

**U.S. Census Bureau Urban Areas  
Climate Change Atlas Tree Species  
Current and Potential Future Habitat, Capability, and Migration**

	sq. km	sq. mi	FIA Plots
Area of Region	8,753.6	3,379.8	111

**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	Rare	Absent	Reliability	Adaptability	Scenario	Scenario	Scenario	Scenario	Scenario	Scenario	SHIFT	SHIFT		
																RCP45	RCP85
Ash	2					High	21	20	Increase	26	24	Very Good	4	4	Likely	4	4
Hickory	4					Medium	35	49	No Change	8	11	Good	21	20	Infill	26	26
Maple	5					Low	26	17	Decrease	17	16	Fair	7	9	Migrate	11	10
Oak	8					FIA	9		New	26	26	Poor	6	5			
Pine	5								Unknown	14	14	Very Poor	12	11			
Other	36											FIA Only	4	4			
	<b>60</b>						<b>91</b>	<b>86</b>				Unknown	5	5			
										<b>91</b>	<b>91</b>		<b>59</b>	<b>58</b>			

**Potential Changes in Climate Variables**

**Temperature (°F)**

	Scenario	2009	2039	2069	2099	
Annual Average	CCSM45	52.3	54.1	56.3	56.6	
	CCSM85	52.3	54.5	57.0	60.1	
	GFDL45	52.3	57.6	57.9	59.1	
	GFDL85	52.3	55.6	59.1	63.2	
	HAD45	52.3	55.0	58.3	59.8	
	HAD85	52.3	55.1	59.2	63.9	
Growing Season (May—Sep)	CCSM45	68.6	70.5	72.3	72.8	
	CCSM85	68.6	70.7	73.2	77.0	
	GFDL45	68.6	74.7	75.1	76.5	
	GFDL85	68.6	72.6	76.6	80.9	
	HAD45	68.6	71.6	74.6	76.6	
	HAD85	68.6	71.2	75.9	81.1	
Coldest Month Average	CCSM45	27.9	29.9	31.5	31.9	
	CCSM85	27.9	30.3	31.6	33.4	
	GFDL45	27.9	31.2	32.1	32.8	
	GFDL85	27.9	31.1	32.4	34.1	
	HAD45	27.9	29.5	31.9	32.1	
	HAD85	27.9	30.3	32.1	34.4	
Warmest Month Average	CCSM45	74.6	76.8	77.8	78.0	
	CCSM85	74.6	77.1	78.8	80.6	
	GFDL45	74.6	77.5	79.5	80.7	
	GFDL85	74.6	78.8	81.1	84.0	
	HAD45	74.6	78.1	79.7	80.9	
	HAD85	74.6	77.9	80.7	84.2	

**Precipitation (in)**

	Scenario	2009	2039	2069	2099	
Annual Total	CCSM45	46.7	49.4	51.3	54.7	
	CCSM85	46.7	49.9	52.6	56.8	
	GFDL45	46.7	52.2	55.8	55.6	
	GFDL85	46.7	49.6	55.4	57.6	
	HAD45	46.7	49.6	50.5	50.4	
	HAD85	46.7	52.2	49.1	52.2	
Growing Season (May—Sep)	CCSM45	21.4	24.8	25.5	27.4	
	CCSM85	21.4	23.9	25.6	26.7	
	GFDL45	21.4	22.8	24.0	25.1	
	GFDL85	21.4	21.6	23.7	24.6	
	HAD45	21.4	22.9	21.2	20.7	
	HAD85	21.4	22.9	20.4	20.6	

**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>.

U.S. Census Bureau Urban Areas  
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
white ash	Fraxinus americana	WDL	Medium	75	411.8	13.8	Sm. dec.	Sm. dec.	Low	Common	Poor	Poor	Infill +	Infill +	2	1
yellow-poplar	Liriodendron tulipifera	WDH	High	72.7	398.6	16.1	Sm. dec.	Lg. dec.	High	Common	Fair	Fair	Infill +	Infill +	2	2
red maple	Acer rubrum	WDH	High	78.4	348.4	10.8	No change	No change	High	Common	Good	Good	Infill ++	Infill ++	2	3
black walnut	Juglans nigra	WDH	Low	61.3	270.5	13.2	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor	Infill +	Infill +	2	4
black cherry	Prunus serotina	WDL	Medium	71.4	232.8	8.5	No change	No change	Low	Common	Poor	Poor	Infill +	Infill +	2	5
northern red oak	Quercus rubra	WDH	Medium	55.6	218.5	9.1	No change	No change	High	Common	Good	Good	Infill ++	Infill ++	2	6
black oak	Quercus velutina	WDH	High	42.3	177.7	8.5	Sm. inc.	Sm. inc.	Medium	Common	Good	Good	Infill ++	Infill ++	2	7
chestnut oak	Quercus prinus	NDH	High	50.3	164.9	8.3	Sm. inc.	No change	High	Common	Very Good	Good	Infill ++	Infill ++	2	8
green ash	Fraxinus pennsylvanica	WSH	Low	18.3	144.1	16.1	Sm. dec.	No change	Medium	Common	Poor	Fair	Infill +	Infill +	2	9
Norway maple	Acer platanoides	NSL	FIA	28.6	115.6	12.3	Unknown	Unknown	NA	Common	NNIS	NNIS			0	10
mockernut hickory	Carya alba	WDL	Medium	28.6	113.9	7.4	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good	Infill ++	Infill ++	2	11
boxelder	Acer negundo	WSH	Low	43	93.9	7.9	No change	No change	High	Common	Good	Good	Infill ++	Infill ++	2	12
sweet birch	Betula lenta	NDH	High	40.7	87.4	6.7	Lg. dec.	Lg. dec.	Low	Common	Very Poor	Very Poor			2	13
black locust	Robinia pseudoacacia	NDH	Low	25.1	73.0	10.2	Sm. inc.	Sm. inc.	Medium	Common	Good	Good	Infill ++	Infill ++	2	14
eastern white pine	Pinus strobus	WDH	High	12.6	66.3	10.7	Lg. dec.	Lg. dec.	Low	Common	Very Poor	Very Poor			2	15
shagbark hickory	Carya ovata	WSL	Medium	26.3	65.7	5.0	Sm. inc.	No change	Medium	Common	Good	Fair		Infill +	2	16
blackgum	Nyssa sylvatica	WDL	Medium	40.7	62.7	3.9	Sm. inc.	Lg. inc.	High	Common	Very Good	Very Good	Infill ++	Infill ++	2	17
black willow	Salix nigra	NSH	Low	4.6	62.7	11.9	Sm. dec.	No change	Low	Common	Poor	Poor		Infill +	2	18
American elm	Ulmus americana	WDH	Medium	29.7	60.1	4.5	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good			2	19
sassafras	Sassafras albidum	WSL	Low	65.8	58.2	3.5	Sm. inc.	Sm. inc.	Medium	Common	Good	Good	Infill ++	Infill ++	2	20
sugar maple	Acer saccharum	WDH	High	14.9	52.7	6.9	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			2	21
eastern redcedar	Juniperus virginiana	WDH	Medium	9.1	47.5	9.0	Sm. inc.	Sm. inc.	Medium	Rare	Fair	Fair	Infill +	Infill +	2	22
swamp white oak	Quercus bicolor	NSL	Low	2.3	44.9	17.0	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			2	23
pignut hickory	Carya glabra	WDL	Medium	22.8	42.7	3.4	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	24
ailanthus	Ailanthus altissima	NSL	FIA	19.4	40.0	5.5	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	25
white oak	Quercus alba	WDH	Medium	20.6	35.7	3.7	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	26
scarlet oak	Quercus coccinea	WDL	Medium	17.1	31.5	3.0	Lg. inc.	Sm. inc.	Medium	Rare	Good	Fair		Infill +	2	27
American beech	Fagus grandifolia	WDH	High	39.6	29.0	2.3	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	2	28
paulownia	Paulownia tomentosa	NSL	FIA	4.5	18.8	55.4	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	29
silver maple	Acer saccharinum	NSH	Low	6.9	18.0	5.8	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	30
bitternut hickory	Carya cordiformis	WSL	Low	19.4	13.3	6.0	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	31
hackberry	Celtis occidentalis	WDH	Medium	10.2	13.2	6.5	Sm. inc.	Lg. inc.	High	Rare	Good	Good			2	32
red mulberry	Morus rubra	NSL	Low	9	9.9	14.7	Lg. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	33
bigtooth aspen	Populus grandidentata	NSL	Medium	6.9	9.8	3.6	Very Lg. dec.	Very Lg. dec.	Medium	Rare	Lost	Lost			0	34
pin oak	Quercus palustris	NSH	Low	19.4	9.0	5.2	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair	Infill +	Infill +	2	35
flowering dogwood	Cornus florida	WDL	Medium	18.3	8.9	1.3	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	2	36
white spruce	Picea glauca	NSL	Medium	1.1	8.1	6.2	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	37
American hornbeam; musclev	Carpinus caroliniana	WSL	Low	6.9	6.5	1.9	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good	Infill +		2	38
slippery elm	Ulmus rubra	WSL	Low	5.7	6.4	4.4	No change	Sm. inc.	Medium	Rare	Poor	Fair	Infill +	Infill +	2	39
eastern hemlock	Tsuga canadensis	NSH	High	6.9	5.9	1.6	No change	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	40
Norway spruce	Picea abies	NSH	FIA	1.1	5.4	4.1	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	41
Osage-orange	Maclura pomifera	NDH	Medium	9.1	5.3	8.0	No change	No change	High	Rare	Fair	Fair	Infill +		2	42
American basswood	Tilia americana	WSL	Medium	11.4	4.9	1.3	Sm. inc.	No change	Medium	Rare	Fair	Poor	Infill +		2	43
white mulberry	Morus alba	NSL	FIA	1.1	4.2	3.2	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	44
Kentucky coffeetree	Gymnocladus dioicus	NSLX	FIA	1.1	2.8	2.1	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	45
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	10.3	2.2	0.7	Lg. inc.	Lg. inc.	High	Rare	Good	Good			2	46
sycamore	Platanus occidentalis	NSL	Low	14.9	2.0	0.9	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	47



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
sweetgum	Liquidambar styraciflua	WDH	High	4.2	2.0	5.4	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	2	48
pitch pine	Pinus rigida	NSH	High	1.1	1.8	1.4	Sm. dec.	Very Lg. dec.	Medium	Rare	Very Poor	Lost			0	49
Virginia pine	Pinus virginiana	NDH	High	1.1	1.7	1.3	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	50
chokecherry	Prunus virginiana	NSLX	FIA	1.1	1.7	1.3	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	51
serviceberry	Amelanchier spp.	NSL	Low	10.3	1.4	0.5	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	52
rock elm	Ulmus thomasii	NSLX	FIA	4.6	1.3	4.0	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	53
tamarack (native)	Larix laricina	NSH	High	4.6	0.9	2.8	Lg. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	54
butternut	Juglans cinerea	NSLX	FIA	4.6	0.8	2.4	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	55
loblolly pine	Pinus taeda	WDH	High	4.2	0.7	1.8	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	56
yellow birch	Betula alleghaniensis	NDL	High	4.6	0.5	1.5	Lg. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	57
swamp chestnut oak	Quercus michauxii	NSL	Low	4.2	0.3	0.8	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	58
red pine	Pinus resinosa	NSH	Medium	4.6	0.2	0.4	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	59
quaking aspen	Populus tremuloides	WDH	High	4.6	0.1	0.3	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	60
shortleaf pine	Pinus echinata	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate ++	Migrate ++	3	61
longleaf pine	Pinus palustris	NSH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	62
bald cypress	Taxodium distichum	NSH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	63
florida maple	Acer barbatum	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			3	64
striped maple	Acer pensylvanicum	NSL	Medium	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	65
yellow buckeye	Aesculus flava	NSL	Low	0	0	0	Unknown	Unknown	Low	Modeled	Unknown	Unknown			0	66
water hickory	Carya aquatica	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	67
pecan	Carya illinoensis	NSH	Low	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	68
shellbark hickory	Carya laciniosa	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	69
black hickory	Carya texana	NDL	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	70
sugarberry	Celtis laevigata	NDH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	71
eastern redbud	Cercis canadensis	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	72
common persimmon	Diospyros virginiana	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Likely +	Likely +	3	73
black ash	Fraxinus nigra	WSH	Medium	0	0	0	Unknown	Unknown	Low	Modeled	Unknown	Unknown			0	74
silverbell	Halesia spp.	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	75
American holly	Ilex opaca	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Likely +	Likely +	3	76
sweetbay	Magnolia virginiana	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +		3	77
water tupelo	Nyssa aquatica	NSH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	78
swamp tupelo	Nyssa biflora	NDH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	79
sourwood	Oxydendrum arboreum	NDL	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +		3	80
southern red oak	Quercus falcata	WDL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Likely +	Likely +	3	81
cherrybark oak; swamp red o.	Quercus pagoda	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	82
laurel oak	Quercus laurifolia	NDH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Likely +	Likely +	3	83
overcup oak	Quercus lyrata	NSL	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	84
blackjack oak	Quercus marilandica	NSL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +	3	85
chinkapin oak	Quercus muehlenbergii	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	86
water oak	Quercus nigra	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	87
willow oak	Quercus phellos	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate ++	Migrate ++	3	88
post oak	Quercus stellata	WDH	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate ++	Migrate ++	3	89
bluejack oak	Quercus incana	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	90
winged elm	Ulmus alata	WDL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	91