

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 9,412.7 3,634.3 167

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	3			High	22	Increase	18	21	Very Good	6	6	Likely	0	2
Hickory	4			Medium	28	No Change	11	10	Good	16	18	Infill	13	13
Maple	6	Abundant	4	Low	33	Decrease	24	22	Fair	3	6	Migrate	9	14
Oak	9	Common	21	FIA	10	New	19	22	Poor	14	8			
Pine	4	Rare	38			Unknown	21	18	Very Poor	11	11			
Other	37	Absent	27						FIA Only	4	4			
	63		90				93	93	Unknown	11	8			
										65	61			

Potential Changes in Climate Variables

Temperature (°F)

	Scenario	2009	2039	2069	2099	
Annual Average	CCSM45	50.7	52.5	54.8	55.0	
	CCSM85	50.7	52.9	55.4	58.6	
	GFDL45	50.7	55.2	56.5	57.7	
	GFDL85	50.7	54.1	57.7	62.0	
	HAD45	50.7	53.5	56.9	58.5	
	HAD85	50.7	53.6	57.8	62.7	
Growing Season (May—Sep)	CCSM45	67.1	69.0	70.9	71.4	
	CCSM85	67.1	69.2	71.8	75.7	
	GFDL45	67.1	72.3	73.9	75.4	
	GFDL85	67.1	71.3	75.4	80.1	
	HAD45	67.1	70.3	73.3	75.5	
	HAD85	67.1	69.9	74.9	80.4	
Coldest Month Average	CCSM45	25.9	27.8	29.5	30.0	
	CCSM85	25.9	28.2	29.6	31.4	
	GFDL45	25.9	29.3	30.2	30.8	
	GFDL85	25.9	29.2	30.5	32.2	
	HAD45	25.9	27.7	30.2	30.4	
	HAD85	25.9	28.4	30.4	32.8	
Warmest Month Average	CCSM45	73.1	75.3	76.4	76.6	
	CCSM85	73.1	75.6	77.4	79.3	
	GFDL45	73.1	76.1	78.2	79.6	
	GFDL85	73.1	77.5	80.0	83.0	
	HAD45	73.1	76.7	78.6	79.9	
	HAD85	73.1	76.7	79.8	83.7	

Precipitation (in)

	Scenario	2009	2039	2069	2099	
Annual Total	CCSM45	44.8	46.9	48.1	51.5	
	CCSM85	44.8	47.5	49.7	53.2	
	GFDL45	44.8	50.0	53.1	52.5	
	GFDL85	44.8	46.7	52.4	54.3	
	HAD45	44.8	47.2	48.2	47.6	
	HAD85	44.8	49.7	46.6	49.9	
Growing Season (May—Sep)	CCSM45	20.8	23.0	23.7	25.2	
	CCSM85	20.8	22.8	23.9	24.7	
	GFDL45	20.8	21.8	22.6	23.0	
	GFDL85	20.8	20.2	22.0	22.4	
	HAD45	20.8	21.7	20.1	20.0	
	HAD85	20.8	21.9	19.7	20.2	

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>.

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	90.9	1026.2	12.3	Sm. dec.	Lg. dec.	High	Abundant	Good	Good			1	1
chestnut oak	Quercus prinus	NDH	High	76	986.0	13.9	No change	Sm. dec.	High	Abundant	Very Good	Good			1	2
sweet birch	Betula lenta	NDH	High	72.1	548.8	9.1	Lg. dec.	Lg. dec.	Low	Abundant	Poor	Poor			0	3
northern red oak	Quercus rubra	WDH	Medium	72.8	518.7	7.4	No change	No change	High	Abundant	Very Good	Very Good			1	4
black cherry	Prunus serotina	WDL	Medium	71	439.0	7.8	Sm. dec.	Sm. dec.	Low	Common	Poor	Poor			0	5
white oak	Quercus alba	WDH	Medium	67.7	381.6	6.7	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	6
yellow-poplar	Liriodendron tulipifera	WDH	High	60.2	316.9	9.3	Sm. inc.	No change	High	Common	Very Good	Good			1	7
white ash	Fraxinus americana	WDL	Medium	54.4	299.0	6.9	No change	No change	Low	Common	Poor	Poor			0	8
black oak	Quercus velutina	WDH	High	57.2	284.8	5.5	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	9
blackgum	Nyssa sylvatica	WDL	Medium	60.9	276.2	5.1	No change	No change	High	Common	Good	Good			1	10
scarlet oak	Quercus coccinea	WDL	Medium	34.4	152.2	4.7	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	11
black walnut	Juglans nigra	WDH	Low	29.1	148.2	8.9	Sm. dec.	No change	Medium	Common	Poor	Fair			1	12
sassafras	Sassafras albidum	WSL	Low	68	148.2	2.7	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	13
eastern hemlock	Tsuga canadensis	NSH	High	27.3	135.4	4.3	Sm. dec.	Lg. dec.	Low	Common	Poor	Very Poor			0	14
eastern white pine	Pinus strobus	WDH	High	25.4	107.6	3.5	No change	Sm. dec.	Low	Common	Poor	Poor			0	15
Virginia pine	Pinus virginiana	NDH	High	9.6	107.5	12.2	No change	No change	Medium	Common	Fair	Fair			1	16
pitch pine	Pinus rigida	NSH	High	12.2	92.5	7.2	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	17
pignut hickory	Carya glabra	WDL	Medium	39.8	82.2	2.1	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	18
sugar maple	Acer saccharum	WDH	High	9.7	80.3	8.1	No change	Sm. inc.	High	Common	Good	Very Good	Infill ++	Infill ++	1	19
bigtooth aspen	Populus grandidentata	NSL	Medium	16.8	75.7	5.6	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	20
green ash	Fraxinus pennsylvanica	WSH	Low	6.8	75.4	8.8	Sm. dec.	No change	Medium	Common	Poor	Fair	Infill +	Infill +	2	21
mockernut hickory	Carya alba	WDL	Medium	19.5	71.4	3.0	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	22
silver maple	Acer saccharinum	NSH	Low	6.7	71.3	11.7	Sm. dec.	No change	High	Common	Fair	Good	Infill +	Infill ++	1	23
black locust	Robinia pseudoacacia	NDH	Low	24.1	70.1	8.0	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good			1	24
shagbark hickory	Carya ovata	WSL	Medium	20	61.9	3.0	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	25
American elm	Ulmus americana	WDH	Medium	18.6	46.6	3.2	No change	Sm. inc.	Medium	Rare	Poor	Fair	Infill +	Infill +	1	26
gray birch	Betula populifolia	NSL	Low	7	45.5	6.0	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	27
American basswood	Tilia americana	WSL	Medium	19.1	40.2	3.4	Sm. inc.	Sm. inc.	Medium	Rare	Fair	Fair			1	28
American beech	Fagus grandifolia	WDH	High	25.5	34.9	3.0	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	1	29
hackberry	Celtis occidentalis	WDH	Medium	18	33.9	4.7	Sm. dec.	Sm. inc.	High	Rare	Poor	Good	Infill +	Infill ++	1	30
sycamore	Platanus occidentalis	NSL	Low	3.7	32.5	7.1	No change	Sm. inc.	Medium	Rare	Poor	Fair	Infill +	Infill +	2	31
swamp white oak	Quercus bicolor	NSL	Low	1.4	25.3	6.6	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	32
ailanthus	Ailanthus altissima	NSL	FIA	22.2	24.1	2.7	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	33
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	17	23.5	1.4	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	1	34
quaking aspen	Populus tremuloides	WDH	High	8.8	19.5	6.4	Very Lg. dec.	Very Lg. dec.	Medium	Rare	Lost	Lost			0	35
paper birch	Betula papyrifera	WDH	High	2.6	16.5	4.5	Very Lg. dec.	Very Lg. dec.	Medium	Rare	Lost	Lost			0	36
bitternut hickory	Carya cordiformis	WSL	Low	15.4	16.4	2.0	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	1	37
serviceberry	Amelanchier spp.	NSL	Low	14.7	15.4	1.0	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	38
yellow birch	Betula alleghaniensis	NDL	High	3.8	14.5	3.2	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	39
American hornbeam; musclev	Carpinus caroliniana	WSL	Low	7.5	14.2	2.7	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	1	40
eastern redcedar	Juniperus virginiana	WDH	Medium	8.9	11.3	3.8	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	2	41
Norway maple	Acer platanoides	NSL	FIA	17.4	9.1	4.2	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	42
pin cherry	Prunus sylvanica	NSL	Low	6.4	9.0	3.2	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	43
tamarack (native)	Larix laricina	NSH	High	2.1	8.7	4.1	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	44
Scots pine	Pinus sylvestris	NSH	FIA	2.9	7.2	1.9	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	45
white spruce	Picea glauca	NSL	Medium	0.2	6.5	1.0	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	46
Norway spruce	Picea abies	NSH	FIA	4.6	6.1	3.9	Unknown	Unknown	NA	Rare	NNIS	NNIS			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
pin oak	Quercus palustris	NSH	Low	4.2	6.1	3.1	No change	No change	Low	Rare	Very Poor	Very Poor			2	48
bear oak; scrub oak	Quercus ilicifolia	NSLX	FIA	5.1	5.8	1.1	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	49
boxelder	Acer negundo	WSH	Low	19	5.1	3.4	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	50
striped maple	Acer pensylvanicum	NSL	Medium	5.5	4.4	0.6	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	51
white mulberry	Morus alba	NSL	FIA	3.7	3.6	0.6	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	52
flowering dogwood	Cornus florida	WDL	Medium	10.4	2.4	0.6	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	1	53
northern catalpa	Catalpa speciosa	NSHX	FIA	3	1.6	4.1	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	54
pawpaw	Asimina triloba	NSL	Low	4.6	1.4	0.9	Lg. dec.	Very Lg. dec.	Medium	Rare	Very Poor	Lost			0	55
balsam poplar	Populus balsamifera	NSH	Medium	1.1	1.4	1.3	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	56
American chestnut	Castanea dentata	NSLX	FIA	5.6	1.2	0.4	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	57
rock elm	Ulmus thomasii	NSLX	FIA	4.2	1.1	4.0	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	58
black ash	Fraxinus nigra	WSH	Medium	0.4	0.9	0.3	Very Lg. dec.	Very Lg. dec.	Low	Rare	Lost	Lost			0	59
northern pin oak	Quercus ellipsoidalis	NSH	Medium	0.9	0.5	0.4	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			0	60
slippery elm	Ulmus rubra	WSL	Low	4.1	0.5	0.6	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	61
paulownia	Paulownia tomentosa	NSL	FIA	0.4	0.5	0.2	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	62
eastern redbud	Cercis canadensis	NSL	Low	3.5	0.3	0.9	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	63
shortleaf pine	Pinus echinata	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	64
loblolly pine	Pinus taeda	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate ++	3	65
florida maple	Acer barbatum	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +	3	66
yellow buckeye	Aesculus flava	NSL	Low	0	0	0	Unknown	Unknown	Low	Modeled	Unknown	Unknown			0	67
cittamwood/gum bumelia	Sideroxylon lanuginosum ssp.	NSL	Low	0	0	0	Unknown	New Habitat	High	Absent	Unknown	New Habitat			0	68
pecan	Carya illinoensis	NSH	Low	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	69
shellbark hickory	Carya laciniosa	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	70
black hickory	Carya texana	NDL	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	71
sugarberry	Celtis laevigata	NDH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	72
common persimmon	Diospyros virginiana	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate ++	Migrate ++	3	73
silverbell	Halesia spp.	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	74
American holly	Ilex opaca	NSL	Medium	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown			0	75
sweetgum	Liquidambar styraciflua	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate ++	Migrate ++	3	76
bigleaf magnolia	Magnolia macrophylla	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	77
mountain or Fraser magnolia	Magnolia fraseri	NSL	Low	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown			0	78
red mulberry	Morus rubra	NSL	Low	0	0	0	Unknown	New Habitat	Medium	Absent	Unknown	New Habitat		Likely +	3	79
sourwood	Oxydendrum arboreum	NDL	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	80
redbay	Persea borbonia	NSL	Low	0	0	0	Unknown	Unknown	High	Absent	Unknown	Unknown			0	81
southern red oak	Quercus falcata	WDL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	82
cherrybark oak; swamp red o	Quercus pagoda	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	83
overcup oak	Quercus lyrata	NSL	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	84
blackjack oak	Quercus marilandica	NSL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	85
swamp chestnut oak	Quercus michauxii	NSL	Low	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown			0	86
chinkapin oak	Quercus muehlenbergii	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	87
water oak	Quercus nigra	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate ++	3	88
willow oak	Quercus phellos	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	89
post oak	Quercus stellata	WDH	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate ++	Migrate ++	3	90
bluejack oak	Quercus incana	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	91
black willow	Salix nigra	NSH	Low	0	0	0	Unknown	New Habitat	Low	Absent	Unknown	New Habitat		Likely +	3	92
winged elm	Ulmus alata	WDL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	93