# The Nature Conservancy and New Hampshire Fish & Game Department
# Spatial Data Notes

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|---|---|
| **DATA LAYER:** | Hemlock-hardwood-pine habitats of New Hampshire |
| **COVER NAME:** | hemhwdpine |
| **COVER CONTENTS:** | hemlock-hardwood-pine habitat polygons |
| **COVER TYPE:** | Poly |
| **SOURCE:** | The Nature Conservancy, New Hampshire Department of Fish and Game, NH Audubon, and New Hampshire Natural Heritage model criteria |
| **SOURCE SCALE:** | 1:24,000 and 30-meter raster |
| **SOURCE MEDIA:** | digital |
| **COORDINATE SYSTEM:** | NH State Plane feet, horizontal datum NAD83 |
| **TILE:** | State |
| **AUTOMATED BY:** | The Nature Conservancy, New Hampshire Chapter |
| **STATUS:** | Complete |
| **LAST REVISION:** | May 2005; attributes revised April 2006 (NHFGD) |

## General Description of the Data

- Development of this coverage provides general Hemlock-hardwood-pine habitat locations within the state of New Hampshire. Analysis was completed for incorporation into the New Hampshire Wildlife Action Plan. Funding for the Plan was provided by State Wildlife Grants administered by the US Fish & Wildlife Service.

- Relevant forested 2001 NH Land Cover Assessment grid values were combined with elevation ranges from sea level to 2000' based on criteria developed by experts from The Nature Conservancy, New Hampshire Fish and Game, NH Audubon, and the NH Natural Heritage Bureau.

- Ecological Land Units, created by The Nature Conservancy's Conservation Science Support, were also added to capture additional areas likely to have geo-physical conditions favorable to hemlock-hardwood-pine, or remove areas likely to have geo-physical conditions unfavorable to hemlock-hardwood-pine. North-facing sideslopes and north-facing coves were removed from some land cover/elevation classes, and some land cover/elevation classes were restricted to only north-facing sideslopes and north-facing coves. South-facing sideslopes and south-facing coves were removed from some land cover/elevation classes, and some land cover/elevation classes were restricted to only south-facing sideslopes and south-facing coves.

- To further refine the model, soil types associated with hemlock-hardwood-pine were selected from county soil data, where available (Merrimack county soils have not been digitized). The soils were selected, then clipped to only include forested areas, and added to the existing model information. The same was done for Appalachian oak-pine, and then Appalachian oak-pine was used to erase areas from hemlock-hardwood-pine where there was overlap, so that Appalachian oak-pine takes precedence over hemlock-hardwood-pine. This process is expected to somewhat over-predict locations of Appalachian oak-pine, but better captures broad patterns of Appalachian oak-pine.

- Model results were reviewed by experts from The Nature Conservancy, the NH Fish and Game Department, and NH Heritage Bureau, who agreed that the broad patterns depicted by the model align with reasonable expectations. No ground truthing was conducted. This version of the model is considered a first iteration, and further refinements may be developed in the future.

- The complete model criteria grid is available with the data layer. To obtain additional information, please contact The Nature Conservancy.

**5 June 2006**
**Spatial Data Notes: HEMHWDPINE**

## Item definitions for HEMHWDPINE polygon attributes:

| ITEM NAME | WIDTH | TYPE | N.DEC | DESCRIPTION |
|---|---|---|---|---|
| FGID | 2 | I | 0 | unique sequential polygon ID number |
| AREA | 8 | F | 3 | Area (square feet) calculated by software |
| PERIMETER | 8 | F | 3 | Perimeter length (feet) calculated by software |
| ACRES | 8 | N | 1 | Area (acres) |
| HECTARES | 8 | N | 2 | Area (hectares) |
| LANDHA | 8 | N | 2 | Land area (hectares) |
| LANDSQKM | 8 | N | 2 | Land area (square kilometers) |
| DOTROADKM | 8 | N | 1 | Kilometers of all NHDOT roads within the area/unit |
| DENSROADS | 5 | N | 2 | Road density in the area/unit (km/km2) |
| DOTMAJORKM | 8 | N | 1 | Kilometers of NHDOT major roads in the area/unit |
| DENSMAJOR | 5 | N | 2 | Density of major roads (km/km2) |
| DISTROUTE | 8 | I | 0 | Distance to nearest state route (meters) |
| DOTMINORKM | 8 | N | 1 | Kilometers of unmaintained and private roads in the area/unit |
| DENSMINOR | 5 | N | 2 | Density of unmaintained and private roads (km/km2) |
| DISTROAD | 8 | I | 0 | Distance to nearest road (meters) |
| CONSFO | 8 | N | 2 | Area in conservation fee ownership (hectares) |
| CONSFO_PCT | 5 | N | 1 | Percent in conservation fee ownership (%) |
| CONSCE | 8 | N | 1 | Area in conservation easement/other (hectares) |
| CONSCE_PCT | 5 | N | 1 | Percent in conservation easement/other (%) |
| CONSHA | 8 | N | 2 | Area in conservation (hectares) |
| CONS_PCT | 5 | N | 1 | Percent in conservation |
| GAP123HA | 8 | N | 2 | Area in GAP mgt status 1,2 or 3 (TNC 2005) |
| GAP123PCT | 5 | N | 1 | Percent in GAP mgt status 1,2 or 3 (TNC 2005) |
| BUILDHA | 8 | N | 2 | Buildable area/generalized buildout analysis (hectares) |
| CNSTRNDHA | 8 | N | 2 | Buildable area with constraints (hectares) |
| BUILDPCT | 5 | N | 1 | Percent area that is buildable |
| NREL4HA | 8 | N | 2 | Natl' Renewable Energy Laboratory wind power class 4 |
| NREL4PCT | 5 | N | 1 | hectares, percent (commercial turbine potential) |
| NREL2HA | 8 | N | 2 | Natl' Renewable Energy Laboratory wind power class 2 |
| NREL2PCT | 5 | N | 1 | hectares, percent (small turbine potential) |
| NREL4DIST | 8 | I | 0 | Distance to nearest NREL class 4 area gt 4 acres size |
| TOWERCNT | 3 | I | 0 | Number of communication towers in the area/unit (NHOEP) |
| TOWERHT | 3 | I | 0 | Maximum height of towers in the area/unit (feet) |
| TOWERDIST | 8 | I | 0 | Distance to nearest communication tower (meters) |
| HIKEKM | 8 | N | 1 | Kilometers of hiking trails within the area/unit (AMC, NHOEP) |
| HIKEDENS | 5 | N | 2 | Hiking trail density in the area/unit (km/km2) |
| DISTHIKE | 8 | I | 0 | Distance to nearest hiking trail (meters) |
| TRANSKM | 8 | N | 1 | Kilometers of hiking trails within the area/unit (AMC, NHOEP) |
| TRANSDENS | 5 | N | 2 | Hiking trail density in the area/unit (km/km2) |
| DISTTRANS | 8 | I | 0 | Distance to nearest transmission line (meters) |
| RAILKM | 8 | N | 1 | Kilometers of active railroad within the area/unit (NHDOT) |
| RAILDENS | 5 | N | 2 | Rail density in the area/unit (km/km2) |
| DISTRAIL | 8 | I | 0 | Distance to nearest railroad (meters) |
| ELUVAR | 3 | I | 0 | Variety of ecological land units (ELU30 = elevation, substrate, landform) |
| AREA_M2 | 8 | N | 1 | Total size of area/unit (square meters) |
| PERIM_M | 8 | N | 1 | Total perimeter of area/unit (meters) |
| NEARDIST | 8 | I | 0 | Distance to nearest neighboring area/unit (meters) |
| NEAR_FGID | 4 | I | 0 | ID of nearest neighbor |
| SHAPEINDEX | 5 | N | 1 | Shape index |
| PROXINDEX | 8 | N | 2 | Proximity index |
| IFESMEAN | 2 | I | 0 | Mean IFES score (Integrated Fragmentation Effects Surface The Nature Conservancy; Zankel, 2005) |
| WETPCT | 5 | N | 2 | Percent wetland |

## Item definitions for HEMHWDPINE polygon attributes (continued):

| ITEM NAME | WIDTH | TYPE | N.DEC | DESCRIPTION |
|---|---|---|---|---|
| A_RICH_BUF | 3 | I | 0 | Species richness of rare animals within their dispersal distances from the polygon |
| A_SF_BUF | 3 | I | 0 | Number of source features of rare animals within their dispersal distances from the polygon |
| A_SHAN_BUF | 3 | N | 3 | Shannon diversity index of rare animal source features within their dispersal distances from the polygon |
| A_RICH_POL | 3 | I | 0 | Species richness of rare animals within polygon |
| A_SF_POLY | 3 | I | 0 | Number of source features of rare animals within polygon |
| A_SHAN_POL | 3 | N | 3 | Shannon diversity index of rare animal source features in poly |
| P_RICH_BUF | 3 | I | 0 | Species richness of rare plants within 1km of polygon |
| P_SF_BUF | 3 | I | 0 | Number of source features of rare plants within 1km of polygon |
| P_SHAN_BUF | 3 | N | 3 | Shannon diversity index of rare plant source features within 1km |
| P_COND_BUF | 2 | C | 0 | Average rank of rare plant source features within 1km of polygon |
| P_DISP_BUF | 3 | N | 3 | Dispersal of rare plant source features within 1km of polygon |
| P_RICH_POL | 3 | I | 0 | Species richness of rare plants in polygon |
| P_SF_POLY | 3 | I | 0 | Number of source features of rare plants in polygon |
| P_SHAN_POL | 3 | N | 3 | Shannon diversity index of rare plant source features in polygon |
| C_RICH_BUF | 3 | I | 0 | Richness of rare and exemplary natural communities within 1km |
| C_SF_BUF | 3 | I | 0 | Number of source features of rare and exemplary natural communities within 1km of polygon |
| C_COND_BUF | 2 | C | 0 | Average rank of rare and exemplary natural community source features within 1km of polygon |
| C_AREA_BUF | 3 | N | 3 | Percent of area within 1km of polygon that is rare or exemplary natural community |
| C_AREA_POL | 6 | N | 3 | Percent of polygon that is rare or exemplary natural community |
| C_RICH_POL | 3 | I | 0 | Richness of rare and exemplary natural communities in polygon |
| C_SF_POLY | 3 | I | 0 | Number of source features of rare and exemplary natural communities in polygon |
| POP90X00 | 8 | I | 0 | Change in population 1990 to 2000 |
| POPDENSX | 8 | I | 0 | Change in population density 1990 to 2000 |
| POP00SQMI | 8 | I | 0 | Population density in 2000 (persons per square mile) |
| HOUSES00 | 8 | I | 0 | Housing units in 2000 (total count) |
| HU00SQMI | 8 | I | 0 | Housing units density in 2000 (houses per square mile) |
| HG_GEM | 16 | N | 6 | Average deposition of gaseous elemental mercury (GEM) via assimilation into tree foliage by land cover type within the polygon (Miller et al, 2005) |
| HG_TOT | 16 | N | 6 | average total deposition of mercury (wet [precipitation + cloud water interception] + dry [GEM + RGM + aerosol]) by land cover type within the polygon (Miller et al, 2005) |
| CA_INDEX | 16 | N | 6 | avg deposition index, rate of cation depletion per ha/per year (Miller et al, 2005) |
| B_NHW | 7 | N | 3 | hectares of this forest type, 1992 NLCD (Miller 2005) |
| SM_NHW | 7 | N | 3 | hectares of this forest type, 1992 NLCD (Miller 2005) |
| NHW | 7 | N | 3 | hectares of this forest type, 1992 NLCD (Miller 2005) |
| CHW | 7 | N | 3 | hectares of this forest type, 1992 NLCD (Miller 2005) |
| WP | 7 | N | 3 | hectares of this forest type, 1992 NLCD (Miller 2005) |
| WP_HEM_RS | 7 | N | 3 | hectares of this forest type, 1992 NLCD (Miller 2005) |
| BF_RS_WP_H | 7 | N | 3 | hectares of this forest type, 1992 NLCD (Miller 2005) |
| CHW_WP_HEM | 7 | N | 3 | hectares of this forest type, 1992 NLCD (Miller 2005) |
| NHW_WP_HEM | 7 | N | 3 | hectares of this forest type, 1992 NLCD (Miller 2005) |
| NHW_BF_RS_ | 7 | N | 3 | hectares of this forest type, 1992 NLCD (Miller 2005) |
| NHW_BF_RS | 7 | N | 3 | hectares of this forest type, 1992 NLCD (Miller 2005) |

## Item definitions for HEMHWDPINE polygon attributes (continued):

| ITEM NAME | WIDTH | TYPE | N.DEC | DESCRIPTION |
|---|---|---|---|---|
| BF_RS_B | 7 | N | 3 | hectares of this forest type, 1992 NLCD (Miller 2005) |
| BF_RS | 7 | N | 3 | hectares of this forest type, 1992 NLCD (Miller 2005) |
| GAPVERTRCH | 7 | N | 1 | Vertebrate species avg richness (VT/NH GAP Analysis) |
| GAPVERTMAX | 3 | I | 0 | Vertebrate species maximum (VT/NH GAP Analysis) |
| HAB | 8 | C | 0 | Habitat name (abbrv) |
| BIO | 8 | N | 2 | Raw biological score (high score = high quality) |
| LAND | 8 | N | 2 | Raw landscape score (high score = high quality) |
| HUMAN | 8 | N | 2 | Raw human impact score (high score = low impact) |
| COND | 8 | N | 3 | Raw habitat condition score (high score = good condition) |
| DEV | 8 | N | 3 | Raw development risk (high score = high risk) |
| RISK | 8 | N | 3 | Raw risk score (high score = high risk) |
| SUBBIO | 3 | I | 0 | Subsection biological rank (high rank = high quality) |
| SUBLAND | 3 | I | 0 | Subsection landscape rank (high rank = high quality) |
| SUBHUMN | 3 | I | 0 | Subsection human impact rank (high rank = low impact) |
| SUBCOND | 3 | I | 0 | Subsection habitat condition rank (high rank = good condition) |
| SUBDEV | 3 | I | 0 | Subsection development risk (high rank = high risk) |
| SUBRISK | 3 | I | 0 | Subsection risk rank (high rank = high risk) |
| NHBIO | 3 | I | 0 | Statewide biological rank (high rank = high quality) |
| NHLAND | 3 | I | 0 | Statewide landscape rank (high rank = high quality) |
| NHHUMN | 3 | I | 0 | Statewide human impact rank (high rank = low impact) |
| NHCOND | 3 | I | 0 | Statewide habitat condition rank (high rank = good condition) |
| NHDEV | 3 | I | 0 | Statewide development risk rank (high rank = high risk) |
| NHRISK | 3 | I | 0 | Statewide risk rank (high rank = high risk) |
| PRIORITY | 50 | C | 0 | WAP Priority |
| ECOSUB | 40 | C | 0 | Ecoregional subsection |
| S1 | 1 | C | 0 | Contains an EO of an S1 rank wildlife species |
| S2 | 1 | C | 0 | Contains an EO of an S2 rank wildlife species |
| LEVEL1 | 1 | C | 0 | Contains an EO of a WAP Level 1 wildlife species |
| LEVEL2 | 1 | C | 0 | Contains an EO of a WAP Level 2 wildlife species |
| LEVEL3 | 1 | C | 0 | Contains an EO of a WAP Level 3 wildlife species |
| LEVEL4 | 1 | C | 0 | Contains an EO of a WAP Level 4 wildlife species |

**NOTES**

BIO2 Condition = ($A\_RICH\_BUF_R$*.1666) + ($A\_RICH\_POL_R$*.1666) + ($P\_RICH\_POL_R$*.1666) + ($C\_RICH\_POL_R$*.1666) + ($MILLERPCT_R$*.1666) + ($GAPVERTMAX_R$*.167)
where all biological variables are positive indicators of biological quality and subscript R denotes percentile rank, thus “good” sites score high (maximum percentile rank=100) and “poor” sites score low (minimum percentile rank=0)

LAND1 Condition = ($HECTARES_R$*.25) + ($PROXINDEX_R$*.25) + ($WETPCT_R$*.25) + ($ELU30VAR_R$*.25)
where all landscape variables are positive indicators of landscape integrity and subscript R denotes percentile rank, thus “good” sites score high (maximum percentile rank=100) and “poor” sites score low (minimum percentile rank=0)

HUMAN2 Condition = ($IFESMEAN_R$*.167) + ($ROAD\_DENSITY_R$*.1666) + ($POP00SQMI_R$*.1666) + ($HU00SQMI_R$*.1666) + ($HG\_TOT_R$*.1666) + ($CA\_INDEX_R$*.1666)
where deleterious human impact variables have been transformed so that all variables are positive indicators of ecological integrity and subscript R denotes percentile rank, thus “good” sites score high (maximum percentile rank=100) and “poor” sites score low (minimum percentile rank=0)

COND2 Condition index = (BIO1+LAND1+HUMAN2)/3 as defined above

Digital data describing atmospheric deposition of mercury were provided by Ecosystems Research Group, Ltd. using the methods described in Miller et al. (2005). Digital data describing the risk of calcium and other base cation depletion and limitation in forested ecosystems provided by Ecosystems Research Group, Ltd. using methods described in Miller (2005).

The list above represents the complete set of attributes developed for the WAP habitat data layer. Only select attributes are distributed in the public release version WAP data layers. For more information, please contact the NH Fish and Game Department, Wildlife Division, 11 Hazen Dr, Concord NH 03301 Phone: (603) 271-2461 E-mail: wilddiv@wildlife.state.nh.us

**LITERATURE AND DIGITAL DATA CITED:**

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