

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	9,549.4	3,687.0	43

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										
Hickory	4										
Maple	5	Abundant 0	High 8	21	Increase 16	17	Very Good 0	0	Likely 2	2	
Oak	9	Common 2	Medium 26	34	No Change 10	10	Good 10	13	Infill 24	25	
Pine	1	Rare 40	Low 30	10	Decrease 15	14	Fair 12	10	Migrate 5	14	
Other	21	Absent 22	FIA 1		New 18	18	Poor 8	7			
	42	64		65	65	Unknown 6	6	Very Poor 10	9	31	41
						65	65	FIA Only 1	1		
								Unknown 5	5		
								46	45		

Potential Changes in Climate Variables

Temperature (°F)

	Scenario	2009	2039	2069	2099	
Annual Average	CCSM45	53.3	55.2	57.2	57.5	
	CCSM85	53.3	55.8	58.1	61.0	
	GFDL45	53.3	59.3	58.6	59.5	
	GFDL85	53.3	56.2	59.6	63.6	
	HAD45	53.3	56.1	59.5	61.1	
HAD85	53.3	56.5	61.1	65.5		
Growing Season May—Sep	CCSM45	70.8	72.9	74.5	75.4	
	CCSM85	70.8	73.6	75.8	79.2	
	GFDL45	70.8	78.2	77.0	78.4	
	GFDL85	70.8	74.3	78.3	83.2	
	HAD45	70.8	74.0	77.0	79.1	
HAD85	70.8	74.3	80.2	84.5		
Coldest Month Average	CCSM45	25.2	26.7	28.3	28.7	
	CCSM85	25.2	28.1	29.2	30.6	
	GFDL45	25.2	29.8	30.4	30.9	
	GFDL85	25.2	28.5	29.9	30.8	
	HAD45	25.2	27.0	29.8	29.8	
HAD85	25.2	28.4	31.0	33.1		
Warmest Month Average	CCSM45	76.5	78.3	79.5	80.4	
	CCSM85	76.5	79.7	81.4	83.1	
	GFDL45	76.5	79.6	81.2	82.1	
	GFDL85	76.5	80.2	82.2	85.2	
	HAD45	76.5	80.0	82.3	83.3	
HAD85	76.5	81.7	85.4	87.9		

Precipitation (in)

	Scenario	2009	2039	2069	2099	
Annual Total	CCSM45	40.2	38.5	41.6	40.5	
	CCSM85	40.2	40.7	41.4	42.4	
	GFDL45	40.2	45.6	48.2	49.6	
	GFDL85	40.2	44.3	50.7	52.0	
	HAD45	40.2	41.7	44.2	43.7	
HAD85	40.2	43.1	41.6	44.9		
Growing Season May—Sep	CCSM45	18.9	17.8	18.7	17.2	
	CCSM85	18.9	17.6	17.7	17.3	
	GFDL45	18.9	21.3	21.4	22.1	
	GFDL85	18.9	20.6	22.0	22.0	
	HAD45	18.9	18.8	17.7	18.1	
HAD85	18.9	18.8	15.9	15.9		

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-DGP30 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
honeylocust	Gleditsia triacanthos	NSH	Low	27.5	81.7	15.8	Sm. dec.	Sm. dec.	High	Common	Fair	Fair	Infill +	Infill +	1	1
white oak	Quercus alba	WDH	Medium	33.4	60.9	17.3	Sm. dec.	Sm. dec.	High	Common	Fair	Fair	Infill +	Infill +	1	2
shingle oak	Quercus imbricaria	NDH	Medium	24.1	49.5	6.9	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	3
black cherry	Prunus serotina	WDL	Medium	42.8	42.8	5.3	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	4
hackberry	Celtis occidentalis	WDH	Medium	45	42.7	6.8	Sm. inc.	Sm. inc.	High	Rare	Good	Good	Infill ++	Infill ++	1	5
silver maple	Acer saccharinum	NSH	Low	16.2	39.4	16.2	Sm. inc.	Sm. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	6
sugar maple	Acer saccharum	WDH	High	46.3	38.2	6.8	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	1	7
eastern cottonwood	Populus deltoides	NSH	Low	23.5	38.1	13.9	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	8
green ash	Fraxinus pennsylvanica	WSH	Low	44.4	35.6	5.5	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good	Infill +	Infill ++	1	9
black walnut	Juglans nigra	WDH	Low	51.4	35.5	6.1	Sm. inc.	Sm. inc.	Medium	Rare	Fair	Fair	Infill +	Infill +	1	10
pignut hickory	Carya glabra	WDL	Medium	19.7	33.9	8.3	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			2	11
shagbark hickory	Carya ovata	WSL	Medium	39.6	26.4	4.9	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	1	12
American elm	Ulmus americana	WDH	Medium	61	26.1	3.0	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	1	13
black oak	Quercus velutina	WDH	High	30	23.0	4.6	Sm. inc.	Sm. inc.	Medium	Rare	Fair	Fair	Infill +	Infill +	2	14
black locust	Robinia pseudoacacia	NDH	Low	8.4	22.4	42.8	Lg. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	15
northern red oak	Quercus rubra	WDH	Medium	27.7	21.0	4.3	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor	Infill +	Infill +	2	16
white ash	Fraxinus americana	WDL	Medium	22.5	20.7	6.6	Sm. inc.	Sm. inc.	Low	Rare	Poor	Poor	Infill +	Infill +	2	17
bitternut hickory	Carya cordiformis	WSL	Low	23.2	16.9	2.2	Sm. inc.	Sm. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	18
pin oak	Quercus palustris	NSH	Low	5.3	14.3	6.5	No change	No change	Low	Rare	Very Poor	Very Poor			2	19
red mulberry	Morus rubra	NSL	Low	8.8	13.4	5.0	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	20
sycamore	Platanus occidentalis	NSL	Low	11	11.6	5.8	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	2	21
common persimmon	Diospyros virginiana	NSL	Low	7.6	11.2	2.3	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	22
Osage-orange	Maclura pomifera	NDH	Medium	7.1	11.0	1.3	No change	Sm. inc.	High	Rare	Fair	Good	Infill +		2	23
mockernut hickory	Carya alba	WDL	Medium	17.8	8.5	2.4	Sm. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	24
sassafras	Sassafras albidum	WSL	Low	7.4	6.5	1.6	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	1	25
boxelder	Acer negundo	WSH	Low	18.8	5.6	3.3	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	26
slippery elm	Ulmus rubra	WSL	Low	33.1	5.1	1.6	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	1	27
post oak	Quercus stellata	WDH	High	4.2	5.1	5.0	Lg. inc.	Lg. inc.	High	Rare	Good	Good			2	28
bur oak	Quercus macrocarpa	NDH	Medium	8.5	4.7	5.1	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	29
American basswood	Tilia americana	WSL	Medium	5.2	4.5	3.3	Very Lg. dec.	Very Lg. dec.	Medium	Rare	Lost	Lost			0	30
red maple	Acer rubrum	WDH	High	7.9	4.4	8.1	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	31
eastern redbud	Cercis canadensis	NSL	Low	13.6	3.7	2.3	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good	Infill +	Infill ++	2	32
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	14	3.3	0.7	Sm. dec.	No change	High	Rare	Poor	Fair			0	33
chinkapin oak	Quercus muehlenbergii	NSL	Medium	17.9	2.8	1.7	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	34
swamp white oak	Quercus bicolor	NSL	Low	5.4	2.6	0.8	Lg. dec.	Very Lg. dec.	Medium	Rare	Very Poor	Lost			0	35
Kentucky coffeetree	Gymnocladus dioicus	NSLX	FIA	11.2	2.1	2.5	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			2	36
red pine	Pinus resinosa	NSH	Medium	4.1	1.0	3.9	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	37
black willow	Salix nigra	NSH	Low	4.2	0.9	3.5	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair		Infill +	2	38
river birch	Betula nigra	NSL	Low	0.3	0.7	0.2	No change	No change	Medium	Rare	Poor	Poor		Infill +	2	39
Ohio buckeye	Aesculus glabra	NSL	Low	2.8	0.5	1.2	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	40
eastern redcedar	Juniperus virginiana	WDH	Medium	3.8	0.4	1.4	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	41
black maple	Acer nigrum	NSH	Low	2.1	0.1	0.2	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			0	42
loblolly pine	Pinus taeda	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate ++	3	43
serviceberry	Amelanchier spp.	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	44
cittamwood/gum bumelia	Sideroxylon lanuginosum ssp.	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +	3	45
American hornbeam; musclev	Carpinus caroliniana	WSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	46
pecan	Carya illinoensis	NSH	Low	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	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
shellbark hickory	<i>Carya laciniosa</i>	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Likely +	Likely +	3	48
black hickory	<i>Carya texana</i>	NDL	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	49
sugarberry	<i>Celtis laevigata</i>	NDH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	50
flowering dogwood	<i>Cornus florida</i>	WDL	Medium	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	51
black ash	<i>Fraxinus nigra</i>	WSH	Medium	0	0	0	Unknown	Unknown	Low	Modeled	Unknown	Unknown			0	52
blue ash	<i>Fraxinus quadrangulata</i>	NSL	Low	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown			0	53
sweetgum	<i>Liquidambar styraciflua</i>	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate ++	Migrate +	3	54
blackgum	<i>Nyssa sylvatica</i>	WDL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate ++	3	55
pin cherry	<i>Prunus pensylvanica</i>	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	56
southern red oak	<i>Quercus falcata</i>	WDL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +	3	57
cherrybark oak; swamp red o.	<i>Quercus pagoda</i>	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	58
overcup oak	<i>Quercus lyrata</i>	NSL	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat		Migrate +	3	59
blackjack oak	<i>Quercus marilandica</i>	NSL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate ++	3	60
water oak	<i>Quercus nigra</i>	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate ++	3	61
willow oak	<i>Quercus phellos</i>	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	62
Shumard oak	<i>Quercus shumardii</i>	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Likely +	Likely +	3	63
winged elm	<i>Ulmus alata</i>	WDL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate ++	Migrate ++	3	64
cedar elm	<i>Ulmus crassifolia</i>	NDH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	65