

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	369

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	21	24	Increase	27	28	Very Good	12	11	Likely	3	3
Hickory	4			Medium	27	48	No Change	14	12	Good	13	18	Infill	5	6
Maple	6	Abundant	8	Low	38	16	Decrease	15	16	Fair	13	9	Migrate	6	13
Oak	6	Common	22	FIA	4		New	17	19	Poor	10	10			
Pine	5	Rare	30				Unknown	17	15	Very Poor	7	7			
Other	37	Absent	27							FIA Only	2	2			
	60		87		90	88		90	90	Unknown	13	11			
											70	68			

Potential Changes in Climate Variables

Temperature (°F)

	Scenario	2009	2039	2069	2099	
Annual Average	CCSM45	50.4	52.3	54.6	54.8	
	CCSM85	50.4	52.7	55.2	58.3	
	GFDL45	50.4	53.1	56.1	57.0	
	GFDL85	50.4	53.7	57.2	61.2	
	HAD45	50.4	53.0	56.4	57.7	
	HAD85	50.4	53.3	57.6	62.0	
Growing Season (May—Sep)	CCSM45	65.2	67.2	69.3	69.9	
	CCSM85	65.2	67.6	70.1	74.2	
	GFDL45	65.2	68.4	72.1	73.4	
	GFDL85	65.2	69.4	73.6	78.1	
	HAD45	65.2	68.4	71.8	73.4	
	HAD85	65.2	68.6	74.1	78.9	
Coldest Month (Average)	CCSM45	27.4	29.4	30.7	31.2	
	CCSM85	27.4	30.2	31.3	32.7	
	GFDL45	27.4	31.0	31.5	32.2	
	GFDL85	27.4	30.2	31.1	32.3	
	HAD45	27.4	28.2	30.3	30.5	
	HAD85	27.4	28.8	30.4	32.2	
Warmest Month (Average)	CCSM45	70.4	72.5	73.7	74.1	
	CCSM85	70.4	72.7	74.4	76.3	
	GFDL45	70.4	73.9	76.0	77.1	
	GFDL85	70.4	75.3	77.9	80.4	
	HAD45	70.4	74.1	76.5	77.7	
	HAD85	70.4	75.2	78.9	81.9	

Precipitation (in)

	Scenario	2009	2039	2069	2099	
Annual Total	CCSM45	52.5	56.2	57.4	58.1	
	CCSM85	52.5	56.9	58.5	63.6	
	GFDL45	52.5	57.3	58.4	61.2	
	GFDL85	52.5	54.3	60.0	61.6	
	HAD45	52.5	54.2	54.5	53.7	
	HAD85	52.5	55.2	52.5	54.5	
Growing Season (May—Sep)	CCSM45	24.6	27.0	27.5	27.4	
	CCSM85	24.6	26.8	26.4	28.5	
	GFDL45	24.6	26.6	26.0	27.3	
	GFDL85	24.6	24.4	25.8	26.4	
	HAD45	24.6	26.3	23.8	24.5	
	HAD85	24.6	25.7	23.1	24.1	

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
red maple	Acer rubrum	WDH	High	93.5	1552.5	13.2	Sm. dec.	Sm. dec.	High	Abundant	Good	Good			1	1
sugar maple	Acer saccharum	WDH	High	93.8	1092.0	9.8	No change	Sm. dec.	High	Abundant	Very Good	Good			1	2
yellow-poplar	Liriodendron tulipifera	WDH	High	84.8	1012.2	9.3	No change	Sm. dec.	High	Abundant	Very Good	Good			1	3
chestnut oak	Quercus prinus	NDH	High	63.9	696.0	9.4	Sm. inc.	No change	High	Abundant	Very Good	Very Good			1	4
American beech	Fagus grandifolia	WDH	High	71.8	695.8	8.4	No change	No change	Medium	Abundant	Good	Good			1	5
white oak	Quercus alba	WDH	Medium	54.3	586.9	8.6	Sm. inc.	Sm. inc.	High	Abundant	Very Good	Very Good			1	6
northern red oak	Quercus rubra	WDH	Medium	72.1	548.2	6.1	Sm. inc.	Sm. inc.	High	Abundant	Very Good	Very Good			1	7
black cherry	Prunus serotina	WDL	Medium	64.8	547.0	6.2	Sm. dec.	Sm. dec.	Low	Abundant	Fair	Fair			0	8
pignut hickory	Carya glabra	WDL	Medium	55.3	355.6	4.9	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	9
sweet birch	Betula lenta	NDH	High	65.1	321.7	4.3	Sm. dec.	Sm. dec.	Low	Common	Poor	Poor			0	10
black locust	Robinia pseudoacacia	NDH	Low	57.3	318.4	4.7	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	11
yellow birch	Betula alleghaniensis	NDL	High	35.9	282.6	7.4	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	12
eastern hemlock	Tsuga canadensis	NSH	High	43.1	256.8	5.4	Sm. inc.	No change	Low	Common	Fair	Poor			1	13
black oak	Quercus velutina	WDH	High	46.4	246.8	3.6	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	14
white ash	Fraxinus americana	WDL	Medium	63.6	228.7	2.9	Sm. inc.	Sm. inc.	Low	Common	Fair	Fair			1	15
American basswood	Tilia americana	WSL	Medium	53.1	219.3	3.9	No change	No change	Medium	Common	Fair	Fair			1	16
mockernut hickory	Carya alba	WDL	Medium	45.2	212.6	3.5	Sm. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	17
scarlet oak	Quercus coccinea	WDL	Medium	33.4	150.3	3.4	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	18
sourwood	Oxydendrum arboreum	NDL	High	38.3	146.4	2.8	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	19
shagbark hickory	Carya ovata	WSL	Medium	33.2	123.2	2.6	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	20
blackgum	Nyssa sylvatica	WDL	Medium	51	122.5	1.9	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	21
cucumbertree	Magnolia acuminata	NSL	Low	50.6	115.0	2.0	No change	No change	Medium	Common	Fair	Fair			1	22
red spruce	Picea rubens	NDH	High	14.2	110.5	7.6	Sm. dec.	Sm. dec.	Low	Common	Poor	Poor	Infill +	Infill +	0	23
sassafras	Sassafras albidum	WSL	Low	38.8	97.5	1.8	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	24
sycamore	Platanus occidentalis	NSL	Low	14.8	97.1	4.0	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	25
mountain or Fraser magnolia	Magnolia fraseri	NSL	Low	32.6	75.0	2.1	Sm. inc.	Sm. inc.	Low	Common	Fair	Fair			0	26
slippery elm	Ulmus rubra	WSL	Low	16.6	67.2	2.1	No change	Sm. inc.	Medium	Common	Fair	Good			1	27
black walnut	Juglans nigra	WDH	Low	12.6	65.5	2.4	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good			1	28
eastern white pine	Pinus strobus	WDH	High	6.6	60.7	6.7	Sm. inc.	Sm. inc.	Low	Common	Fair	Fair			1	29
striped maple	Acer pensylvanicum	NSL	Medium	33.7	50.5	1.2	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	30
serviceberry	Amelanchier spp.	NSL	Low	29.7	49.8	1.4	No change	No change	Medium	Rare	Poor	Poor			1	31
bitternut hickory	Carya cordiformis	WSL	Low	23	48.1	1.7	Lg. inc.	Lg. inc.	High	Rare	Good	Good			1	32
pin cherry	Prunus pensylvanica	NSL	Low	21.3	42.7	1.9	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	33
American elm	Ulmus americana	WDH	Medium	7.5	40.5	1.5	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	34
American hornbeam; muscley	Carpinus caroliniana	WSL	Low	18.3	30.7	1.6	No change	Lg. inc.	Medium	Rare	Poor	Good			1	35
Virginia pine	Pinus virginiana	NDH	High	6.1	29.2	3.0	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			1	36
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	25.7	28.0	0.9	Sm. inc.	Lg. inc.	High	Rare	Good	Good			1	37
flowering dogwood	Cornus florida	WDL	Medium	23.1	23.4	0.7	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			1	38
bigtooth aspen	Populus grandidentata	NSL	Medium	4.3	21.8	3.6	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	39
boxelder	Acer negundo	WSH	Low	3.3	21.8	1.7	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	1	40
yellow buckeye	Aesculus flava	NSL	Low	8.2	20.3	2.4	No change	No change	Low	Rare	Very Poor	Very Poor			0	41
eastern redbud	Cercis canadensis	NSL	Low	9.4	16.5	1.0	Sm. inc.	Sm. inc.	Medium	Rare	Fair	Fair			1	42
pitch pine	Pinus rigida	NSH	High	5.8	7.1	1.0	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good			1	43
pawpaw	Asimina triloba	NSL	Low	5.1	6.9	1.3	Sm. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	44
common persimmon	Diospyros virginiana	NSL	Low	2.2	6.9	0.5	No change	Lg. inc.	High	Rare	Fair	Good	Infill +	Infill ++	2	45
ailanthus	Ailanthus altissima	NSL	FIA	3.1	5.7	1.8	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	46
American holly	Ilex opaca	NSL	Medium	3.3	5.5	0.7	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			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	
black willow	Salix nigra	NSH	Low	2	4.8	2.2	Sm. dec.	No change	Low	Rare	Very Poor	Very Poor				2	48
Table Mountain pine	Pinus pungens	NSL	Low	1.8	3.0	1.2	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +		2	49
green ash	Fraxinus pennsylvanica	WSH	Low	2.1	2.3	1.1	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good				2	50
American chestnut	Castanea dentata	NSLX	FIA	5	2.2	0.4	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only				0	51
river birch	Betula nigra	NSL	Low	1	1.9	1.9	No change	No change	Medium	Rare	Poor	Poor		Infill +		2	52
black maple	Acer nigrum	NSH	Low	2.1	1.6	0.8	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor				0	53
shortleaf pine	Pinus echinata	WDH	High	1	0.8	0.8	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good				2	54
shingle oak	Quercus imbricaria	NDH	Medium	0.2	0.8	0.1	Very Lg. dec.	Very Lg. dec.	Medium	Rare	Lost	Lost				0	55
eastern redcedar	Juniperus virginiana	WDH	Medium	1	0.8	0.8	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good				2	56
American mountain-ash	Sorbus americana	NSL	Low	3.1	0.7	0.2	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor				0	57
paulownia	Paulownia tomentosa	NSL	FIA	1	0.7	0.7	Unknown	Unknown	NA	Rare	NNIS	NNIS				0	58
mountain maple	Acer spicatum	NSL	Low	2.1	0.6	0.3	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor				0	59
butternut	Juglans cinerea	NSLX	FIA	0.1	0.6	0.1	Unknown	Unknown	Low	Rare	FIA Only	FIA Only				0	60
Atlantic white-cedar	Chamaecyparis thyoides	NSH	Low	0	0	0	New Habitat	Unknown	Low	Absent	New Habitat	Unknown				3	61
loblolly pine	Pinus taeda	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Likely +	Likely +		3	62
northern white-cedar	Thuja occidentalis	WDH	High	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown				0	63
florida maple	Acer barbatum	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate +		3	64
Ohio buckeye	Aesculus glabra	NSL	Low	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown				0	65
cittamwood/gum bumelia	Sideroxylon lanuginosum ssp.	NSL	Low	0	0	0	Unknown	New Habitat	High	Absent	Unknown	New Habitat				0	66
pecan	Carya illinoensis	NSH	Low	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat		Migrate +		3	67
shellbark hickory	Carya laciniosa	NSL	Low	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown				0	68
black hickory	Carya texana	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat				0	69
sugarberry	Celtis laevigata	NDH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate ++		3	70
hackberry	Celtis occidentalis	WDH	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate ++		3	71
black ash	Fraxinus nigra	WSH	Medium	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown				0	72
honeylocust	Gleditsia triacanthos	NSH	Low	0	0	0	Unknown	New Habitat	High	Absent	Unknown	New Habitat		Migrate +		3	73
silverbell	Halesia spp.	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat				3	74
sweetgum	Liquidambar styraciflua	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Likely +	Likely +		3	75
southern magnolia	Magnolia grandiflora	NSL	Low	0	0	0	New Habitat	Unknown	Medium	Absent	New Habitat	Unknown				3	76
bigleaf magnolia	Magnolia macrophylla	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown				0	77
red mulberry	Morus rubra	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +		3	78
water tupelo	Nyssa aquatica	NSH	Medium	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown				0	79
eastern cottonwood	Populus deltoides	NSH	Low	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown				0	80
southern red oak	Quercus falcata	WDL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate ++		3	81
cherrybark oak; swamp red o.	Quercus pagoda	NSL	Medium	0	0	0	Unknown	New Habitat	Medium	Absent	Unknown	New Habitat		Migrate +		3	82
overcup oak	Quercus lyrata	NSL	Medium	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown				0	83
blackjack oak	Quercus marilandica	NSL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate ++		3	84
chinkapin oak	Quercus muehlenbergii	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Likely +	Likely +		3	85
water oak	Quercus nigra	WDH	High	0	0	0	Unknown	New Habitat	Medium	Absent	Unknown	New Habitat		Migrate +		3	86
Shumard oak	Quercus shumardii	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +		3	87
post oak	Quercus stellata	WDH	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate ++	Migrate ++		3	88
bluejack oak	Quercus incana	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown				0	89
winged elm	Ulmus alata	WDL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +		3	90