

	sq. km	sq. mi	FIA Plots
Area of Region	24,377	9,412.2	641

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	4			19	24	Increase	23	31	Very Good	9	12	Likely	0	0	
Hickory	6			40	60	No Change	16	11	Good	12	17	Infill	16	19	
Maple	4	Abundant	4	Low	38	14	Decrease	40	37	Fair	14	11	Migrate	0	3
Oak	20	Common	23	FIA	6		New	9	9	Poor	18	16		16	22
Pine	7	Rare	58				Unknown	15	15	Very Poor	24	21			
Other	44	Absent	16							FIA Only	3	3			
	85		101		103	98		103	103	Unknown	9	9			
											89	89			

Potential Changes in Climate Variables

Temperature (°F)

	Scenario	2009	2039	2069	2099	
Annual Average	CCSM45	61.3	62.9	64.7	64.8	
	CCSM85	61.3	63.2	65.4	68.0	
	GFDL45	61.3	64.3	66.1	67.0	
	GFDL85	61.3	64.0	67.2	70.7	
	HAD45	61.3	63.0	65.7	66.9	
HAD85	61.3	63.4	66.4	70.0		
Growing Season (May—Sep)	CCSM45	75.0	76.4	77.9	78.3	
	CCSM85	75.0	76.5	78.8	81.9	
	GFDL45	75.0	78.2	80.1	81.4	
	GFDL85	75.0	78.0	81.5	85.3	
	HAD45	75.0	77.0	79.3	80.7	
HAD85	75.0	77.0	80.6	84.2		
Coldest Month (Average)	CCSM45	40.9	43.1	44.0	44.2	
	CCSM85	40.9	43.3	44.2	45.5	
	GFDL45	40.9	44.0	44.5	45.2	
	GFDL85	40.9	42.9	43.9	45.0	
	HAD45	40.9	41.3	43.1	43.5	
HAD85	40.9	41.7	42.9	44.5		
Warmest Month (Average)	CCSM45	80.0	81.4	82.3	82.3	
	CCSM85	80.0	81.6	83.1	84.4	
	GFDL45	80.0	82.4	83.5	84.5	
	GFDL85	80.0	83.1	84.8	87.0	
	HAD45	80.0	82.2	83.6	84.1	
HAD85	80.0	82.5	84.6	86.6		

Precipitation (in)

	Scenario	2009	2039	2069	2099	
Annual Total	CCSM45	50.2	55.4	57.1	56.8	
	CCSM85	50.2	55.6	57.2	63.5	
	GFDL45	50.2	53.9	57.1	59.7	
	GFDL85	50.2	53.0	57.7	58.1	
	HAD45	50.2	53.7	53.3	51.8	
HAD85	50.2	56.1	51.4	49.2		
Growing Season (May—Sep)	CCSM45	25.2	30.7	31.4	31.4	
	CCSM85	25.2	29.0	30.6	34.1	
	GFDL45	25.2	27.1	29.3	31.1	
	GFDL85	25.2	26.3	30.2	30.9	
	HAD45	25.2	27.3	26.2	24.2	
HAD85	25.2	28.4	24.7	21.5		

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>.

Section 232I

EcoMap 2007
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	83.8	3968.3	27.5	No change	No change	Medium	Abundant	Good	Good			1	1
red maple	Acer rubrum	WDH	High	84.7	1399.5	10.4	Sm. dec.	Sm. dec.	High	Abundant	Good	Good			1	2
sweetgum	Liquidambar styraciflua	WDH	High	79.1	1244.3	8.8	No change	No change	Medium	Abundant	Good	Good			1	3
pond pine	Pinus serotina	NSH	Medium	26.9	647.0	18.1	No change	No change	Low	Abundant	Fair	Fair			0	4
swamp tupelo	Nyssa biflora	NDH	Medium	52.7	482.2	5.9	Sm. inc.	Sm. inc.	Low	Common	Fair	Fair			1	5
yellow-poplar	Liriodendron tulipifera	WDH	High	41	430.5	5.2	Lg. dec.	Lg. dec.	High	Common	Fair	Fair			1	6
water oak	Quercus nigra	WDH	High	44	250.4	3.3	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	7
redbay	Persea borbonia	NSL	Low	46.6	221.4	3.0	No change	No change	High	Common	Good	Good			1	8
American holly	Ilex opaca	NSL	Medium	39.6	178.1	1.8	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	9
green ash	Fraxinus pennsylvanica	WSH	Low	26.5	159.2	5.0	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good			1	10
water tupelo	Nyssa aquatica	NSH	Medium	7.6	155.0	10.1	No change	No change	Low	Common	Poor	Poor	Infill +	Infill +	0	11
sweetbay	Magnolia virginiana	NSL	Medium	47.3	152.8	2.5	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	12
bald cypress	Taxodium distichum	NSH	Medium	20.4	149.9	4.5	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	13
loblolly-bay	Gordonia lasianthus	NSH	Medium	14.4	149.2	7.9	No change	Sm. dec.	Medium	Common	Fair	Poor	Infill +	Infill +	1	14
white oak	Quercus alba	WDH	Medium	20.6	123.7	2.1	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	15
southern red oak	Quercus falcata	WDL	Medium	16.2	94.5	2.0	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	16
black cherry	Prunus serotina	WDL	Medium	19.4	75.0	1.7	Sm. inc.	Lg. inc.	Low	Common	Fair	Good			1	17
American beech	Fagus grandifolia	WDH	High	12.3	74.7	2.2	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor	Infill +	Infill +	0	18
blackgum	Nyssa sylvatica	WDL	Medium	27.4	74.3	1.3	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	19
pond cypress	Taxodium ascendens	NSH	Medium	6.6	72.1	8.4	No change	No change	Medium	Common	Fair	Fair	Infill +	Infill +	2	20
American hornbeam; muscle	Carpinus caroliniana	WSL	Low	21	70.3	1.9	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good			1	21
longleaf pine	Pinus palustris	NSH	Medium	4.9	70.1	5.2	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good	Infill ++	Infill ++	2	22
Atlantic white-cedar	Chamaecyparis thyoides	NSH	Low	11.1	66.2	7.1	Lg. dec.	Lg. dec.	Low	Common	Very Poor	Very Poor			0	23
laurel oak	Quercus laurifolia	NDH	Medium	18.9	65.9	2.6	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	24
willow oak	Quercus phellos	NSL	Low	17.5	65.3	1.9	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	25
American elm	Ulmus americana	WDH	Medium	22	62.2	2.0	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good	Infill ++	Infill ++	1	26
swamp chestnut oak	Quercus michauxii	NSL	Low	15.4	58.6	2.2	No change	Sm. inc.	Medium	Common	Fair	Good			1	27
sourwood	Oxydendrum arboreum	NDL	High	16.5	48.4	1.5	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			1	28
cherrybark oak; swamp red o	Quercus pagoda	NSL	Medium	8.8	43.0	1.6	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	1	29
Virginia pine	Pinus virginiana	NDH	High	3.4	39.8	1.3	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	30
black willow	Salix nigra	NSH	Low	7	36.7	3.6	No change	Sm. inc.	Low	Rare	Very Poor	Poor		Infill +	1	31
mockernut hickory	Carya alba	WDL	Medium	9.4	35.7	1.0	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	1	32
sassafras	Sassafras albidum	WSL	Low	3.6	35.5	3.7	Lg. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	33
black oak	Quercus velutina	WDH	High	7.3	31.2	1.0	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	34
slash pine	Pinus elliotii	NDH	High	1	27.5	21.9	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	35
flowering dogwood	Cornus florida	WDL	Medium	11.6	27.5	1.2	No change	Sm. inc.	Medium	Rare	Poor	Fair			1	36
eastern redcedar	Juniperus virginiana	WDH	Medium	4.7	26.5	1.3	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	37
slippery elm	Ulmus rubra	WSL	Low	6.3	25.0	2.9	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	38
sycamore	Platanus occidentalis	NSL	Low	3.2	24.4	2.2	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	39
chestnut oak	Quercus prinus	NDH	High	1.1	21.4	1.5	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			0	40
pignut hickory	Carya glabra	WDL	Medium	5	21.2	1.0	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	41
pumpkin ash	Fraxinus profunda	NSH	FIA	4.2	19.9	4.4	Unknown	Unknown	NA	Rare	FIA Only	FIA Only			0	42
post oak	Quercus stellata	WDH	High	6.9	18.0	1.4	No change	Lg. inc.	High	Rare	Fair	Good	Infill +	Infill ++	2	43
black locust	Robinia pseudoacacia	NDH	Low	1.1	14.9	1.8	Very Lg. dec.	Very Lg. dec.	Medium	Rare	Lost	Lost			0	44
common persimmon	Diospyros virginiana	NSL	Low	4.3	14.5	0.7	Lg. dec.	Sm. dec.	High	Rare	Poor	Poor		Infill +	1	45
northern red oak	Quercus rubra	WDH	Medium	3.6	14.5	1.1	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor	Infill +	Infill +	2	46
river birch	Betula nigra	NSL	Low	2.5	13.3	2.6	No change	Sm. inc.	Medium	Rare	Poor	Fair	Infill +	Infill +	1	47



Section 232I

EcoMap 2007
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
hackberry	Celtis occidentalis	WDH	Medium	1.1	12.9	3.5	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor			0	48
scarlet oak	Quercus coccinea	WDL	Medium	3.8	12.2	0.6	Sm. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			2	49
boxelder	Acer negundo	WSH	Low	2.9	10.3	1.6	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor		Infill +	2	50
Carolina ash	Fraxinus caroliniana	NSL	FIA	3.1	9.5	4.7	Unknown	Unknown	NA	Rare	FIA Only	FIA Only			0	51
black walnut	Juglans nigra	WDH	Low	1	9.2	1.9	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	52
eastern cottonwood	Populus deltoides	NSH	Low	2.5	8.1	1.1	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	53
turkey oak	Quercus laevis	NSH	Medium	0.1	6.6	0.5	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	54
sugarberry	Celtis laevigata	NDH	Medium	0.3	6.4	2.9	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	55
live oak	Quercus virginiana	NDH	High	0.7	6.3	2.1	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	56
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	3.4	5.5	1.2	Sm. dec.	No change	High	Rare	Poor	Fair		Infill +	2	57
white ash	Fraxinus americana	WDL	Medium	2.6	4.7	0.6	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	58
overcup oak	Quercus lyrata	NSL	Medium	3.8	4.6	0.8	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair	Infill +	Infill +	2	59
shagbark hickory	Carya ovata	WSL	Medium	0.9	4.2	1.8	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			2	60
pin oak	Quercus palustris	NSH	Low	0.1	4.1	0.6	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	61
paulownia	Paulownia tomentosa	NSL	FIA	0.7	3.7	0.6	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	62
winged elm	Ulmus alata	WDL	Medium	1.1	3.7	0.4	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good			2	63
Shumard oak	Quercus shumardii	NSL	Low	1.8	3.2	0.9	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor			0	64
pecan	Carya illinoensis	NSH	Low	0.4	2.8	6.8	Sm. dec.	Lg. inc.	Low	Rare	Very Poor	Fair		Infill +	2	65
red mulberry	Morus rubra	NSL	Low	0.6	2.5	0.3	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	66
florida maple	Acer barbatum	NSL	Low	0.5	2.3	2.1	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			0	67
bitternut hickory	Carya cordiformis	WSL	Low	0.5	2.1	1.8	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor			0	68
ailanthus	Ailanthus altissima	NSL	FIA	0.8	2.1	0.7	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	69
cucumbertree	Magnolia acuminata	NSL	Low	0.9	1.9	1.1	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	70
shortleaf pine	Pinus echinata	WDH	High	0.5	1.8	2.0	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	71
southern magnolia	Magnolia grandiflora	NSL	Low	0.8	1.7	0.6	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good		Infill +	2	72
blackjack oak	Quercus marilandica	NSL	Medium	1.2	1.5	0.5	Very Lg. dec.	Sm. inc.	High	Rare	Lost	Good			2	73
pawpaw	Asimina triloba	NSL	Low	0.8	1.2	0.6	Lg. dec.	Very Lg. dec.	Medium	Rare	Very Poor	Lost			0	74
water hickory	Carya aquatica	NSL	Medium	0.6	1.1	0.3	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good		Infill +	2	75
serviceberry	Amelanchier spp.	NSL	Low	1.8	0.6	0.2	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	76
chokecherry	Prunus virginiana	NSLX	FIA	0	0.2	0.1	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	77
eastern white pine	Pinus strobus	WDH	High	0.1	0.2	0.1	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	78
bigtooth aspen	Populus grandidentata	NSL	Medium	0	0.2	0.1	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	79
chinkapin oak	Quercus muehlenbergii	NSL	Medium	0.3	0.2	0.3	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	80
bigleaf magnolia	Magnolia macrophylla	NSL	Low	0.3	0.2	0.2	Sm. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	81
sugar maple	Acer saccharum	WDH	High	0.4	0.1	0.3	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			0	82
white mulberry	Morus alba	NSL	FIA	0.5	0.1	0.5	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	83
swamp white oak	Quercus bicolor	NSL	Low	0.4	0.1	0.3	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	84
Osage-orange	Maclura pomifera	NDH	Medium	0.1	0.1	0.0	Lg. dec.	Lg. inc.	High	Rare	Poor	Good			2	85
sand pine	Pinus clausa	NDH	High	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	86
spruce pine	Pinus glabra	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	87
striped maple	Acer pensylvanicum	NSL	Medium	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	88
cittamwood/gum bumelia	Sideroxylon lanuginosum ssp.	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			0	89
shellbark hickory	Carya laciniosa	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	90
black hickory	Carya texana	NDL	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	91
eastern redbud	Cercis canadensis	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	92
black ash	Fraxinus nigra	WSH	Medium	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown			0	93
honeylocust	Gleditsia triacanthos	NSH	Low	0	0	0	Unknown	New Habitat	High	Absent	Unknown	New Habitat		Migrate +	3	94



Section 232I

EcoMap 2007

Climate Change Atlas Tree Species

Current and Potential Future Habitat, Capability, and Migration

USDA Forest Service
Northern Research Station
Landscape Change Research Group
Iverson, Peters, Prasad, Matthews

Common Name	Scientific Name	Range	MR	%Cell	FIAsum	FIAiv	ChngCl45	ChngCl85	Adap	Abund	Capabil45	Capabil85	SHIFT45	SHIFT85	SSO	N
silverbell	Halesia spp.	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	95
water elm	Planera aquatica	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +		3	96
quaking aspen	Populus tremuloides	WDH	High	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown			0	97
pin cherry	Prunus pensylvanica	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	98
shingle oak	Quercus imbricaria	NDH	Medium	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown			0	99
bluejack oak	Quercus incana	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +		3	100
cabbage palmetto	Sabal palmetto	NDH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	101
American basswood	Tilia americana	WSL	Medium	0	0	0	New Habitat	Unknown	Medium	Absent	New Habitat	Unknown			3	102
cedar elm	Ulmus crassifolia	NDH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			0	103