

**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	10,642	4,108.9	227

**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		RCP45	RCP85	RCP45	RCP85	RCP45	RCP85				
Ash	3			14	25	Increase	19	28	Very Good	4	5	Likely	1	1	
Hickory	7			34	50	No Change	33	25	Good	15	21	Infill	24	26	
Maple	5	Abundant	6	Low	36	10	Decrease	19	18	Fair	21	18	Migrate	2	2
Oak	15	Common	20	FIA	2		New	8	8	Poor	16	13			
Pine	4	Rare	47				Unknown	7	7	Very Poor	12	11			
Other	39	Absent	12							FIA Only	1	1			
	<b>73</b>		<b>85</b>		<b>86</b>	<b>85</b>		<b>86</b>	<b>86</b>	Unknown	5	5			
											<b>74</b>	<b>74</b>			

**Potential Changes in Climate Variables**

**Temperature (°F)**

	Scenario	2009	2039	2069	2099	
Annual Average	CCSM45	67.5	69.0	70.7	70.9	
	CCSM85	67.5	69.3	71.6	73.8	
	GFDL45	67.5	70.5	71.6	72.5	
	GFDL85	67.5	69.9	72.9	76.1	
	HAD45	67.5	69.7	72.3	73.4	
	HAD85	67.5	70.0	73.4	77.0	
Growing Season (May—Sep)	CCSM45	79.3	80.6	81.8	82.2	
	CCSM85	79.3	80.8	82.9	85.4	
	GFDL45	79.3	82.7	83.5	85.2	
	GFDL85	79.3	82.0	85.2	89.0	
	HAD45	79.3	82.1	84.5	85.2	
	HAD85	79.3	82.2	86.7	89.6	
Coldest Month Average	CCSM45	49.4	51.6	52.5	52.5	
	CCSM85	49.4	52.1	53.3	54.4	
	GFDL45	49.4	52.7	52.8	52.8	
	GFDL85	49.4	50.6	51.4	52.2	
	HAD45	49.4	50.0	51.7	52.5	
	HAD85	49.4	51.4	52.6	54.4	
Warmest Month Average	CCSM45	82.5	83.5	83.9	84.1	
	CCSM85	82.5	83.7	84.6	86.0	
	GFDL45	82.5	85.7	85.7	87.0	
	GFDL85	82.5	85.4	86.8	89.1	
	HAD45	82.5	85.8	87.1	87.2	
	HAD85	82.5	86.1	88.7	89.7	

**Precipitation (in)**

	Scenario	2009	2039	2069	2099	
Annual Total	CCSM45	61.7	63.9	69.5	66.7	
	CCSM85	61.7	63.8	65.9	67.7	
	GFDL45	61.7	67.0	74.3	68.2	
	GFDL85	61.7	65.9	67.0	67.7	
	HAD45	61.7	59.9	61.7	65.2	
	HAD85	61.7	65.3	58.4	62.6	
Growing Season (May—Sep)	CCSM45	26.6	27.4	28.8	28.1	
	CCSM85	26.6	25.9	26.9	26.6	
	GFDL45	26.6	30.2	35.6	30.3	
	GFDL85	26.6	30.1	32.0	33.7	
	HAD45	26.6	26.4	26.5	27.4	
	HAD85	26.6	26.3	22.7	23.3	

**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
sweetgum	Liquidambar styraciflua	WDH	High	71.6	984.9	12.8	No change	No change	Medium	Abundant	Good	Good			1	1
sugarberry	Celtis laevigata	NDH	Medium	75.1	941.9	13.2	No change	No change	Medium	Abundant	Good	Good			1	2
green ash	Fraxinus pennsylvanica	WSH	Low	74.2	692.7	9.7	No change	No change	Medium	Abundant	Good	Good			1	3
water oak	Quercus nigra	WDH	High	59.3	657.4	10.3	Sm. inc.	Sm. inc.	Medium	Abundant	Very Good	Very Good			1	4
bald cypress	Taxodium distichum	NSH	Medium	47.3	651.4	14.3	Sm. inc.	Sm. inc.	Medium	Abundant	Very Good	Very Good			1	5
loblolly pine	Pinus taeda	WDH	High	12.8	548.6	19.9	Lg. inc.	Lg. inc.	Medium	Abundant	Very Good	Very Good	Infill ++	Infill ++	1	6
American elm	Ulmus americana	WDH	Medium	69.2	448.4	7.2	No change	No change	Medium	Common	Fair	Fair			1	7
red maple	Acer rubrum	WDH	High	62.8	429.1	6.6	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	8
boxelder	Acer negundo	WSH	Low	47.2	317.4	6.4	No change	No change	High	Common	Good	Good			1	9
nuttall oak	Quercus texana	NSH	Medium	42.2	271.5	6.6	No change	No change	High	Common	Good	Good			0	10
pecan	Carya illinoensis	NSH	Low	30	226.7	8.3	No change	Sm. inc.	Low	Common	Poor	Fair			1	11
black willow	Salix nigra	NSH	Low	37.5	218.8	7.2	Sm. inc.	Lg. inc.	Low	Common	Fair	Good			1	12
water hickory	Carya aquatica	NSL	Medium	53.9	211.0	4.0	No change	Sm. inc.	Medium	Common	Fair	Good			1	13
water tupelo	Nyssa aquatica	NSH	Medium	22	195.3	9.2	Sm. inc.	Sm. inc.	Low	Common	Fair	Fair			1	14
sycamore	Platanus occidentalis	NSL	Low	25.1	176.8	6.3	No change	No change	Medium	Common	Fair	Fair			1	15
cherrybark oak; swamp red o	Quercus pagoda	NSL	Medium	28.9	129.3	5.0	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	16
overcup oak	Quercus lyrata	NSL	Medium	31	124.5	4.4	Sm. inc.	Lg. inc.	Low	Common	Fair	Good			1	17
American hornbeam; muscle	Carpinus caroliniana	WSL	Low	19.7	105.9	4.1	No change	No change	Medium	Common	Fair	Fair			1	18
laurel oak	Quercus laurifolia	NDH	Medium	14.6	82.2	3.7	No change	No change	Medium	Common	Fair	Fair			1	19
winged elm	Ulmus alata	WDL	Medium	33.6	77.2	2.3	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good			1	20
yellow-poplar	Liriodendron tulipifera	WDH	High	9.8	69.7	3.6	No change	Sm. dec.	High	Common	Good	Fair	Infill ++	Infill +	2	21
swamp chestnut oak	Quercus michauxii	NSL	Low	14.1	66.2	2.6	No change	Sm. inc.	Medium	Common	Fair	Good	Infill +	Infill ++	1	22
common persimmon	Diospyros virginiana	NSL	Low	22.1	60.8	2.1	Lg. dec.	Lg. dec.	High	Common	Fair	Fair			1	23
American beech	Fagus grandifolia	WDH	High	12.6	59.2	3.5	No change	No change	Medium	Common	Fair	Fair	Infill +	Infill +	2	24
eastern cottonwood	Populus deltoides	NSH	Low	16.9	56.9	3.6	Sm. dec.	Sm. inc.	Medium	Common	Poor	Good	Infill +	Infill ++	1	25
willow oak	Quercus phellos	NSL	Low	6.8	55.3	3.9	Sm. inc.	Sm. inc.	Medium	Common	Good	Good	Infill ++	Infill ++	1	26
blackgum	Nyssa sylvatica	WDL	Medium	14.8	45.0	1.9	Sm. inc.	Sm. inc.	High	Rare	Good	Good	Infill ++	Infill ++	1	27
honeylocust	Gleditsia triacanthos	NSH	Low	25.9	44.4	2.3	Sm. inc.	Lg. inc.	High	Rare	Good	Good			1	28
slippery elm	Ulmus rubra	WSL	Low	25	39.4	1.8	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good			1	29
white oak	Quercus alba	WDH	Medium	6.6	38.8	3.7	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	30
southern magnolia	Magnolia grandiflora	NSL	Low	8.7	34.7	2.7	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	1	31
black cherry	Prunus serotina	WDL	Medium	9.6	33.5	1.6	No change	No change	Low	Rare	Very Poor	Very Poor			0	32
live oak	Quercus virginiana	NDH	High	10.5	33.2	3.4	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	2	33
bitternut hickory	Carya cordiformis	WSL	Low	5.1	32.1	5.4	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor	Infill +	Infill +	1	34
southern red oak	Quercus falcata	WDL	Medium	6.4	30.5	2.5	No change	Sm. inc.	High	Rare	Fair	Good	Infill +	Infill ++	2	35
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	14	29.2	1.8	No change	Sm. inc.	High	Rare	Fair	Good	Infill +	Infill ++	1	36
water elm	Planera aquatica	NSL	Low	10.2	27.5	2.4	No change	Sm. inc.	Medium	Rare	Poor	Fair	Infill +	Infill +	1	37
swamp tupelo	Nyssa biflora	NDH	Medium	3.2	26.7	3.0	Sm. dec.	No change	Low	Rare	Very Poor	Very Poor			2	38
white ash	Fraxinus americana	WDL	Medium	6.1	26.6	3.3	No change	No change	Low	Rare	Very Poor	Very Poor			0	39
pignut hickory	Carya glabra	WDL	Medium	7.7	25.2	1.6	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	40
flowering dogwood	Cornus florida	WDL	Medium	13.2	25.1	1.4	No change	No change	Medium	Rare	Poor	Poor			1	41
shortleaf pine	Pinus echinata	WDH	High	2.9	19.6	2.8	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	42
spruce pine	Pinus glabra	NSL	Low	0	17.8	1.0	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	43
slash pine	Pinus elliottii	NDH	High	0.9	15.7	16.7	Lg. inc.	Sm. inc.	Medium	Rare	Good	Fair		Infill +	2	44
red mulberry	Morus rubra	NSL	Low	8.5	12.5	1.7	Sm. dec.	No change	Medium	Rare	Very Poor	Poor		Infill +	1	45
mockernut hickory	Carya alba	WDL	Medium	4.1	9.4	1.2	No change	Sm. inc.	High	Rare	Fair	Good	Infill +	Infill ++	1	46
waterlocust	Gleditsia aquatica	NSLX	FIA	4.4	7.5	1.5	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
sassafras	Sassafras albidum	WSL	Low	0.9	5.8	6.2	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	48
black oak	Quercus velutina	WDH	High	3.1	5.8	1.1	No change	Sm. dec.	Medium	Rare	Poor	Very Poor	Infill +		2	49
cedar elm	Ulmus crassifolia	NDH	Medium	3.2	5.8	1.1	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair	Infill +	Infill +	2	50
Shumard oak	Quercus shumardii	NSL	Low	2.8	5.5	1.9	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor		Infill +	2	51
silverbell	Halesia spp.	NSL	Low	2.1	4.2	0.7	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	52
black hickory	Carya texana	NDL	High	0.9	4.0	4.3	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	53
post oak	Quercus stellata	WDH	High	2	4.0	1.1	Lg. inc.	Lg. inc.	High	Rare	Good	Good			2	54
American holly	Ilex opaca	NSL	Medium	7.9	3.9	0.6	Sm. inc.	Sm. inc.	Medium	Rare	Fair	Fair	Infill +	Infill +	2	55
river birch	Betula nigra	NSL	Low	1.3	3.7	1.6	No change	No change	Medium	Rare	Poor	Poor			0	56
redbay	Persea borbonia	NSL	Low	1.1	3.5	1.4	No change	Sm. dec.	High	Rare	Fair	Poor			0	57
white mulberry	Morus alba	NSL	FIA	0.9	2.7	2.9	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	58
eastern redcedar	Juniperus virginiana	WDH	Medium	1.4	2.2	0.7	No change	Sm. inc.	Medium	Rare	Poor	Fair		Infill +	2	59
sugar maple	Acer saccharum	WDH	High	0.9	2.0	2.1	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor			0	60
florida maple	Acer barbatum	NSL	Low	1.7	1.9	0.9	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	61
sweetbay	Magnolia virginiana	NSL	Medium	1.9	1.7	0.9	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	62
shagbark hickory	Carya ovata	WSL	Medium	1.9	1.7	0.9	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	63
sourwood	Oxydendrum arboreum	NDL	High	1.4	1.7	0.8	No change	No change	High	Rare	Fair	Fair	Infill +		2	64
Osage-orange	Maclura pomifera	NDH	Medium	0.6	1.4	0.2	Very Lg. dec.	Very Lg. dec.	High	Rare	Lost	Lost			0	65
blue ash	Fraxinus quadrangulata	NSL	Low	0.9	1.0	1.1	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	66
black locust	Robinia pseudoacacia	NDH	Low	0.9	1.0	1.1	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	67
hackberry	Celtis occidentalis	WDH	Medium	0.9	0.9	1.0	Very Lg. dec.	No change	High	Rare	Lost	Fair			0	68
American basswood	Tilia americana	WSL	Medium	4.2	0.8	0.6	Sm. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	69
swamp white oak	Quercus bicolor	NSL	Low	0.9	0.6	0.7	Very Lg. dec.	Very Lg. dec.	Medium	Rare	Lost	Lost			0	70
chinkapin oak	Quercus muehlenbergii	NSL	Medium	0.9	0.6	0.7	Lg. dec.	Very Lg. dec.	Medium	Rare	Very Poor	Lost			0	71
pawpaw	Asimina triloba	NSL	Low	0.3	0.5	0.2	Sm. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	72
silver maple	Acer saccharinum	NSH	Low	0.9	0.4	0.4	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			0	73
Atlantic white-cedar	Chamaecyparis thyoides	NSH	Low	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	74
longleaf pine	Pinus palustris	NSH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate ++	Migrate ++	3	75
striped maple	Acer pensylvanicum	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	76
mountain maple	Acer spicatum	NSL	Low	0	0	0	Unknown	Unknown	High	Absent	Unknown	Unknown			0	77
serviceberry	Amelanchier spp.	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	78
cittamwood/gum bumelia	Sideroxylon lanuginosum ssp.	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	79
loblolly-bay	Gordonia lasianthus	NSH	Medium	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	80
cucumbertree	Magnolia acuminata	NSL	Low	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown			0	81
bigleaf magnolia	Magnolia macrophylla	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	82
pin cherry	Prunus pensylvanica	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	83
scarlet oak	Quercus coccinea	WDL	Medium	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	84
blackjack oak	Quercus marilandica	NSL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Likely +	Likely +	3	85
northern red oak	Quercus rubra	WDH	Medium	0	0	0	Unknown	Unknown	High	Absent	Unknown	Unknown			0	86