

	sq. km	sq. mi	FIA Plots
Area of Region	78,432	30,283	2,503

**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	2			High	21	28	Increase	37	41	Very Good	15	17	Likely	2	2
Hickory	9			Medium	36	59	No Change	19	16	Good	21	22	Infill	22	20
Maple	5	Abundant	3	Low	41	17	Decrease	34	33	Fair	14	15	Migrate	0	0
Oak	23	Common	32	FIA	10		New	5	5	Poor	17	12			
Pine	8	Rare	65				Unknown	13	13	Very Poor	22	23			
Other	53	Absent	8							FIA Only	7	7			
	<b>100</b>		<b>108</b>		<b>108</b>	<b>104</b>		<b>108</b>	<b>108</b>	Unknown	3	3			
											<b>99</b>	<b>99</b>			

**Potential Changes in Climate Variables**

**Temperature (°F)**

	Scenario	2009	2039	2069	2099	
Annual Average	CCSM45	62.6	64.4	66.4	66.6	
	CCSM85	62.6	64.7	67.2	69.8	
	GFDL45	62.6	65.5	67.3	68.1	
	GFDL85	62.6	65.2	68.3	71.7	
	HAD45	62.6	65.0	67.9	69.3	
	HAD85	62.6	65.3	69.6	73.4	
Growing Season May—Sep	CCSM45	76.4	78.0	79.7	80.2	
	CCSM85	76.4	78.2	80.8	84.1	
	GFDL45	76.4	79.5	81.3	82.8	
	GFDL85	76.4	79.1	82.6	86.6	
	HAD45	76.4	79.8	82.4	83.8	
	HAD85	76.4	79.9	86.0	89.4	
Coldest Month Average	CCSM45	41.9	44.1	45.1	45.0	
	CCSM85	41.9	44.5	45.8	47.0	
	GFDL45	41.9	45.6	45.7	45.9	
	GFDL85	41.9	43.7	44.8	45.2	
	HAD45	41.9	42.1	43.9	44.5	
	HAD85	41.9	43.3	44.7	46.3	
Warmest Month Average	CCSM45	80.8	82.3	83.1	83.3	
	CCSM85	80.8	82.5	83.8	85.7	
	GFDL45	80.8	84.2	84.8	85.7	
	GFDL85	80.8	83.5	85.2	87.4	
	HAD45	80.8	85.3	87.3	87.7	
	HAD85	80.8	85.8	89.8	91.0	

**Precipitation (in)**

	Scenario	2009	2039	2069	2099	
Annual Total	CCSM45	54.9	57.0	62.3	60.3	
	CCSM85	54.9	58.2	59.5	65.2	
	GFDL45	54.9	61.8	65.7	67.2	
	GFDL85	54.9	61.8	64.6	66.9	
	HAD45	54.9	52.8	58.6	59.1	
	HAD85	54.9	56.9	51.7	55.6	
Growing Season May—Sep	CCSM45	21.1	21.3	22.6	22.4	
	CCSM85	21.1	20.5	20.7	22.4	
	GFDL45	21.1	25.2	27.1	26.8	
	GFDL85	21.1	26.1	28.0	28.9	
	HAD45	21.1	19.6	21.6	20.2	
	HAD85	21.1	21.6	16.4	17.4	

**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.

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Section 231B

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	89.6	3625.5	33.6	No change	No change	Medium	Abundant	Good	Good			1	1
sweetgum	Liquidambar styraciflua	WDH	High	91.6	1203.4	10.5	No change	No change	Medium	Abundant	Good	Good			1	2
water oak	Quercus nigra	WDH	High	74.5	557.5	6.5	Lg. inc.	Lg. inc.	Medium	Abundant	Very Good	Very Good			1	3
white oak	Quercus alba	WDH	Medium	61.4	390.9	5.0	No change	No change	High	Common	Good	Good			1	4
red maple	Acer rubrum	WDH	High	74.3	345.5	3.9	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	5
yellow-poplar	Liriodendron tulipifera	WDH	High	59.2	328.1	4.4	Lg. dec.	Lg. dec.	High	Common	Fair	Fair			1	6
southern red oak	Quercus falcata	WDL	Medium	59.8	315.2	4.2	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	7
shortleaf pine	Pinus echinata	WDH	High	48.5	277.1	4.5	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	8
eastern redcedar	Juniperus virginiana	WDH	Medium	40.9	247.9	5.3	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	9
post oak	Quercus stellata	WDH	High	49.4	201.5	3.2	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	10
blackgum	Nyssa sylvatica	WDL	Medium	66.4	190.3	2.3	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	11
pignut hickory	Carya glabra	WDL	Medium	49.2	162.6	2.5	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	12
green ash	Fraxinus pennsylvanica	WSH	Low	38.4	159.2	3.5	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	13
mockernut hickory	Carya alba	WDL	Medium	49.5	153.6	2.5	Sm. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	14
sugarberry	Celtis laevigata	NDH	Medium	24.3	153.0	5.9	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	15
winged elm	Ulmus alata	WDL	Medium	56.4	145.5	2.1	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	16
cherrybark oak; swamp red o	Quercus pagoda	NSL	Medium	32.1	126.2	3.2	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good			1	17
black cherry	Prunus serotina	WDL	Medium	53.2	119.9	1.8	Sm. inc.	Sm. inc.	Low	Common	Fair	Fair			1	18
willow oak	Quercus phellos	NSL	Low	27.6	108.7	3.6	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	19
American hornbeam; muscle	Carpinus caroliniana	WSL	Low	35.7	103.3	2.3	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	20
flowering dogwood	Cornus florida	WDL	Medium	48.5	87.5	1.5	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	21
sourwood	Oxydendrum arboreum	NDL	High	33.5	87.2	2.1	Sm. dec.	Sm. dec.	High	Common	Fair	Fair			1	22
Virginia pine	Pinus virginiana	NDH	High	5.9	71.8	6.5	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor	Infill +	Infill +	0	23
black oak	Quercus velutina	WDH	High	26.4	71.7	2.1	No change	No change	Medium	Common	Fair	Fair			1	24
American beech	Fagus grandifolia	WDH	High	21.8	69.7	2.2	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good	Infill ++	Infill ++	1	25
longleaf pine	Pinus palustris	NSH	Medium	7.9	68.6	6.8	Sm. inc.	Sm. inc.	Medium	Common	Good	Good	Infill ++	Infill ++	1	26
American elm	Ulmus americana	WDH	Medium	24.5	61.7	1.9	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	27
chestnut oak	Quercus prinus	NDH	High	8.9	61.6	4.3	Sm. dec.	Sm. dec.	High	Common	Fair	Fair	Infill +	Infill +	2	28
black willow	Salix nigra	NSH	Low	15.1	60.2	3.7	Lg. inc.	Lg. inc.	Low	Common	Good	Good			1	29
sweetbay	Magnolia virginiana	NSL	Medium	15	57.1	3.2	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	30
boxelder	Acer negundo	WSH	Low	11.8	56.4	3.9	Sm. dec.	No change	High	Common	Fair	Good			1	31
sycamore	Platanus occidentalis	NSL	Low	14.6	55.3	3.2	No change	Sm. inc.	Medium	Common	Fair	Good			1	32
shagbark hickory	Carya ovata	WSL	Medium	18.8	55.0	2.3	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	33
laurel oak	Quercus laurifolia	NDH	Medium	20	53.3	2.3	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	34
common persimmon	Diospyros virginiana	NSL	Low	37.5	50.5	1.1	No change	Sm. inc.	High	Common	Good	Very Good			1	35
river birch	Betula nigra	NSL	Low	9.2	46.9	4.3	No change	No change	Medium	Rare	Poor	Poor			1	36
water tupelo	Nyssa aquatica	NSH	Medium	5.9	44.3	6.5	Sm. dec.	No change	Low	Rare	Very Poor	Very Poor			2	37
scarlet oak	Quercus coccinea	WDL	Medium	13.5	43.5	2.6	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	38
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	21	43.3	1.4	Lg. inc.	Lg. inc.	High	Rare	Good	Good			1	39
swamp tupelo	Nyssa biflora	NDH	Medium	6	41.3	6.7	No change	No change	Low	Rare	Very Poor	Very Poor			0	40
Osage-orange	Maclura pomifera	NDH	Medium	7.4	41.0	7.2	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	1	41
slippery elm	Ulmus rubra	WSL	Low	14.8	36.8	2.0	No change	Sm. inc.	Medium	Rare	Poor	Fair			1	42
overcup oak	Quercus lyrata	NSL	Medium	8.4	36.5	4.2	No change	No change	Low	Rare	Very Poor	Very Poor			0	43
northern red oak	Quercus rubra	WDH	Medium	13.3	31.2	1.6	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor	Infill +	Infill +	1	44
sassafras	Sassafras albidum	WSL	Low	22	29.1	1.1	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			1	45
swamp chestnut oak	Quercus michauxii	NSL	Low	12.1	28.4	1.8	Sm. inc.	Sm. inc.	Medium	Rare	Fair	Fair			1	46
white ash	Fraxinus americana	WDL	Medium	11.5	27.0	2.0	Sm. inc.	Lg. inc.	Low	Rare	Poor	Fair	Infill +	Infill +	1	47



Section 231B

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Common Name	Scientific Name	Range	MR	%Cell	FIAsum	FIAiv	ChngCl45	ChngCl85	Adap	Abund	Capabil45	Capabil85	SHIFT45	SHIFT85	SSO	N
Shumard oak	Quercus shumardii	NSL	Low	8.1	24.3	2.7	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	1	48
red mulberry	Morus rubra	NSL	Low	11.2	24.0	1.6	Lg. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	49
blackjack oak	Quercus marilandica	NSL	Medium	12	23.0	1.7	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	1	50
bald cypress	Taxodium distichum	NSH	Medium	3.3	22.0	4.6	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	51
eastern redbud	Cercis canadensis	NSL	Low	10.1	20.7	1.5	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	52
spruce pine	Pinus glabra	NSL	Low	6.7	18.9	2.0	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	53
florida maple	Acer barbatum	NSL	Low	8.6	17.1	1.4	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	1	54
pecan	Carya illinoensis	NSH	Low	4.7	15.5	2.9	Sm. inc.	Lg. inc.	Low	Rare	Poor	Fair	Infill +	Infill +	2	55
eastern cottonwood	Populus deltoides	NSH	Low	3.2	15.1	4.2	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	56
black walnut	Juglans nigra	WDH	Low	5	15.0	1.8	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	57
honeylocust	Gleditsia triacanthos	NSH	Low	3.2	14.5	4.3	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	58
American holly	Ilex opaca	NSL	Medium	12.9	14.0	1.0	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			1	59
sugar maple	Acer saccharum	WDH	High	3.2	13.4	2.1	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor	Infill +	Infill +	2	60
slash pine	Pinus elliotii	NDH	High	2	12.6	5.3	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	61
Nuttall oak	Quercus texana	NSH	Medium	3.4	12.0	3.7	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor			0	62
bitternut hickory	Carya cordiformis	WSL	Low	6.1	10.6	1.7	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor	Infill +	Infill +	2	63
black locust	Robinia pseudoacacia	NDH	Low	1.8	10.2	4.4	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	64
durand oak	Quercus sinuata var. sinuata	NSL	FIA	3.7	9.5	2.4	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	65
water hickory	Carya aquatica	NSL	Medium	3.1	9.0	2.7	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	66
bigleaf magnolia	Magnolia macrophylla	NSL	Low	3.9	7.2	1.6	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	67
southern magnolia	Magnolia grandiflora	NSL	Low	3.2	6.2	1.4	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	2	68
chinkapin oak	Quercus muehlenbergii	NSL	Medium	3	5.7	1.2	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	69
shellbark hickory	Carya laciniosa	NSL	Low	3	4.9	1.2	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	70
hackberry	Celtis occidentalis	WDH	Medium	1.2	3.8	2.9	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	71
serviceberry	Amelanchier spp.	NSL	Low	2.8	3.5	0.7	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	72
turkey oak	Quercus laevis	NSH	Medium	1.5	3.3	2.1	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor	Infill +	Infill +	2	73
silver maple	Acer saccharinum	NSH	Low	1.4	2.8	2.0	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor			0	74
American basswood	Tilia americana	WSL	Medium	1.6	2.4	0.9	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	75
black hickory	Carya texana	NDL	High	0.9	2.1	1.4	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	76
eastern hemlock	Tsuga canadensis	NSH	High	0.5	2.1	4.0	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	77
wild plum	Prunus americana	NSLX	FIA	2.4	1.7	0.7	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	78
ailanthus	Ailanthus altissima	NSL	FIA	0.3	1.4	0.4	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	79
sand hickory	Carya pallida	NSL	FIA	0.6	1.3	2.0	Unknown	Unknown	NA	Rare	FIA Only	FIA Only			0	80
cucumbertree	Magnolia acuminata	NSL	Low	1.4	1.3	0.7	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	81
water elm	Planera aquatica	NSL	Low	0.6	1.3	2.0	No change	Lg. inc.	Medium	Rare	Poor	Good	Infill +		2	82
pond cypress	Taxodium ascendens	NSH	Medium	0.1	1.2	5.2	No change	Sm. dec.	Medium	Rare	Poor	Very Poor	Infill +		2	83
pawpaw	Asimina triloba	NSL	Low	0.8	1.2	0.7	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	84
rock elm	Ulmus thomasii	NSLX	FIA	0.3	0.8	1.8	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	85
redbay	Persea borbonia	NSL	Low	1	0.8	0.7	Sm. inc.	Lg. inc.	High	Rare	Good	Good			2	86
pin oak	Quercus palustris	NSH	Low	0.1	0.8	5.9	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	87
waterlocust	Gleditsia aquatica	NSLX	FIA	0.1	0.7	5.4	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	88
swamp white oak	Quercus bicolor	NSL	Low	0.3	0.5	2.0	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	89
yellow buckeye	Aesculus flava	NSL	Low	0	0.5	0.5	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	90
white mulberry	Morus alba	NSL	FIA	0.2	0.4	0.7	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	91
paulownia	Paulownia tomentosa	NSL	FIA	0.3	0.2	0.6	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	92
sand pine	Pinus clausa	NDH	High	0	0.2	0.2	Very Lg. dec.	Very Lg. dec.	Low	Rare	Lost	Lost			0	93
chokecherry	Prunus virginiana	NSLX	FIA	0.1	0.2	1.6	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	94



# Section 231B

## EcoMap 2007 Climate Change Atlas Tree Species

USDA Forest Service  
Northern Research Station  
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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	0.2	0.2	0.5	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair	Infill +	Infill +	2	95
live oak	Quercus virginiana	NDH	High	0.3	0.2	0.7	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	96
bluejack oak	Quercus incana	NSL	Low	0.3	0.1	0.3	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	97
butternut	Juglans cinerea	NSLX	FIA	0.1	0.1	0.2	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	98
cittamwood/gum bumelia	Sideroxylon lanuginosum ssp.	NSL	Low	0.3	0.1	0.2	Lg. inc.	Lg. inc.	High	Rare	Good	Good			2	99
eastern white pine	Pinus strobus	WDH	High	0.1	0.0	0.3	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	100
ashe juniper	Juniperus ashei	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	101
Table Mountain pine	Pinus pungens	NSL	Low	0	0	0	Unknown	Unknown	High	Absent	Unknown	Unknown			0	102
striped maple	Acer pensylvanicum	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Likely +	Likely +	3	103
mountain maple	Acer spicatum	NSL	Low	0	0	0	Unknown	Unknown	High	Absent	Unknown	Unknown			0	104
sweet birch	Betula lenta	NDH	High	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown			0	105
black ash	Fraxinus nigra	WSH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	106
silverbell	Halesia spp.	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	107
pin cherry	Prunus pensylvanica	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Likely +	Likely +	3	108