

**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	72

**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	2			High	6	14	Increase	7	8	Very Good	0	0	Likely	3	3
Hickory	4			Medium	15	27	No Change	5	6	Good	5	7	Infill	17	18
Maple	2	Abundant	0	Low	25	6	Decrease	19	17	Fair	9	8	Migrate	4	6
Oak	4	Common	12	FIA	3		New	13	12	Poor	6	7			
Pine	0	Rare	22				Unknown	5	6	Very Poor	11	9			
Other	22	Absent	15							FIA Only	1	1			
	<b>34</b>		<b>49</b>		<b>49</b>	<b>47</b>		<b>49</b>	<b>49</b>	Unknown	2	3			
											<b>34</b>	<b>35</b>			

**Potential Changes in Climate Variables**

**Temperature (°F)**

	Scenario	2009	2039	2069	2099	
Annual Average	CCSM45	55.3	57.1	59.1	59.5	
	CCSM85	55.3	57.8	60.1	62.7	
	GFDL45	55.3	61.0	60.3	61.5	
	GFDL85	55.3	58.1	61.1	65.2	
	HAD45	55.3	57.7	60.6	62.0	
HAD85	55.3	58.0	62.8	66.3		
Growing Season (May—Sep)	CCSM45	72.7	75.0	76.8	77.4	
	CCSM85	72.7	75.9	78.0	81.0	
	GFDL45	72.7	80.3	78.9	80.9	
	GFDL85	72.7	76.4	79.8	85.1	
	HAD45	72.7	74.9	77.3	78.8	
HAD85	72.7	75.5	80.9	84.0		
Coldest Month (Average)	CCSM45	27.9	29.7	31.1	31.6	
	CCSM85	27.9	30.4	31.3	32.9	
	GFDL45	27.9	31.9	32.4	32.4	
	GFDL85	27.9	30.3	31.4	32.6	
	HAD45	27.9	29.3	32.1	32.0	
HAD85	27.9	31.3	33.8	35.8		
Warmest Month (Average)	CCSM45	79.4	81.9	83.1	83.7	
	CCSM85	79.4	83.2	84.5	86.1	
	GFDL45	79.4	83.5	84.8	86.4	
	GFDL85	79.4	83.7	85.1	89.3	
	HAD45	79.4	81.6	83.3	84.0	
HAD85	79.4	83.4	86.1	87.7		

**Precipitation (in)**

	Scenario	2009	2039	2069	2099	
Annual Total	CCSM45	39.5	38.1	39.7	38.1	
	CCSM85	39.5	39.1	39.6	40.3	
	GFDL45	39.5	43.2	44.5	43.1	
	GFDL85	39.5	43.5	50.0	47.5	
	HAD45	39.5	42.6	41.8	41.9	
HAD85	39.5	41.1	38.3	41.7		
Growing Season (May—Sep)	CCSM45	23.1	21.4	22.4	21.0	
	CCSM85	23.1	22.4	22.1	22.2	
	GFDL45	23.1	25.7	25.0	24.5	
	GFDL85	23.1	25.9	29.1	26.8	
	HAD45	23.1	23.7	23.9	24.1	
HAD85	23.1	23.3	20.4	21.3		

**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
hackberry	Celtis occidentalis	WDH	Medium	67.8	348.1	12.4	Sm. dec.	Sm. dec.	High	Common	Fair	Fair	Infill +	Infill +	1	1
Osage-orange	Maclura pomifera	NDH	Medium	70.6	244.2	15.4	No change	No change	High	Common	Good	Good	Infill ++	Infill ++	1	2
American elm	Ulmus americana	WDH	Medium	81.4	237.0	10.6	No change	No change	Medium	Common	Fair	Fair	Infill +	Infill +	1	3
eastern redcedar	Juniperus virginiana	WDH	Medium	52.4	214.4	14.9	No change	No change	Medium	Common	Fair	Fair	Infill +	Infill +	1	4
black walnut	Juglans nigra	WDH	Low	74.6	193.0	10.5	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor	Infill +	Infill +	0	5
honeylocust	Gleditsia triacanthos	NSH	Low	65.4	153.1	9.2	Sm. dec.	Sm. dec.	High	Common	Fair	Fair	Infill +	Infill +	1	6
red mulberry	Morus rubra	NSL	Low	34.5	111.3	8.8	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor	Infill +	Infill +	0	7
green ash	Fraxinus pennsylvanica	WSH	Low	39.1	96.1	7.1	Sm. inc.	Sm. inc.	Medium	Common	Good	Good	Infill ++	Infill ++	1	8
sycamore	Platanus occidentalis	NSL	Low	16.2	83.0	11.3	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor	Infill +	Infill +	2	9
silver maple	Acer saccharinum	NSH	Low	4.5	59.2	10.7	Sm. dec.	Sm. dec.	High	Common	Fair	Fair	Infill +	Infill +	2	10
boxelder	Acer negundo	WSH	Low	29.4	57.9	10.8	Lg. dec.	Sm. dec.	High	Common	Fair	Fair	Infill +	Infill +	1	11
pin oak	Quercus palustris	NSH	Low	5.8	51.0	17.9	Lg. dec.	Sm. dec.	Low	Common	Very Poor	Poor			0	12
northern red oak	Quercus rubra	WDH	Medium	23.1	44.9	6.2	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor	Infill +	Infill +	2	13
chinkapin oak	Quercus muehlenbergii	NSL	Medium	36.6	44.5	5.2	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	14
black willow	Salix nigra	NSH	Low	9.3	32.6	21.4	No change	No change	Low	Rare	Very Poor	Very Poor			2	15
eastern cottonwood	Populus deltoides	NSH	Low	7	31.3	16.1	Sm. dec.	No change	Medium	Rare	Very Poor	Poor		Infill +	2	16
shagbark hickory	Carya ovata	WSL	Medium	17.8	25.8	4.0	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	17
white mulberry	Morus alba	NSL	FIA	1.7	24.7	8.8	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	18
black cherry	Prunus serotina	WDL	Medium	17.2	24.2	3.4	Lg. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			2	19
eastern redbud	Cercis canadensis	NSL	Low	27.1	22.9	2.6	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	1	20
bitternut hickory	Carya cordiformis	WSL	Low	15.1	20.5	7.0	Sm. inc.	Sm. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	21
pecan	Carya illinoensis	NSH	Low	12.6	14.3	10.5	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair	Infill +	Infill +	2	22
bur oak	Quercus macrocarpa	NDH	Medium	14.6	14.1	3.1	Sm. inc.	Sm. inc.	High	Rare	Good	Good			2	23
shellbark hickory	Carya laciniosa	NSL	Low	10.1	10.5	3.4	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	24
slippery elm	Ulmus rubra	WSL	Low	17	9.6	1.9	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good	Infill +	Infill ++	2	25
black locust	Robinia pseudoacacia	NDH	Low	1	9.4	9.1	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	26
Kentucky coffeetree	Gymnocladus dioicus	NSLX	FIA	15.8	8.5	2.4	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			2	27
American basswood	Tilia americana	WSL	Medium	4.7	2.9	2.5	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	28
white ash	Fraxinus americana	WDL	Medium	13.4	2.5	2.2	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair	Infill +	Infill +	2	29
sugarberry	Celtis laevigata	NDH	Medium	4.1	2.0	7.9	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	30
Siberian elm	Ulmus pumila	NDH	FIA	4.1	1.3	4.9	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	31
pawpaw	Asimina triloba	NSL	Low	0.9	0.9	0.8	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	32
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	1.4	0.3	0.4	Lg. dec.	Sm. inc.	High	Rare	Poor	Good			0	33
Ohio buckeye	Aesculus glabra	NSL	Low	3.7	0.2	0.8	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	34
ashe juniper	Juniperus ashei	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	35
serviceberry	Amelanchier spp.	NSL	Low	0	0	0	New Habitat	Unknown	Medium	Absent	New Habitat	Unknown			3	36
cittamwood/gum bumelia	Sideroxylon lanuginosum ssp.	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	37
black hickory	Carya texana	NDL	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	38
common persimmon	Diospyros virginiana	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Likely +	Likely +	3	39
bigleaf magnolia	Magnolia macrophylla	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	40
pin cherry	Prunus pensylvanica	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	41
blackjack oak	Quercus marilandica	NSL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate ++	Migrate ++	3	42
water oak	Quercus nigra	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	43
Shumard oak	Quercus shumardii	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate ++	3	44
post oak	Quercus stellata	WDH	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Likely +	Likely +	3	45
black oak	Quercus velutina	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Likely +	Likely +	3	46
live oak	Quercus virginiana	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	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
winged elm	Ulmus alata	WDL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	48
cedar elm	Ulmus crassifolia	NDH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	49