for New and modified with information from further literature review, personal experience, and expert opinion. Elevation, proximity to water, and other ancillary data layers improved predictions for many species. Overall accuracy was 80.5 percent across all sites and taxonomic groups. Accuracy across taxa at individual sites ranged from 70.6 percent at Missisquoi National Wildlife Refuge to 86.0 percent at White Mountain National Forest. Taxonomic group accuracies were reasonably close to 80 percent except for reptiles (52.6 percent).

Land Stewardship

We developed a stewardship lands map by adapting an existing data layer for New Hampshire for use with a cooperative mapping project designed to produce Vermont stewardship data specifically for Gap Analysis. Source data for these projects were generally 1:24,000 scale or better. Stewardship parcels were attributed with owner, managing entity, and management status, among many other attributes. One of four GAP management status codes were assigned to each parcel based on permanency of protection from conversion and degree of disturbance or extractive uses allowed. Status 1 and 2 lands represented the highest levels of protection, and these lands were used for the gap analysis overlays.

Gap Analysis—Land Cover

Federal agencies own the majority of New Hampshire's stewardship lands; U.S. Forest Service holds 60.5 percent. Of the remainder, State government owns 18 percent, and private entities hold 13 percent. Half of private holdings are controlled by the Society of the Protection of New Hampshire Forests (SPNHF). Almost 40 percent of New Hampshire's conserved land falls under management categories 1 and 2. Forest Service tracts account for 84 percent of lands receiving this high degree of protection. State government is the next closest contributor with slightly less than 10 percent of category 1 and 2 lands. Most State holdings in these categories are State Forests or State Parks including four parcels larger than 20 km².

Vermont's largest stewardship tracts are concentrated along the spine of the Green Mountains. The arrangement of parcels in this mountainous region provides opportunities for north-south linkages. The narrow Appalachian Trail corridor connects Green Mountain lands with those of the White Mountain National Forest, which nearly spans New Hampshire. Vermont's Northeast Kingdom and the southwestern hills of New Hampshire also have concentrations of large parcels that could provide connectivity among protected lands. Stewardship parcels are few and sparse in lowland areas of both states where proportionately more forest cover has been lost and the pace of development is high. Establishing connectivity in these regions will be a substantial challenge unless more land can be conserved.

Less than 10 percent of New Hampshire and only 3.1 percent of Vermont were categorized as management status 1 or 2. Federal owners accounted for the majority of stewardship lands in New Hampshire, whereas Vermont's stewardship parcels were more evenly distributed among federal, state, municipal, and private owners. We overlaid predicted distributions with stewardship lands to determine level of protection.

Gap Analysis—Vertebrates

Species were identified as gap species if less than 1 percent of their predicted habitat occurred on status 1 and 2 lands. We expanded this criterion slightly by also including species having less than 50 km² of habitat in status 1 and 2 lands. In both states, a vast majority of species had less than 10 percent of their predicted habitat represented on

status 1 and 2 lands. In Vermont, 15.8 percent of birds and approximately 10 percent of amphibians and reptiles were identified as gap species. In New Hampshire nearly 10 percent of amphibians and over 20 percent of bird species were underrepresented. Judging from the distribution of listed species and other species of known conservation need, the criteria used to identify gap species performed reasonably well but failed to correctly prioritize some species. A tendency of habitat models to either over- or under-predict habitat for certain species might account for some of the perceived discrepancies. Better habitat and species occurrence data would likely improve results of similar efforts in the future.

Despite a scarcity of lands in management status 1 and 2, both Vermont and New Hampshire have substantial areas in management status 3. These lands already have a reasonable level of protection and provide excellent habitat for many species. Efforts to conserve habitat for certain species might focus on potential management changes on less-protected stewardship lands.

References Cited

- ECOMAP. 1993. National hierarchical framework of ecological units. Unpublished administrative paper. Washington, DC: U.S. Department of Agriculture, Forest Service. 20 p. Ecoregions of the United States [map, rev. ed.]. Robert G. Bailey, cartog. 1994. Washington, DC: U.S. Department of Agriculture, Forest Service. Scale 1:7,500,000; colored.