

**One x One Degree**  
**Climate Change Atlas Tree Species**  
 Current and Potential Future Habitat, Capability, and Migration

sq. km      sq. mi      FIA Plots  
 Area of Region    8,604.5    3,322.2      286

**Species Information**

The columns below provide brief summaries of the species associated with the region and described in the table on the next pages. Definitions are provided in the Excel file for this region.

Genus	Species	Abundance		Model		Potential Change in Habitat Suitability		Capability to Cope or Persist		Migration Potential					
				Reliability	Adaptability	Scenario RCP45	Scenario RCP85	Scenario RCP45	Scenario RCP85	SHIFT RCP45	SHIFT RCP85				
Ash	3			High	20	15	Increase	7	11	Very Good	4	4	Likely	0	0
Hickory	0			Medium	19	31	No Change	11	9	Good	5	7	Infill	0	2
Maple	6	Abundant	7	Low	17	13	Decrease	19	17	Fair	9	9	Migrate	10	11
Oak	4	Common	15	FIA	5		New	18	18	Poor	9	8		10	13
Pine	3	Rare	20				Unknown	6	6	Very Poor	9	7			
Other	26	Absent	19							FIA Only	3	3			
	<b>42</b>		<b>61</b>		<b>61</b>	<b>59</b>		<b>61</b>	<b>61</b>	Unknown	1	1			
											<b>40</b>	<b>39</b>			

**Potential Changes in Climate Variables**

**Temperature (°F)**

Scenario	2009	2039	2069	2099		
Annual	CCSM45	44.2	46.0	48.2	48.3	
Average	CCSM85	44.2	46.6	49.1	52.2	
	GFDL45	44.2	47.1	50.4	51.9	
	GFDL85	44.2	47.5	51.8	56.8	
	HAD45	44.2	47.1	50.2	51.9	
	HAD85	44.2	47.4	51.5	56.8	
Growing Season	CCSM45	62.0	64.0	65.8	66.0	
	CCSM85	62.0	64.3	66.5	70.1	
May—Sep	GFDL45	62.0	65.3	68.6	70.3	
	GFDL85	62.0	65.5	70.0	75.2	
	HAD45	62.0	64.8	67.6	69.7	
	HAD85	62.0	64.6	69.3	74.7	
Coldest Month	CCSM45	16.0	17.5	19.1	19.8	
	CCSM85	16.0	18.6	19.9	22.3	
Average	GFDL45	16.0	19.0	21.4	22.8	
	GFDL85	16.0	19.8	22.3	25.1	
	HAD45	16.0	18.5	21.1	21.6	
	HAD85	16.0	20.1	22.4	25.9	
Warmest Month	CCSM45	68.4	70.5	71.6	71.5	
	CCSM85	68.4	70.9	72.5	74.2	
Average	GFDL45	68.4	71.5	73.3	74.5	
	GFDL85	68.4	71.5	74.4	77.1	
	HAD45	68.4	71.3	72.7	74.0	
	HAD85	68.4	71.1	73.7	77.1	

**Precipitation (in)**

Scenario	2009	2039	2069	2099		
Annual	CCSM45	45.4	44.6	42.8	49.2	
Total	CCSM85	45.4	45.4	46.4	48.3	
	GFDL45	45.4	49.4	52.4	50.8	
	GFDL85	45.4	48.0	50.4	51.8	
	HAD45	45.4	49.0	52.6	50.4	
	HAD85	45.4	50.2	50.7	53.1	
Growing Season	CCSM45	18.5	18.7	16.7	18.9	
	CCSM85	18.5	18.5	18.9	18.2	
May—Sep	GFDL45	18.5	17.7	17.5	17.1	
	GFDL85	18.5	18.5	17.3	16.1	
	HAD45	18.5	20.0	20.6	20.4	
	HAD85	18.5	19.2	20.1	20.9	

**NOTE:** For the six climate variables, four 30-year periods are used to indicate six potential future trajectories. The period ending in 2009 is based on modeled observations from the PRISM Climate Group and the three future periods were obtained from the NASA NEX-DCP30 dataset. Future climate projections from three models under two emission scenarios show estimates of each climate variable within the region. The three models are CCSM4, GFDL CM3, and HadGEM2-ES and the emission scenarios are the 4.5 and 8.5 RCP. The average value for the region is reported, even though locations within the region may vary substantially based on latitude, elevation, land-use, or other factors.

**Cite as:** Iverson, L.R.; Prasad, A.M.; Peters, M.P.; Matthews, S.N. 2019. Facilitating Adaptive Forest Management under Climate Change: A Spatially Specific Synthesis of 125 Species for Habitat Changes and Assisted Migration over the Eastern United States. *Forests*. 10(11): 989. <https://doi.org/10.3390/f10110989>.

One x One Degree  
Climate Change Atlas Tree Species

USDA Forest Service  
Northern Research Station  
Landscape Change Research Group  
Iverson, Peters, Prasad, Matthews

Current and Potential Future Habitat, Capability, and Migration

Common Name	Scientific Name	Range	MR	%Cell	FIAsum	FIAiv	ChngCl45	ChngCl85	Adap	Abund	Capabil45	Capabil85	SHIFT45	SHIFT85	SSO	N
red maple	Acer rubrum	WDH	High	97.6	1972.9	15.7	No change	No change	High	Abundant	Very Good	Very Good			1	1
balsam fir	Abies balsamea	NDH	High	95.4	1541.2	11.6	Sm. dec.	Sm. dec.	Low	Abundant	Fair	Fair			0	2
eastern white pine	Pinus strobus	WDH	High	82.3	1240.8	12.0	No change	Sm. dec.	Low	Abundant	Fair	Fair			0	3
eastern hemlock	Tsuga canadensis	NSH	High	80.1	1099.3	10.5	Sm. dec.	Lg. dec.	Low	Abundant	Fair	Poor			0	4
northern red oak	Quercus rubra	WDH	Medium	65.3	652.0	7.2	Sm. inc.	Sm. inc.	High	Abundant	Very Good	Very Good			1	5
northern white-cedar	Thuja occidentalis	WSH	High	53	546.0	8.5	Sm. dec.	Sm. dec.	Medium	Abundant	Fair	Fair			0	6
American beech	Fagus grandifolia	WDH	High	70.3	512.4	5.4	No change	No change	Medium	Abundant	Good	Good			1	7
paper birch	Betula papyrifera	WDH	High	87.8	492.2	4.4	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	8
white ash	Fraxinus americana	WDH	Medium	77.4	432.8	4.1	No change	No change	Low	Common	Poor	Poor			0	9
quaking aspen	Populus tremuloides	WDH	High	61	389.6	4.9	No change	No change	Medium	Common	Fair	Fair			1	10
sugar maple	Acer saccharum	WDH	High	65.3	363.4	4.2	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	11
red spruce	Picea rubens	NDH	High	52.6	352.1	3.2	Sm. dec.	Sm. dec.	Low	Common	Poor	Poor			0	12
yellow birch	Betula alleghaniensis	NDL	High	75.5	295.0	2.9	No change	No change	Medium	Common	Fair	Fair			1	13
bigtooth aspen	Populus grandidentata	NSL	Medium	45.9	273.7	4.4	No change	Sm. dec.	Medium	Common	Fair	Poor			1	14
gray birch	Betula populifolia	NSL	Low	57.9	202.7	2.8	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	15
black cherry	Prunus serotina	WDL	Medium	41.8	177.0	3.4	Lg. inc.	Lg. inc.	Low	Common	Good	Good			1	16
black ash	Fraxinus nigra	WSH	Medium	34.8	169.4	3.8	Lg. dec.	Lg. dec.	Low	Common	Very Poor	Very Poor			0	17
American elm	Ulmus americana	WDH	Medium	30.4	114.9	3.4	No change	Sm. inc.	Medium	Common	Fair	Good			1	18
tamarack (native)	Larix laricina	NSH	High	23.1	85.9	2.5	Lg. dec.	Lg. dec.	Low	Common	Very Poor	Very Poor			0	19
white spruce	Picea glauca	NSL	Medium	38.5	79.6	1.5	No change	No change	Medium	Common	Fair	Fair			1	20
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	37.7	61.2	1.2	Sm. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	21
pin cherry	Prunus pensylvanica	NSL	Low	13.1	59.0	4.1	Lg. dec.	Very Lg. dec.	Medium	Common	Poor	Lost			0	22
green ash	Fraxinus pennsylvanica	WSH	Low	9.8	37.1	3.5	No change	Sm. inc.	Medium	Rare	Poor	Fair			1	23
American basswood	Tilia americana	WSL	Medium	18.3	28.6	1.1	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			1	24
chokecherry	Prunus virginiana	NSLX	FIA	3.4	23.9	6.4	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	25
striped maple	Acer pensylvanicum	NSL	Medium	18.6	20.9	1.0	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	26
balsam poplar	Populus balsamifera	NSH	Medium	7.4	19.2	2.2	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	27
Scots pine	Pinus sylvestris	NSH	FIA	1.2	17.1	14.7	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	28
black spruce	Picea mariana	NSH	High	3.3	16.5	4.5	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	29
silver maple	Acer saccharinum	NSH	Low	1.2	14.8	12.7	Sm. dec.	No change	High	Rare	Poor	Fair		Infill +	2	30
Norway spruce	Picea abies	NSH	FIA	1.2	10.7	3.3	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	31
American hornbeam; musclev	Carpinus caroliniana	WSL	Low	6.4	6.6	0.9	Sm. dec.	Sm. inc.	Medium	Rare	Very Poor	Fair		Infill +	1	32
American chestnut	Castanea dentata	NSLX	FIA	0.5	6.5	2.6	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	33
butternut	Juglans cinerea	NSLX	FIA	2.2	4.3	1.7	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	34
white oak	Quercus alba	WDH	Medium	4.3	3.3	0.7	Lg. inc.	Lg. inc.	High	Rare	Good	Good			2	35
red pine	Pinus resinosa	NSH	Medium	3.5	2.9	0.8	No change	No change	Low	Rare	Very Poor	Very Poor			2	36
bur oak	Quercus macrocarpa	NDH	Medium	1.2	2.4	2.1	Very Lg. dec.	Very Lg. dec.	High	Rare	Lost	Lost			0	37
boxelder	Acer negundo	WSH	Low	1.2	2.0	1.7	Sm. dec.	Lg. inc.	High	Rare	Poor	Good			2	38
mountain maple	Acer spicatum	NSL	Low	3.3	1.9	0.2	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			1	39
swamp white oak	Quercus bicolor	NSL	Low	1.2	1.3	1.1	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	40
serviceberry	Amelanchier spp.	NSL	Low	3.3	1.0	0.2	Lg. dec.	No change	Medium	Rare	Very Poor	Poor			0	41
American mountain-ash	Sorbus americana	NSL	Low	1	0.2	0.2	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	42
eastern redcedar	Juniperus virginiana	WDH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	43
Virginia pine	Pinus virginiana	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	44
sweet birch	Betula lenta	NDH	High	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	45
cittamwood/gum bumelia	Sideroxylon lanuginosum ssp.	NSL	Low	0	0	0	Unknown	Unknown	High	Absent	Unknown	Unknown			0	46
pignut hickory	Carya glabra	WDL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	47



One x One Degree  
Climate Change Atlas Tree Species

USDA Forest Service  
Northern Research Station  
Landscape Change Research Group  
Iverson, Peters, Prasad, Matthews

Current and Potential Future Habitat, Capability, and Migration

Common Name	Scientific Name	Range	MR	%Cell	FIAsum	FIAiv	ChngCl45	ChngCl85	Adap	Abund	Capabil45	Capabil85	SHIFT45	SHIFT85	SSO	N
shagbark hickory	<i>Carya ovata</i>	WSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	48
mockernut hickory	<i>Carya alba</i>	WDL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			3	49
black walnut	<i>Juglans nigra</i>	WDH	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	50
sweetgum	<i>Liquidambar styraciflua</i>	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	51
yellow-poplar	<i>Liriodendron tulipifera</i>	WDH	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			3	52
blackgum	<i>Nyssa sylvatica</i>	WDL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	53
sycamore	<i>Platanus occidentalis</i>	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	54
scarlet oak	<i>Quercus coccinea</i>	WDL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	55
pin oak	<i>Quercus palustris</i>	NSH	Low	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	56
chestnut oak	<i>Quercus prinus</i>	NDH	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	57
post oak	<i>Quercus stellata</i>	WDH	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			0	58
black oak	<i>Quercus velutina</i>	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate ++	Migrate ++	3	59
black locust	<i>Robinia pseudoacacia</i>	NDH	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	60
sassafras	<i>Sassafras albidum</i>	WSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	61