

	sq. km	sq. mi	FIA Plots
Area of Region	26,718	10,316	940

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	24	Increase	24	30	Very Good	11	9	Likely	2	2
Hickory	4		Medium	33	No Change	16	15	Good	11	16	Infill	9	9
Maple	6	Abundant 7	Low	40	Decrease	27	22	Fair	13	18	Migrate	5	11
Oak	11	Common 23	FIA	9	New	15	19	Poor	17	10		16	22
Pine	7	Rare 46			Unknown	24	20	Very Poor	10	10			
Other	46	Absent 29						FIA Only	5	5			
	76	105		106	102		106	106					
								Unknown	15	11			
									82	79			

Potential Changes in Climate Variables

Temperature (°F)

	Scenario	2009	2039	2069	2099	
Annual Average	CCSM45	48.6	50.5	52.8	53.1	
	CCSM85	48.6	50.9	53.5	56.6	
	GFDL45	48.6	51.4	54.4	55.4	
	GFDL85	48.6	52.1	55.5	59.6	
	HAD45	48.6	51.3	54.7	56.1	
	HAD85	48.6	51.5	55.8	60.4	
Growing Season (May—Sep)	CCSM45	63.9	65.8	68.0	68.5	
	CCSM85	63.9	66.2	68.8	72.8	
	GFDL45	63.9	67.0	70.9	72.4	
	GFDL85	63.9	68.2	72.4	76.9	
	HAD45	63.9	67.1	70.3	72.1	
	HAD85	63.9	67.1	72.5	77.5	
Coldest Month (Average)	CCSM45	25.1	27.0	28.6	29.0	
	CCSM85	25.1	27.8	28.9	30.4	
	GFDL45	25.1	28.4	29.1	29.8	
	GFDL85	25.1	28.0	29.0	30.4	
	HAD45	25.1	26.2	28.5	28.6	
	HAD85	25.1	26.9	28.6	30.6	
Warmest Month (Average)	CCSM45	69.2	71.4	72.6	72.9	
	CCSM85	69.2	71.6	73.4	75.4	
	GFDL45	69.2	72.6	74.8	76.1	
	GFDL85	69.2	74.2	76.7	79.5	
	HAD45	69.2	72.9	75.2	76.4	
	HAD85	69.2	73.7	77.2	80.6	

Precipitation (in)

	Scenario	2009	2039	2069	2099	
Annual Total	CCSM45	47.5	50.9	51.3	52.6	
	CCSM85	47.5	51.0	52.6	57.1	
	GFDL45	47.5	52.1	53.4	54.8	
	GFDL85	47.5	48.9	54.6	55.8	
	HAD45	47.5	49.7	50.1	49.8	
	HAD85	47.5	51.0	48.0	50.5	
Growing Season (May—Sep)	CCSM45	22.0	24.2	24.3	24.4	
	CCSM85	22.0	23.8	23.8	25.3	
	GFDL45	22.0	23.6	23.2	23.6	
	GFDL85	22.0	21.5	23.1	23.2	
	HAD45	22.0	23.7	21.5	22.1	
	HAD85	22.0	23.2	20.7	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.

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Section M221B

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
red maple	Acer rubrum	WDH	High	91	1902.5	13.9	Sm. dec.	Sm. dec.	High	Abundant	Good	Good			1	1
sugar maple	Acer saccharum	WDH	High	78.2	1076.3	9.3	No change	Sm. dec.	High	Abundant	Very Good	Good			1	2
black cherry	Prunus serotina	WDL	Medium	74.1	1020.6	9.4	Sm. dec.	Sm. dec.	Low	Abundant	Fair	Fair			0	3
northern red oak	Quercus rubra	WDH	Medium	76.7	897.8	7.7	No change	No change	High	Abundant	Very Good	Very Good			1	4
chestnut oak	Quercus prinus	NDH	High	52.8	741.8	8.1	Sm. inc.	Sm. inc.	High	Abundant	Very Good	Very Good			1	5
yellow-poplar	Liriodendron tulipifera	WDH	High	51.4	587.0	7.3	Sm. inc.	Sm. inc.	High	Abundant	Very Good	Very Good			1	6
white oak	Quercus alba	WDH	Medium	48.5	530.6	6.8	Lg. inc.	Lg. inc.	High	Abundant	Very Good	Very Good			1	7
sweet birch	Betula lenta	NDH	High	68	483.1	5.1	Sm. dec.	Sm. dec.	Low	Common	Poor	Poor			0	8
black locust	Robinia pseudoacacia	NDH	Low	57.6	455.3	4.9	No change	No change	Medium	Common	Fair	Fair			1	9
American beech	Fagus grandifolia	WDH	High	46.3	434.0	6.7	No change	No change	Medium	Common	Fair	Fair			1	10
eastern white pine	Pinus strobus	WDH	High	19.5	288.7	7.7	Sm. inc.	Sm. inc.	Low	Common	Fair	Fair			1	11
white ash	Fraxinus americana	WDL	Medium	52.7	262.0	3.0	Sm. inc.	Sm. inc.	Low	Common	Fair	Fair			1	12
eastern hemlock	Tsuga canadensis	NSH	High	33.2	259.8	5.3	No change	No change	Low	Common	Poor	Poor			0	13
yellow birch	Betula alleghaniensis	NDL	High	31.6	258.6	6.8	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	14
scarlet oak	Quercus coccinea	WDL	Medium	33.4	235.5	4.0	Lg. inc.	Sm. inc.	Medium	Common	Very Good	Good			1	15
black oak	Quercus velutina	WDH	High	34.4	223.7	3.8	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	16
American basswood	Tilia americana	WSL	Medium	34.6	210.2	3.7	No change	No change	Medium	Common	Fair	Fair			1	17
sassafras	Sassafras albidum	WSL	Low	37.5	165.9	2.9	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	18
pignut hickory	Carya glabra	WDL	Medium	39.1	162.7	2.3	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	19
red spruce	Picea rubens	NDH	High	14.9	142.2	8.3	Lg. dec.	Lg. dec.	Low	Common	Very Poor	Very Poor			0	20
blackgum	Nyssa sylvatica	WDL	Medium	42.7	120.5	1.8	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	21
shagbark hickory	Carya ovata	WSL	Medium	27.4	111.8	2.7	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	22
cucumber tree	Magnolia acuminata	NSL	Low	43.2	99.4	1.7	No change	No change	Medium	Common	Fair	Fair			1	23
sourwood	Oxydendrum arboreum	NDL	High	15.2	88.2	3.3	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	24
Virginia pine	Pinus virginiana	NDH	High	6.4	84.0	7.0	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	25
mockernut hickory	Carya alba	WDL	Medium	24.9	83.0	1.8	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	26
serviceberry	Amelanchier spp.	NSL	Low	38.9	71.6	1.4	Sm. dec.	No change	Medium	Common	Poor	Fair			1	27
striped maple	Acer pensylvanicum	NSL	Medium	33.8	70.5	1.5	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	28
Norway spruce	Picea abies	NSH	FIA	5	66.3	9.1	Unknown	Unknown	NA	Common	NNIS	NNIS			0	29
pin cherry	Prunus pensylvanica	NSL	Low	18.7	64.1	2.6	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	30
slippery elm	Ulmus rubra	WSL	Low	12.8	45.3	2.0	No change	Sm. inc.	Medium	Rare	Poor	Fair			1	31
quaking aspen	Populus tremuloides	WDH	High	2.4	42.8	5.2	Very Lg. dec.	Lg. dec.	Medium	Rare	Lost	Very Poor			0	32
bigtooth aspen	Populus grandidentata	NSL	Medium	9.6	40.6	2.7	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	33
bitternut hickory	Carya cordiformis	WSL	Low	13.8	40.2	1.9	Sm. inc.	Lg. inc.	High	Rare	Good	Good			1	34
Scots pine	Pinus sylvestris	NSH	FIA	2.4	37.9	10.0	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	35
sycamore	Platanus occidentalis	NSL	Low	3.6	37.3	3.6	Sm. inc.	Sm. inc.	Medium	Rare	Fair	Fair	Infill +	Infill +	1	36
black walnut	Juglans nigra	WDH	Low	9	37.2	2.2	No change	Sm. inc.	Medium	Rare	Poor	Fair			1	37
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	20.1	34.7	0.8	No change	Lg. inc.	High	Rare	Fair	Good			1	38
American elm	Ulmus americana	WDH	Medium	5.4	34.6	3.2	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	1	39
mountain or Fraser magnolia	Magnolia fraseri	NSL	Low	12.6	29.6	1.8	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair			0	40
yellow buckeye	Aesculus flava	NSL	Low	4.1	27.4	2.9	No change	No change	Low	Rare	Very Poor	Very Poor			0	41
eastern redcedar	Juniperus virginiana	WDH	Medium	2.8	26.9	8.8	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	2	42
American hornbeam; muscle	Carpinus caroliniana	WSL	Low	10.4	25.5	1.6	Sm. dec.	Sm. inc.	Medium	Rare	Very Poor	Fair			1	43
red pine	Pinus resinosa	NSH	Medium	3.4	25.1	4.7	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	44
pitch pine	Pinus rigida	NSH	High	5	23.4	1.8	No change	No change	Medium	Rare	Poor	Poor			1	45
butternut	Juglans cinerea	NSLX	FIA	2.1	12.4	2.8	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	46
ailanthus	Ailanthus altissima	NSL	FIA	2.5	10.9	1.9	Unknown	Unknown	NA	Rare	NNIS	NNIS			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
chinkapin oak	Quercus muehlenbergii	NSL	Medium	1.3	10.4	6.3	No change	Sm. inc.	Medium	Rare	Poor	Fair	Infill +	Infill +	2	48
flowering dogwood	Cornus florida	WDL	Medium	7.6	10.1	0.7	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			1	49
boxelder	Acer negundo	WSH	Low	0.6	9.5	4.1	Sm. dec.	No change	High	Rare	Poor	Fair	Infill +	Infill +	2	50
Table Mountain pine	Pinus pungens	NSL	Low	2.3	8.0	2.7	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	1	51
post oak	Quercus stellata	WDH	High	1	5.6	4.8	Lg. inc.	Lg. inc.	High	Rare	Good	Good			2	52
honeylocust	Gleditsia triacanthos	NSH	Low	0.3	5.0	12.1	Sm. dec.	No change	High	Rare	Poor	Fair		Infill +	2	53
shortleaf pine	Pinus echinata	WDH	High	2.3	4.6	1.5	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	54
eastern redbud	Cercis canadensis	NSL	Low	1.6	4.5	1.4	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	1	55
American chestnut	Castanea dentata	NSLX	FIA	3.7	3.6	0.6	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	56
hackberry	Celtis occidentalis	WDH	Medium	0.8	3.3	1.1	No change	Sm. inc.	High	Rare	Fair	Good	Infill +		2	57
green ash	Fraxinus pennsylvanica	WSH	Low	1.6	2.9	1.4	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good	Infill +		2	58
black maple	Acer nigrum	NSH	Low	0.6	2.4	1.6	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			0	59
balsam fir	Abies balsamea	NDH	High	0.4	2.0	5.4	Very Lg. dec.	Very Lg. dec.	Low	Rare	Lost	Lost			0	60
wild plum	Prunus americana	NSLX	FIA	0.1	2.0	1.4	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	61
bur oak	Quercus macrocarpa	NDH	Medium	0.4	2.0	1.3	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			0	62
American mountain-ash	Sorbus americana	NSL	Low	3	2.0	0.7	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	63
paulownia	Paulownia tomentosa	NSL	FIA	0.1	1.8	1.4	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	64
Osage-orange	Maclura pomifera	NDH	Medium	0.3	1.8	4.3	Sm. dec.	No change	High	Rare	Poor	Fair		Infill +	2	65
American holly	Ilex opaca	NSL	Medium	0.8	1.3	0.8	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	66
pawpaw	Asimina triloba	NSL	Low	0.7	1.2	1.5	Sm. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	67
bear oak; scrub oak	Quercus ilicifolia	NSLX	FIA	0	1.2	0.4	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	68
black willow	Salix nigra	NSH	Low	0.4	0.9	2.5	Sm. dec.	No change	Low	Rare	Very Poor	Very Poor			2	69
southern red oak	Quercus falcata	WDL	Medium	0	0.8	0.2	Lg. inc.	Lg. inc.	High	Rare	Good	Good			2	70
mountain maple	Acer spicatum	NSL	Low	1.8	0.7	0.4	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor			0	71
paper birch	Betula papyrifera	WDH	High	0.4	0.7	1.8	Very Lg. dec.	Very Lg. dec.	Medium	Rare	Lost	Lost			0	72
chokecherry	Prunus virginiana	NSLX	FIA	0.7	0.6	0.8	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	73
white spruce	Picea glauca	NSL	Medium	0.4	0.6	1.5	Very Lg. dec.	Very Lg. dec.	Medium	Rare	Lost	Lost			0	74
Ohio buckeye	Aesculus glabra	NSL	Low	0.4	0.5	1.3	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	75
shingle oak	Quercus imbricaria	NDH	Medium	0.2	0.3	0.5	Very Lg. dec.	Very Lg. dec.	Medium	Rare	Lost	Lost			0	76
Atlantic white-cedar	Chamaecyparis thyoides	NSH	Low	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown			0	77
longleaf pine	Pinus palustris	NSH	Medium	0	0	0	Unknown	New Habitat	Medium	Absent	Unknown	New Habitat		Migrate +	3	78
loblolly pine	Pinus taeda	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Likely +	Likely +	3	79
northern white-cedar	Thuja occidentalis	WSH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	80
florida maple	Acer barbatum	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	81
river birch	Betula nigra	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	82
gray birch	Betula populifolia	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	83
cittamwood/gum bumelia	Sideroxylon lanuginosum ssp.	NSL	Low	0	0	0	Unknown	New Habitat	High	Absent	Unknown	New Habitat			0	84
water hickory	Carya aquatica	NSL	Medium	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	85
pecan	Carya illinoensis	NSH	Low	0	0	0	Unknown	New Habitat	Low	Absent	Unknown	New Habitat		Migrate +	3	86
shellbark hickory	Carya laciniosa	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	87
black hickory	Carya texana	NDL	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	88
sugarberry	Celtis laevigata	NDH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate ++	3	89
common persimmon	Diospyros virginiana	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Likely +	Likely +	3	90
black ash	Fraxinus nigra	WSH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	91
blue ash	Fraxinus quadrangulata	NSL	Low	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown			0	92
silverbell	Halesia spp.	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	93
sweetgum	Liquidambar styraciflua	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	94



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Common Name	Scientific Name	Range	MR	%Cell	FIAsum	FIAiv	ChngCl45	ChngCl85	Adap	Abund	Capabil45	Capabil85	SHIFT45	SHIFT85	SSO	N
southern magnolia	Magnolia grandiflora	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	95
bigleaf magnolia	Magnolia macrophylla	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	96
red mulberry	Morus rubra	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	97
water tupelo	Nyssa aquatica	NSH	Medium	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown			0	98
eastern cottonwood	Populus deltoides	NSH	Low	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown			0	99
cherrybark oak; swamp red o.	Quercus pagoda	NSL	Medium	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	100
overcup oak	Quercus lyrata	NSL	Medium	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown			0	101
blackjack oak	Quercus marilandica	NSL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	102
water oak	Quercus nigra	WDH	High	0	0	0	Unknown	New Habitat	Medium	Absent	Unknown	New Habitat		Migrate +	3	103
Shumard oak	Quercus shumardii	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +	3	104
bluejack oak	Quercus incana	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	105
winged elm	Ulmus alata	WDL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	106