

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

Area of Region    sq. km    sq. mi    FIA Plots  
 8,598.9    3,320.1    148

**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	17	21	Increase	15	16	Very Good	4	4	Likely	2	2
Hickory	3			Medium	29	43	No Change	9	7	Good	12	12	Infill	10	11
Maple	6	Abundant	4	Low	28	13	Decrease	18	19	Fair	8	6	Migrate	10	14
Oak	7	Common	20	FIA	6		New	26	28	Poor	9	10			
Pine	3	Rare	24				Unknown	12	10	Very Poor	7	7			
Other	26	Absent	30							FIA Only	3	3			
	<b>48</b>		<b>78</b>		<b>80</b>	<b>77</b>		<b>80</b>	<b>80</b>	Unknown	6	4			
											<b>49</b>	<b>46</b>			

**Potential Changes in Climate Variables**

**Temperature (°F)**

Scenario	2009	2039	2069	2099		
Annual	CCSM45	47.2	49.2	51.9	51.9	
Average	CCSM85	47.2	49.6	52.3	55.6	
	GFDL45	47.2	51.1	53.4	54.6	
	GFDL85	47.2	50.7	54.6	59.3	
	HAD45	47.2	50.5	53.9	55.7	
	HAD85	47.2	50.5	54.9	60.4	
Growing Season	CCSM45	63.9	65.8	68.1	68.4	
	CCSM85	63.9	66.2	68.8	72.7	
May—Sep	GFDL45	63.9	68.5	71.5	73.1	
	GFDL85	63.9	68.5	72.9	78.0	
	HAD45	63.9	67.5	70.3	72.8	
	HAD85	63.9	67.0	71.9	77.9	
Coldest Month	CCSM45	21.5	23.7	26.1	26.1	
Average	CCSM85	21.5	24.7	26.2	28.3	
	GFDL45	21.5	24.2	25.9	26.6	
	GFDL85	21.5	25.0	26.6	29.0	
	HAD45	21.5	23.4	26.9	26.9	
	HAD85	21.5	24.8	27.5	31.0	
Warmest Month	CCSM45	69.9	72.2	73.6	73.9	
Average	CCSM85	69.9	72.8	74.5	76.7	
	GFDL45	69.9	72.9	75.3	76.4	
	GFDL85	69.9	74.4	76.9	79.8	
	HAD45	69.9	74.0	75.6	77.4	
	HAD85	69.9	74.1	77.3	81.8	

**Precipitation (in)**

Scenario	2009	2039	2069	2099		
Annual	CCSM45	40.1	40.2	39.0	41.6	
Total	CCSM85	40.1	41.6	41.1	41.4	
	GFDL45	40.1	43.8	45.4	44.8	
	GFDL85	40.1	41.3	44.7	45.9	
	HAD45	40.1	40.3	41.7	41.7	
	HAD85	40.1	41.6	40.0	43.6	
Growing Season	CCSM45	18.4	18.4	17.0	18.3	
Season	CCSM85	18.4	18.0	17.5	16.9	
May—Sep	GFDL45	18.4	19.2	18.8	18.3	
	GFDL85	18.4	18.0	18.1	17.5	
	HAD45	18.4	17.8	16.5	17.5	
	HAD85	18.4	17.9	15.3	16.0	

**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
red maple	Acer rubrum	WDH	High	57.4	1082.3	19.5	Sm. dec.	Sm. dec.	High	Abundant	Good	Good			1	1
green ash	Fraxinus pennsylvanica	WSH	Low	45.6	1006.4	26.4	Sm. dec.	Sm. dec.	Medium	Abundant	Fair	Fair			0	2
sugar maple	Acer saccharum	WDH	High	53	844.7	15.8	No change	Sm. dec.	High	Abundant	Very Good	Good			1	3
white ash	Fraxinus americana	WDL	Medium	52.4	688.8	14.4	No change	No change	Low	Abundant	Fair	Fair			0	4
black cherry	Prunus serotina	WDL	Medium	54.5	483.8	8.5	No change	No change	Low	Common	Poor	Poor			0	5
quaking aspen	Populus tremuloides	WDH	High	33.6	311.4	11.0	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	6
eastern hemlock	Tsuga canadensis	NSH	High	24.2	289.4	11.9	Sm. dec.	Lg. dec.	Low	Common	Poor	Very Poor			0	7
American elm	Ulmus americana	WDH	Medium	54.7	226.1	5.6	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	8
Scots pine	Pinus sylvestris	NSH	FIA	15.6	221.5	15.1	Unknown	Unknown	NA	Common	NNIS	NNIS			0	9
American beech	Fagus grandifolia	WDH	High	31.4	218.6	6.9	No change	No change	Medium	Common	Fair	Fair			1	10
American basswood	Tilia americana	WSL	Medium	30.6	201.8	6.9	No change	Sm. dec.	Medium	Common	Fair	Poor			1	11
silver maple	Acer saccharinum	NSH	Low	20.4	146.5	11.3	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good	Infill ++	Infill ++	1	12
black locust	Robinia pseudoacacia	NDH	Low	7.2	135.5	16.9	No change	No change	Medium	Common	Fair	Fair			1	13
white spruce	Picea glauca	NSL	Medium	2.3	111.8	41.2	Very Lg. dec.	Very Lg. dec.	Medium	Common	Lost	Lost			0	14
bitternut hickory	Carya cordiformis	WSL	Low	19.8	109.2	5.8	No change	Sm. inc.	High	Common	Good	Very Good			1	15
eastern white pine	Pinus strobus	WDH	High	9.3	90.6	13.5	No change	No change	Low	Common	Poor	Poor	Infill +	Infill +	0	16
eastern cottonwood	Populus deltoides	NSH	Low	16.9	83.2	8.5	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	17
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	25.3	73.3	2.9	No change	No change	High	Common	Good	Good			1	18
shagbark hickory	Carya ovata	WSL	Medium	10.8	70.1	7.0	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good	Infill ++	Infill ++	1	19
bigtooth aspen	Populus grandidentata	NSL	Medium	7.8	64.1	8.3	Sm. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	20
black ash	Fraxinus nigra	WSH	Medium	9.9	63.1	7.8	Lg. dec.	Lg. dec.	Low	Common	Very Poor	Very Poor			0	21
pin cherry	Prunus pensylvanica	NSL	Low	7.3	58.4	7.2	Lg. dec.	Very Lg. dec.	Medium	Common	Poor	Lost			0	22
northern red oak	Quercus rubra	WDH	Medium	8.9	57.1	6.1	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good	Infill ++	Infill ++	1	23
yellow birch	Betula alleghaniensis	NDL	High	17.2	52.7	3.4	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	24
black walnut	Juglans nigra	WDH	Low	8.5	46.7	4.9	Sm. inc.	Sm. inc.	Medium	Rare	Fair	Fair			1	25
Norway spruce	Picea abies	NSH	FIA	14	46.2	4.2	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	26
black willow	Salix nigra	NSH	Low	13.8	45.9	4.7	Sm. dec.	Sm. inc.	Low	Rare	Very Poor	Poor			1	27
red pine	Pinus resinosa	NSH	Medium	9.3	40.3	6.8	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	28
bur oak	Quercus macrocarpa	NDH	Medium	4.7	39.7	7.3	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor		Infill +	2	29
American hornbeam; muscle	Carpinus caroliniana	WSL	Low	22.4	39.3	2.0	Lg. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	30
swamp white oak	Quercus bicolor	NSL	Low	14.6	38.1	5.5	Sm. inc.	No change	Medium	Rare	Fair	Poor	Infill +	Infill +	1	31
boxelder	Acer negundo	WSH	Low	11.5	28.7	5.3	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	1	32
chokecherry	Prunus virginiana	NSLX	FIA	7.7	23.6	4.4	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	33
white oak	Quercus alba	WDH	Medium	5.4	23.4	9.7	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	34
serviceberry	Amelanchier spp.	NSL	Low	12.8	16.1	1.6	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	35
northern pin oak	Quercus ellipsoidalis	NSH	Medium	1.2	12.1	8.9	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor	Infill +	Infill +	2	36
blackgum	Nyssa sylvatica	WDL	Medium	2.9	8.7	5.0	Sm. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	37
butternut	Juglans cinerea	NSLX	FIA	3.8	6.4	1.6	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	38
pignut hickory	Carya glabra	WDL	Medium	1.2	5.3	3.9	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	39
peachleaf willow	Salix amygdaloides	NSLX	FIA	1.2	5.2	3.8	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	40
yellow-poplar	Liriodendron tulipifera	WDH	High	1.2	5.1	3.8	Lg. inc.	Lg. inc.	High	Rare	Good	Good			2	41
cucumber tree	Magnolia acuminata	NSL	Low	1.2	3.7	2.8	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	42
Norway maple	Acer platanoides	NSL	FIA	1.2	3.7	2.7	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	43
pin oak	Quercus palustris	NSH	Low	5.4	3.1	3.1	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair	Infill +	Infill +	2	44
striped maple	Acer pensylvanicum	NSL	Medium	1.2	1.4	1.1	Very Lg. dec.	Very Lg. dec.	Medium	Rare	Lost	Lost			0	45
black oak	Quercus velutina	WDH	High	1.2	1.3	0.9	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	46
slippery elm	Ulmus rubra	WSL	Low	1.2	0.6	0.5	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
American mountain-ash	Sorbus americana	NSL	Low	1.2	0.4	0.3	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	48
eastern redcedar	Juniperus virginiana	WDH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Likely +	Likely +	3	49
shortleaf pine	Pinus echinata	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	50
sweet birch	Betula lenta	NDH	High	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat	Likely +	Likely +	3	51
paper birch	Betula papyrifera	WDH	High	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown			0	52
gray birch	Betula populifolia	NSL	Low	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown			0	53
cittamwood/gum bumelia	Sideroxylon lanuginosum ssp.	NSL	Low	0	0	0	Unknown	New Habitat	High	Absent	Unknown	New Habitat			0	54
black hickory	Carya texana	NDL	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	55
mockernut hickory	Carya alba	WDL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	56
sugarberry	Celtis laevigata	NDH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	57
hackberry	Celtis occidentalis	WDH	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	58
eastern redbud	Cercis canadensis	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	59
flowering dogwood	Cornus florida	WDL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	60
common persimmon	Diospyros virginiana	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +	3	61
honeylocust	Gleditsia triacanthos	NSH	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	62
sweetgum	Liquidambar styraciflua	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate ++	3	63
Osage-orange	Maclura pomifera	NDH	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +	3	64
bigleaf magnolia	Magnolia macrophylla	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	65
mountain or Fraser magnolia	Magnolia fraseri	NSL	Low	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown			0	66
red mulberry	Morus rubra	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	67
sycamore	Platanus occidentalis	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	68
scarlet oak	Quercus coccinea	WDL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	69
cherrybark oak; swamp red o.	Quercus pagoda	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	70
shingle oak	Quercus imbricaria	NDH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	71
blackjack oak	Quercus marilandica	NSL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			3	72
chinkapin oak	Quercus muehlenbergii	NSL	Medium	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	Unknown	New Habitat	Medium	Absent	Unknown	New Habitat			3	74
chestnut oak	Quercus prinus	NDH	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate ++	Migrate ++	3	75
post oak	Quercus stellata	WDH	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			3	76
live oak	Quercus virginiana	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	77
sassafras	Sassafras albidum	WSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate ++	Migrate ++	3	78
winged elm	Ulmus alata	WDL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	79
cedar elm	Ulmus crassifolia	NDH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			0	80