

	sq. km	sq. mi	FIA Plots
Area of Region	30,002	11,584	1,012

**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	27	Increase	RCP45	RCP85	Very Good	13	13	Likely	1	1	
Ash	2			Medium	34	54	No Change	20	17	Good	16	19	Infill	17	17
Hickory	8			Low	39	12	Decrease	18	16	Fair	11	10	Migrate	10	11
Maple	5	Abundant	4	FIA	3		New	14	17	Poor	11	12			
Oak	16	Common	19				Unknown	14	11	Very Poor	16	13			
Pine	2	Rare	47							FIA Only	1	1			
Other	37	Absent	22							Unknown	11	8			
	<b>70</b>		<b>92</b>		<b>95</b>	<b>93</b>		<b>95</b>	<b>95</b>		<b>79</b>	<b>76</b>		<b>28</b>	<b>29</b>

**Potential Changes in Climate Variables**

**Temperature (°F)**

	Scenario	2009	2039	2069	2099	
Annual Average	CCSM45	60.8	62.5	64.4	64.8	
	CCSM85	60.8	63.0	65.4	68.1	
	GFDL45	60.8	63.8	65.5	66.7	
	GFDL85	60.8	63.7	66.5	70.2	
	HAD45	60.8	63.1	66.0	67.3	
HAD85	60.8	63.4	67.9	71.5		
Growing Season (May—Sep)	CCSM45	75.5	77.2	78.8	79.4	
	CCSM85	75.5	77.9	80.2	83.6	
	GFDL45	75.5	79.1	80.9	83.2	
	GFDL85	75.5	79.4	82.5	87.2	
	HAD45	75.5	78.3	81.1	82.1	
HAD85	75.5	78.7	84.4	87.6		
Coldest Month Average	CCSM45	38.7	41.2	42.2	42.4	
	CCSM85	38.7	41.4	42.4	44.0	
	GFDL45	38.7	42.5	42.9	42.9	
	GFDL85	38.7	39.8	41.4	41.9	
	HAD45	38.7	39.6	41.6	42.0	
HAD85	38.7	41.1	42.9	44.6		
Warmest Month Average	CCSM45	81.4	82.9	83.7	83.9	
	CCSM85	81.4	83.8	84.6	86.4	
	GFDL45	81.4	86.3	87.1	88.6	
	GFDL85	81.4	86.0	87.5	91.1	
	HAD45	81.4	84.6	86.2	86.5	
HAD85	81.4	85.6	88.7	89.8		

**Precipitation (in)**

	Scenario	2009	2039	2069	2099	
Annual Total	CCSM45	53.5	52.8	55.3	54.7	
	CCSM85	53.5	53.3	56.4	56.5	
	GFDL45	53.5	56.0	62.3	56.8	
	GFDL85	53.5	56.5	61.8	61.1	
	HAD45	53.5	53.5	56.7	58.5	
HAD85	53.5	58.4	50.3	54.2		
Growing Season (May—Sep)	CCSM45	21.9	21.6	20.8	21.4	
	CCSM85	21.9	21.3	19.9	20.7	
	GFDL45	21.9	23.2	25.3	23.8	
	GFDL85	21.9	24.0	26.2	24.7	
	HAD45	21.9	21.4	21.7	21.4	
HAD85	21.9	22.7	16.7	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-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 M231A

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
shortleaf pine	Pinus echinata	WDH	High	90.4	2416.7	23.1	No change	No change	Medium	Abundant	Good	Good			1	1
loblolly pine	Pinus taeda	WDH	High	58.5	2047.2	27.4	Sm. inc.	Sm. inc.	Medium	Abundant	Very Good	Very Good			1	2
post oak	Quercus stellata	WDH	High	88.4	1438.4	12.5	Sm. inc.	Sm. inc.	High	Abundant	Very Good	Very Good			1	3
white oak	Quercus alba	WDH	Medium	69.5	776.0	9.8	No change	No change	High	Abundant	Very Good	Very Good			1	4
sweetgum	Liquidambar styraciflua	WDH	High	53.8	428.1	5.8	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	5
winged elm	Ulmus alata	WDL	Medium	83.8	397.3	3.6	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	6
eastern redcedar	Juniperus virginiana	WDH	Medium	56.2	377.4	5.2	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	7
mockernut hickory	Carya alba	WDL	Medium	78.6	355.8	3.7	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	8
black hickory	Carya texana	NDL	High	74.2	350.6	3.9	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	9
northern red oak	Quercus rubra	WDH	Medium	59.3	287.5	4.5	No change	No change	High	Common	Good	Good			1	10
black oak	Quercus velutina	WDH	High	57.9	204.1	3.0	No change	No change	Medium	Common	Fair	Fair			1	11
blackgum	Nyssa sylvatica	WDL	Medium	56.7	183.2	2.7	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	12
red maple	Acer rubrum	WDH	High	54.5	175.5	2.8	Sm. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	13
southern red oak	Quercus falcata	WDL	Medium	45.5	166.1	3.1	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	14
blackjack oak	Quercus marilandica	NSL	Medium	42.3	159.8	3.3	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	15
green ash	Fraxinus pennsylvanica	WSH	Low	33.2	113.8	2.2	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	16
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	43.9	102.1	2.0	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	17
water oak	Quercus nigra	WDH	High	23.3	99.0	2.8	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	18
black cherry	Prunus serotina	WDL	Medium	47.2	95.5	1.7	Lg. inc.	Lg. inc.	Low	Common	Good	Good			1	19
American elm	Ulmus americana	WDH	Medium	19.2	66.6	3.0	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	20
willow oak	Quercus phellos	NSL	Low	10.5	58.5	3.6	No change	Sm. inc.	Medium	Common	Fair	Good	Infill +	Infill ++	1	21
American hornbeam; musclev	Carpinus caroliniana	WSL	Low	19.1	51.9	2.1	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	22
honeylocust	Gleditsia triacanthos	NSH	Low	7.7	51.2	3.7	No change	No change	High	Common	Good	Good			1	23
flowering dogwood	Cornus florida	WDL	Medium	39.6	46.3	1.0	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			1	24
white ash	Fraxinus americana	WDL	Medium	20.4	42.9	1.7	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair			1	25
river birch	Betula nigra	NSL	Low	5	36.0	4.9	No change	No change	Medium	Rare	Poor	Poor			1	26
sugarberry	Celtis laevigata	NDH	Medium	15.2	35.7	1.5	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			1	27
Shumard oak	Quercus shumardii	NSL	Low	6.2	32.6	4.4	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	1	28
slippery elm	Ulmus rubra	WSL	Low	10.1	30.0	2.5	Sm. dec.	Sm. inc.	Medium	Rare	Very Poor	Fair			1	29
Osage-orange	Maclura pomifera	NDH	Medium	2.3	29.8	6.9	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	30
sycamore	Platanus occidentalis	NSL	Low	7.6	29.2	2.9	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	1	31
cherrybark oak; swamp red o	Quercus pagoda	NSL	Medium	6.4	24.6	2.0	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	1	32
common persimmon	Diospyros virginiana	NSL	Low	10.1	21.7	1.8	Lg. inc.	Lg. inc.	High	Rare	Good	Good			1	33
hackberry	Celtis occidentalis	WDH	Medium	5.7	18.8	2.5	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	1	34
bitternut hickory	Carya cordiformis	WSL	Low	8.3	18.4	1.4	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor	Infill +	Infill +	1	35
silver maple	Acer saccharinum	NSH	Low	1.6	15.1	4.1	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor			0	36
black willow	Salix nigra	NSH	Low	3.2	14.8	3.6	No change	Sm. inc.	Low	Rare	Very Poor	Poor		Infill +	2	37
eastern redbud	Cercis canadensis	NSL	Low	9.6	14.1	1.2	Sm. dec.	No change	Medium	Rare	Very Poor	Poor			1	38
American holly	Ilex opaca	NSL	Medium	8.3	12.6	1.2	No change	No change	Medium	Rare	Poor	Poor			1	39
boxelder	Acer negundo	WSH	Low	3	10.4	2.1	No change	Sm. inc.	High	Rare	Fair	Good	Infill +	Infill ++	1	40
florida maple	Acer barbatum	NSL	Low	6.9	10.2	1.4	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	1	41
pin oak	Quercus palustris	NSH	Low	1.7	9.4	3.9	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	42
cittamwood/gum bumelia	Sideroxylon lanuginosum ssp.	NSL	Low	2.7	9.1	1.9	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	43
shagbark hickory	Carya ovata	WSL	Medium	2.7	7.9	1.7	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	44
red mulberry	Morus rubra	NSL	Low	9.6	7.2	0.6	No change	Sm. inc.	Medium	Rare	Poor	Fair			1	45
serviceberry	Amelanchier spp.	NSL	Low	10	6.5	0.6	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	46
black walnut	Juglans nigra	WDH	Low	2	5.9	2.2	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	47



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Common Name	Scientific Name	Range	MR	%Cell	FIAsum	FIAiv	ChngCl45	ChngCl85	Adap	Abund	Capabil45	Capabil85	SHIFT45	SHIFT85	SSO	N
pignut hickory	Carya glabra	WDL	Medium	2.5	5.7	1.8	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	2	48
bald cypress	Taxodium distichum	NSH	Medium	0.3	5.5	16.6	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	49
sassafras	Sassafras albidum	WSL	Low	5.5	5.2	1.0	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	1	50
chinkapin oak	Quercus muehlenbergii	NSL	Medium	2.5	5.0	1.6	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	51
cedar elm	Ulmus crassifolia	NDH	Medium	1	4.9	4.9	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair	Infill +	Infill +	2	52
black locust	Robinia pseudoacacia	NDH	Low	2.9	4.6	1.1	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	53
Nuttall oak	Quercus texana	NSH	Medium	1.1	4.5	3.0	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor			0	54
overcup oak	Quercus lyrata	NSL	Medium	1.6	4.0	1.3	No change	No change	Low	Rare	Very Poor	Very Poor			2	55
American beech	Fagus grandifolia	WDH	High	1.7	3.6	2.2	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	56
American basswood	Tilia americana	WSL	Medium	2.9	3.0	1.0	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	57
pecan	Carya illinoensis	NSH	Low	0.7	2.8	1.0	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair	Infill +	Infill +	2	58
water hickory	Carya aquatica	NSL	Medium	1	2.6	2.5	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			2	59
wild plum	Prunus americana	NSLX	FIA	4.5	2.4	0.6	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	60
swamp chestnut oak	Quercus michauxii	NSL	Low	1.1	2.4	1.7	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	61
shellbark hickory	Carya laciniosa	NSL	Low	0.6	1.9	2.1	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	62
cucumbertree	Magnolia acuminata	NSL	Low	0.3	0.9	2.5	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	63
eastern cottonwood	Populus deltoides	NSH	Low	0	0.9	0.2	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	64
bluejack oak	Quercus incana	NSL	Low	0.3	0.5	1.4	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good	Infill +		2	65
sweetbay	Magnolia virginiana	NSL	Medium	0.7	0.4	0.3	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	66
paulownia	Paulownia tomentosa	NSL	FIA	0.3	0.3	0.9	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	67
white mulberry	Morus alba	NSL	FIA	0.2	0.2	0.4	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	68
sugar maple	Acer saccharum	WDH	High	0.3	0.2	0.5	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			0	69
pawpaw	Asimina triloba	NSL	Low	0.3	0.1	0.4	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	70
ashe juniper	Juniperus ashei	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	71
slash pine	Pinus elliottii	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	72
longleaf pine	Pinus palustris	NSH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate ++	Migrate ++	3	73
pitch pine	Pinus rigida	NSH	High	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown			0	74
Virginia pine	Pinus virginiana	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	75
striped maple	Acer pensylvanicum	NSL	Medium	0	0	0	Unknown	New Habitat	Medium	Absent	Unknown	New Habitat			3	76
mountain maple	Acer spicatum	NSL	Low	0	0	0	Unknown	Unknown	High	Absent	Unknown	Unknown			0	77
sweet birch	Betula lenta	NDH	High	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown			0	78
black ash	Fraxinus nigra	WSH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	79
blue ash	Fraxinus quadrangulata	NSL	Low	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown			0	80
silverbell	Halesia spp.	NSL	Low	0	0	0	Unknown	New Habitat	Medium	Absent	Unknown	New Habitat			3	81
yellow-poplar	Liriodendron tulipifera	WDH	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	82
southern magnolia	Magnolia grandiflora	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	83
bigleaf magnolia	Magnolia macrophylla	NSL	Low	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown			0	84
mountain or Fraser magnolia	Magnolia fraseri	NSL	Low	0	0	0	Unknown	New Habitat	Low	Absent	Unknown	New Habitat			0	85
swamp tupelo	Nyssa biflora	NDH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat		Migrate +	3	86
sourwood	Oxydendrum arboreum	NDL	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	87
redbay	Persea borbonia	NSL	Low	0	0	0	Unknown	Unknown	High	Modeled	Unknown	Unknown			0	88
water elm	Planera aquatica	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Likely +	Likely +	3	89
pin cherry	Prunus pensylvanica	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	90
scarlet oak	Quercus coccinea	WDL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	91
laurel oak	Quercus laurifolia	NDH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	92
bur oak	Quercus macrocarpa	NDH	Medium	0	0	0	Unknown	Unknown	High	Absent	Unknown	Unknown			0	93
chestnut oak	Quercus prinus	NDH	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	94



# Section M231A

## EcoMap 2007

### Climate Change Atlas Tree Species

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

USDA Forest Service  
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Common Name	Scientific Name	Range	MR	%Cell	FIAsum	FIAiv	ChngCl45	ChngCl85	Adap	Abund	Capabil45	Capabil85	SHIFT45	SHIFT85	SSO	N
live oak	Quercus virginiana	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate ++	Migrate ++	3	95