

**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    9,941.4    3,838.4      275

**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	Scenario	Scenario	Scenario	SHIFT	SHIFT	
				High	23	RCP45	RCP85	RCP45	RCP85	RCP45	RCP85	
Ash	3			Medium	26	Increase	29	35	Very Good	13	14	
Hickory	7			Low	26	No Change	12	6	Good	17	23	
Maple	4	Abundant	5	FIA	6	Decrease	12	12	Fair	13	7	
Oak	10	Common	26			New	10	10	Poor	2	2	
Pine	2	Rare	28			Unknown	11	11	Very Poor	8	6	
Other	33	Absent	13				<b>74</b>	<b>74</b>	FIA Only	3	3	
	<b>59</b>		<b>72</b>						Unknown	5	5	
										<b>61</b>	<b>60</b>	
										Likely	2	2
										Infill	8	9
										Migrate	<u>1</u>	<u>3</u>
											<b>11</b>	<b>14</b>

**Potential Changes in Climate Variables**

**Temperature (°F)**

Scenario	2009	2039	2069	2099	
Annual	56.9	58.8	60.7	61.1	
Average	56.9	59.3	61.6	64.7	
GFDL45	56.9	60.0	62.0	63.0	
GFDL85	56.9	59.8	62.7	66.6	
HAD45	56.9	59.4	62.3	63.8	
HAD85	56.9	59.6	64.3	67.9	
Growing Season	72.4	74.4	76.0	76.7	
May—Sep	72.4	75.1	77.4	81.3	
GFDL45	72.4	76.1	78.5	80.4	
GFDL85	72.4	76.2	79.5	84.4	
HAD45	72.4	75.2	77.9	79.4	
HAD85	72.4	75.6	81.4	84.7	
Coldest Month	32.9	35.3	36.5	36.9	
Average	32.9	36.0	37.0	38.7	
GFDL45	32.9	37.1	37.4	37.4	
GFDL85	32.9	34.8	36.2	36.9	
HAD45	32.9	33.9	36.4	36.5	
HAD85	32.9	35.6	37.7	39.4	
Warmest Month	78.4	80.7	81.6	82.0	
Average	78.4	81.5	82.5	84.3	
GFDL45	78.4	83.3	84.6	85.9	
GFDL85	78.4	83.1	84.7	88.3	
HAD45	78.4	81.7	83.4	84.1	
HAD85	78.4	82.8	86.1	87.5	

**Precipitation (in)**

Scenario	2009	2039	2069	2099	
Annual	45.9	44.5	47.5	46.3	
Total	45.9	45.6	47.5	47.5	
GFDL45	45.9	49.4	52.1	50.0	
GFDL85	45.9	49.9	56.2	55.3	
HAD45	45.9	45.5	48.8	49.5	
HAD85	45.9	49.4	44.2	46.8	
Growing Season	20.9	19.2	19.9	19.6	
May—Sep	20.9	20.2	18.8	19.3	
GFDL45	20.9	22.7	22.2	22.6	
GFDL85	20.9	22.7	25.4	24.0	
HAD45	20.9	20.3	20.6	20.6	
HAD85	20.9	21.7	17.1	17.6	

**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>.

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
black oak	Quercus velutina	WDH	High	85.2	1391.2	13.5	No change	Sm. dec.	Medium	Abundant	Good	Fair			1	1
eastern redcedar	Juniperus virginiana	WDH	Medium	73.1	1378.9	14.6	No change	No change	Medium	Abundant	Good	Good			1	2
white oak	Quercus alba	WDH	Medium	76.2	1119.0	11.5	No change	No change	High	Abundant	Very Good	Very Good			1	3
post oak	Quercus stellata	WDH	High	82.5	996.3	10.0	Sm. inc.	Sm. inc.	High	Abundant	Very Good	Very Good			1	4
northern red oak	Quercus rubra	WDH	Medium	72.1	818.1	8.6	Sm. dec.	Sm. dec.	High	Abundant	Good	Good			1	5
black hickory	Carya texana	NDL	High	68.3	469.7	4.8	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	6
shortleaf pine	Pinus echinata	WDH	High	21	313.3	10.8	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	7
mockernut hickory	Carya alba	WDL	Medium	58	293.0	3.8	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	8
black walnut	Juglans nigra	WDH	Low	42.3	229.0	4.2	No change	Sm. inc.	Medium	Common	Fair	Good			1	9
chinkapin oak	Quercus muehlenbergii	NSL	Medium	49.3	224.1	3.8	No change	No change	Medium	Common	Fair	Fair			1	10
winged elm	Ulmus alata	WDL	Medium	66.1	213.0	2.7	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	11
bitternut hickory	Carya cordiformis	WSL	Low	27.7	195.6	5.5	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	12
white ash	Fraxinus americana	WDL	Medium	49.9	168.7	2.8	Sm. inc.	Sm. inc.	Low	Common	Fair	Fair			1	13
hackberry	Celtis occidentalis	WDH	Medium	33.9	168.3	4.3	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	14
American elm	Ulmus americana	WDH	Medium	47.1	163.9	3.0	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	15
blackgum	Nyssa sylvatica	WDL	Medium	33.8	142.8	2.5	Sm. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	16
flowering dogwood	Cornus florida	WDL	Medium	60.3	139.8	1.9	No change	No change	Medium	Common	Fair	Fair			1	17
slippery elm	Ulmus rubra	WSL	Low	41.6	126.7	2.4	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	18
sassafras	Sassafras albidum	WSL	Low	42.5	126.5	2.6	No change	Sm. inc.	Medium	Common	Fair	Good			1	19
sycamore	Platanus occidentalis	NSL	Low	16.7	121.0	6.0	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	20
blackjack oak	Quercus marilandica	NSL	Medium	30.8	120.8	3.2	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	21
sugar maple	Acer saccharum	WDH	High	29.5	108.6	3.4	Lg. dec.	Sm. dec.	High	Common	Fair	Fair			1	22
shagbark hickory	Carya ovata	WSL	Medium	33.2	103.3	2.9	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	23
southern red oak	Quercus falcata	WDL	Medium	11.4	97.1	4.4	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	24
florida maple	Acer barbatum	NSL	Low	17.2	87.6	2.9	Sm. dec.	Sm. dec.	High	Common	Fair	Fair			1	25
Shumard oak	Quercus shumardii	NSL	Low	17.3	70.2	3.1	No change	Sm. inc.	High	Common	Good	Very Good			1	26
red maple	Acer rubrum	WDH	High	19.4	66.4	2.1	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	27
black cherry	Prunus serotina	WDL	Medium	33.7	66.1	1.7	Lg. inc.	Lg. inc.	Low	Common	Good	Good			1	28
black locust	Robinia pseudoacacia	NDH	Low	9.1	64.6	4.2	No change	No change	Medium	Common	Fair	Fair			1	29
common persimmon	Diospyros virginiana	NSL	Low	21.1	54.5	2.1	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	30
pecan	Carya illinoensis	NSH	Low	1	50.3	50.0	Sm. inc.	Lg. inc.	Low	Common	Fair	Good	Infill +	Infill ++	2	31
honeylocust	Gleditsia triacanthos	NSH	Low	10.9	43.1	2.7	Sm. inc.	Lg. inc.	High	Rare	Good	Good			1	32
blue ash	Fraxinus quadrangulata	NSL	Low	10.5	39.5	4.5	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	33
eastern redbud	Cercis canadensis	NSL	Low	26.4	38.8	1.1	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			1	34
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	27.5	29.0	0.8	Lg. inc.	Lg. inc.	High	Rare	Good	Good			1	35
boxelder	Acer negundo	WSH	Low	4.2	27.4	4.4	No change	Sm. inc.	High	Rare	Fair	Good	Infill +	Infill ++	1	36
green ash	Fraxinus pennsylvanica	WSH	Low	10.7	27.1	3.4	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	1	37
red mulberry	Morus rubra	NSL	Low	22.3	25.7	1.0	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good			1	38
serviceberry	Amelanchier spp.	NSL	Low	21.4	17.5	0.7	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	39
sweetgum	Liquidambar styraciflua	WDH	High	1.5	16.1	3.0	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	2	40
Osage-orange	Maclura pomifera	NDH	Medium	4	13.1	3.6	No change	Lg. inc.	High	Rare	Fair	Good	Infill +	Infill ++	1	41
American basswood	Tilia americana	WSL	Medium	10.4	12.7	0.9	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	42
wild plum	Prunus americana	NSLX	FIA	3.6	9.8	2.3	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	43
pignut hickory	Carya glabra	WDL	Medium	4.6	8.3	0.9	No change	Lg. inc.	Medium	Rare	Poor	Good	Infill +	Infill ++	2	44
ashe juniper	Juniperus ashei	NDH	High	1	7.1	7.1	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			0	45
cittamwood/gum bumelia	Sideroxylon lanuginosum ssp.	NSL	Low	9.7	6.5	0.5	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	1	46
northern catalpa	Catalpa speciosa	NSHX	FIA	1	6.0	6.0	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	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
ailanthus	Ailanthus altissima	NSL	FIA	2.7	5.6	1.7	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	48
paulownia	Paulownia tomentosa	NSL	FIA	1	5.3	5.3	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	49
loblolly pine	Pinus taeda	WDH	High	1	5.1	5.1	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	50
pawpaw	Asimina triloba	NSL	Low	2.9	5.0	0.8	Lg. dec.	Very Lg. dec.	Medium	Rare	Very Poor	Lost			0	51
butternut	Juglans cinerea	NSLX	FIA	2	4.4	2.2	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	52
Ohio buckeye	Aesculus glabra	NSL	Low	3.2	3.9	0.9	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	53
sugarberry	Celtis laevigata	NDH	Medium	5.4	3.2	0.5	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	2	54
white mulberry	Morus alba	NSL	FIA	1	2.2	2.2	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	55
scarlet oak	Quercus coccinea	WDL	Medium	1	1.8	1.8	Sm. dec.	No change	Medium	Rare	Very Poor	Poor		Infill +	2	56
shellbark hickory	Carya laciniosa	NSL	Low	0.3	1.6	0.5	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	57
swamp chestnut oak	Quercus michauxii	NSL	Low	0.1	1.4	0.1	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	58
American hornbeam; muscley	Carpinus caroliniana	WSL	Low	0.1	0.4	0.1	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good			2	59
longleaf pine	Pinus palustris	NSH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	60
Virginia pine	Pinus virginiana	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	61
striped maple	Acer pensylvanicum	NSL	Medium	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	62
silver maple	Acer saccharinum	NSH	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			3	63
yellow birch	Betula alleghaniensis	NDL	High	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	64
American beech	Fagus grandifolia	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Likely +	Likely +	3	65
black ash	Fraxinus nigra	WSH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	66
American holly	Ilex opaca	NSL	Medium	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown			0	67
bigleaf magnolia	Magnolia macrophylla	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	68
sourwood	Oxydendrum arboreum	NDL	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			3	69
bur oak	Quercus macrocarpa	NDH	Medium	0	0	0	Unknown	Unknown	High	Modeled	Unknown	Unknown			0	70
water oak	Quercus nigra	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	71
chestnut oak	Quercus prinus	NDH	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			3	72
live oak	Quercus virginiana	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate ++	3	73
cedar elm	Ulmus crassifolia	NDH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat	Likely +	Likely +	3	74