

**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	9,412.7	3,634.3	218

**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	21	24	Increase	19	22	Very Good	8	10	Likely	0	1
Hickory	4			Medium	25	42	No Change	10	10	Good	15	15	Infill	7	10
Maple	6	Abundant	4	Low	30	13	Decrease	24	21	Fair	5	4	Migrate	8	12
Oak	9	Common	24	FIA	8		New	15	17	Poor	8	8		<b>15</b>	<b>23</b>
Pine	6	Rare	33				Unknown	16	14	Very Poor	13	11			
Other	33	Absent	22					<b>84</b>	<b>84</b>	FIA Only	3	3			
	<b>61</b>		<b>83</b>		<b>84</b>	<b>79</b>				Unknown	8	6			
											<b>60</b>	<b>57</b>			

**Potential Changes in Climate Variables**

**Temperature (°F)**

	Scenario	2009	2039	2069	2099	
Annual Average	CCSM45	50.2	52.0	54.3	54.6	
	CCSM85	50.2	52.4	55.0	58.1	
	GFDL45	50.2	53.4	56.1	57.3	
	GFDL85	50.2	53.6	57.3	61.6	
	HAD45	50.2	53.0	56.4	58.0	
	HAD85	50.2	53.1	57.4	62.3	
Growing Season (May—Sep)	CCSM45	66.5	68.4	70.4	70.9	
	CCSM85	66.5	68.7	71.4	75.3	
	GFDL45	66.5	70.1	73.6	75.2	
	GFDL85	66.5	70.9	75.0	79.8	
	HAD45	66.5	69.7	72.8	75.0	
	HAD85	66.5	69.4	74.5	80.1	
Coldest Month Average	CCSM45	25.5	27.2	29.0	29.4	
	CCSM85	25.5	27.8	29.1	30.9	
	GFDL45	25.5	28.7	29.7	30.3	
	GFDL85	25.5	28.7	30.0	31.7	
	HAD45	25.5	27.2	29.7	29.9	
	HAD85	25.5	27.9	30.0	32.4	
Warmest Month Average	CCSM45	72.4	74.5	75.7	76.0	
	CCSM85	72.4	74.9	76.7	78.8	
	GFDL45	72.4	75.4	77.7	79.1	
	GFDL85	72.4	77.1	79.5	82.7	
	HAD45	72.4	76.1	78.0	79.5	
	HAD85	72.4	76.3	79.6	83.5	

**Precipitation (in)**

	Scenario	2009	2039	2069	2099	
Annual Total	CCSM45	41.6	44.3	44.1	47.4	
	CCSM85	41.6	44.4	46.0	49.2	
	GFDL45	41.6	46.2	48.4	48.1	
	GFDL85	41.6	42.9	48.4	49.9	
	HAD45	41.6	43.7	44.6	44.0	
	HAD85	41.6	45.9	42.6	45.9	
Growing Season (May—Sep)	CCSM45	19.2	21.1	20.9	22.1	
	CCSM85	19.2	20.8	21.3	22.0	
	GFDL45	19.2	20.0	20.1	20.2	
	GFDL85	19.2	18.3	19.9	19.8	
	HAD45	19.2	20.0	18.4	18.4	
	HAD85	19.2	20.1	17.8	18.4	

**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	83.6	1467.9	14.5	Sm. dec.	Lg. dec.	High	Abundant	Good	Good			1	1
chestnut oak	Quercus prinus	NDH	High	76	1453.9	16.7	Sm. dec.	Sm. dec.	High	Abundant	Good	Good			1	2
northern red oak	Quercus rubra	WDH	Medium	73.9	833.0	9.8	No change	No change	High	Abundant	Very Good	Very Good			1	3
sweet birch	Betula lenta	NDH	High	72.8	684.0	8.3	Lg. dec.	Lg. dec.	Low	Abundant	Poor	Poor			0	4
black cherry	Prunus serotina	WDL	Medium	44.8	436.6	7.6	No change	No change	Low	Common	Poor	Poor			0	5
white oak	Quercus alba	WDH	Medium	52.3	422.8	6.8	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	6
black oak	Quercus velutina	WDH	High	57.2	406.6	5.6	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	7
white ash	Fraxinus americana	WDL	Medium	49.3	371.1	5.9	No change	No change	Low	Common	Poor	Poor			0	8
blackgum	Nyssa sylvatica	WDL	Medium	59.6	303.1	4.6	No change	Sm. inc.	High	Common	Good	Very Good			1	9
eastern hemlock	Tsuga canadensis	NSH	High	39.8	298.0	6.6	Lg. dec.	Lg. dec.	Low	Common	Very Poor	Very Poor			0	10
sugar maple	Acer saccharum	WDH	High	34.8	293.9	8.0	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	11
eastern white pine	Pinus strobus	WDH	High	44.6	262.7	5.3	Lg. dec.	Lg. dec.	Low	Common	Very Poor	Very Poor			0	12
black locust	Robinia pseudoacacia	NDH	Low	27	200.8	6.9	No change	Sm. inc.	Medium	Common	Fair	Good			1	13
pignut hickory	Carya glabra	WDL	Medium	41.7	189.3	4.2	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	14
yellow-poplar	Liriodendron tulipifera	WDH	High	30	171.6	5.7	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	15
Virginia pine	Pinus virginiana	NDH	High	17.2	164.5	6.8	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	16
black walnut	Juglans nigra	WDH	Low	26.2	147.4	5.1	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	17
mockernut hickory	Carya alba	WDL	Medium	33.3	140.1	4.2	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	18
scarlet oak	Quercus coccinea	WDL	Medium	35.9	140.1	3.9	Lg. inc.	Sm. inc.	Medium	Common	Very Good	Good			1	19
sassafras	Sassafras albidum	WSL	Low	30.9	132.5	3.6	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	20
American basswood	Tilia americana	WSL	Medium	23.6	106.8	3.8	No change	No change	Medium	Common	Fair	Fair			1	21
pitch pine	Pinus rigida	NSH	High	16.6	103.5	5.2	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	22
ailanthus	Ailanthus altissima	NSL	FIA	13.4	86.6	10.0	Unknown	Unknown	NA	Common	NNIS	NNIS			0	23
shagbark hickory	Carya ovata	WSL	Medium	21.6	85.7	3.2	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	24
bitternut hickory	Carya cordiformis	WSL	Low	9.7	72.6	5.9	No change	No change	High	Common	Good	Good	Infill ++	Infill ++	1	25
American elm	Ulmus americana	WDH	Medium	17.5	66.3	3.4	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good			1	26
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	18.9	54.3	2.4	No change	Sm. inc.	High	Common	Good	Very Good			1	27
American beech	Fagus grandifolia	WDH	High	19.8	53.3	2.9	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good	Infill ++	Infill ++	1	28
striped maple	Acer pensylvanicum	NSL	Medium	22.9	39.3	2.1	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	29
hackberry	Celtis occidentalis	WDH	Medium	5.2	35.8	6.5	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	30
silver maple	Acer saccharinum	NSH	Low	0.8	35.4	24.1	Sm. dec.	No change	High	Rare	Poor	Fair		Infill +	2	31
serviceberry	Amelanchier spp.	NSL	Low	19.6	35.0	1.4	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	32
pin oak	Quercus palustris	NSH	Low	3.9	25.7	5.8	Sm. dec.	No change	Low	Rare	Very Poor	Very Poor			2	33
quaking aspen	Populus tremuloides	WDH	High	0.1	23.0	2.9	Very Lg. dec.	Very Lg. dec.	Medium	Rare	Lost	Lost			0	34
slippery elm	Ulmus rubra	WSL	Low	7	22.0	3.4	No change	No change	Medium	Rare	Poor	Poor			1	35
Scots pine	Pinus sylvestris	NSH	FIA	3.8	18.7	4.1	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	36
sycamore	Platanus occidentalis	NSL	Low	1.7	17.8	7.6	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good	Infill +	Infill ++	2	37
yellow birch	Betula alleghaniensis	NDL	High	6.3	17.3	1.4	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	38
cucumbertree	Magnolia acuminata	NSL	Low	7.3	16.0	1.7	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	39
eastern redcedar	Juniperus virginiana	WDH	Medium	2.2	15.7	4.8	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	2	40
flowering dogwood	Cornus florida	WDL	Medium	11.3	14.1	0.9	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			1	41
paper birch	Betula papyrifera	WDH	High	1.1	13.0	12.3	Very Lg. dec.	Very Lg. dec.	Medium	Rare	Lost	Lost			0	42
swamp white oak	Quercus bicolor	NSL	Low	3.2	12.7	4.0	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	43
white spruce	Picea glauca	NSL	Medium	1.1	10.9	10.3	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	44
bigtooth aspen	Populus grandidentata	NSL	Medium	4.6	9.7	1.0	Lg. dec.	Very Lg. dec.	Medium	Rare	Very Poor	Lost			0	45
eastern redbud	Cercis canadensis	NSL	Low	5	9.6	1.3	Sm. inc.	Sm. inc.	Medium	Rare	Fair	Fair	Infill +	Infill +	1	46
Table Mountain pine	Pinus pungens	NSL	Low	3.2	7.5	2.4	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor		Infill +	2	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
red mulberry	Morus rubra	NSL	Low	0.7	7.1	4.6	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	48
bear oak; scrub oak	Quercus ilicifolia	NSLX	FIA	2.1	7.0	3.2	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	49
Norway maple	Acer platanoides	NSL	FIA	3.2	5.8	1.8	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	50
chokecherry	Prunus virginiana	NSLX	FIA	0.8	5.7	3.9	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	51
butternut	Juglans cinerea	NSLX	FIA	0.1	5.2	0.5	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	52
American hornbeam; muscle	Carpinus caroliniana	WSL	Low	2.3	4.9	1.0	Sm. dec.	No change	Medium	Rare	Very Poor	Poor		Infill +	2	53
Norway spruce	Picea abies	NSH	FIA	0.1	4.9	0.4	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	54
red pine	Pinus resinosa	NSH	Medium	2.4	3.9	1.0	Very Lg. dec.	Very Lg. dec.	Low	Rare	Lost	Lost			0	55
boxelder	Acer negundo	WSH	Low	1.3	1.8	0.6	Sm. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	56
paulownia	Paulownia tomentosa	NSL	FIA	4.9	1.8	1.4	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	57
green ash	Fraxinus pennsylvanica	WSH	Low	1.1	1.3	1.2	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	58
black ash	Fraxinus nigra	WSH	Medium	0.7	0.9	0.6	Very Lg. dec.	Very Lg. dec.	Low	Rare	Lost	Lost			0	59
northern pin oak	Quercus ellipsoidalis	NSH	Medium	2	0.5	0.9	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			0	60
red spruce	Picea rubens	NDH	High	0.1	0.4	0.0	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	61
shortleaf pine	Pinus echinata	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	62
loblolly pine	Pinus taeda	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate ++	3	63
florida maple	Acer barbatum	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +	3	64
cittamwood/gum bumelia	Sideroxylon lanuginosum ssp.	NSL	Low	0	0	0	Unknown	New Habitat	High	Absent	Unknown	New Habitat			0	65
pecan	Carya illinoensis	NSH	Low	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	66
black hickory	Carya texana	NDL	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	67
sugarberry	Celtis laevigata	NDH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	68
common persimmon	Diospyros virginiana	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	69
blue ash	Fraxinus quadrangulata	NSL	Low	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown			0	70
honeylocust	Gleditsia triacanthos	NSH	Low	0	0	0	Unknown	New Habitat	High	Absent	Unknown	New Habitat		Likely +	3	71
sweetgum	Liquidambar styraciflua	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	72
bigleaf magnolia	Magnolia macrophylla	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	73
mountain or Fraser magnolia	Magnolia fraseri	NSL	Low	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown			0	74
sourwood	Oxydendrum arboreum	NDL	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	75
redbay	Persea borbonia	NSL	Low	0	0	0	Unknown	Unknown	High	Absent	Unknown	Unknown			0	76
pin cherry	Prunus pensylvanica	NSL	Low	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown			0	77
southern red oak	Quercus falcata	WDL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	78
blackjack oak	Quercus marilandica	NSL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate ++	3	79
chinkapin oak	Quercus muehlenbergii	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	80
willow oak	Quercus phellos	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	81
post oak	Quercus stellata	WDH	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate ++	Migrate ++	3	82
bluejack oak	Quercus incana	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	83
winged elm	Ulmus alata	WDL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	84