

**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	10,066	3,886.5	85

**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	7	15	Increase	11	12	Very Good	0	0
Hickory	4			Medium	15	23	No Change	6	7	Good	7	8
Maple	1	Abundant	0	Low	17	4	Decrease	17	15	Fair	9	9
Oak	7	Common	6	FIA	5		New	4	4	Poor	11	12
Pine	1	Rare	33				Unknown	6	6	Very Poor	7	5
Other	24	Absent	5							FIA Only	3	3
	<b>39</b>		<b>44</b>		<b>44</b>	<b>42</b>		<b>44</b>	<b>44</b>	Unknown	1	1
											<b>18</b>	<b>20</b>
											<b>38</b>	<b>38</b>

**Potential Changes in Climate Variables**

**Temperature (°F)**

	Scenario	2009	2039	2069	2099	
Annual Average	CCSM45	60.6	62.5	64.1	64.8	
	CCSM85	60.6	63.0	65.0	67.8	
	GFDL45	60.6	66.6	65.5	66.8	
	GFDL85	60.6	63.6	66.6	70.5	
	HAD45	60.6	62.9	65.5	66.4	
	HAD85	60.6	63.2	67.7	70.7	
Growing Season (May—Sep)	CCSM45	76.7	78.7	80.3	81.1	
	CCSM85	76.7	79.4	81.4	84.8	
	GFDL45	76.7	84.9	82.7	85.1	
	GFDL85	76.7	80.7	84.3	89.3	
	HAD45	76.7	78.8	81.0	81.7	
	HAD85	76.7	79.3	84.3	86.8	
Coldest Month (Average)	CCSM45	36.5	39.0	39.8	40.6	
	CCSM85	36.5	39.0	39.6	41.4	
	GFDL45	36.5	40.0	40.1	40.3	
	GFDL85	36.5	37.4	38.7	39.3	
	HAD45	36.5	37.3	39.7	39.9	
	HAD85	36.5	39.5	41.4	43.2	
Warmest Month (Average)	CCSM45	83.2	85.0	86.3	86.7	
	CCSM85	83.2	85.8	86.7	88.7	
	GFDL45	83.2	88.2	89.0	91.0	
	GFDL85	83.2	88.1	90.0	94.4	
	HAD45	83.2	85.1	86.6	86.8	
	HAD85	83.2	86.3	88.7	89.7	

**Precipitation (in)**

	Scenario	2009	2039	2069	2099	
Annual Total	CCSM45	36.2	35.6	37.0	35.2	
	CCSM85	36.2	35.1	36.7	37.0	
	GFDL45	36.2	37.4	41.7	37.8	
	GFDL85	36.2	38.3	41.8	40.3	
	HAD45	36.2	37.3	37.6	39.2	
	HAD85	36.2	37.9	33.1	37.5	
Growing Season (May—Sep)	CCSM45	19.2	17.9	18.4	17.9	
	CCSM85	19.2	18.3	18.0	18.1	
	GFDL45	19.2	19.8	22.0	20.3	
	GFDL85	19.2	21.1	23.0	21.4	
	HAD45	19.2	19.7	20.0	20.1	
	HAD85	19.2	19.5	16.0	18.2	

**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>.

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
post oak	Quercus stellata	WDH	High	58.1	335.0	21.4	No change	No change	High	Common	Good	Good			1	1
eastern redcedar	Juniperus virginiana	WDH	Medium	73.6	184.5	13.6	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	2
blackjack oak	Quercus marilandica	NSL	Medium	57	156.3	14.3	No change	No change	High	Common	Good	Good			1	3
American elm	Ulmus americana	WDH	Medium	55.4	115.1	10.1	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	4
black oak	Quercus velutina	WDH	High	22.6	96.5	11.2	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor	Infill +	Infill +	0	5
hackberry	Celtis occidentalis	WDH	Medium	56.3	64.3	12.2	Lg. dec.	Sm. dec.	High	Common	Fair	Fair			1	6
ashe juniper	Juniperus ashei	NDH	High	1	25.0	25.2	No change	Sm. inc.	Medium	Rare	Poor	Fair			0	7
honeylocust	Gleditsia triacanthos	NSH	Low	1.3	23.7	32.1	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor		Infill +	2	8
boxelder	Acer negundo	WSH	Low	15.9	22.8	9.9	Lg. dec.	Sm. dec.	High	Rare	Poor	Poor		Infill +	1	9
chinkapin oak	Quercus muehlenbergii	NSL	Medium	21.3	19.6	2.8	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	10
pecan	Carya illinoensis	NSH	Low	23.7	18.3	5.3	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair	Infill +	Infill +	1	11
black locust	Robinia pseudoacacia	NDH	Low	11.7	17.5	6.0	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	12
black hickory	Carya texana	NDL	High	19.9	17.3	5.6	Sm. inc.	Sm. inc.	Medium	Rare	Fair	Fair	Infill +	Infill +	1	13
sugarberry	Celtis laevigata	NDH	Medium	23.4	17.3	5.2	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	1	14
eastern cottonwood	Populus deltoides	NSH	Low	16.7	15.8	8.2	Sm. inc.	Sm. inc.	Medium	Rare	Fair	Fair	Infill +	Infill +	1	15
common persimmon	Diospyros virginiana	NSL	Low	25.2	15.6	4.0	Lg. dec.	Sm. dec.	High	Rare	Poor	Poor			1	16
winged elm	Ulmus alata	WDL	Medium	6.5	14.8	3.5	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	1	17
black walnut	Juglans nigra	WDH	Low	17.3	12.3	6.0	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	18
cittamwood/gum bumelia	Sideroxylon lanuginosum ssp.	NSL	Low	23.3	10.8	2.0	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	1	19
Siberian elm	Ulmus pumila	NDH	FIA	12.9	10.7	8.7	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	20
black willow	Salix nigra	NSH	Low	15.7	6.4	4.6	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair	Infill +	Infill +	1	21
red mulberry	Morus rubra	NSL	Low	12.1	5.6	2.0	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	22
loblolly pine	Pinus taeda	WDH	High	3.2	5.4	17.5	Sm. dec.	No change	Medium	Rare	Very Poor	Poor			0	23
eastern redbud	Cercis canadensis	NSL	Low	30.5	4.3	1.0	Sm. dec.	No change	Medium	Rare	Very Poor	Poor		Infill +	1	24
Shumard oak	Quercus shumardii	NSL	Low	2.6	4.2	1.4	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	25
slippery elm	Ulmus rubra	WSL	Low	17.3	3.9	2.0	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good	Infill +	Infill ++	1	26
bur oak	Quercus macrocarpa	NDH	Medium	0.1	3.3	0.3	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor	Infill +		2	27
mockernut hickory	Carya alba	WDL	Medium	1	2.9	2.8	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	28
green ash	Fraxinus pennsylvanica	WSH	Low	12.7	2.6	1.1	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	1	29
wild plum	Prunus americana	NSLX	FIA	6.2	1.8	0.6	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	30
northern catalpa	Catalpa speciosa	NSHX	FIA	2.5	1.4	3.4	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	31
bitternut hickory	Carya cordiformis	WSL	Low	5.1	1.3	1.8	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor			0	32
Osage-orange	Maclura pomifera	NDH	Medium	3.1	1.1	1.0	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	33
Kentucky coffeetree	Gymnocladus dioicus	NSLX	FIA	4	1.1	4.3	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	34
white ash	Fraxinus americana	WDL	Medium	4	0.5	2.1	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair	Infill +	Infill +	2	35
white mulberry	Morus alba	NSL	FIA	0.1	0.5	0.0	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	36
flowering dogwood	Cornus florida	WDL	Medium	3.8	0.4	1.6	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	37
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	1.1	0.2	0.2	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			0	38
northern red oak	Quercus rubra	WDH	Medium	0.5	0.1	0.0	Lg. inc.	Lg. inc.	High	Rare	Good	Good			0	39
serviceberry	Amelanchier spp.	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	40
southern red oak	Quercus falcata	WDL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			3	41
water oak	Quercus nigra	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	42
live oak	Quercus virginiana	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate ++	Migrate ++	3	43
cedar elm	Ulmus crassifolia	NDH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat	Migrate ++	Migrate ++	3	44