

Climate Change Atlas Tree Species  
Current and Potential Future Habitat, Capability, and Migration

	sq. km	sq. mi	FIA Plots
Area of Region	166,196	64,168	1,844

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	18	26	Increase	16	24	Very Good	3	3	Likely	1	1
Hickory	8			Medium	33	58	No Change	30	26	Good	9	15	Infill	43	45
Maple	5	Abundant	1	Low	39	9	Decrease	22	18	Fair	17	17	Migrate	7	8
Oak	17	Common	11	FIA	11		New	13	13	Poor	20	17			
Pine	3	Rare	67				Unknown	20	20	Very Poor	18	15			
Other	43	Absent	20							FIA Only	6	6			
	79		99		101	93		101	101	Unknown	10	10			
											83	83			

Potential Changes in Climate Variables

Temperature (°F)

	Scenario	2009	2039	2069	2099	
Annual Average	CCSM45	60.4	62.2	63.9	64.5	
	CCSM85	60.4	62.8	64.8	67.6	
	GFDL45	60.4	65.8	65.2	66.5	
	GFDL85	60.4	63.3	66.3	70.3	
	HAD45	60.4	62.7	65.4	66.4	
	HAD85	60.4	63.0	67.5	70.6	
Growing Season (May—Sep)	CCSM45	76.3	78.2	79.9	80.6	
	CCSM85	76.3	79.1	81.1	84.5	
	GFDL45	76.3	83.6	82.2	84.6	
	GFDL85	76.3	80.3	83.8	88.8	
	HAD45	76.3	78.6	80.9	81.8	
	HAD85	76.3	79.1	84.2	86.8	
Coldest Month (Average)	CCSM45	36.5	38.8	39.7	40.4	
	CCSM85	36.5	39.0	39.7	41.4	
	GFDL45	36.5	40.2	40.3	40.5	
	GFDL85	36.5	37.6	39.0	39.7	
	HAD45	36.5	37.3	39.6	39.7	
	HAD85	36.5	39.4	41.4	43.1	
Warmest Month (Average)	CCSM45	82.7	84.5	85.7	86.1	
	CCSM85	82.7	85.5	86.4	88.3	
	GFDL45	82.7	87.7	88.5	90.4	
	GFDL85	82.7	87.5	89.3	93.5	
	HAD45	82.7	84.8	86.3	86.6	
	HAD85	82.7	86.1	88.5	89.6	

Precipitation (in)

	Scenario	2009	2039	2069	2099	
Annual Total	CCSM45	37.8	37.2	38.3	37.4	
	CCSM85	37.8	36.9	38.8	38.8	
	GFDL45	37.8	39.3	43.4	39.4	
	GFDL85	37.8	39.7	43.7	42.2	
	HAD45	37.8	39.1	39.3	40.9	
	HAD85	37.8	39.8	34.9	39.0	
Growing Season (May—Sep)	CCSM45	19.0	17.9	17.9	17.9	
	CCSM85	19.0	18.3	17.7	17.8	
	GFDL45	19.0	19.9	21.8	20.1	
	GFDL85	19.0	20.7	22.8	21.1	
	HAD45	19.0	19.5	19.6	19.9	
	HAD85	19.0	19.3	15.6	17.5	

**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
post oak	Quercus stellata	WDH	High	50.6	565.2	25.5	No change	No change	High	Abundant	Very Good	Very Good	Infill ++	Infill ++	1	1
shortleaf pine	Pinus echinata	WDH	High	10.1	211.6	20.1	Sm. inc.	Sm. inc.	Medium	Common	Good	Good	Infill ++	Infill ++	2	2
loblolly pine	Pinus taeda	WDH	High	6.1	198.0	30.1	No change	No change	Medium	Common	Fair	Fair	Infill +	Infill +	2	3
eastern redcedar	Juniperus virginiana	WDH	Medium	46.2	182.4	15.3	No change	Sm. inc.	Medium	Common	Fair	Good			1	4
winged elm	Ulmus alata	WDL	Medium	34.4	146.8	7.5	Sm. inc.	Sm. inc.	Medium	Common	Good	Good	Infill ++	Infill ++	1	5
blackjack oak	Quercus marilandica	NSL	Medium	42	142.1	10.6	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good	Infill ++	Infill ++	1	6
black oak	Quercus velutina	WDH	High	27	134.6	9.8	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor	Infill +	Infill +	0	7
American elm	Ulmus americana	WDH	Medium	44.2	99.4	11.0	No change	Sm. inc.	Medium	Common	Fair	Good			1	8
black hickory	Carya texana	NDL	High	30.4	91.4	5.9	No change	No change	Medium	Common	Fair	Fair	Infill +	Infill +	1	9
white oak	Quercus alba	WDH	Medium	7.8	77.4	9.2	No change	No change	High	Common	Good	Good	Infill ++	Infill ++	2	10
mockernut hickory	Carya alba	WDL	Medium	15.2	66.4	4.7	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good	Infill ++	Infill ++	1	11
green ash	Fraxinus pennsylvanica	WSH	Low	24.5	62.1	6.8	Sm. inc.	Sm. inc.	Medium	Common	Good	Good	Infill ++	Infill ++	1	12
pecan	Carya illinoensis	NSH	Low	23.1	45.5	11.5	Sm. inc.	Lg. inc.	Low	Rare	Poor	Fair	Infill +	Infill +	1	13
Osage-orange	Maclura pomifera	NDH	Medium	16	44.4	8.3	No change	Sm. inc.	High	Rare	Fair	Good	Infill +	Infill ++	1	14
water oak	Quercus nigra	WDH	High	6.3	43.7	7.6	No change	Sm. inc.	Medium	Rare	Poor	Fair	Infill +	Infill +	2	15
southern red oak	Quercus falcata	WDL	Medium	6.3	40.8	6.7	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	16
sweetgum	Liquidambar styraciflua	WDH	High	3.7	38.2	7.8	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	17
honeylocust	Gleditsia triacanthos	NSH	Low	14.7	33.0	10.5	No change	Sm. inc.	High	Rare	Fair	Good	Infill +	Infill ++	1	18
sugarberry	Celtis laevigata	NDH	Medium	25.2	31.9	5.3	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	1	19
common persimmon	Diospyros virginiana	NSL	Low	17.4	31.7	6.0	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	1	20
northern red oak	Quercus rubra	WDH	Medium	13.3	28.2	3.7	Sm. inc.	Sm. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	21
hackberry	Celtis occidentalis	WDH	Medium	26.6	26.9	7.5	No change	Sm. inc.	High	Rare	Fair	Good	Infill +	Infill ++	1	22
sycamore	Platanus occidentalis	NSL	Low	8.4	25.7	6.5	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	23
white ash	Fraxinus americana	WDL	Medium	16.5	25.3	3.4	Sm. inc.	Lg. inc.	Low	Rare	Poor	Fair	Infill +	Infill +	1	24
black willow	Salix nigra	NSH	Low	12.1	21.8	13.3	Sm. inc.	Sm. inc.	Low	Rare	Poor	Poor	Infill +	Infill +	1	25
black walnut	Juglans nigra	WDH	Low	12.6	18.2	6.9	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	26
bitternut hickory	Carya cordiformis	WSL	Low	9.4	17.8	4.4	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	27
Shumard oak	Quercus shumardii	NSL	Low	10.2	16.6	4.3	Sm. dec.	No change	High	Rare	Poor	Fair	Infill +	Infill +	1	28
eastern cottonwood	Populus deltoides	NSH	Low	8	16.4	14.0	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	29
slippery elm	Ulmus rubra	WSL	Low	13.2	15.9	3.8	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good	Infill +	Infill ++	1	30
black cherry	Prunus serotina	WDL	Medium	9.1	15.8	2.6	No change	No change	Low	Rare	Very Poor	Very Poor			0	31
red maple	Acer rubrum	WDH	High	4.3	14.8	2.9	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	32
boxelder	Acer negundo	WSH	Low	9.8	14.5	5.4	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	1	33
blackgum	Nyssa sylvatica	WDL	Medium	4.8	14.4	2.8	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	34
black locust	Robinia pseudoacacia	NDH	Low	6.9	14.4	19.2	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	35
red mulberry	Morus rubra	NSL	Low	14.3	11.9	3.7	Sm. dec.	No change	Medium	Rare	Very Poor	Poor		Infill +	1	36
cedar elm	Ulmus crassifolia	NDH	Medium	2	10.9	8.3	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair	Infill +	Infill +	2	37
chinkapin oak	Quercus muehlenbergii	NSL	Medium	10.5	10.0	3.6	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	38
cittamwood/gum bumelia	Sideroxylon lanuginosum ssp.	NSL	Low	16.4	9.8	4.2	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	1	39
river birch	Betula nigra	NSL	Low	2.1	9.8	7.3	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	40
flowering dogwood	Cornus florida	WDL	Medium	5.2	8.9	1.8	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	41
eastern redbud	Cercis canadensis	NSL	Low	13.4	6.6	1.8	Sm. dec.	Sm. inc.	Medium	Rare	Very Poor	Fair			0	42
Siberian elm	Ulmus pumila	NDH	FIA	4.8	6.1	15.7	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	43
silver maple	Acer saccharinum	NSH	Low	2	5.8	7.8	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor	Infill +	Infill +	2	44
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	3.1	5.8	1.7	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	45
pin oak	Quercus palustris	NSH	Low	3.8	5.3	4.7	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			2	46
sassafras	Sassafras albidum	WSL	Low	3.3	5.1	2.4	No change	Sm. inc.	Medium	Rare	Poor	Fair	Infill +	Infill +	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
bur oak	Quercus macrocarpa	NDH	Medium	6.9	4.7	5.8	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor	Infill +	Infill +	2	48
wild plum	Prunus americana	NSLX	FIA	6.3	4.2	2.3	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	49
ashe juniper	Juniperus ashei	NDH	High	1.3	4.1	33.1	Lg. inc.	Lg. inc.	NA	Rare	Unknown	Unknown			0	50
willow oak	Quercus phellos	NSL	Low	1	4.0	3.5	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	51
cherrybark oak; swamp red o.	Quercus pagoda	NSL	Medium	0.5	3.7	6.6	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	52
American hornbeam; musclev	Carpinus caroliniana	WSL	Low	1.1	3.7	3.1	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	53
shagbark hickory	Carya ovata	WSL	Medium	0.8	3.0	4.2	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	54
florida maple	Acer barbatum	NSL	Low	1.3	2.4	2.2	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	55
pignut hickory	Carya glabra	WDL	Medium	1	2.1	2.5	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	56
overcup oak	Quercus lyrata	NSL	Medium	0.5	2.1	4.2	No change	No change	Low	Rare	Very Poor	Very Poor			2	57
white mulberry	Morus alba	NSL	FIA	2.2	2.0	5.7	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	58
sugar maple	Acer saccharum	WDH	High	0.9	1.1	3.6	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor			0	59
American holly	Ilex opaca	NSL	Medium	0.7	1.0	1.3	Sm. dec.	No change	Medium	Rare	Very Poor	Poor		Infill +	2	60
swamp chestnut oak	Quercus michauxii	NSL	Low	0.1	0.9	2.5	Lg. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	61
ailanthus	Ailanthus altissima	NSL	FIA	0.5	0.9	3.4	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	62
serviceberry	Amelanchier spp.	NSL	Low	1.1	0.7	0.7	Sm. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	63
Kentucky coffeetree	Gymnocladus dioicus	NSLX	FIA	2	0.7	3.1	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	64
water hickory	Carya aquatica	NSL	Medium	0.2	0.6	2.3	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	65
Texas ash	Fraxinus texensis	NDH	FIA	0.5	0.4	4.6	Unknown	Unknown	NA	Rare	FIA Only	FIA Only			0	66
water elm	Planera aquatica	NSL	Low	0.1	0.4	7.2	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	67
paulownia	Paulownia tomentosa	NSL	FIA	0.2	0.3	21.2	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	68
northern catalpa	Catalpa speciosa	NSHX	FIA	0.4	0.3	6.2	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	69
pawpaw	Asimina triloba	NSL	Low	0.2	0.2	0.5	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	70
cucumbertree	Magnolia acuminata	NSL	Low	0.1	0.2	2.7	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	71
waterlocust	Gleditsia aquatica	NSLX	FIA	0	0.1	1.1	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	72
Nuttall oak	Quercus texana	NSH	Medium	0.3	0.1	3.0	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			0	73
American basswood	Tilia americana	WSL	Medium	0.4	0.1	0.9	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	74
durand oak	Quercus sinuata var. sinuata	NSL	FIA	0	0.1	0.4	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	75
Scots pine	Pinus sylvestris	NSH	FIA	0.2	0.1	4.7	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	76
shellbark hickory	Carya laciniosa	NSL	Low	0.1	0.1	0.6	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	77
American beech	Fagus grandifolia	WDH	High	0.1	0.1	1.2	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	78
yellow-poplar	Liriodendron tulipifera	WDH	High	0.1	0.1	0.7	Lg. inc.	Lg. inc.	High	Rare	Good	Good			2	79
slash pine	Pinus elliottii	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	80
spruce pine	Pinus glabra	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	81
longleaf pine	Pinus palustris	NSH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	82
pitch pine	Pinus rigida	NSH	High	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown			0	83
Virginia pine	Pinus virginiana	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	84
striped maple	Acer pensylvanicum	NSL	Medium	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	85
Ohio buckeye	Aesculus glabra	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	86
black ash	Fraxinus nigra	WSH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	87
silverbell	Halesia spp.	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	88
southern magnolia	Magnolia grandiflora	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	89
sweetbay	Magnolia virginiana	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	90
bigleaf magnolia	Magnolia macrophylla	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	91
mountain or Fraser magnolia	Magnolia fraseri	NSL	Low	0	0	0	Unknown	Unknown	NA	Absent	Unknown	Unknown			0	92
water tupelo	Nyssa aquatica	NSH	Medium	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown			0	93
sourwood	Oxydendrum arboreum	NDL	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	94

Climate Change Atlas Tree Species  
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
redbay	Persea borbonia	NSL	Low	0	0	0	Unknown	Unknown	High	Modeled	Unknown	Unknown			0	95
pin cherry	Prunus pensylvanica	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	96
scarlet oak	Quercus coccinea	WDL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	97
laurel oak	Quercus laurifolia	NDH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	98
chestnut oak	Quercus prinus	NDH	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			3	99
live oak	Quercus virginiana	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate ++	Migrate ++	3	100
bluejack oak	Quercus incana	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Likely +	Likely +	3	101