

	sq. km	sq. mi	FIA Plots
Area of Region	35,473	13,696	959

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	20	27	Increase	27	36	Very Good	12	17	Likely	0	0
Hickory	8			Medium	35	54	No Change	20	15	Good	18	17	Infill	16	19
Maple	6	Abundant	3	Low	39	18	Decrease	33	29	Fair	13	13	Migrate	1	3
Oak	19	Common	36	FIA	10		New	9	12	Poor	18	17		17	22
Pine	7	Rare	51				Unknown	15	12	Very Poor	18	14			
Other	46	Absent	14							FIA Only	6	6			
	90		104		104	99		104	104	Unknown	5	2			
											90	86			

Potential Changes in Climate Variables

Temperature (°F)

	Scenario	2009	2039	2069	2099	
Annual Average	CCSM45	56.5	58.3	60.5	60.8	
	CCSM85	56.5	58.7	61.5	64.5	
	GFDL45	56.5	59.8	61.7	62.5	
	GFDL85	56.5	59.3	62.6	66.4	
	HAD45	56.5	59.2	62.5	63.9	
	HAD85	56.5	59.6	64.3	68.4	
Growing Season (May—Sep)	CCSM45	72.5	74.3	76.2	76.9	
	CCSM85	72.5	74.7	77.6	81.5	
	GFDL45	72.5	76.3	78.5	79.8	
	GFDL85	72.5	75.9	79.9	84.4	
	HAD45	72.5	75.8	79.1	80.8	
	HAD85	72.5	76.3	82.7	86.6	
Coldest Month (Average)	CCSM45	31.3	32.8	34.5	34.9	
	CCSM85	31.3	34.3	35.3	37.0	
	GFDL45	31.3	35.6	35.7	36.0	
	GFDL85	31.3	33.5	34.6	35.2	
	HAD45	31.3	32.5	34.8	35.0	
	HAD85	31.3	33.7	35.8	37.5	
Warmest Month (Average)	CCSM45	78.0	79.7	80.9	81.4	
	CCSM85	78.0	80.4	82.2	84.0	
	GFDL45	78.0	81.2	82.7	83.6	
	GFDL85	78.0	81.6	83.9	86.5	
	HAD45	78.0	82.1	84.7	85.5	
	HAD85	78.0	83.9	88.3	90.2	

Precipitation (in)

	Scenario	2009	2039	2069	2099	
Annual Total	CCSM45	47.9	47.7	53.1	51.6	
	CCSM85	47.9	51.6	52.3	55.5	
	GFDL45	47.9	54.9	57.9	60.2	
	GFDL85	47.9	54.2	59.1	62.5	
	HAD45	47.9	48.0	51.2	50.8	
	HAD85	47.9	48.8	46.5	51.4	
Growing Season (May—Sep)	CCSM45	20.1	18.9	20.5	19.9	
	CCSM85	20.1	20.5	19.0	20.0	
	GFDL45	20.1	23.0	23.0	23.6	
	GFDL85	20.1	22.5	23.1	23.8	
	HAD45	20.1	19.0	18.0	17.9	
	HAD85	20.1	19.1	15.4	15.8	

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 223D

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
sugar maple	Acer saccharum	WDH	High	77.2	927.4	10.9	Sm. dec.	Sm. dec.	High	Abundant	Good	Good			1	1
yellow-poplar	Liriodendron tulipifera	WDH	High	60.5	626.8	8.7	Lg. dec.	Lg. dec.	High	Abundant	Good	Good			1	2
white oak	Quercus alba	WDH	Medium	67.8	617.9	8.7	No change	No change	High	Abundant	Very Good	Very Good			1	3
pignut hickory	Carya glabra	WDL	Medium	63.1	408.2	6.0	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	4
eastern redcedar	Juniperus virginiana	WDH	Medium	48.2	395.7	6.7	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	5
sweetgum	Liquidambar styraciflua	WDH	High	47.5	393.3	9.0	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good			1	6
black oak	Quercus velutina	WDH	High	55.8	363.9	5.8	No change	No change	Medium	Common	Fair	Fair			1	7
sassafras	Sassafras albidum	WSL	Low	64.8	344.8	4.5	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	8
white ash	Fraxinus americana	WDL	Medium	56.5	280.3	4.2	No change	Sm. inc.	Low	Common	Poor	Fair			1	9
red maple	Acer rubrum	WDH	High	50	279.6	5.2	No change	Sm. inc.	High	Common	Good	Very Good			1	10
black cherry	Prunus serotina	WDL	Medium	51.4	250.9	3.4	No change	No change	Low	Common	Poor	Poor			0	11
green ash	Fraxinus pennsylvanica	WSH	Low	46.9	228.3	5.1	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good			1	12
blackgum	Nyssa sylvatica	WDL	Medium	53.9	214.1	3.6	No change	Sm. inc.	High	Common	Good	Very Good			1	13
American beech	Fagus grandifolia	WDH	High	39.3	210.9	4.6	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	14
silver maple	Acer saccharinum	NSH	Low	16	204.9	12.4	Sm. dec.	Sm. dec.	High	Common	Fair	Fair			1	15
shagbark hickory	Carya ovata	WSL	Medium	52	203.9	3.5	No change	No change	Medium	Common	Fair	Fair			1	16
winged elm	Ulmus alata	WDL	Medium	46.7	196.1	4.6	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	17
American elm	Ulmus americana	WDH	Medium	56.2	190.5	2.9	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	18
post oak	Quercus stellata	WDH	High	28.6	181.6	5.8	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	19
northern red oak	Quercus rubra	WDH	Medium	44.1	177.6	3.4	No change	No change	High	Common	Good	Good			1	20
sycamore	Platanus occidentalis	NSL	Low	37.6	171.6	3.9	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	21
Virginia pine	Pinus virginiana	NDH	High	14.6	152.0	8.9	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	22
black walnut	Juglans nigra	WDH	Low	38.7	113.9	2.5	No change	No change	Medium	Common	Fair	Fair			1	23
flowering dogwood	Cornus florida	WDL	Medium	49.2	109.3	2.1	No change	No change	Medium	Common	Fair	Fair			1	24
mockernut hickory	Carya alba	WDL	Medium	26.1	101.7	3.8	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	25
black locust	Robinia pseudoacacia	NDH	Low	15	98.9	7.2	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	26
chinkapin oak	Quercus muehlenbergii	NSL	Medium	26.9	97.9	2.9	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	27
slippery elm	Ulmus rubra	WSL	Low	34.7	91.9	2.3	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good			1	28
hackberry	Celtis occidentalis	WDH	Medium	32.9	89.5	2.7	Sm. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	29
bitternut hickory	Carya cordiformis	WSL	Low	26.2	89.4	2.5	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	30
common persimmon	Diospyros virginiana	NSL	Low	35.7	80.8	2.4	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	31
shortleaf pine	Pinus echinata	WDH	High	5.8	80.4	10.4	No change	Sm. inc.	Medium	Common	Fair	Good	Infill +	Infill ++	1	32
shingle oak	Quercus imbricaria	NDH	Medium	13.6	73.9	3.6	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor	Infill +	Infill +	0	33
boxelder	Acer negundo	WSH	Low	21.3	71.5	3.5	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	34
loblolly pine	Pinus taeda	WDH	High	3.4	69.2	18.5	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good	Infill ++	Infill ++	2	35
southern red oak	Quercus falcata	WDL	Medium	15.5	66.4	3.8	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good	Infill ++	Infill ++	1	36
cherrybark oak; swamp red o	Quercus pagoda	NSL	Medium	16.7	60.9	5.2	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good	Infill ++	Infill ++	1	37
black willow	Salix nigra	NSH	Low	7.3	58.8	8.2	No change	No change	Low	Common	Poor	Poor	Infill +	Infill +	0	38
scarlet oak	Quercus coccinea	WDL	Medium	21.1	54.6	2.4	Sm. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	39
chestnut oak	Quercus prinus	NDH	High	7.2	46.6	6.3	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor	Infill +	Infill +	1	40
pin oak	Quercus palustris	NSH	Low	11.1	44.4	3.2	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	41
eastern redbud	Cercis canadensis	NSL	Low	28.7	42.6	1.3	No change	Sm. inc.	Medium	Rare	Poor	Fair			1	42
eastern white pine	Pinus strobus	WDH	High	6.8	41.8	6.4	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	43
eastern cottonwood	Populus deltoides	NSH	Low	6.8	39.4	3.6	Sm. dec.	No change	Medium	Rare	Very Poor	Poor		Infill +	1	44
shellbark hickory	Carya laciniosa	NSL	Low	12	34.1	3.0	Sm. inc.	Sm. inc.	Medium	Rare	Fair	Fair	Infill +	Infill +	1	45
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	22.3	34.1	1.4	Lg. inc.	Lg. inc.	High	Rare	Good	Good			1	46
ailanthus	Ailanthus altissima	NSL	FIA	3.9	28.3	6.5	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
river birch	Betula nigra	NSL	Low	7.4	25.3	3.8	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	1	48
American hornbeam; musclev	Carpinus caroliniana	WSL	Low	13.5	24.8	1.4	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			1	49
honeylocust	Gleditsia triacanthos	NSH	Low	7.7	24.5	3.1	No change	Sm. inc.	High	Rare	Fair	Good	Infill +	Infill ++	1	50
pawpaw	Asimina triloba	NSL	Low	11.8	22.3	1.5	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	51
red mulberry	Morus rubra	NSL	Low	15.2	16.1	1.3	No change	Sm. inc.	Medium	Rare	Poor	Fair			1	52
sourwood	Oxydendrum arboreum	NDL	High	6.5	15.0	2.2	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	1	53
swamp white oak	Quercus bicolor	NSL	Low	3.2	10.1	2.8	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	54
Shumard oak	Quercus shumardii	NSL	Low	2.8	9.0	2.1	No change	Lg. inc.	High	Rare	Fair	Good	Infill +	Infill ++	2	55
American basswood	Tilia americana	WSL	Medium	3.1	9.0	1.8	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	56
pitch pine	Pinus rigida	NSH	High	0.6	7.6	8.9	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	57
black hickory	Carya texana	NDL	High	2.9	7.5	1.7	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	58
Osage-orange	Maclura pomifera	NDH	Medium	2	7.3	2.0	No change	Lg. inc.	High	Rare	Fair	Good		Infill ++	2	59
sugarberry	Celtis laevigata	NDH	Medium	6.3	7.2	1.8	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	2	60
northern catalpa	Catalpa speciosa	NSHX	FIA	2.5	6.7	1.0	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	61
pecan	Carya illinoensis	NSH	Low	4.6	6.4	1.8	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair	Infill +	Infill +	2	62
blackjack oak	Quercus marilandica	NSL	Medium	2.7	5.9	2.7	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	63
pumpkin ash	Fraxinus profunda	NSH	FIA	0.5	5.2	7.2	Unknown	Unknown	NA	Rare	FIA Only	FIA Only			0	64
white mulberry	Morus alba	NSL	FIA	1.1	5.2	4.6	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	65
bigtooth aspen	Populus grandidentata	NSL	Medium	2.4	4.7	1.3	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	66
swamp chestnut oak	Quercus michauxii	NSL	Low	2.9	4.7	1.7	No change	No change	Medium	Rare	Poor	Poor		Infill +	2	67
butternut	Juglans cinerea	NSLX	FIA	1.1	3.8	3.4	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	68
paulownia	Paulownia tomentosa	NSL	FIA	2	2.7	2.5	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	69
water tupelo	Nyssa aquatica	NSH	Medium	0.2	2.6	6.8	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	70
serviceberry	Amelanchier spp.	NSL	Low	2.8	2.1	0.6	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	71
Ohio buckeye	Aesculus glabra	NSL	Low	1.1	1.9	1.7	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	72
Kentucky coffeetree	Gymnocladus dioicus	NSLX	FIA	0.4	1.8	0.9	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	73
bur oak	Quercus macrocarpa	NDH	Medium	2.1	1.4	0.6	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			0	74
yellow buckeye	Aesculus flava	NSL	Low	1.4	1.3	0.9	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	75
overcup oak	Quercus lyrata	NSL	Medium	1.7	1.0	1.6	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair	Infill +	Infill +	2	76
red pine	Pinus resinosa	NSH	Medium	0.6	1.0	1.8	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	77
blue ash	Fraxinus quadrangulata	NSL	Low	0.5	1.0	1.7	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	78
eastern hemlock	Tsuga canadensis	NSH	High	0.3	0.8	2.8	Very Lg. dec.	Very Lg. dec.	Low	Rare	Lost	Lost			0	79
willow oak	Quercus phellos	NSL	Low	1.7	0.8	1.4	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	80
water hickory	Carya aquatica	NSL	Medium	2.3	0.6	4.3	Sm. dec.	No change	Medium	Rare	Very Poor	Poor			0	81
Scots pine	Pinus sylvestris	NSH	FIA	1.5	0.5	0.5	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	82
bald cypress	Taxodium distichum	NSH	Medium	0.1	0.5	0.7	Sm. dec.	No change	Medium	Rare	Very Poor	Poor			0	83
black maple	Acer nigrum	NSH	Low	0.3	0.4	0.2	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor			0	84
American chestnut	Castanea dentata	NSLX	FIA	0.6	0.4	0.6	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	85
mountain maple	Acer spicatum	NSL	Low	0.3	0.2	0.8	Sm. dec.	No change	High	Rare	Poor	Fair			0	86
cucumbertree	Magnolia acuminata	NSL	Low	0.1	0.2	0.2	Lg. dec.	Very Lg. dec.	Medium	Rare	Very Poor	Lost			0	87
rock elm	Ulmus thomasii	NSLX	FIA	0.3	0.2	0.5	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	88
Nuttall oak	Quercus texana	NSH	Medium	0.3	0.1	0.2	Sm. inc.	Lg. inc.	High	Rare	Good	Good			0	89
swamp tupelo	Nyssa biflora	NDH	Medium	0.3	0.1	0.2	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	90
ashe juniper	Juniperus ashei	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	91
red spruce	Picea rubens	NDH	High	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown			0	92
florida maple	Acer barbatum	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +	3	93
striped maple	Acer pensylvanicum	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	94



Section 223D

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Common Name	Scientific Name	Range	MR	%Cell	FIAsum	FIAiv	ChngCl45	ChngCl85	Adap	Abund	Capabil45	Capabil85	SHIFT45	SHIFT85	SSO	N
cittamwood/gum bumelia	Sideroxylon lanuginosum ssp.	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate ++	3	95
black ash	Fraxinus nigra	WSH	Medium	0	0	0	Unknown	New Habitat	Low	Absent	Unknown	New Habitat			3	96
southern magnolia	Magnolia grandiflora	NSL	Low	0	0	0	Unknown	New Habitat	Medium	Absent	Unknown	New Habitat			3	97
bigleaf magnolia	Magnolia macrophylla	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	98
water elm	Planera aquatica	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	99
pin cherry	Prunus pensylvanica	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	100
laurel oak	Quercus laurifolia	NDH	Medium	0	0	0	Unknown	New Habitat	Medium	Absent	Unknown	New Habitat			3	101
water oak	Quercus nigra	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	102
live oak	Quercus virginiana	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	103
cedar elm	Ulmus crassifolia	NDH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	104