

One x One Degree
Climate Change Atlas Tree Species
 Current and Potential Future Habitat, Capability, and Migration

Area of Region sq. km sq. mi FIA Plots
 9,742.2 3,761.5 296

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	Scenario	Scenario	Scenario	SHIFT	SHIFT				
				High	20	23	Increase	26	29	Very Good	9	13	Likely	0	0
Ash	4			Medium	34	51	No Change	7	7	Good	17	13	Infill	11	15
Hickory	4			Low	35	16	Decrease	35	32	Fair	8	12	Migrate	2	5
Maple	4	Abundant	5	FIA	6		New	10	12	Poor	15	12			
Oak	15	Common	25				Unknown	17	15	Very Poor	12	13			
Pine	5	Rare	44							FIA Only	3	3			
Other	42	Absent	17							Unknown	11	9			
	74		91		95	90		95	95		75	75		13	20

Potential Changes in Climate Variables

Temperature (°F)

	Scenario	2009	2039	2069	2099	
Annual Average	CCSM45	57.8	59.5	61.6	61.8	
	CCSM85	57.8	59.9	62.3	65.3	
	GFDL45	57.8	60.5	63.0	64.0	
	GFDL85	57.8	60.8	64.1	67.9	
	HAD45	57.8	60.0	63.1	64.4	
	HAD85	57.8	60.3	63.9	68.2	
Growing Season (May—Sep)	CCSM45	72.7	74.4	76.3	76.8	
	CCSM85	72.7	74.7	77.3	81.0	
	GFDL45	72.7	75.7	78.6	80.1	
	GFDL85	72.7	76.3	80.1	84.3	
	HAD45	72.7	75.3	78.2	79.7	
	HAD85	72.7	75.3	79.7	84.2	
Coldest Month (Average)	CCSM45	35.5	37.6	38.7	39.0	
	CCSM85	35.5	38.1	39.1	40.4	
	GFDL45	35.5	38.8	39.3	39.9	
	GFDL85	35.5	37.8	38.7	40.1	
	HAD45	35.5	36.7	38.5	38.9	
	HAD85	35.5	37.0	38.5	40.2	
Warmest Month (Average)	CCSM45	78.3	80.4	81.4	81.5	
	CCSM85	78.3	80.5	82.4	83.9	
	GFDL45	78.3	81.3	82.7	83.9	
	GFDL85	78.3	82.4	84.3	86.8	
	HAD45	78.3	81.3	83.1	83.8	
	HAD85	78.3	81.6	84.2	87.1	

Precipitation (in)

	Scenario	2009	2039	2069	2099	
Annual Total	CCSM45	43.9	48.6	51.9	51.1	
	CCSM85	43.9	49.0	51.3	57.9	
	GFDL45	43.9	48.9	52.3	54.1	
	GFDL85	43.9	47.0	52.5	53.9	
	HAD45	43.9	47.0	47.5	45.9	
	HAD85	43.9	50.3	46.5	47.7	
Growing Season (May—Sep)	CCSM45	19.9	24.7	26.1	25.8	
	CCSM85	19.9	23.7	25.3	28.8	
	GFDL45	19.9	21.9	24.0	25.1	
	GFDL85	19.9	20.8	24.1	25.0	
	HAD45	19.9	22.5	21.0	19.4	
	HAD85	19.9	22.9	20.4	19.7	

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
loblolly pine	Pinus taeda	WDH	High	88.8	3319.0	25.8	No change	Sm. inc.	Medium	Abundant	Good	Very Good			1	1
sweetgum	Liquidambar styraciflua	WDH	High	96.1	1302.2	10.0	Sm. inc.	Sm. inc.	Medium	Abundant	Very Good	Very Good			1	2
white oak	Quercus alba	WDH	Medium	84.4	1116.7	9.2	Lg. dec.	Lg. dec.	High	Abundant	Good	Good			1	3
yellow-poplar	Liriodendron tulipifera	WDH	High	81.5	977.8	8.0	Lg. dec.	Lg. dec.	High	Abundant	Good	Good			1	4
red maple	Acer rubrum	WDH	High	84.4	644.7	4.9	Sm. inc.	Sm. inc.	High	Abundant	Very Good	Very Good			1	5
Virginia pine	Pinus virginiana	NDH	High	45.4	428.3	6.0	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	6
southern red oak	Quercus falcata	WDL	Medium	68.1	311.6	3.2	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	7
American holly	Ilex opaca	NSL	Medium	72.7	281.9	2.8	No change	No change	Medium	Common	Fair	Fair			1	8
American beech	Fagus grandifolia	WDH	High	46.1	279.3	3.9	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	9
mockernut hickory	Carya alba	WDL	Medium	55.9	241.4	2.9	No change	Sm. inc.	High	Common	Good	Very Good			1	10
scarlet oak	Quercus coccinea	WDL	Medium	57.5	221.1	3.2	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	11
blackgum	Nyssa sylvatica	WDL	Medium	73.3	212.6	2.2	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	12
black oak	Quercus velutina	WDH	High	55.8	165.5	2.1	No change	No change	Medium	Common	Fair	Fair			1	13
pignut hickory	Carya glabra	WDL	Medium	54.6	157.9	1.7	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	14
eastern redcedar	Juniperus virginiana	WDH	Medium	51.5	134.9	1.6	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	15
willow oak	Quercus phellos	NSL	Low	46.4	128.2	2.1	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	16
northern red oak	Quercus rubra	WDH	Medium	39.8	123.4	2.1	Lg. dec.	Lg. dec.	High	Common	Fair	Fair			1	17
swamp tupelo	Nyssa biflora	NDH	Medium	17.6	121.0	4.7	Sm. inc.	Sm. inc.	Low	Common	Fair	Fair			1	18
green ash	Fraxinus pennsylvanica	WSH	Low	28	115.1	3.1	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	19
American hornbeam; muscley	Carpinus caroliniana	WSL	Low	41.5	107.4	1.6	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good			1	20
river birch	Betula nigra	NSL	Low	22.8	100.5	3.1	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good			1	21
chestnut oak	Quercus prinus	NDH	High	17.8	83.5	5.7	Lg. dec.	Lg. dec.	High	Common	Fair	Fair			1	22
winged elm	Ulmus alata	WDL	Medium	28	71.8	1.3	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	23
flowering dogwood	Cornus florida	WDL	Medium	43.7	58.7	0.9	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	24
water tupelo	Nyssa aquatica	NSH	Medium	3.1	58.5	19.0	No change	No change	Low	Common	Poor	Poor	Infill +	Infill +	2	25
slippery elm	Ulmus rubra	WSL	Low	16	58.1	2.3	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	26
black cherry	Prunus serotina	WDL	Medium	25.1	56.9	1.3	Lg. inc.	Lg. inc.	Low	Common	Good	Good			1	27
shortleaf pine	Pinus echinata	WDH	High	16.3	55.8	2.1	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	28
white ash	Fraxinus americana	WDL	Medium	14.3	52.4	2.0	Lg. dec.	Lg. dec.	Low	Common	Very Poor	Very Poor			0	29
post oak	Quercus stellata	WDH	High	25.8	50.8	1.4	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	30
water oak	Quercus nigra	WDH	High	21.7	49.9	1.3	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	1	31
sycamore	Platanus occidentalis	NSL	Low	6.5	33.0	1.5	No change	Sm. inc.	Medium	Rare	Poor	Fair	Infill +	Infill +	1	32
black walnut	Juglans nigra	WDH	Low	12.6	30.1	1.8	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	33
swamp chestnut oak	Quercus michauxii	NSL	Low	7.7	29.7	2.2	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	1	34
bald cypress	Taxodium distichum	NSH	Medium	1.6	29.5	8.7	Sm. inc.	Sm. inc.	Medium	Rare	Fair	Fair	Infill +	Infill +	2	35
American elm	Ulmus americana	WDH	Medium	17.4	29.3	1.0	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	1	36
sassafras	Sassafras albidum	WSL	Low	19.7	21.6	1.0	Very Lg. dec.	Lg. dec.	Medium	Rare	Lost	Very Poor			0	37
bitternut hickory	Carya cordiformis	WSL	Low	7.7	21.5	1.9	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			1	38
hackberry	Celtis occidentalis	WDH	Medium	8.3	20.2	1.7	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			1	39
pawpaw	Asimina triloba	NSL	Low	6	19.1	2.0	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	40
sourwood	Oxydendrum arboreum	NDL	High	11	18.9	0.9	Sm. inc.	Sm. dec.	High	Rare	Good	Poor	Infill ++	Infill +	1	41
common persimmon	Diospyros virginiana	NSL	Low	13.2	17.2	1.0	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			1	42
black locust	Robinia pseudoacacia	NDH	Low	11.3	16.8	1.5	Very Lg. dec.	Very Lg. dec.	Medium	Rare	Lost	Lost			0	43
boxelder	Acer negundo	WSH	Low	6.4	14.7	2.0	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor	Infill +	Infill +	1	44
ailanthus	Ailanthus altissima	NSL	FIA	3.5	14.3	3.4	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	45
pin oak	Quercus palustris	NSH	Low	5.7	13.0	1.9	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	46
pitch pine	Pinus rigida	NSH	High	0.3	12.9	4.2	Very Lg. dec.	Very Lg. dec.	Medium	Rare	Lost	Lost			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
shagbark hickory	Carya ovata	WSL	Medium	5.1	9.7	1.9	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	48
sweetbay	Magnolia virginiana	NSL	Medium	4.9	9.4	1.8	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	1	49
eastern redbud	Cercis canadensis	NSL	Low	7.2	8.8	0.7	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	50
bigtooth aspen	Populus grandidentata	NSL	Medium	5	7.9	1.5	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	51
eastern cottonwood	Populus deltoides	NSH	Low	0.5	7.3	3.3	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	52
cherrybark oak; swamp red o	Quercus pagoda	NSL	Medium	3.8	5.7	1.1	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	2	53
pumpkin ash	Fraxinus profunda	NSH	FIA	0.6	5.4	2.8	Unknown	Unknown	NA	Rare	FIA Only	FIA Only			0	54
white mulberry	Morus alba	NSL	FIA	2.1	3.6	1.8	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	55
florida maple	Acer barbatum	NSL	Low	3.2	3.3	0.6	Sm. dec.	No change	High	Rare	Poor	Fair		Infill +	2	56
sugar maple	Acer saccharum	WDH	High	1.5	3.2	0.5	Very Lg. dec.	Very Lg. dec.	High	Rare	Lost	Lost			0	57
Osage-orange	Maclura pomifera	NDH	Medium	0.3	3.0	0.8	Sm. dec.	No change	High	Rare	Poor	Fair		Infill +	2	58
black willow	Salix nigra	NSH	Low	0.4	2.7	0.3	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair		Infill +	2	59
pond pine	Pinus serotina	NSH	Medium	1.2	2.2	0.5	Very Lg. dec.	Very Lg. dec.	Low	Rare	Lost	Lost			0	60
yellow birch	Betula alleghaniensis	NDL	High	1	2.1	2.1	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	61
laurel oak	Quercus laurifolia	NDH	Medium	1.4	2.1	0.4	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	62
Carolina ash	Fraxinus caroliniana	NSL	FIA	0.7	1.7	1.2	Unknown	Unknown	NA	Rare	FIA Only	FIA Only			0	63
butternut	Juglans cinerea	NSLX	FIA	1	1.7	1.7	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	64
overcup oak	Quercus lyrata	NSL	Medium	2.1	1.7	0.8	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair	Infill +	Infill +	2	65
blackjack oak	Quercus marilandica	NSL	Medium	1.8	1.5	0.7	Very Lg. dec.	Lg. inc.	High	Rare	Lost	Good			2	66
red mulberry	Morus rubra	NSL	Low	2.1	1.5	0.7	Very Lg. dec.	Very Lg. dec.	Medium	Rare	Lost	Lost			0	67
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	1	1.2	1.2	Lg. inc.	Lg. inc.	High	Rare	Good	Good			2	68
sweet birch	Betula lenta	NDH	High	2.2	1.1	0.3	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	69
honeylocust	Gleditsia triacanthos	NSH	Low	2.1	0.9	0.4	Sm. dec.	No change	High	Rare	Poor	Fair		Infill +	2	70
redbay	Persea borbonia	NSL	Low	1	0.7	0.6	Lg. inc.	Lg. inc.	High	Rare	Good	Good			2	71
paulownia	Paulownia tomentosa	NSL	FIA	1	0.5	0.5	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	72
pin cherry	Prunus pensylvanica	NSL	Low	1	0.5	0.5	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	73
serviceberry	Amelanchier spp.	NSL	Low	1	0.3	0.3	Sm. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	74
slash pine	Pinus elliotii	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate ++	3	75
longleaf pine	Pinus palustris	NSH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	76
eastern white pine	Pinus strobus	WDH	High	0	0	0	Unknown	Unknown	Low	Modeled	Unknown	Unknown			0	77
yellow buckeye	Aesculus flava	NSL	Low	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown			0	78
cittamwood/gum bumelia	Sideroxylon lanuginosum ssp.	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			0	79
water hickory	Carya aquatica	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	80
pecan	Carya illinoensis	NSH	Low	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat		Migrate +	3	81
black hickory	Carya texana	NDL	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	82
sugarberry	Celtis laevigata	NDH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	83
black ash	Fraxinus nigra	WSH	Medium	0	0	0	Unknown	New Habitat	Low	Absent	Unknown	New Habitat			3	84
loblolly-bay	Gordonia lasianthus	NSH	Medium	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown			0	85
silverbell	Halesia spp.	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	86
cucumbertree	Magnolia acuminata	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	87
bigleaf magnolia	Magnolia macrophylla	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	88
mountain or Fraser magnolia	Magnolia fraseri	NSL	Low	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown			0	89
water elm	Planera aquatica	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	90
shingle oak	Quercus imbricaria	NDH	Medium	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown			0	91
Shumard oak	Quercus shumardii	NSL	Low	0	0	0	Unknown	Unknown	High	Modeled	Unknown	Unknown			0	92
live oak	Quercus virginiana	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	93
bluejack oak	Quercus incana	NSL	Low	0	0	0	Unknown	New Habitat	Medium	Absent	Unknown	New Habitat			3	94



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
cedar elm	Ulmus crassifolia	NDH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			0	95