HABITAT PROFILE

Appalachian Oak Pine Forest

Associated Species: Timber rattlesnake, eastern hognose snake, whip-poor will, veery, eastern pipistrelle, eastern red bat, northern myotis, silver haired bat, bobcat, black bear

Global Rank: Not ranked
State Rank: Not ranked
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Element 1: Distribution and Habitat

1.1 Habitat description

Appalachian oak pine forest systems are found mostly below 900 ft elevation in southern New Hampshire south of and at lower elevations than the hemlock-hardwood-pine forest system. The southern-most portions of the state are associated with the warmer and drier climatic conditions and apparently more fire-influenced landscapes that prevail south of New Hampshire in lower New England. Substrates in these forests include nutrient-poor, dry to mesic sandy glacial tills, and some large areas of sand plain or shallow-to-bedrock tills, particularly in the seacoast and lower Merrimack and Connecticut River valleys. Sand plains in these areas that have a frequent fire history correspond to pitch pine sand plain; those with a less frequent fire regime (i.e., more than 50 to 100 years) are classified as oak pine forest or sometimes hemlock hardwood pine forest systems depending on the composition of trees. More isolated patches of oak pine forest systems are found to the north in central New Hampshire associated with dry rocky ridges or sand plains with a historic fire regime.

1.2 Justification

Appalachian oak pine forest currently has a limited distribution in New Hampshire, covering less than 10% of the state's land area. Available data indicate that only 7.3% of the state's potential Appalachian oak pine forest is on permanently protected lands. This forest type supports 104 vertebrate species in New Hampshire, including 8 amphibians, 12 reptiles, 67 birds, and 17 mammals. Threatened and endangered wildlife species occurring in this forest type include osprey, Cooper's hawk, timber rattlesnake, and eastern hognose snake. In New Hampshire, intense development has dramatically reduced the area of this forest type influenced by natural disturbance regimes, resulting in a preponderance of the forest currently in older age classes. A full range of age classes well distributed on the landscape is important to support the diversity of wildlife species that depend on this forest type.

1.3 Protection and Regulatory Status

Most of New Hampshire's Appalachian oak pine forest occurs on small, privately owned parcels. Less than 15% of this forest type occurs on conservation lands. Forestry on state lands is covered by RSAs 216, 217, and 218. RSA 227 stipulates requirements for residual basal area in riparian areas. The manuals "Best Management Practices for Erosion Control on Timber Harvesting Operations in New Hampshire" (Cullen 1996) and "Good Forestry in the Granite State" (FSSWT 1996) provide recommended management practices for sustainable forestry in New Hampshire.

1.4 Distribution

Appalachian oak pine forest occurs primarily in southern New Hampshire, with more than 40%

by area in Rockingham County and approximately 20%, 15%, and 10% in Hillsborough Strafford, and Cheshire counties, respectively.

1.5 Town Distribution Map

See attached.

1.6 Habitat Map

To develop a map of Appalachian oak pine forest in New Hampshire, a model was developed for each ecoregion subsection of the state based on the 2001 New Hampshire Land Cover Assessment, elevation, landform, and soils. The model was developed by experts from The Nature Conservancy (TNC), the New Hampshire Natural Heritage Bureau (NHNHB), and New Hampshire Fish and Game (NHFG).

First, relevant forested 2001 New Hampshire Land Cover Assessment grid values were combined with elevation ranges from sea level to 900' (CSRC 2001, USGS 2003). Ecological Land Units, created by The Nature Conservancy's Conservation Science Support, were then added to capture additional areas likely to have geo-physical conditions favorable to Appalachian oak pine, or remove areas likely to have geo-physical conditions unfavorable to Appalachian oak pine (TNC 2003). Specifically, north-facing side slopes and north-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.

During previous fieldwork, NHNHB mapped exemplary Dry Appalachian oak-hickory forest, Mesic Appalachian oak-hickory forest, Appalachian oak-mountain laurel forest, and Semi-rich Appalachian oak-sugar maple forest systems in the state. These areas were added to ensure that known Appalachian oak pine locations were captured (NHNHB 2005). These data do not capture all existing locations of these communities, only those that have been mapped by NHNHB.

To further refine the model, soil types associated with Appalachian oak pine were identified by Natural Resource Conservation Service scientists and selected from digitized county soil data, where available (e.g., Merrimack county soils have not been digitized) (NRCS 2002, Homer 2005). The soils were selected, and then clipped to only include forested areas based on the New Hampshire Landcover Assessment, and added to the existing model information. The same was done for hemlock-hardwood-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. NHFG then applied a filter to determine the majority forest type between neighboring polygons in the TNC model, and smoothed the boundaries to generalize the transition between matrix forest types. This process is expected to somewhat over-predict current locations of Appalachian oak pine, but it captures better broad distribution patterns of the type.

Model results were reviewed by experts from TNC, NHFG, and NHNHB, who agreed that the broad patterns depicted by the model align with reasonable expectations. No ground truthing was conducted.

1.7 Sources of Information

The Appalachian oak pine map was developed based on expert input from scientists from the NHNHB, NHFG, and the New Hampshire Chapter of The Nature Conservancy. The results were reviewed by additional scientists from NHFG and the Audubon Society of New Hampshire. A variety of GIS data was used to generate the map including elevation data from the United States Geological Survey, landform data from The Nature Conservancy's eastern regional office, landcover data from the New Hampshire Landcover Assessment, and soils data from the Natural Resource Conservation Service, among others.

1.8 Extent and Quality of Data

The Appalachian oak pine habitat map is a depiction of broad landscape patterns with limited fine-scale accuracy. Additional refinements will likely be necessary based on ground truthing of the existing map. The Natural Resource Conservation Service provided a table of soil series that were believed to be strongly correlated with Appalachian oak pine and other forest types (Homer 2005). Soil series were provided by ecoregional subsection and elevation ranges. There was considerable overlap between series outlined for Appalachian oak pine and other forest types, especially hemlock-hardwood-pine. The transition between Appalachian oak pine and hemlock-hardwood-pine

was especially difficult to delineate, as disturbance is a driving factor in the distribution of Appalachian oak pine. The soil series considered to be most strongly correlated with Appalachian oak pine that did not overlap with hemlock-hardwood-pine were used in mapping Appalachian oak pine. Additional review of soils data, as well as land use history and paleoecology information, are necessary for future iterations.

1.9 Distribution Research

Additional fieldwork is needed to evaluate correlations between soil series and forest type as outlined in Homer (2005). County soil surveys outline soils suitable for forestry from an economic perspective. However, little has been done to evaluate soils from an ecological perspective (e.g., if left unmanaged, an area with a particular soil would eventually succeed to Appalachian oak pine forest).
Fieldwork is also needed to ground truth the Appalachian oak pine map.
Research is needed to identify human-created disturbance regimes that can maintain and regenerate Appalachian oak pine forest.

Element 2: Species/Habitat Condition

2.1 Scale

County

2.2 Relative Health of Populations

An approximately 5% decrease in forest area occurred between 1992 and 1993 and 2001 in the 4-county area where approximately 90% of New Hampshire's potential Appalachian oak pine forest occurs. An additional approximately 5% decrease is projected to occur between 2001 and 2025 (calculated from data in SPNHF 2005).

2.4 Relative Quality of Habitat Patches

Analysis pending

2.5 Habitat Patch Protection Status

Approximately 10% of potential Appalachian oak pine forest in the 4-county area where approximately 90% of this forest type occurs is in conservation ownership (calculated from TNC data). Approximately 14% of this type occurs on lands with some form of conservation protection (calculated from NHFG data).

2.6 Habitat Management Status

Approximately 25% of the 4-county area in which approximately 90% of potential Appalachian oak pine forest area occurs is in certified Tree Farms (calculated from TNC data and data in Thorne and Sundquist 2001).

2.7 Sources of Information

See 1.7

2.8 Extent and Quality of Data

See 1.8 regarding extent and quality of data associated with the TNC matrix forest map. Tree farm data from Thorne and Sundquist 2001 are based on a New Hampshire Tree Farm program database issued in August 2000. Data regarding changes in forest area from SPNHF 2005 include information from the New Hampshire Land Cover Assessment, 2001 and results of predictive modeling.

2.9 Condition Assessment Research

- Research is needed to determine the extent of this forest type that occurs in large unfragmented blocks.
- Research is needed to determine the age class distribution of this forest type on the landscape.

Element 3: Species and Habitat Threat Assessment

3.1.1 Transportation Infrastructure

(A) Exposure Pathway
Transportation infrastructure fragments forest blocks, creating edge effects from light penetration and exposure to wind and pollutants such as road salt and hydrocarbons. Transportation infrastructure and its use by vehicles also create dispersal barriers, edge effects, and increased mortality for matrix forest wildlife (Forman et al. 2003).

(B) Direct Evidence
Large carnivores may be unable to maintain sustainable populations in landscapes with road densities exceeding 1 mi/ mi^2 (Forman and Alexander 1998). Roads affect forest and habitat conditions well beyond the actual edge of the forest (Ranney et al. 1981). Roads can negatively affect landscape permeability for black bears, bobcats, and lynx (Forman et al. 2003).

3.1.2. Development (Habitat Loss and Conversion)

(A) Exposure Pathway
Development reduces matrix forest habitat by converting natural forest to landscaped lawns and impermeable surfaces (e.g., buildings, roads). Development also contributes to forest fragmentation by directly reducing habitat, increasing traffic on existing roads, and requiring construction of new transportation infrastructure.

(B) Direct Evidence
A study of 10 New Hampshire communities found that their populations increased by an average of 70.9% (range 9.7 to 189.7%) between 1974 and 1992, while developed land increased by an average of 137.2%. In the community with 9.7% population growth, developed land increased by 15.9% (New Hampshire Office of State Planning (NHOSP) 2000).

3.1.3. Development (Land Use Planning)

(A) Exposure Pathway
In New Hampshire, land use decisions are made at the municipal scale by volunteer planning boards with little or no training in natural resource issues. In cities and some of the larger towns, professional planning staff evaluate proposed developments and provide input to the planning board, but this is the exception rather than the rule. Most professional planners lack training in ecology or natural resources. Decisions are typically based on engineering and aesthetic considerations, with no recognition of direct or cumulative impacts on the underlying ecological functions of the affected lands or on impacts to wildlife habitat.

(B) Direct Evidence
A Growth Management Advisory Committee convened by the New HOSP in 1999 concluded that:

- Impacts of growth and development are cumulative over decades
- Development in New Hampshire has occurred incrementally, resulting in fragmentation and loss of important and environmentally sensitive areas, including forestlands and wildlife habitat
- Communities seldom evaluate the potential impacts of their zoning ordinance or land use regulations (NHOSP 2000)

3.1.5 Altered Natural Disturbance (Succession)

(A) Exposure Pathway
Extinction of the passenger pigeon, fire suppression, development, and accompanying land-use policies have essentially eliminated the major historical natural disturbances for this forest type. Parcelization and extensive residential development now preclude forest management in much of New Hampshire's Appalachian oak pine forest. Habitat for wildlife species requiring early successional stages of this forest type has been substantially reduced.

(B) Direct Evidence
Forest inventory data for New Hampshire show major deficits in the 2-inch diameter class for hickory and the 4-inch diameter class for white oaks (Miles 2005).

3.2 Sources of Information

Threat information was derived from a work session with forestry professionals and stakeholders, available data, published literature, and personal experience.

3.3 Extent and Quality of Data

Threats to Appalachian oak pine forest resulting directly or indirectly from land conversion and development are well documented.

3.4 Threat Assessment Research

The major threats are adequately documented. Re-

search should be directed to condition assessment and conservation actions.

Element 4: Conservation Actions

4.1.1 Incorporate Habitat Conservation into Local Land Use Planning

See Strategies: Local Regulation and Policy

4.1.2 Advise Conservation Commissions and Open Space Committees

See Strategies: Local Regulation and Policy, Education and Outreach

4.1.3 Promote Role of the Regional Planning Commissions in Landscape-Scale Conservation

See Strategies: Local Regulation and Policy

4.1.4 Protect unfragmented blocks and other key wildlife habitats

See Strategies: Land Protection

4.1.5 Develop a comprehensive land protection support program

See Strategies: Land Protection

4.1.6 Advocate adoption of sustainable forestry

See Strategies: Education and Outreach

4.2 Conservation Action Research

Research is needed to provide a sound scientific basis for new tools to help municipalities maintain large forest blocks and significant wildlife habitat in the face of development. Such research could include:

- Road noise effects on forest bird distribution and breeding status
- Behavior and land use of mesocarnivores in relation to development and road densities
- Bear use of mast stands relative to proximity of development
- Effects of residential lot sizes on habitat suitability and landscape permeability for selected wildlife species

Element 5. References

5.1 Literature

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5.2 Data sources

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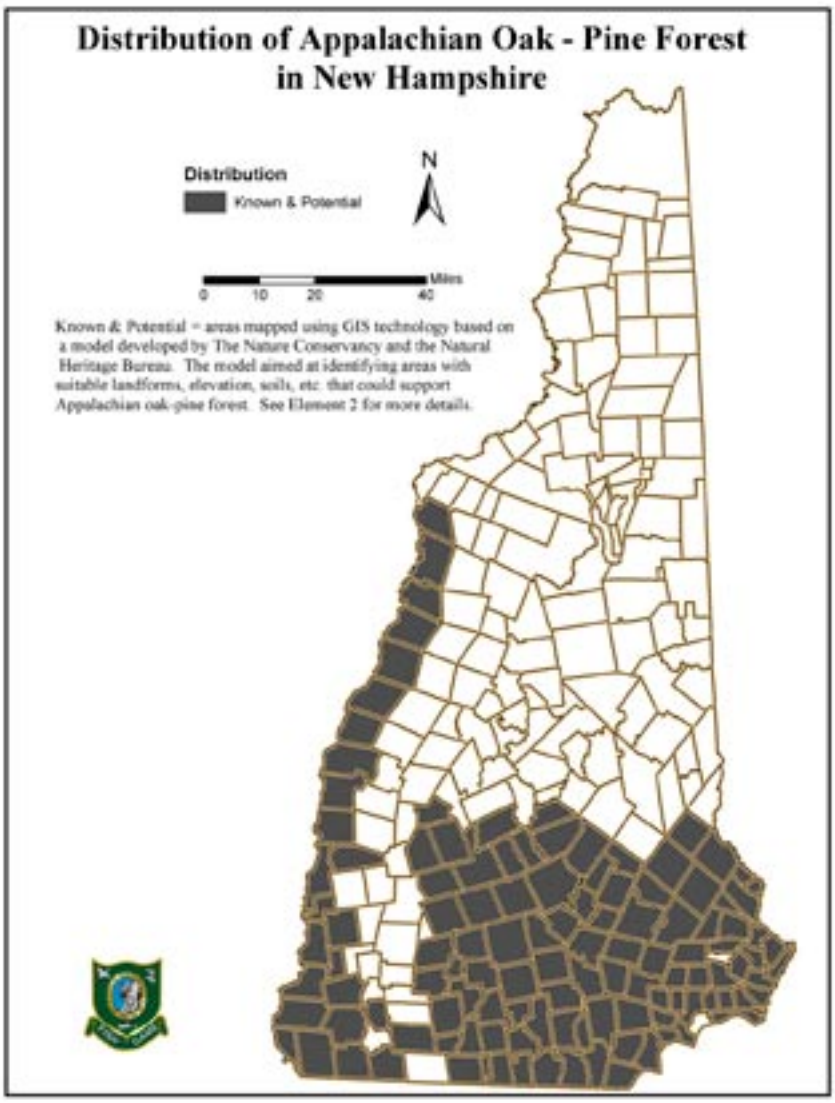
Distribution of Appalachian Oak - Pine Forest in New Hampshire
Distribution
Known & Potential
N
Miles
0
10
20
40
Known & Potential = areas mapped using GIS technology based on a model developed by The Nature Conservancy and the Natural Heritage Bureau. The model aimed at identifying areas with suitable landforms, elevation, soils, etc. that could support Appalachian oak-pine forest. See Element 2 for more details.