WHEN TO CONSIDER SCALE

ALWAYS!

- **Habitats/species that may be fixed in space but extend across a wide geographical range and may have different exposures**
- **Species that are highly migratory**
- **Species/habitats that may show high rates of adaptation to local conditions (the regional, large scale approach may not work)**
- **Consider the scale of those that will implement the adaptation strategy/strategies**

Massachusetts Wildlife Habitat Climate Change Vulnerability Assessment

NORTHERN HARDWOODS FOREST VULNERABILITY EVALUATION

NTWHCS category: Appalachian northern hardwood forest
State ranking ss

Vulnerability score **5 and 6 (lower and higher emissions scenarios, respectively)**
Confidence evaluation **Medium**

Rationale

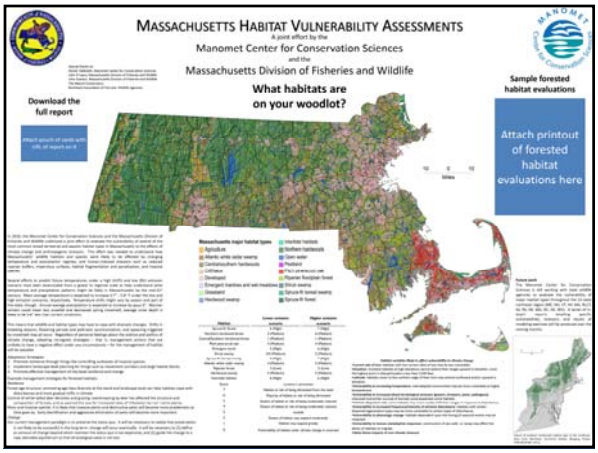
With the distributional range of this habitat extending from Quebec in the north to high-elevation areas of Virginia and West Virginia, Massachusetts is close to the center of this community type's geographical distribution. In Massachusetts, where it is the predominant hardwood forest (see map below from the Massachusetts Natural Heritage and Endangered Species Program [NHESP]) in many areas, it is generally restricted to an altitudinal range of about 1,000-3,000 feet, being more adapted to colder temperatures and shorter growing seasons than southern/central hardwood forest (but less so than spruce-fir forest). It is dominated by Sugar Maple, Yellow Birch, and American Beech mixed with White Pine; with Eastern Hemlock at lower elevations; and with Red Spruce and Balsam Fir becoming important at the highest elevations where it grades into spruce-fir forest (Swain and Kearsley, 2001). Within the broad matrix of northern hardwood forest a number of variants occur, depending on local conditions. These include rich mesic forests dominated by Sugar Maples, Eastern Hemlock groves on cool, north-facing slopes or in ravines, and transition forests that include some species more typical of southern/central hardwood forest. It is not a fire-adapted community and fire suppression may have extended the range of this habitat in New England (J. Scanlon, Massachusetts DFW, *pers comm.*). This forest type is vulnerable to attack by insects, including gypsy moth and hemlock wooly adelgid, and to beech scale disease. Disturbance from blowdown, logging, or fire can lead to the (at least temporary) dominance of White Pine over other species. In areas closer to human habitation or powerline cuts, non-native plant species, including Japanese Barberry, Japanese Knotweed, etc., can form dense growths.

NORTHERN HARDWOODS – A WIDELY DISTRIBUTED HABITAT

Vulnerability may vary across range

REGIONAL ZONES

Habitat Vulnerability Varies Across Scales				
	Zone I	Zone II	Zone III	Zone IV
Acadian-Appalachian Alpine Tundra	Highly Vulnerable			
Acadian-Appalachian Montane Spruce-Fir Forest	Vulnerable	Critically Vulnerable		
Laurentian-Acadian Northern Hardwood Forest	Less Vulnerable	Vulnerable	Vulnerable	Critically Vulnerable
Central Mixed Oak-Pine Forests	Least Vulnerable	Least Vulnerable	Less Vulnerable	Vulnerable
Pitch Pine Barrens		Less Vulnerable	Less Vulnerable	Less Vulnerable
Northern Atlantic Coastal Plain Basin Peat Swamp		Less Vulnerable	Less Vulnerable	Less Vulnerable
Central and Southern Appalachian Spruce-Fir Forest				Critically Vulnerable
Boreal-Laurentian Bog	Highly Vulnerable	Highly Vulnerable		
Shrub Swamp	Vulnerable	Vulnerable	Vulnerable	Vulnerable
Emergent Marsh	Vulnerable	Vulnerable	Vulnerable	Vulnerable




Low
High