

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	146

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		RCP45	RCP85	RCP45	RCP85	RCP45	RCP85				
Ash	3			14	22	Increase	22	28	Very Good	5	8	Likely	0	0	
Hickory	7			28	44	No Change	14	13	Good	19	19	Infill	13	14	
Maple	4	Abundant	3	Low	33	10	Decrease	21	16	Fair	12	13	Migrate	5	8
Oak	14	Common	26	FIA	3		New	10	10	Poor	10	8			
Pine	2	Rare	31				Unknown	11	11	Very Poor	10	8			
Other	30	Absent	17							FIA Only	1	1			
	60		77		78	76		78	78	Unknown	8	8			
											65	65			

Potential Changes in Climate Variables

Temperature (°F)

	Scenario	2009	2039	2069	2099	
Annual Average	CCSM45	55.5	57.4	59.4	59.7	
	CCSM85	55.5	57.9	60.3	63.4	
	GFDL45	55.5	59.4	60.8	61.7	
	GFDL85	55.5	58.4	61.6	65.5	
	HAD45	55.5	58.3	61.5	63.1	
	HAD85	55.5	58.6	63.3	67.3	
Growing Season May—Sep	CCSM45	72.4	74.4	75.9	76.6	
	CCSM85	72.4	75.0	77.5	81.3	
	GFDL45	72.4	77.0	78.6	80.1	
	GFDL85	72.4	75.9	79.7	84.5	
	HAD45	72.4	75.5	78.4	80.4	
	HAD85	72.4	75.9	81.9	85.6	
Coldest Month Average	CCSM45	28.9	30.9	32.4	32.7	
	CCSM85	28.9	31.8	32.8	34.5	
	GFDL45	28.9	33.6	33.8	34.3	
	GFDL85	28.9	31.9	33.1	34.0	
	HAD45	28.9	30.3	32.9	33.1	
	HAD85	28.9	31.7	34.2	36.1	
Warmest Month Average	CCSM45	78.6	80.8	81.7	82.3	
	CCSM85	78.6	81.6	83.2	84.9	
	GFDL45	78.6	82.0	83.6	84.5	
	GFDL85	78.6	82.4	84.2	87.3	
	HAD45	78.6	82.1	84.2	85.0	
	HAD85	78.6	83.7	87.3	89.2	

Precipitation (in)

	Scenario	2009	2039	2069	2099	
Annual Total	CCSM45	41.7	40.5	45.3	44.0	
	CCSM85	41.7	43.5	44.7	45.6	
	GFDL45	41.7	47.1	49.2	50.1	
	GFDL85	41.7	46.6	52.8	53.9	
	HAD45	41.7	42.5	44.7	44.6	
	HAD85	41.7	44.2	42.2	45.3	
Growing Season May—Sep	CCSM45	19.3	18.3	20.5	19.0	
	CCSM85	19.3	19.4	19.1	19.2	
	GFDL45	19.3	21.4	21.2	22.0	
	GFDL85	19.3	21.6	22.9	23.2	
	HAD45	19.3	18.9	18.1	18.3	
	HAD85	19.3	19.1	16.1	16.4	

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
white oak	Quercus alba	WDH	Medium	57.8	927.1	12.5	Sm. dec.	Lg. dec.	High	Abundant	Good	Good			1	1
post oak	Quercus stellata	WDH	High	34.5	757.6	14.7	Sm. inc.	Sm. inc.	High	Abundant	Very Good	Very Good			1	2
eastern redcedar	Juniperus virginiana	WDH	Medium	39.1	727.2	15.3	No change	No change	Medium	Abundant	Good	Good			1	3
black oak	Quercus velutina	WDH	High	44.7	439.0	6.8	Sm. inc.	No change	Medium	Common	Good	Fair			1	4
sugar maple	Acer saccharum	WDH	High	43.5	437.9	8.6	No change	No change	High	Common	Good	Good			1	5
northern red oak	Quercus rubra	WDH	Medium	45.7	351.0	6.5	Sm. dec.	Sm. dec.	High	Common	Fair	Fair			1	6
hackberry	Celtis occidentalis	WDH	Medium	47	321.0	7.5	No change	No change	High	Common	Good	Good			1	7
American elm	Ulmus americana	WDH	Medium	62.2	250.1	4.6	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good			1	8
shagbark hickory	Carya ovata	WSL	Medium	47.7	191.4	3.7	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	9
chinkapin oak	Quercus muehlenbergii	NSL	Medium	28	187.9	5.9	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	10
shingle oak	Quercus imbricaria	NDH	Medium	24.5	178.5	5.5	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	11
white ash	Fraxinus americana	WDL	Medium	41.6	169.9	4.2	Sm. inc.	Sm. inc.	Low	Common	Fair	Fair			1	12
boxelder	Acer negundo	WSH	Low	43.9	150.0	10.1	No change	Sm. inc.	High	Common	Good	Very Good			1	13
black walnut	Juglans nigra	WDH	Low	33.4	141.7	4.0	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	14
pignut hickory	Carya glabra	WDL	Medium	26.7	132.4	2.7	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	15
slippery elm	Ulmus rubra	WSL	Low	44.9	130.6	3.1	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	16
black willow	Salix nigra	NSH	Low	6.8	123.5	29.8	Sm. dec.	No change	Low	Common	Poor	Poor	Infill +	Infill +	2	17
sassafras	Sassafras albidum	WSL	Low	42.5	120.2	3.3	No change	No change	Medium	Common	Fair	Fair			1	18
shortleaf pine	Pinus echinata	WDH	High	4.5	114.8	8.0	No change	No change	Medium	Common	Fair	Fair	Infill +	Infill +	1	19
black hickory	Carya texana	NDL	High	25.5	111.1	3.1	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	20
green ash	Fraxinus pennsylvanica	WSH	Low	29.9	107.3	3.3	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	21
eastern cottonwood	Populus deltoides	NSH	Low	24.4	102.0	11.9	Sm. dec.	No change	Medium	Common	Poor	Fair	Infill +	Infill +	1	22
mockernut hickory	Carya alba	WDL	Medium	26.8	94.0	2.0	Sm. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	23
bitternut hickory	Carya cordiformis	WSL	Low	24.3	89.4	2.9	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	24
black cherry	Prunus serotina	WDL	Medium	30.7	89.0	2.6	Sm. inc.	Sm. inc.	Low	Common	Fair	Fair			1	25
red mulberry	Morus rubra	NSL	Low	37.9	83.9	3.9	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	26
honeylocust	Gleditsia triacanthos	NSH	Low	9.8	61.0	5.0	No change	Sm. inc.	High	Common	Good	Very Good			1	27
eastern redbud	Cercis canadensis	NSL	Low	29.5	58.9	3.6	No change	Sm. inc.	Medium	Common	Fair	Good			1	28
flowering dogwood	Cornus florida	WDL	Medium	43.4	56.0	1.3	No change	No change	Medium	Common	Fair	Fair			1	29
scarlet oak	Quercus coccinea	WDL	Medium	10.6	49.3	3.2	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	30
silver maple	Acer saccharinum	NSH	Low	20.5	49.0	10.1	Lg. inc.	Lg. inc.	High	Rare	Good	Good			1	31
sycamore	Platanus occidentalis	NSL	Low	18.1	45.6	4.1	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	1	32
black locust	Robinia pseudoacacia	NDH	Low	6.2	41.9	14.0	No change	Sm. inc.	Medium	Rare	Poor	Fair	Infill +	Infill +	1	33
blackgum	Nyssa sylvatica	WDL	Medium	4.7	39.9	4.1	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	1	34
blue ash	Fraxinus quadrangulata	NSL	Low	1.7	39.1	13.9	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	35
sugarberry	Celtis laevigata	NDH	Medium	1	37.3	36.1	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	36
Shumard oak	Quercus shumardii	NSL	Low	8.9	33.1	2.9	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	1	37
common persimmon	Diospyros virginiana	NSL	Low	23	32.3	1.6	Lg. inc.	Lg. inc.	High	Rare	Good	Good			1	38
American basswood	Tilia americana	WSL	Medium	8.8	27.7	4.7	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	39
winged elm	Ulmus alata	WDL	Medium	6.7	24.4	3.3	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	1	40
blackjack oak	Quercus marilandica	NSL	Medium	9.1	21.7	1.5	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	1	41
red maple	Acer rubrum	WDH	High	12	19.9	1.8	Sm. dec.	Sm. inc.	High	Rare	Poor	Good		Infill ++	1	42
Ohio buckeye	Aesculus glabra	NSL	Low	1	18.0	17.5	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	43
bur oak	Quercus macrocarpa	NDH	Medium	1.6	16.8	6.0	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor			0	44
southern red oak	Quercus falcata	WDL	Medium	1.3	16.5	5.0	Lg. inc.	Lg. inc.	High	Rare	Good	Good			2	45
pawpaw	Asimina triloba	NSL	Low	4.3	12.4	2.2	Lg. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	46
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	8.7	10.7	1.1	No change	Sm. inc.	High	Rare	Fair	Good	Infill +	Infill ++	1	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
Osage-orange	Maclura pomifera	NDH	Medium	2.3	10.7	2.0	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	48
pin oak	Quercus palustris	NSH	Low	1	8.8	2.5	No change	No change	Low	Rare	Very Poor	Very Poor			2	49
pecan	Carya illinoensis	NSH	Low	2.1	7.2	3.5	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair	Infill +	Infill +	2	50
serviceberry	Amelanchier spp.	NSL	Low	9.9	6.1	0.8	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	51
eastern white pine	Pinus strobus	WDH	High	1	6.0	5.8	Very Lg. dec.	Very Lg. dec.	Low	Rare	Lost	Lost			0	52
American hornbeam; musclev	Carpinus caroliniana	WSL	Low	0.2	5.7	0.4	Sm. dec.	Sm. inc.	Medium	Rare	Very Poor	Fair			0	53
shellbark hickory	Carya laciniosa	NSL	Low	3.1	5.4	1.8	Sm. dec.	No change	Medium	Rare	Very Poor	Poor			0	54
Kentucky coffeetree	Gymnocladus dioicus	NSLX	FIA	3.1	5.4	1.7	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	55
ailanthus	Ailanthus altissima	NSL	FIA	5.2	5.3	5.3	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	56
cherrybark oak; swamp red o	Quercus pagoda	NSL	Medium	0.6	5.1	3.1	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good	Infill +		2	57
cittamwood/gum bumelia	Sideroxylon lanuginosum ssp.	NSL	Low	4.7	3.7	0.7	Lg. inc.	Lg. inc.	High	Rare	Good	Good		Infill ++	2	58
swamp white oak	Quercus bicolor	NSL	Low	1	3.5	3.4	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	59
white mulberry	Morus alba	NSL	FIA	4.2	3.1	4.4	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	60
ashe juniper	Juniperus ashei	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	61
loblolly pine	Pinus taeda	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	62
striped maple	Acer pensylvanicum	NSL	Medium	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	63
mountain maple	Acer spicatum	NSL	Low	0	0	0	Unknown	Unknown	High	Absent	Unknown	Unknown			0	64
American beech	Fagus grandifolia	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	65
black ash	Fraxinus nigra	WSH	Medium	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown			0	66
silverbell	Halesia spp.	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	67
sweetgum	Liquidambar styraciflua	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate ++	Migrate ++	3	68
yellow-poplar	Liriodendron tulipifera	WDH	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	69
cucumbertree	Magnolia acuminata	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	70
bigleaf magnolia	Magnolia macrophylla	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	71
bigtooth aspen	Populus grandidentata	NSL	Medium	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown			0	72
pin cherry	Prunus pensylvanica	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	73
overcup oak	Quercus lyrata	NSL	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat		Migrate +	3	74
water oak	Quercus nigra	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	75
willow oak	Quercus phellos	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	76
live oak	Quercus virginiana	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	77
cedar elm	Ulmus crassifolia	NDH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat		Migrate ++	3	78