

**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	9,683.1	3,738.7	79

**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	
		Abundant	Common	High	Low	Scenario	Scenario	Scenario	Scenario	SHIFT	SHIFT
				Reliability	Adaptability	RCP45	RCP85	RCP45	RCP85	RCP45	RCP85
Ash	2										
Hickory	7										
Maple	5	0		14	24	Increase	19	19	Very Good	4	3
Oak	11	24		25	43	No Change	11	15	Good	15	18
Pine	2			35	7	Decrease	22	18	Fair	11	10
Other	28	31		3		New	14	14	Poor	13	15
		21				Unknown	11	11	Very Poor	9	6
	<b>55</b>	<b>76</b>		<b>77</b>	<b>74</b>		<b>77</b>	<b>77</b>	FIA Only	0	0
									Unknown	8	8
										<b>28</b>	<b>34</b>
										<b>60</b>	<b>60</b>

**Potential Changes in Climate Variables**

Temperature (°F)						
Scenario	2009	2039	2069	2099		
Annual	CCSM45	55.4	57.3	59.2	59.5	
Average	CCSM85	55.4	57.7	60.1	63.1	
	GFDL45	55.4	60.7	60.7	61.5	
	GFDL85	55.4	58.3	61.5	65.4	
	HAD45	55.4	58.2	61.4	63.1	
	HAD85	55.4	58.5	63.2	67.3	
Growing	CCSM45	72.4	74.4	75.8	76.6	
Season	CCSM85	72.4	74.9	77.3	80.9	
May—Sep	GFDL45	72.4	78.8	78.5	79.9	
	GFDL85	72.4	75.9	79.7	84.5	
	HAD45	72.4	75.6	78.6	80.6	
	HAD85	72.4	76.0	82.0	85.9	
Coldest	CCSM45	28.6	30.4	31.9	32.2	
Month	CCSM85	28.6	31.5	32.5	34.1	
Average	GFDL45	28.6	33.4	33.6	34.2	
	GFDL85	28.6	31.7	32.9	33.7	
	HAD45	28.6	30.2	32.8	32.9	
	HAD85	28.6	31.5	33.9	35.8	
Warmest	CCSM45	78.2	80.3	81.3	81.9	
Month	CCSM85	78.2	81.2	82.8	84.6	
Average	GFDL45	78.2	81.6	83.0	83.9	
	GFDL85	78.2	82.0	83.9	86.9	
	HAD45	78.2	81.9	84.1	85.0	
	HAD85	78.2	83.6	87.3	89.4	

Precipitation (in)						
Scenario	2009	2039	2069	2099		
Annual	CCSM45	42.2	40.7	45.7	44.5	
Total	CCSM85	42.2	44.1	45.0	46.5	
	GFDL45	42.2	48.4	50.9	52.0	
	GFDL85	42.2	47.8	54.0	55.7	
	HAD45	42.2	42.9	45.6	45.2	
	HAD85	42.2	44.5	42.8	46.0	
Growing	CCSM45	19.1	18.0	19.8	18.6	
Season	CCSM85	19.1	19.0	18.5	18.8	
May—Sep	GFDL45	19.1	21.7	21.8	22.5	
	GFDL85	19.1	21.6	22.8	23.3	
	HAD45	19.1	18.5	17.8	17.5	
	HAD85	19.1	18.6	15.7	15.7	

**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-DPC30 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
hackberry	Celtis occidentalis	WDH	Medium	75	306.1	9.6	Sm. dec.	Sm. dec.	High	Common	Fair	Fair			1	1
boxelder	Acer negundo	WDH	Low	59.5	212.1	7.7	Lg. dec.	Lg. dec.	High	Common	Fair	Fair			1	2
American elm	Ulmus americana	WDH	Medium	71.6	208.9	6.3	No change	No change	Medium	Common	Fair	Fair			1	3
green ash	Fraxinus pennsylvanica	WSH	Low	61.3	130.3	8.4	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	4
silver maple	Acer saccharinum	NSH	Low	36.2	129.9	10.2	Sm. inc.	No change	High	Common	Very Good	Good			1	5
post oak	Quercus stellata	WDH	High	33.9	128.8	12.3	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good	Infill ++	Infill ++	1	6
black walnut	Juglans nigra	WDH	Low	48.6	121.5	5.7	No change	No change	Medium	Common	Fair	Fair			1	7
shingle oak	Quercus imbricaria	NDH	Medium	32.5	115.0	5.8	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor	Infill +	Infill +	0	8
white oak	Quercus alba	WDH	Medium	32.2	114.1	8.2	No change	No change	High	Common	Good	Good	Infill ++	Infill ++	1	9
bitternut hickory	Carya cordiformis	WSL	Low	25.1	111.9	5.3	Sm. dec.	Sm. dec.	High	Common	Fair	Fair	Infill +	Infill +	1	10
black willow	Salix nigra	NSH	Low	14.9	107.2	19.8	Lg. dec.	No change	Low	Common	Very Poor	Poor		Infill +	0	11
Osage-orange	Maclura pomifera	NDH	Medium	15.6	106.3	12.0	Lg. dec.	No change	High	Common	Fair	Good	Infill +	Infill ++	1	12
black oak	Quercus velutina	WDH	High	42.2	95.9	5.3	No change	No change	Medium	Common	Fair	Fair	Infill +	Infill +	1	13
black locust	Robinia pseudoacacia	NDH	Low	0.5	92.7	11.5	Lg. dec.	Sm. dec.	Medium	Common	Poor	Poor		Infill +	2	14
black cherry	Prunus serotina	WDL	Medium	62.2	91.7	3.8	Sm. dec.	Sm. dec.	Low	Common	Poor	Poor			0	15
sassafras	Sassafras albidum	WSL	Low	40	84.2	4.8	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	16
pignut hickory	Carya glabra	WDL	Medium	34.6	82.8	6.1	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	17
shagbark hickory	Carya ovata	WSL	Medium	58.3	81.6	3.7	No change	No change	Medium	Common	Fair	Fair			1	18
sycamore	Platanus occidentalis	NSL	Low	32.1	77.4	5.1	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	19
mockernut hickory	Carya alba	WDL	Medium	38.7	77.0	5.1	Sm. dec.	No change	High	Common	Fair	Good	Infill +	Infill ++	1	20
eastern cottonwood	Populus deltoides	NSH	Low	9.6	70.2	11.9	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor	Infill +	Infill +	2	21
sugar maple	Acer saccharum	WDH	High	13.9	58.8	2.9	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good	Infill ++	Infill ++	2	22
white ash	Fraxinus americana	WDL	Medium	22.4	53.1	3.5	Lg. inc.	Lg. inc.	Low	Common	Good	Good	Infill ++	Infill ++	1	23
honeylocust	Gleditsia triacanthos	NSH	Low	18.5	51.5	4.5	Sm. inc.	Lg. inc.	High	Common	Very Good	Very Good	Infill ++	Infill ++	1	24
pin oak	Quercus palustris	NSH	Low	40.1	48.0	6.6	No change	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	25
eastern redbud	Cercis canadensis	NSL	Low	18.2	35.0	1.9	Sm. dec.	No change	Medium	Rare	Very Poor	Poor		Infill +	1	26
bur oak	Quercus macrocarpa	NDH	Medium	15.5	31.4	3.2	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			0	27
slippery elm	Ulmus rubra	WSL	Low	44.5	31.1	2.3	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			1	28
common persimmon	Diospyros virginiana	NSL	Low	37.6	27.6	4.3	Lg. inc.	Lg. inc.	High	Rare	Good	Good			1	29
eastern hopcedar	Juniperus virginiana	WDH	Medium	13.2	24.3	1.5	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	2	30
red mulberry	Morus rubra	NSL	Low	26	20.2	0.9	Sm. dec.	No change	Medium	Rare	Very Poor	Poor		Infill +	1	31
northern red oak	Quercus rubra	WDH	Medium	23.8	17.2	3.3	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor	Infill +	Infill +	1	32
sweetgum	Liquidambar styraciflua	WDH	High	5.5	12.8	10.8	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	2	33
red maple	Acer rubrum	WDH	High	14.7	8.0	4.3	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	34
shortleaf pine	Pinus echinata	WDH	High	1	7.8	2.8	No change	No change	Medium	Rare	Poor	Poor		Infill +	2	35
swamp white oak	Quercus bicolor	NSL	Low	10.9	6.7	3.1	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	36
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	2.3	4.1	1.3	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	37
Ohio buckeye	Aesculus glabra	NSL	Low	0.8	3.9	3.1	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	38
white mulberry	Morus alba	NSL	FIA	8.4	3.7	1.3	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	39
chinkapin oak	Quercus muehlenbergii	NSL	Medium	8.5	3.4	0.9	No change	No change	Medium	Rare	Poor	Poor			0	40
river birch	Betula nigra	NSL	Low	2.4	3.1	0.4	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	41
winged elm	Ulmus alata	WDL	Medium	1.2	2.8	1.1	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	2	42
pecan	Carya illinoensis	NSH	Low	9.6	2.7	1.8	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair	Infill +	Infill +	2	43
black hickory	Carya texana	NDL	High	1.3	2.6	1.2	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	44
Scots pine	Pinus sylvestris	NSH	FIA	4.1	2.5	9.9	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	45
shellbark hickory	Carya laciniosa	NSL	Low	8.6	2.3	2.7	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	46
flowering dogwood	Cornus florida	WDL	Medium	11.2	2.2	0.6	No change	Sm. inc.	Medium	Rare	Poor	Fair	Infill +	Infill +	1	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
blackjack oak	Quercus marilandica	NSL	Medium	8.3	1.3	2.4	Lg. inc.	Lg. inc.	High	Rare	Good	Good			2	48
American basswood	Tilia americana	WSL	Medium	4.1	0.7	2.8	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	49
ailanthus	Ailanthus altissima	NSL	FIA	4.1	0.6	2.4	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	50
cherrybark oak; swamp red o	Quercus pagoda	NSL	Medium	1.3	0.6	0.2	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	51
pawpaw	Asimina triloba	NSL	Low	0.6	0.5	0.1	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	52
blackgum	Nyssa sylvatica	WDL	Medium	0.3	0.3	0.1	Lg. inc.	Lg. inc.	High	Rare	Good	Good			2	53
black maple	Acer nigrum	NSH	Low	0.3	0.1	0.0	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			0	54
American hornbeam; muscle	Carpinus caroliniana	WDL	Low	0.4	0.1	0.0	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	55
ashe juniper	Juniperus ashei	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	56
loblolly pine	Pinus taeda	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Likely +	Likely +	3	57
striped maple	Acer pensylvanicum	NSL	Medium	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	58
mountain maple	Acer spicatum	NSL	Low	0	0	0	Unknown	Unknown	High	Absent	Unknown	Unknown			0	59
serviceberry	Amelanchier spp.	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	60
yellow birch	Betula alleghaniensis	NDL	High	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	61
cittamwood/gum bumelia	Sideroxylon lanuginosum ssp.	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +	3	62
sugarberry	Celtis laevigata	NDH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate ++	Migrate ++	3	63
American beech	Fagus grandifolia	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	64
yellow-poplar	Liriodendron tulipifera	WDH	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Likely +	Likely +	3	65
cucumbertree	Magnolia acuminata	NSL	Low	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown			0	66
bigleaf magnolia	Magnolia macrophylla	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	67
redbay	Persea borbonia	NSL	Low	0	0	0	Unknown	Unknown	High	Absent	Unknown	Unknown			0	68
pin cherry	Prunus pensylvanica	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	69
southern red oak	Quercus falcata	WDL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Likely +	Likely +	3	70
overcup oak	Quercus lyrata	NSL	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	71
swamp chestnut oak	Quercus michauxii	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	72
water oak	Quercus nigra	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	73
willow oak	Quercus phellos	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	74
Shumard oak	Quercus shumardii	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Likely +	Likely +	3	75
live oak	Quercus virginiana	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	76
cedar elm	Ulmus crassifolia	NDH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	77