Appendix B: Habitats

Temperate Swamps

Photo by Ben Kimball

Acres in NH: 92333
Percent of NH Area: 2
Acres Protected: 20313
Percent Protected: 22

Habitat Distribution Map

Habitat Description

This habitat consists of forested wetlands found primarily in central and southern New Hampshire, and corresponds to the temperate peat swamp, coastal conifer peat swamp, and temperate minerotrophic swamp systems described by NHNHB (Sperduto 2011). In the 2005 Wildlife Action Plan, the temperate peat swamp and coastal conifer peat swamp systems were included as a subset of peatlands, but their structure and associated species differ substantially from open peatlands such as bogs and fens, and here are addressed as a separate habitat. The wetlands of the temperate minerotrophic swamp system were essentially unrepresented in the original WAP. They are distinct from peat swamps in terms of hydrology, water chemistry, and species composition, but have a generally similar structure as forested wetlands.

Temperate peat swamps are found throughout southern and central New Hampshire, typically in isolated or stagnant basins with saturated, organic soils. These swamps are most frequently dominated by red maple (Acer rubrum), with an understory characterized by the tall shrubs highbush blueberry (Vaccinium corymbosum) and winterberry (Ilex verticillata). In many examples in southeastern New Hampshire, black gum (Nyssa sylvatica) is a significant component of the canopy. Most occurrences of the coastal conifer peat swamp system are defined by the dominance of Atlantic white cedar (Chamaecyparis thyoides). There are four Atlantic white cedar communities described for New Hampshire, all of which are rare in the state. This system also includes the pitch
Appendix B: Habitats

pine-heath swamp, a rare community usually associated with the pine barrens landscape. Most coastal conifer peat swamps occur within 30 miles of the Atlantic coast, although a few examples of an inland type of Atlantic white cedar swamp occur at a greater distance from the ocean.

Like temperate peat swamps, temperate minerotrophic swamps are typically dominated by red maple. However, unlike peat swamps, minerotrophic swamps primarily have mineral soils that are less acidic. The hydrology of these wetlands is variable, and includes headwater swamps fed by groundwater seepage, as well as seasonally-flooded swamps associated with low-gradient streams and small rivers. Floristically, these minerotrophic swamps tend to be more diverse than the peat swamps, with greater variety of herbaceous species associated with marshes and forest seeps.

Justification (Reason for Concern in NH)

Wetlands are habitats that provide a number of critical functions such as flood control, pollutant filters, shoreline stabilization, sediment retention and erosion control, food web productivity, wildlife habitat, recreation, and education (Tiner 1984, North American Waterfowl Management Plan 1986, New Hampshire Office of State Planning 1989).

Protection and Regulatory Status

Federal
- Clean Water Act-Section 404; administered by the USACE and USEPA: regulates discharge of dredge or fill material into “waters of the United States” including wetlands.
- Migratory Bird Treaty Act (1918)
- Emergency Wetlands Resources Act (1986): requires the Secretary of Interior (through USFWS) to produce updated reports every ten years on the status and trends of wetlands and deepwater habitats in the conterminous United States (Dahl and Johnson 1991); Section 303- requires inclusion of wetlands in statewide comprehensive outdoor recreation plans (SCORP).

State
- Fill and Dredge in Wetlands; NHDES (NHDES, RSA 482-A)- requires applicant to obtain a permit to fill or dredge jurisdictional wetland habitats. The NHDES has placed emphasis on preserving bogs and marshes based upon rarity and difficulty in restoration of value and functions (NHDES Wt 302.01). For all major (> 1,800 m2) and minor (270-1,800 m2) impact projects, the applicant must assess impacts to plants, fish, and wildlife including rare, special concern species, state and federally listed threatened and endangered species, species at the extremities of their ranges, migratory fish and wildlife, and exemplary Natural communities identified by the NHNHB (NHDES Wt 302.04). The NHDES Wetlands Bureau does not require construction setbacks from non-tidal freshwater wetlands (except under RSA 485-A).
- Water Pollution and Waste Disposal Statute (RSA 485-A)- subsurface wastewater disposal systems must be greater than 15 m (50 ft) from poorly drained (hydric B) soils and 23 m (75 ft) from very poorly drained (hydric A) soils.
- New Hampshire Endangered Species Conservation Act (RSA 212-A)
- Nongame Species Management Act (1988) (RSA 212-B)—the NHFG Nongame and Endangered Species Program has responsibility and authority to conduct research, management, and education related to those species not hunted, fished, or trapped.
- Native Plant Protection Act (RSA 217-A); HNHB
**Appendix B: Habitats**

**Local**
- Designation of Prime Wetlands (RSA 482:a-15): towns may designate individual wetlands as 'prime' based on NHDES protocol (NHDES Wt 700). Projects located in or adjacent to designated prime wetlands under RSA 482-A:15 are considered major impact projects and require a full application to NHDES.
- Local wetland regulations and zoning vary considerably. Recommended buffer distances are summarized in Chase et al. (1995).

<table>
<thead>
<tr>
<th>Distribution and Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperate swamps are found primarily in central and southern New Hampshire, with the greatest concentration in the Seacoast region. There are some temperate swamps mapped in Coos County, but these areas would probably be better classified as northern swamps. Research should focus on surveying these locations to determine their proper classification.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Relative Health of Populations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperate swamps occupy roughly 2% of New Hampshire's land area, with 22% occurring on conservation lands. Between 2004 and 2015, NH DES documented approximately 950 acres of wetlands lost in New Hampshire through development activities (Crystal, pers. comm).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Habitat Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>A set of GIS data was used to assess ecological condition of each habitat type. Chapter 3 describes the methodology. The data used for this habitat is described below.</td>
</tr>
</tbody>
</table>

**Biological Condition:**
- Species richness of rare animals within polygon
- Species richness of rare animals within their dispersal distances from the polygon
- Species richness of rare plants in polygon
- Richness of rare and exemplary natural communities in polygon

**Landscape Condition:**
- Area of largest swamp in the Complex
- Number of dominant NWI vegetation classes (FO, EM, SS, PUB, AB) in the Complex
- Number of swamp polygons in the Complex
- Local Connectedness
- Landscape Complexity

**Human Condition:**
- Index of Ecological Integrity
- Road density is within 250 meters of the Complex Distance to nearest road (meters)
Appendix B: Habitats

Threats to this Habitat in NH

Threat rankings were calculated by groups of taxonomic or habitat experts using a multistep process (details in Chapter 4). Each threat was ranked for these factors: Spatial Extent, Severity, Immediacy, Certainty, and Reversibility (ability to address the threat). These combined scores produced one overall threat score. Only threats that received a “medium” or “high” score have accompanying text in this profile. Threats that have a low spatial extent, are unlikely to occur in the next ten years, or there is uncertainty in the data will be ranked lower due to these factors.

Habitat degradation from insect pests (Hemlock woolly adelgid invasion) (Threat Rank: High)

The hemlock wooly adelgid (Adelges tsugae), a small, sap-sucking insect native to Japan and China, became established in the Pacific Northwest in 1924 (na.fs.fed.us/fhp/hwa,). This insect became established in Virginia in the early 1950s and has since been spreading in the northeastern United States. As of 2015, infestations have been identified in 82 towns in eight counties in the state (NHDFL 2015). This species can be spread through the transportation of infected nursery stock as well as by wind, birds, and mammals. Eastern hemlock (Tsuga canadensis) has demonstrated little or no resistance to adelgid damage and mortality (McClure et al. 2001).

Although rarely dominant, hemlock is a common component of temperate peat swamps across New Hampshire, so the potential impacts to this habitat are significant. The hemlock wooly adelgid sucks sap from young hemlock twigs, resulting in needle drop, twig die-back, growth reduction, and tree mortality over the course of several years (Havill et al. 2014).

Habitat degradation from sedimentation (Threat Rank: Medium)

Elevated levels of sediments entering wetlands arrive through runoff from roads, construction sites, and agricultural fields. Sediment deposition in wetlands can lead to decreased plant species diversity and favorable conditions for the spread of invasive plants (Wright et al. 2006).

Sediment deposition in wetlands can influence the ability of seeds to germinate and grow by altering light availability, temperature, and oxygen levels in the soil (Wardrop & Brooks 1998). A study of Atlantic white cedar swamps in New Jersey found that increased runoff from developed areas, including sedimentation, led to changes in plant species composition, including failure of cedar seedlings to survive (Simpson 2000).

Species impacts from insecticide use (mosquito treatment) (Threat Rank: Medium)

New Hampshire permits the control of mosquitoes using larvicides (bacteria and insect growth regulators) and adulticides (pyrethroid synthetic pesticides) (NH DHHS 2008). Many of these pesticides can affect a broad spectrum of insect and other invertebrate species.

Larvicides are applied specifically to wetlands. Insect growth regulators like methoprene are broadly toxic to invertebrates, particularly crustaceans. Bacterial controls like Bacillus thuringiensis var. israelensis (BTI) are toxic to non-biting midges, which are an important food source in wetlands for a variety of wildlife species, including invertebrates, fish, amphibians, and birds. Pyrethroid adulticides are highly toxic to many aquatic organisms and are specifically prohibited from being applied to wetlands and water bodies. However, these chemicals can enter wetlands through drift from aerial spraying (Mazzacano & Black 2013).

Habitat degradation from fertilizer that increases eutrophication (Threat Rank: Medium)

 Increased nutrient input through runoff, decaying woody debris, or hydrologic alterations changes the...
nutrient content of the water in wetlands, particularly peat swamps. This increases the rate of peat decomposition, which in turn affects water transport through the soil and nutrient availability. Increases in nutrient levels may result in a change in plant species composition, in particular making the wetland more suitable for the establishment of invasive plants.

Temperate peat swamps are nutrient poor systems where organic decomposition is very slow and organic matter (peat) accumulates over time. Peatlands are inhabited by a suite of plants adapted to nutrient-poor conditions (Sperduto and Nichols 2011). Increases in nutrient concentrations will change the plant community and the rate of organic decomposition (Aerts et al. 2001), resulting in a degradation of habitat. Land conversion and other human activities near peat swamps can alter natural nutrient regimes through the combined effects of erosion, runoff, fertilizers, or hydrologic alteration. The rate of land conversion in New Hampshire, particularly in the two southeastern ecoregions, is quite high (NHNHB, unpublished data).

**Habitat degradation from forestry occurring in a swamp that modifies forest structure (Threat Rank: Medium)**

Timber harvesting in forested wetlands changes the vegetation structure and the amount of decaying woody debris in the wetland. It can cause rutting and increase compaction of the soil, leading to increased runoff and nutrient inputs.

In New Hampshire, any activity that involves dredging material from or adding material to a wetland requires a permit (NHDES 2015). However, forestry activities can occur in wetlands under frozen conditions, since neither dredge nor fill occurs under such circumstances. Forested wetlands are not always properly delineated, particularly on NWI maps (Dan Sperduto, NHNHB, personal communication), so attempts to avoid wetlands during timber harvesting may not be successful. Forestry activities can also compact soil, particularly organic soils such as peat (New Hampshire Forest Sustainability Standards Work Team 1997), leading to increased runoff. Decomposition of slash left near the edge of a peat swamp can alter the structure and density, and thus the water transport abilities, of the peat (Damman and French 1987).

**Mortality and habitat impacts (fragmentation) from roads (Threat Rank: Medium)**

Depending on the extent of fragmentation and loss or degradation of upland habitat, wildlife may be affected differently. Most species associated with wetlands use a portion of surrounding uplands for foraging, dispersing, reproduction, egg laying, resting, cover, and overwintering (Semlitsch and Bodie 2003). Extent and area of upland use can vary widely among species. Impacts to upland habitats from development can result in direct mortality of individuals, create barriers to dispersal, fragment species populations, eliminate or reduce the quality of nesting or forage habitat, and increase predation of nests or young as a result of generalist predators benefiting from an abundance of forage.

Habitat fragmentation can influence many species including those with limited mobility (Mader 1984, Reh and Seitz 1990, Herrmann et al. 2005). Marsh and other wetland taxa are more likely to disperse through forested uplands than non-forested uplands (deMaynadier and Hunter 1999, Nekola et al. 2002), so habitat fragmentation could alter the upland to the extent that individuals are no longer able to migrate. Marshes and other wetlands are patchy habitats within an upland landscape, and the wildlife that depend on them often exhibit little migration between patches (Gibbs 2000). With this limited migration and limited genetic exchange, any further hindrance to migration between habitats could render local populations vulnerable to extinction.
Appendix B: Habitats

**Habitat conversion due to the direct filling of wetlands for development (Threat Rank: Medium)**

On National Wetland Inventory Maps, roughly half of all freshwater wetlands in New Hampshire are forested. However, forested wetlands are often difficult to photointerpret, and as a group may be under-represented on by NWI (Tiner 2007).

The loss and degradation of wetland habitats is a major threat to most groups of wildlife including waterfowl (North American Waterfowl Management Plan 1986, 2000) and other birds (Hunt 2005), and reptiles and amphibians (Mitchell 2003). NHDES currently has regulations that limit the amount of wetland filling (RSA 482-A). Between 2004 and 2014, 957 wetland acres were impacted in New Hampshire, with a high of 197 acres in 2006 and a low of 41 acres in 2012 (S. Crystall NHDES, pers. comm). Wetland types were not described in impact totals and impacts to wildlife resulting from loss of uplands were not considered. Under NHDES regulations, marshes receive some priority for protection and large marshes are not likely to be filled. However, driveway and road crossing placement in wetlands in order to gain access to developable uplands occurs frequently (M. N. Marchand, NHFG, personal observation).

**Habitat conversion due to development of surrounding uplands (Threat Rank: Medium)**

Depending on the extent of fragmentation and loss or degradation of upland habitat, wildlife may be affected differently. Most species associated with wetlands use a portion of surrounding uplands for foraging, dispersing, reproduction, egg laying, resting, cover, and overwintering (Semlitsch and Bodie 2003). Extent and area of upland use can vary widely among species. Impacts to upland habitats from development can result in direct mortality of individuals, create barriers to dispersal, fragment species populations, eliminate or reduce the quality of nesting or forage habitat, and increase predation of nests or young as a result of generalist predators benefiting from an abundance of forage. In forested wetlands, hydrologic changes caused by habitat fragmentation generally reduce species richness and abundance of plants, macroinvertebrates, amphibians, and birds with greater numbers of invasives and exotics (Faulkner 2004).

Habitat fragmentation can influence many species including those with limited mobility (Mader 1984, Reh and Seitz 1990, Herrmann et al. 2005). Swamp and other wetland taxa are more likely to disperse through forested uplands than non-forested uplands (deMaynadier and Hunter 1999, Nekola et al. 2002), so habitat fragmentation could alter the upland to the extent that individuals are no longer able to migrate. Swamps and other wetlands are patchy habitats within an upland landscape, and the wildlife that depend on them often exhibit little migration between patches (Gibbs 2000). With this limited migration and limited genetic exchange, any further hindrance to migration between habitats could render local populations vulnerable to extinction.

**List of Lower Ranking Threats:**

- Habitat degradation from non-point and point contaminants
- Habitat degradation from introduced or invasive plants
- Habitat degradation from groundwater and surface withdrawals
- Mortality from legal and illegal OHRV activity
- Mortality from hiking and biking trails
- Habitat degradation from livestock use near or in wetlands: disturb and compact soil, degrade water quality

New Hampshire Wildlife Action Plan Appendix B-150
Appendix B: Habitats

Habitat degradation from increased vulnerability to invasive species

**Actions to benefit this Habitat in NH**

**Work with foresters to promote use of BMPs presented in Good Forestry in the Granite State.**

**Primary Threat Addressed:** Habitat degradation from forestry occurring in a swamp that modifies forest structure

**Specific Threat (IUCN Threat Levels):** Biological resource use

**Objective:**
The objective is to reduce impacts from forestry activities on forested wetlands.

**General Strategy:**
Through NH Cooperative Extension, promote adherence to Best Management Practices related to wetlands as presented in Good Forestry in the Granite State. Groups such as the Society of American Foresters and the Timberland Owners’ Association conduct workshops and professional development courses that can disseminate information on this subject.

**Political Location:**
Statewide

**Watershed Location:**
Statewide

**Support the Division of Forests and Lands in the implementation of the hemlock woolly adelgid action plan.**

**Primary Threat Addressed:** Habitat degradation from insect pests (Hemlock woolly adelgid invasion)

**Specific Threat (IUCN Threat Levels):** Invasive & other problematic species, genes & diseases

**Objective:**
The objective is to minimize the impact of hemlock woolly adelgid on NH forests and control its spread in the state.

**General Strategy:**
The “Action Plan to Restrict the Spread and Manage Hemlock Woolly Adelgid Within the State of New Hampshire” is designed to guide the appropriate agencies and personnel in the management of hemlock woolly adelgid. The action plan was developed by the NH Division of Forests and Lands and recommended by the state’s Forest Pest Advisory Group which is comprised of pest specialists representing the NH Division of Forests and Lands, USDA Forest Service, NH Department of Agriculture Markets and Foods, UNH Cooperative Extension, The Society for the Protection of New Hampshire’s Forests, The Nature Conservancy, the Granite State Society of American Foresters, and the USDA Animal and Plant Health Inspection Service. These organizations are brought together by the State Forester to provide oversight in the management of major forest pest outbreaks.

**Political Location:**
Statewide

**Watershed Location:**
Statewide

**Promote measures to protect wetlands as described in “Innovative Land Use Planning Techniques.”**

**Primary Threat Addressed:** Habitat degradation from fertilizer that increases eutrophication

**Specific Threat (IUCN Threat Levels):** Pollution

New Hampshire Wildlife Action Plan Appendix B-151
Objective:
The objective is to reduce impacts to wetlands from other land uses, including development, transportation, and agriculture.

General Strategy:
“Innovative Land Use Planning Techniques” is a document developed by the Department of Environmental Services to present ideas on land use planning to New Hampshire municipalities. Included among these ideas are suggestions for protecting wetlands from various forms of human disturbance, focusing on the creation of local ordinances to establish buffers around wetlands and watercourses. NHFG should work with the NH Association of Conservation Commissions to emphasize the value of such protections to wildlife resources.

References and Authors

2015 Authors:
Peter Bowman, NHNHB

2005 Authors:

Literature:


Appendix B: Habitats


New Hampshire Fish and Game Department. 2015. OHRVs in New Hampshire. http://www.wildlife.state.nh.us/OHRV/ohrv.htm

Appendix B: Habitats

NHDFL. 2015. Action Plan to Restrict the Spread and Manage Hemlock Woolly Adelgid within the State of New Hampshire. NH Division of Forests and Lands, Concord.


New Hampshire Wildlife Action Plan Appendix B-154