

	sq. km	sq. mi	FIA Plots
Area of Region	125,997	48,648	3,183

**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	4			High	19	27	Increase	36	41	Very Good	14	16	Likely	1	1
Hickory	7			Medium	36	61	No Change	20	20	Good	19	22	Infill	21	24
Maple	6	Abundant	4	Low	40	13	Decrease	23	18	Fair	13	14	Migrate	1	3
Oak	21	Common	27	FIA	11		New	10	11	Poor	16	13		23	28
Pine	4	Rare	59				Unknown	17	16	Very Poor	17	14			
Other	48	Absent	16							FIA Only	7	7			
	<b>90</b>		<b>106</b>		<b>106</b>	<b>101</b>		<b>106</b>	<b>106</b>	Unknown	6	5			
											<b>92</b>	<b>91</b>			

**Potential Changes in Climate Variables**

**Temperature (°F)**

	Scenario	2009	2039	2069	2099	
Annual Average	CCSM45	56.3	58.2	60.1	60.5	
	CCSM85	56.3	58.7	61.1	64.2	
	GFDL45	56.3	59.6	61.4	62.4	
	GFDL85	56.3	59.2	62.2	66.1	
	HAD45	56.3	58.9	61.9	63.4	
	HAD85	56.3	59.2	63.9	67.6	
Growing Season (May—Sep)	CCSM45	72.4	74.5	76.0	76.7	
	CCSM85	72.4	75.1	77.6	81.4	
	GFDL45	72.4	76.4	78.6	80.3	
	GFDL85	72.4	76.1	79.6	84.4	
	HAD45	72.4	75.4	78.1	79.8	
	HAD85	72.4	75.8	81.7	85.1	
Coldest Month Average	CCSM45	31.0	33.2	34.6	35.0	
	CCSM85	31.0	33.9	35.0	36.7	
	GFDL45	31.0	35.4	35.7	35.9	
	GFDL85	31.0	33.4	34.7	35.4	
	HAD45	31.0	32.2	34.7	34.8	
	HAD85	31.0	33.8	36.0	37.9	
Warmest Month Average	CCSM45	78.6	80.8	81.8	82.2	
	CCSM85	78.6	81.6	82.9	84.7	
	GFDL45	78.6	82.8	84.2	85.4	
	GFDL85	78.6	82.8	84.5	87.8	
	HAD45	78.6	82.0	83.9	84.6	
	HAD85	78.6	83.4	86.8	88.3	

**Precipitation (in)**

	Scenario	2009	2039	2069	2099	
Annual Total	CCSM45	45.1	43.8	48.3	46.6	
	CCSM85	45.1	46.1	47.4	48.0	
	GFDL45	45.1	50.0	52.0	51.4	
	GFDL85	45.1	49.8	56.2	56.2	
	HAD45	45.1	44.9	47.8	48.1	
	HAD85	45.1	47.8	43.9	47.0	
Growing Season (May—Sep)	CCSM45	20.6	19.2	20.9	19.9	
	CCSM85	20.6	20.4	19.4	19.8	
	GFDL45	20.6	22.9	22.2	22.9	
	GFDL85	20.6	22.8	24.9	24.4	
	HAD45	20.6	19.8	19.9	19.8	
	HAD85	20.6	20.7	16.8	17.3	

**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 223A

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	72.6	1226.1	17.5	Sm. dec.	Sm. dec.	High	Abundant	Good	Good			1	1
black oak	Quercus velutina	WDH	High	77.3	1091.4	15.3	Sm. dec.	Sm. dec.	Medium	Abundant	Fair	Fair			0	2
post oak	Quercus stellata	WDH	High	74.6	1054.7	15.0	Sm. inc.	Sm. inc.	High	Abundant	Very Good	Very Good			1	3
eastern redcedar	Juniperus virginiana	WDH	Medium	58.8	669.0	12.0	Sm. inc.	Sm. inc.	Medium	Abundant	Very Good	Very Good			1	4
black hickory	Carya texana	NDL	High	60.7	296.7	5.0	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	5
northern red oak	Quercus rubra	WDH	Medium	47.6	291.2	6.1	No change	No change	High	Common	Good	Good			1	6
shortleaf pine	Pinus echinata	WDH	High	21.6	278.8	12.4	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	7
mockernut hickory	Carya alba	WDL	Medium	54.6	229.2	4.3	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	8
American elm	Ulmus americana	WDH	Medium	52.8	219.8	4.6	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	9
black walnut	Juglans nigra	WDH	Low	45.4	212.1	5.4	No change	No change	Medium	Common	Fair	Fair			1	10
blackjack oak	Quercus marilandica	NSL	Medium	33.2	182.4	5.9	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	11
chinkapin oak	Quercus muehlenbergii	NSL	Medium	35.4	146.2	4.4	No change	No change	Medium	Common	Fair	Fair			1	12
scarlet oak	Quercus coccinea	WDL	Medium	17.5	141.9	8.3	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor	Infill +	Infill +	0	13
shagbark hickory	Carya ovata	WSL	Medium	31.7	131.6	4.6	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	14
sugar maple	Acer saccharum	WDH	High	22.9	130.7	6.0	No change	No change	High	Common	Good	Good	Infill ++	Infill ++	1	15
hackberry	Celtis occidentalis	WDH	Medium	33.1	126.7	4.3	Sm. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	16
white ash	Fraxinus americana	WDL	Medium	42.7	124.9	3.2	Sm. inc.	Lg. inc.	Low	Common	Fair	Good			1	17
bitternut hickory	Carya cordiformis	WSL	Low	29.4	105.3	4.0	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	18
southern red oak	Quercus falcata	WDL	Medium	13.3	104.1	7.6	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good	Infill ++	Infill ++	1	19
blackgum	Nyssa sylvatica	WDL	Medium	30.6	103.6	3.3	Sm. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	20
sycamore	Platanus occidentalis	NSL	Low	19.4	98.7	5.3	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good			1	21
sassafras	Sassafras albidum	WDL	Low	40.6	98.7	2.7	Sm. dec.	No change	Medium	Common	Poor	Fair			1	22
black cherry	Prunus serotina	WDL	Medium	38.9	97.0	2.7	Sm. inc.	Sm. inc.	Low	Common	Fair	Fair			1	23
flowering dogwood	Cornus florida	WDL	Medium	47.6	95.6	2.1	No change	No change	Medium	Common	Fair	Fair			1	24
winged elm	Ulmus alata	WDL	Medium	30.9	94.5	2.8	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	25
slippery elm	Ulmus rubra	WSL	Low	38.3	88.4	2.6	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good			1	26
pignut hickory	Carya glabra	WDL	Medium	19.9	83.0	4.3	Sm. dec.	No change	Medium	Common	Poor	Fair	Infill +	Infill +	1	27
honeylocust	Gleditsia triacanthos	NSH	Low	20.5	75.8	4.6	Sm. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	28
common persimmon	Diospyros virginiana	NSL	Low	26.2	56.6	2.4	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	29
green ash	Fraxinus pennsylvanica	WSH	Low	16.2	54.2	3.1	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	30
red maple	Acer rubrum	WDH	High	21.1	51.1	2.3	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	31
boxelder	Acer negundo	WSH	Low	11.2	47.5	5.6	Sm. inc.	Lg. inc.	High	Rare	Good	Good			1	32
Shumard oak	Quercus shumardii	NSL	Low	12.2	47.1	4.3	Sm. inc.	Sm. inc.	High	Rare	Good	Good			1	33
red mulberry	Morus rubra	NSL	Low	29.6	47.0	2.0	No change	No change	Medium	Rare	Poor	Poor			1	34
shingle oak	Quercus imbricaria	NDH	Medium	13.2	45.0	4.2	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	35
sweetgum	Liquidambar styraciflua	WDH	High	4.8	44.5	5.3	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good	Infill +	Infill ++	2	36
silver maple	Acer saccharinum	NSH	Low	4.9	37.4	9.2	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	37
eastern redbud	Cercis canadensis	NSL	Low	24	34.1	1.6	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good			1	38
black locust	Robinia pseudoacacia	NDH	Low	4.7	31.2	6.0	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	1	39
Osage-orange	Maclura pomifera	NDH	Medium	9.3	27.6	5.3	No change	Sm. inc.	High	Rare	Fair	Good	Infill +	Infill ++	1	40
black willow	Salix nigra	NSH	Low	3.1	24.0	7.9	No change	No change	Low	Rare	Very Poor	Very Poor			2	41
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	12.5	21.2	1.7	Lg. inc.	Lg. inc.	High	Rare	Good	Good			1	42
pin oak	Quercus palustris	NSH	Low	2.8	19.6	6.2	No change	No change	Low	Rare	Very Poor	Very Poor			2	43
yellow-poplar	Liriodendron tulipifera	WDH	High	2	14.2	5.8	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	44
eastern cottonwood	Populus deltoides	NSH	Low	3.2	13.7	8.3	Sm. dec.	No change	Medium	Rare	Very Poor	Poor		Infill +	2	45
sugarberry	Celtis laevigata	NDH	Medium	3.3	12.8	2.2	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	2	46
florida maple	Acer barbatum	NSL	Low	2.7	11.1	3.7	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor	Infill +	Infill +	2	47



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Common Name	Scientific Name	Range	MR	%Cell	FIAsum	FIAiv	ChngCl45	ChngCl85	Adap	Abund	Capabil45	Capabil85	SHIFT45	SHIFT85	SSO	N
pecan	Carya illinoensis	NSH	Low	2.7	10.6	4.7	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair	Infill +	Infill +	2	48
ashe juniper	Juniperus ashei	NDH	High	0.7	9.3	13.0	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			0	49
American basswood	Tilia americana	WSL	Medium	3.9	9.1	2.9	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	50
bur oak	Quercus macrocarpa	NDH	Medium	3.7	8.6	3.8	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor	Infill +	Infill +	2	51
wild plum	Prunus americana	NSLX	FIA	3	8.2	2.7	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	52
river birch	Betula nigra	NSL	Low	1.5	8.0	3.8	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	53
serviceberry	Amelanchier spp.	NSL	Low	9.3	7.9	0.9	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	54
blue ash	Fraxinus quadrangulata	NSL	Low	3.2	7.6	2.8	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	55
cherrybark oak; swamp red o	Quercus pagoda	NSL	Medium	1.6	6.8	3.8	No change	Sm. inc.	Medium	Rare	Poor	Fair	Infill +	Infill +	2	56
Ohio buckeye	Aesculus glabra	NSL	Low	3.4	6.5	2.5	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	57
loblolly pine	Pinus taeda	WDH	High	0.4	5.6	12.9	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	58
American hornbeam; musclev	Carpinus caroliniana	WSL	Low	3.9	5.3	1.3	No change	Lg. inc.	Medium	Rare	Poor	Good	Infill +	Infill ++	2	59
pawpaw	Asimina triloba	NSL	Low	3.4	5.0	1.2	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	60
American beech	Fagus grandifolia	WDH	High	0.9	4.8	3.0	No change	Sm. inc.	Medium	Rare	Poor	Fair	Infill +	Infill +	2	61
swamp white oak	Quercus bicolor	NSL	Low	1.1	4.4	2.9	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	62
cittamwood/gum bumelia	Sideroxylon lanuginosum ssp.	NSL	Low	4.6	4.4	1.0	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	63
white mulberry	Morus alba	NSL	FIA	1.8	3.7	2.2	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	64
eastern white pine	Pinus strobus	WDH	High	0.2	3.4	14.2	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	65
overcup oak	Quercus lyrata	NSL	Medium	0.4	2.4	3.9	No change	No change	Low	Rare	Very Poor	Very Poor			2	66
water tupelo	Nyssa aquatica	NSH	Medium	0.3	2.4	7.4	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	67
Kentucky coffeetree	Gymnocladus dioicus	NSLX	FIA	0.6	2.3	3.0	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	68
water oak	Quercus nigra	WDH	High	0.2	2.2	5.5	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	69
ailanthus	Ailanthus altissima	NSL	FIA	1.4	2.0	2.5	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	70
bald cypress	Taxodium distichum	NSH	Medium	0.2	2.0	12.4	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	71
Siberian elm	Ulmus pumila	NDH	FIA	0.2	1.9	11.9	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	72
northern catalpa	Catalpa speciosa	NSHX	FIA	0.2	1.8	6.6	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	73
shellbark hickory	Carya laciniosa	NSL	Low	1.7	1.7	1.9	Sm. dec.	No change	Medium	Rare	Very Poor	Poor		Infill +	2	74
laurel oak	Quercus laurifolia	NDH	Medium	0.2	1.6	10.0	Sm. dec.	No change	Medium	Rare	Very Poor	Poor			0	75
Virginia pine	Pinus virginiana	NDH	High	0.5	1.6	6.6	No change	Sm. inc.	Medium	Rare	Poor	Fair	Infill +	Infill +	2	76
willow oak	Quercus phellos	NSL	Low	0.3	1.1	2.0	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	77
butternut	Juglans cinerea	NSLX	FIA	0.7	1.0	1.3	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	78
paulownia	Paulownia tomentosa	NSL	FIA	0.1	0.8	1.5	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	79
water elm	Planera aquatica	NSL	Low	0	0.7	5.5	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	80
chestnut oak	Quercus prinus	NDH	High	0.1	0.7	8.4	Sm. inc.	Lg. inc.	High	Rare	Good	Good			2	81
swamp chestnut oak	Quercus michauxii	NSL	Low	0.5	0.7	1.1	No change	No change	Medium	Rare	Poor	Poor		Infill +	2	82
cucumber tree	Magnolia acuminata	NSL	Low	0.4	0.6	0.7	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	83
cedar elm	Ulmus crassifolia	NDH	Medium	0.1	0.5	1.4	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair	Infill +	Infill +	2	84
pumpkin ash	Fraxinus profunda	NSH	FIA	0.2	0.3	2.5	Unknown	Unknown	NA	Rare	FIA Only	FIA Only			0	85
waterlocust	Gleditsia aquatica	NSLX	FIA	0.1	0.2	1.0	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	86
black maple	Acer nigrum	NSH	Low	0	0.1	0.3	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			0	87
American holly	Ilex opaca	NSL	Medium	0.1	0.0	0.6	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	88
peachleaf willow	Salix amygdaloides	NSLX	FIA	0.1	0.0	0.4	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	89
Nuttall oak	Quercus texana	NSH	Medium	0	0.0	0.0	Lg. inc.	Lg. inc.	High	Rare	Good	Good			0	90
slash pine	Pinus elliotii	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	91
longleaf pine	Pinus palustris	NSH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	92
striped maple	Acer pensylvanicum	NSL	Medium	0	0	0	Unknown	New Habitat	Medium	Absent	Unknown	New Habitat			3	93
mountain maple	Acer spicatum	NSL	Low	0	0	0	Unknown	New Habitat	High	Absent	Unknown	New Habitat			3	94



# Section 223A

## EcoMap 2007

### Climate Change Atlas Tree Species

#### Current and Potential Future Habitat, Capability, and Migration

USDA Forest Service  
Northern Research Station  
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Iverson, Peters, Prasad, Matthews

Common Name	Scientific Name	Range	MR	%Cell	FIAsum	FIAiv	ChngCl45	ChngCl85	Adap	Abund	Capabil45	Capabil85	SHIFT45	SHIFT85	SSO	N
yellow birch	Betula alleghaniensis	NDL	High	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	95
water hickory	Carya aquatica	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Likely +	Likely +	3	96
black ash	Fraxinus nigra	WSH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	97
silverbell	Halesia spp.	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	98
sweetbay	Magnolia virginiana	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	99
bigleaf magnolia	Magnolia macrophylla	NSL	Low	0	0	0	New Habitat	Unknown	Medium	Absent	New Habitat	Unknown			3	100
mountain or Fraser magnolia	Magnolia fraseri	NSL	Low	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown			0	101
sourwood	Oxydendrum arboreum	NDL	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	102
bigtooth aspen	Populus grandidentata	NSL	Medium	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	103
pin cherry	Prunus pensylvanica	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	104
live oak	Quercus virginiana	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	105
bluejack oak	Quercus incana	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	106