

	sq. km	sq. mi	FIA Plots
Area of Region	62,792	24,244	1,387

**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	24	Increase	27	33	Very Good	16	19	Likely	2	2
Hickory	8			Medium	36	No Change	23	19	Good	17	14	Infill	11	13
Maple	8	Abundant	4	Low	43	Decrease	36	34	Fair	9	13	Migrate	3	5
Oak	20	Common	37	FIA	10	New	12	11	Poor	17	16			
Pine	5	Rare	55			Unknown	15	16	Very Poor	27	24			
Other	52	Absent	16						FIA Only	6	6			
	<b>96</b>		<b>112</b>		<b>113</b>		<b>113</b>	<b>113</b>	Unknown	5	6		<b>16</b>	<b>20</b>
										<b>97</b>	<b>98</b>			

**Potential Changes in Climate Variables**

**Temperature (°F)**

	Scenario	2009	2039	2069	2099	
Annual Average	CCSM45	58.1	59.9	62.2	62.4	
	CCSM85	58.1	60.3	63.0	65.9	
	GFDL45	58.1	61.2	63.1	63.8	
	GFDL85	58.1	60.8	64.1	67.6	
	HAD45	58.1	60.6	63.8	65.1	
HAD85	58.1	61.0	65.6	69.4		
Growing Season (May—Sep)	CCSM45	73.0	74.7	76.7	77.3	
	CCSM85	73.0	75.1	78.0	81.8	
	GFDL45	73.0	76.5	78.7	80.0	
	GFDL85	73.0	76.1	80.2	84.2	
	HAD45	73.0	76.3	79.4	81.0	
HAD85	73.0	76.7	83.3	86.8		
Coldest Month (Average)	CCSM45	35.2	37.1	38.5	38.8	
	CCSM85	35.2	38.3	39.4	40.9	
	GFDL45	35.2	38.9	38.9	39.2	
	GFDL85	35.2	36.8	38.0	38.5	
	HAD45	35.2	35.6	37.8	38.2	
HAD85	35.2	36.9	38.7	40.3		
Warmest Month (Average)	CCSM45	78.1	79.7	80.9	81.1	
	CCSM85	78.1	80.1	81.8	83.6	
	GFDL45	78.1	81.3	82.7	83.5	
	GFDL85	78.1	81.4	83.8	86.0	
	HAD45	78.1	82.5	85.1	85.8	
HAD85	78.1	83.8	88.5	89.9		

**Precipitation (in)**

	Scenario	2009	2039	2069	2099	
Annual Total	CCSM45	52.7	54.4	59.6	57.6	
	CCSM85	52.7	58.4	58.8	63.2	
	GFDL45	52.7	59.8	62.7	65.9	
	GFDL85	52.7	59.9	63.5	66.9	
	HAD45	52.7	50.5	55.1	55.4	
HAD85	52.7	52.9	49.1	54.1		
Growing Season (May—Sep)	CCSM45	21.5	20.9	22.2	21.8	
	CCSM85	21.5	22.5	20.4	22.2	
	GFDL45	21.5	24.9	25.3	26.1	
	GFDL85	21.5	24.9	25.8	26.7	
	HAD45	21.5	20.2	20.0	19.8	
HAD85	21.5	21.1	16.2	17.6		

**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-DGP30 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.

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Section 223E

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
white oak	Quercus alba	WDH	Medium	57.9	659.1	9.8	No change	No change	High	Abundant	Very Good	Very Good			1	1
sugar maple	Acer saccharum	WDH	High	64.5	643.4	9.3	Lg. dec.	Lg. dec.	High	Abundant	Good	Good			1	2
yellow-poplar	Liriodendron tulipifera	WDH	High	62	636.8	9.2	Lg. dec.	Lg. dec.	High	Abundant	Good	Good			1	3
eastern redcedar	Juniperus virginiana	WDH	Medium	57.8	632.7	11.2	Sm. inc.	Sm. inc.	Medium	Abundant	Very Good	Very Good			1	4
pignut hickory	Carya glabra	WDL	Medium	57.8	350.3	5.4	Sm. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	5
red maple	Acer rubrum	WDH	High	45.3	289.3	5.6	No change	No change	High	Common	Good	Good			1	6
loblolly pine	Pinus taeda	WDH	High	14	272.3	14.8	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good	Infill ++	Infill ++	1	7
sweetgum	Liquidambar styraciflua	WDH	High	35.1	267.1	7.5	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	8
hackberry	Celtis occidentalis	WDH	Medium	35.2	251.5	7.9	No change	Sm. inc.	High	Common	Good	Very Good			1	9
shagbark hickory	Carya ovata	WSL	Medium	48.2	230.3	4.7	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	10
American beech	Fagus grandifolia	WDH	High	40.1	229.2	5.2	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	11
sassafras	Sassafras albidum	WSL	Low	45.3	224.5	4.9	Lg. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	12
winged elm	Ulmus alata	WDL	Medium	54.7	222.9	3.9	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	13
black cherry	Prunus serotina	WDL	Medium	48.9	211.0	4.0	No change	No change	Low	Common	Poor	Poor			0	14
chestnut oak	Quercus prinus	NDH	High	25.6	207.9	7.0	No change	No change	High	Common	Good	Good			1	15
blackgum	Nyssa sylvatica	WDL	Medium	54.9	207.1	3.4	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	16
white ash	Fraxinus americana	WDL	Medium	43.5	206.7	4.7	No change	No change	Low	Common	Poor	Poor			0	17
mockernut hickory	Carya alba	WDL	Medium	45.1	203.1	4.2	Sm. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	18
black oak	Quercus velutina	WDH	High	42	187.7	4.1	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	19
scarlet oak	Quercus coccinea	WDL	Medium	34.8	186.7	5.0	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	20
northern red oak	Quercus rubra	WDH	Medium	38.6	178.2	4.2	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	21
post oak	Quercus stellata	WDH	High	30.8	172.1	5.1	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	22
southern red oak	Quercus falcata	WDL	Medium	28.5	157.8	5.4	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	23
green ash	Fraxinus pennsylvanica	WSH	Low	42.8	155.4	3.4	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good			1	24
chinkapin oak	Quercus muehlenbergii	NSL	Medium	37.4	145.3	3.7	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	25
American elm	Ulmus americana	WDH	Medium	39.3	141.0	3.6	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	26
sourwood	Oxydendrum arboreum	NDL	High	34.2	136.0	3.4	Sm. dec.	Sm. dec.	High	Common	Fair	Fair			1	27
black walnut	Juglans nigra	WDL	Low	37.7	133.8	3.7	No change	No change	Medium	Common	Fair	Fair			1	28
flowering dogwood	Cornus florida	WDL	Medium	44.9	123.6	2.4	No change	No change	Medium	Common	Fair	Fair			1	29
boxelder	Acer negundo	WSH	Low	22.9	121.8	5.9	Sm. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	30
sugarberry	Celtis laevigata	NDH	Medium	20.9	120.2	6.3	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	31
sycamore	Platanus occidentalis	NSL	Low	21.9	100.8	4.4	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	32
bitternut hickory	Carya cordiformis	WSL	Low	23.2	93.3	3.5	No change	No change	High	Common	Good	Good			1	33
black locust	Robinia pseudoacacia	NDH	Low	20.4	93.3	4.8	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	34
slippery elm	Ulmus rubra	NSL	Low	31.7	82.2	2.5	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good			1	35
ailanthus	Ailanthus altissima	WSL	FIA	18.5	74.5	4.3	Unknown	Unknown	NA	Common	NNIS	NNIS			0	36
Osage-orange	Maclura pomifera	NDH	Medium	11.1	72.7	7.1	Sm. inc.	Lg. inc.	High	Common	Very Good	Very Good	Infill ++	Infill ++	1	37
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	35.3	72.4	2.0	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	38
Virginia pine	Pinus virginiana	NDH	High	7.5	66.8	5.0	No change	No change	Medium	Common	Fair	Fair	Infill +	Infill +	1	39
common persimmon	Diospyros virginiana	NSL	Low	24.7	63.2	2.4	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	40
eastern redbud	Cercis canadensis	NSL	Low	33.2	60.6	1.6	No change	No change	Medium	Common	Fair	Fair			1	41
yellow buckeye	Aesculus flava	NSL	Low	11.8	39.4	2.9	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	42
honeylocust	Gleditsia triacanthos	NSH	Low	11.6	36.5	3.1	Lg. inc.	Lg. inc.	High	Rare	Good	Good			1	43
American hornbeam; muscle	Carpinus caroliniana	WSL	Low	17.5	34.8	1.9	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			1	44
blue ash	Fraxinus quadrangulata	NSL	Low	9.1	34.5	4.5	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	45
shortleaf pine	Pinus echinata	WDH	High	4	31.9	3.1	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	2	46
red mulberry	Morus rubra	NSL	Low	17.3	30.6	1.9	Sm. dec.	No change	Medium	Rare	Very Poor	Poor			1	47



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Common Name	Scientific Name	Range	MR	%Cell	FIAsum	FIAiv	ChngCl45	ChngCl85	Adap	Abund	Capabil45	Capabil85	SHIFT45	SHIFT85	SSO	N
shellbark hickory	Carya laciniosa	NSL	Low	8	28.8	3.5	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	48
cherrybark oak; swamp red o	Quercus pagoda	NSL	Medium	6.1	27.2	3.7	No change	Sm. inc.	Medium	Rare	Poor	Fair	Infill +	Infill +	2	49
silver maple	Acer saccharinum	NSH	Low	2.7	24.1	9.1	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor	Infill +	Infill +	2	50
black willow	Salix nigra	NSH	Low	2.9	22.8	8.7	No change	Sm. inc.	Low	Rare	Very Poor	Poor		Infill +	2	51
Shumard oak	Quercus shumardii	NSL	Low	5	22.3	4.6	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	1	52
American basswood	Tilia americana	WSL	Medium	6.4	21.7	2.7	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	53
willow oak	Quercus phellos	NSL	Low	4.4	16.1	5.4	No change	Sm. inc.	Medium	Rare	Poor	Fair	Infill +	Infill +	2	54
water oak	Quercus nigra	WDH	High	4.2	14.0	4.1	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	55
paulownia	Paulownia tomentosa	NSL	FIA	3.9	10.6	2.6	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	56
florida maple	Acer barbatum	NSL	Low	2.4	9.5	5.1	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	57
river birch	Betula nigra	NSL	Low	1.5	9.2	3.5	No change	Sm. inc.	Medium	Rare	Poor	Fair	Infill +	Infill +	2	58
shingle oak	Quercus imbricaria	NDH	Medium	1.9	7.4	2.9	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	59
serviceberry	Amelanchier spp.	NSL	Low	5	7.2	1.0	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	60
blackjack oak	Quercus marilandica	NSL	Medium	1.5	7.2	2.7	Lg. inc.	Lg. inc.	High	Rare	Good	Good			2	61
cucumbertree	Magnolia acuminata	NSL	Low	2.2	6.6	1.4	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	62
pawpaw	Asimina triloba	NSL	Low	4.4	6.5	1.2	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	63
eastern white pine	Pinus strobus	WDH	High	1.1	5.5	6.1	Sm. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			2	64
butternut	Juglans cinerea	NSLX	FIA	2.2	4.2	2.6	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	65
eastern cottonwood	Populus deltoides	NSH	Low	1	3.0	3.2	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	66
pin oak	Quercus palustris	NSH	Low	0.4	2.9	2.4	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	67
overcup oak	Quercus lyrata	NSL	Medium	0.7	2.6	3.1	No change	No change	Low	Rare	Very Poor	Very Poor			2	68
white mulberry	Morus alba	NSL	FIA	1	2.1	2.2	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	69
swamp chestnut oak	Quercus michauxii	NSL	Low	1.3	2.1	1.8	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	70
bigtooth aspen	Populus grandidentata	NSL	Medium	0.2	1.6	4.7	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	71
water tupelo	Nyssa aquatica	NSH	Medium	0.2	1.5	9.0	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	72
Ohio buckeye	Aesculus glabra	NSL	Low	1.2	1.4	0.8	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	73
pitch pine	Pinus rigida	NSH	High	0.3	1.3	2.5	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	74
sand hickory	Carya pallida	NSL	FIA	0.4	1.2	1.3	Unknown	Unknown	NA	Rare	FIA Only	FIA Only			0	75
swamp tupelo	Nyssa biflora	NDH	Medium	0.2	1.1	6.9	No change	No change	Low	Rare	Very Poor	Very Poor			0	76
pin cherry	Prunus pensylvanica	NSL	Low	0.4	1.0	1.3	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	77
swamp white oak	Quercus bicolor	NSL	Low	0.2	1.0	6.2	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	78
eastern hemlock	Tsuga canadensis	NSH	High	0.2	1.0	0.8	No change	No change	Low	Rare	Very Poor	Very Poor			2	79
bigleaf magnolia	Magnolia macrophylla	NSL	Low	0.8	0.9	1.2	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	80
wild plum	Prunus americana	NSLX	FIA	1.5	0.9	1.7	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	81
rock elm	Ulmus thomasii	NSLX	FIA	0	0.7	1.0	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	82
American holly	Ilex opaca	NSL	Medium	0.7	0.7	0.7	No change	Sm. inc.	Medium	Rare	Poor	Fair		Infill +	2	83
pecan	Carya illinoensis	NSH	Low	0.8	0.5	2.0	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair	Infill +	Infill +	2	84
sweet birch	Betula lenta	NDH	High	0.3	0.5	0.6	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	85
bur oak	Quercus macrocarpa	NDH	Medium	0.2	0.4	2.7	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor			0	86
laurel oak	Quercus laurifolia	NDH	Medium	0.7	0.4	2.6	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	87
black maple	Acer nigrum	NSH	Low	0.2	0.4	2.4	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor			0	88
American chestnut	Castanea dentata	NSLX	FIA	0.2	0.4	1.1	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	89
southern magnolia	Magnolia grandiflora	NSL	Low	0.2	0.2	1.4	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	90
Kentucky coffeetree	Gymnocladus dioicus	NSLX	FIA	0.2	0.2	1.2	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	91
mountain maple	Acer spicatum	NSL	Low	0.2	0.1	0.9	No change	No change	High	Rare	Fair	Fair			0	92
yellow birch	Betula alleghaniensis	NDL	High	0	0.1	0.1	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	93
striped maple	Acer pensylvanicum	NSL	Medium	0.2	0.1	0.6	No change	No change	Medium	Rare	Poor	Poor			0	94



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Common Name	Scientific Name	Range	MR	%Cell	FIAsum	FIaiv	ChngCl45	ChngCl85	Adap	Abund	Capabil45	Capabil85	SHIFT45	SHIFT85	SSO	N
Siberian elm	Ulmus pumila	NDH	FIA	0.2	0.1	0.6	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	95
water hickory	Carya aquatica	NSL	Medium	0.2	0.1	0.3	Lg. dec.	No change	Medium	Rare	Very Poor	Poor			0	96
ash juniper	Juniperus ashei	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	97
red spruce	Picea rubens	NDH	High	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown			0	98
slash pine	Pinus elliottii	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate ++	3	99
longleaf pine	Pinus palustris	NSH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	100
Table Mountain pine	Pinus pungens	NSL	Low	0	0	0	Unknown	Unknown	High	Absent	Unknown	Unknown			0	101
bald cypress	Taxodium distichum	NSH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Likely +	Likely +	3	102
cittamwood/gum bumelia	Sideroxylon lanuginosum ssp.	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Likely +	Likely +	3	103
black hickory	Carya texana	NDL	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	104
black ash	Fraxinus nigra	WSH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	105
silverbell	Halesia spp.	NSL	Low	0	0	0	New Habitat	Unknown	Medium	Absent	New Habitat	Unknown			3	106
sweetbay	Magnolia virginiana	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	107
mountain or Fraser magnolia	Magnolia fraseri	NSL	Low	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown			0	108
water elm	Planera aquatica	NSL	Low	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown			0	109
quaking aspen	Populus tremuloides	WDH	High	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	110
live oak	Quercus virginiana	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	111
bluejack oak	Quercus incana	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	112
cedar elm	Ulmus crassifolia	NDH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	113