

	sq. km	sq. mi	FIA Plots
Area of Region	60,385	23,315	757

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	21	23	Increase	14	16	Very Good	4	2	Likely	0	0
Hickory	5			Medium	31	52	No Change	19	14	Good	10	16	Infill	23	22
Maple	6	Abundant	2	Low	33	14	Decrease	32	35	Fair	15	9	Migrate	5	7
Oak	11	Common	23	FIA	10		New	16	17	Poor	14	16		28	29
Pine	5	Rare	50				Unknown	14	13	Very Poor	22	21			
Other	44	Absent	20					95	95	FIA Only	4	4			
	75		95		95	89				Unknown	4	3			
											73	71			

Potential Changes in Climate Variables

Temperature (°F)

	Scenario	2009	2039	2069	2099	
Annual Average	CCSM45	48.4	50.3	53.1	53.1	
	CCSM85	48.4	51.0	53.8	57.0	
	GFDL45	48.4	52.5	54.1	55.1	
	GFDL85	48.4	51.6	55.1	59.5	
	HAD45	48.4	51.6	55.1	56.8	
	HAD85	48.4	51.9	56.4	61.6	
Growing Season (May—Sep)	CCSM45	66.0	67.8	70.2	70.5	
	CCSM85	66.0	68.6	71.0	74.9	
	GFDL45	66.0	70.9	72.8	74.4	
	GFDL85	66.0	69.9	74.1	79.3	
	HAD45	66.0	69.5	72.1	74.5	
	HAD85	66.0	69.2	74.4	79.8	
Coldest Month Average	CCSM45	21.4	23.0	25.7	25.6	
	CCSM85	21.4	24.1	26.0	27.9	
	GFDL45	21.4	24.5	25.6	26.1	
	GFDL85	21.4	24.8	26.1	27.8	
	HAD45	21.4	23.1	26.8	26.7	
	HAD85	21.4	25.2	28.0	31.4	
Warmest Month Average	CCSM45	71.9	74.0	75.6	76.0	
	CCSM85	71.9	75.3	77.0	79.0	
	GFDL45	71.9	75.1	76.9	77.9	
	GFDL85	71.9	76.1	78.1	81.2	
	HAD45	71.9	75.9	77.8	79.2	
	HAD85	71.9	76.6	80.0	83.8	

Precipitation (in)

	Scenario	2009	2039	2069	2099	
Annual Total	CCSM45	35.9	35.3	34.8	35.8	
	CCSM85	35.9	36.0	35.7	36.5	
	GFDL45	35.9	38.4	42.4	42.6	
	GFDL85	35.9	38.8	43.4	44.9	
	HAD45	35.9	36.7	38.9	38.3	
	HAD85	35.9	38.6	36.1	39.3	
Growing Season (May—Sep)	CCSM45	17.9	18.0	17.4	17.3	
	CCSM85	17.9	17.3	17.4	16.6	
	GFDL45	17.9	18.7	20.4	20.8	
	GFDL85	17.9	19.5	20.3	20.6	
	HAD45	17.9	17.7	16.7	17.3	
	HAD85	17.9	17.8	14.6	15.5	

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 222J

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
black cherry	Prunus serotina	WDL	Medium	61.6	694.3	15.9	Sm. dec.	Sm. dec.	Low	Abundant	Fair	Fair			0	1
red maple	Acer rubrum	WDH	High	44.4	561.1	14.5	Sm. dec.	Sm. dec.	High	Abundant	Good	Good			1	2
American elm	Ulmus americana	WDH	Medium	63.5	440.5	9.7	No change	Sm. inc.	Medium	Common	Fair	Good			1	3
green ash	Fraxinus pennsylvanica	WSH	Low	45.5	422.6	12.5	No change	No change	Medium	Common	Fair	Fair			1	4
black oak	Quercus velutina	WDH	High	28.1	300.6	12.5	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	5
silver maple	Acer saccharinum	NSH	Low	22.6	283.7	17.6	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	6
sugar maple	Acer saccharum	WDH	High	36.5	274.0	12.1	Sm. inc.	No change	High	Common	Very Good	Good			1	7
northern red oak	Quercus rubra	WDH	Medium	35.3	213.8	7.8	No change	No change	High	Common	Good	Good			1	8
white oak	Quercus alba	WDH	Medium	27	202.6	9.1	Sm. inc.	No change	High	Common	Very Good	Good			1	9
white ash	Fraxinus americana	WDL	Medium	35.5	168.1	7.6	Sm. inc.	Sm. inc.	Low	Common	Fair	Fair			1	10
quaking aspen	Populus tremuloides	WDH	High	12.3	165.9	13.4	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor	Infill +	Infill +	0	11
eastern white pine	Pinus strobus	WDH	High	12.5	147.7	11.9	Lg. dec.	Lg. dec.	Low	Common	Very Poor	Very Poor			0	12
eastern cottonwood	Populus deltoides	NSH	Low	17.6	146.0	12.9	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	13
sassafras	Sassafras albidum	WSL	Low	23.7	135.9	7.6	No change	Sm. dec.	Medium	Common	Fair	Poor			1	14
Scots pine	Pinus sylvestris	NSH	FIA	9.6	135.3	20.1	Unknown	Unknown	NA	Common	NNIS	NNIS			0	15
American basswood	Tilia americana	WSL	Medium	27.4	132.2	8.5	No change	Sm. dec.	Medium	Common	Fair	Poor			1	16
black walnut	Juglans nigra	WDH	Low	25.9	123.4	9.0	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	17
red pine	Pinus resinosa	NSH	Medium	7.7	121.9	17.2	Sm. dec.	Sm. dec.	Low	Common	Poor	Poor	Infill +	Infill +	0	18
bigtooth aspen	Populus grandidentata	NSL	Medium	12.8	106.7	9.0	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	19
shagbark hickory	Carya ovata	WSL	Medium	23.5	101.4	6.0	No change	Sm. dec.	Medium	Common	Fair	Poor			1	20
bitternut hickory	Carya cordiformis	WSL	Low	19.9	70.9	5.9	No change	No change	High	Common	Good	Good	Infill ++	Infill ++	1	21
boxelder	Acer negundo	WSH	Low	16.8	63.0	6.6	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good	Infill ++	Infill ++	1	22
American beech	Fagus grandifolia	WDH	High	18	59.6	4.8	No change	Lg. dec.	Medium	Common	Fair	Poor	Infill +	Infill +	1	23
slippery elm	Ulmus rubra	WSL	Low	16.8	57.7	6.4	Lg. dec.	Sm. dec.	Medium	Common	Poor	Poor	Infill +	Infill +	0	24
black willow	Salix nigra	NSH	Low	9.6	57.3	8.4	Sm. dec.	No change	Low	Common	Poor	Poor	Infill +	Infill +	0	25
pignut hickory	Carya glabra	WDL	Medium	13.9	44.4	5.5	Sm. inc.	Sm. inc.	Medium	Rare	Fair	Fair	Infill +	Infill +	1	26
swamp white oak	Quercus bicolor	NSL	Low	8.3	40.4	6.3	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	1	27
yellow-poplar	Liriodendron tulipifera	WDH	High	11.3	38.6	7.7	Sm. inc.	Sm. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	28
black locust	Robinia pseudoacacia	NDH	Low	5.6	37.4	8.8	No change	Sm. inc.	Medium	Rare	Poor	Fair	Infill +	Infill +	1	29
hackberry	Celtis occidentalis	WDH	Medium	15.3	36.5	4.9	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	30
black ash	Fraxinus nigra	WSH	Medium	7.6	35.1	5.9	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	31
Siberian elm	Ulmus pumila	NDH	FIA	2.4	34.5	13.6	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	32
northern pin oak	Quercus ellipsoidalis	NSH	Medium	2.4	32.9	10.6	Sm. dec.	Lg. dec.	High	Rare	Poor	Poor	Infill +	Infill +	2	33
paper birch	Betula papyrifera	WDH	High	4.5	31.3	3.9	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			2	34
pin oak	Quercus palustris	NSH	Low	6.8	30.8	6.2	No change	No change	Low	Rare	Very Poor	Very Poor			2	35
bur oak	Quercus macrocarpa	NDH	Medium	10.4	29.4	5.1	Sm. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	36
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	18.7	28.7	3.6	Sm. dec.	Lg. dec.	High	Rare	Poor	Poor	Infill +	Infill +	1	37
yellow birch	Betula alleghaniensis	NDL	High	3.5	26.9	7.2	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			2	38
jack pine	Pinus banksiana	NSH	Medium	2.2	24.2	7.3	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor	Infill +	Infill +	2	39
Norway spruce	Picea abies	NSH	FIA	1.5	22.4	14.9	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	40
northern white-cedar	Thuja occidentalis	WSH	High	1	20.4	12.4	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	41
northern catalpa	Catalpa speciosa	NSHX	FIA	1.5	19.6	16.1	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	42
white mulberry	Morus alba	NSL	FIA	7.2	19.1	4.7	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	43
eastern hemlock	Tsuga canadensis	NSH	High	1.1	18.5	11.9	Sm. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			2	44
scarlet oak	Quercus coccinea	WDL	Medium	0.3	17.9	54.1	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			2	45
white spruce	Picea glauca	NSL	Medium	1.3	17.8	13.0	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	46
tamarack (native)	Larix laricina	NSH	High	1.4	14.6	9.6	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			2	47



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 mulberry	Morus rubra	NSL	Low	9.2	14.3	3.9	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	48
American hornbeam; musclev	Carpinus caroliniana	WDL	Low	11.1	11.7	1.9	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	49
blackgum	Nyssa sylvatica	WDL	Medium	3.8	9.0	3.4	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	50
Osage-orange	Maclura pomifera	NDH	Medium	1.6	8.8	6.8	No change	Sm. inc.	High	Rare	Fair	Good	Infill +		2	51
sycamore	Platanus occidentalis	NSL	Low	4.9	8.1	4.0	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good	Infill +		2	52
serviceberry	Amelanchier spp.	NSL	Low	4.6	7.5	1.9	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	53
eastern redcedar	Juniperus virginiana	WDH	Medium	3.3	6.0	2.1	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	54
chokecherry	Prunus virginiana	NSLX	FIA	4.3	5.4	2.2	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	55
ailanthus	Ailanthus altissima	NSL	FIA	1.5	4.9	5.5	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	56
mockernut hickory	Carya alba	WDL	Medium	1.3	4.7	2.7	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	57
flowering dogwood	Cornus florida	WDL	Medium	3.5	4.6	1.5	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			2	58
peachleaf willow	Salix amygdaloides	NSLX	FIA	0.7	4.6	7.0	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	59
Shumard oak	Quercus shumardii	NSL	Low	0.2	3.3	19.9	No change	No change	High	Rare	Fair	Fair		Infill +	2	60
Norway maple	Acer platanoides	NSL	FIA	0.5	3.3	4.8	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	61
loblolly pine	Pinus taeda	WDH	High	0.2	2.9	17.2	No change	Lg. inc.	Medium	Rare	Poor	Good			2	62
blue ash	Fraxinus quadrangulata	NSL	Low	2.3	2.9	3.2	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	63
Ohio buckeye	Aesculus glabra	NSL	Low	5.7	2.0	1.3	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	64
honeylocust	Gleditsia triacanthos	NSH	Low	1.5	1.8	1.5	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	65
black maple	Acer nigrum	NSH	Low	0.8	1.2	1.3	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			0	66
shellbark hickory	Carya laciniosa	NSL	Low	0.2	1.1	6.9	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	67
eastern redbud	Cercis canadensis	NSL	Low	0.4	1.0	3.1	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	68
pawpaw	Asimina triloba	NSL	Low	1	1.0	2.2	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	69
shingle oak	Quercus imbricaria	NDH	Medium	0.2	0.8	4.6	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	70
chinkapin oak	Quercus muehlenbergii	NSL	Medium	1.9	0.6	1.0	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	71
balsam poplar	Populus balsamifera	NSH	Medium	0.4	0.5	1.0	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	72
pin cherry	Prunus pensylvanica	NSL	Low	0.4	0.4	0.7	Lg. dec.	Very Lg. dec.	Medium	Rare	Very Poor	Lost			0	73
river birch	Betula nigra	NSL	Low	0.1	0.3	0.2	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			2	74
butternut	Juglans cinerea	NSLX	FIA	0.1	0.3	1.2	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	75
ashe juniper	Juniperus ashei	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	76
shortleaf pine	Pinus echinata	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	77
slash pine	Pinus elliotii	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	78
Virginia pine	Pinus virginiana	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +		3	79
pecan	Carya illinoensis	NSH	Low	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	80
black hickory	Carya texana	NDL	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	81
sugarberry	Celtis laevigata	NDH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	82
common persimmon	Diospyros virginiana	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	83
sweetgum	Liquidambar styraciflua	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	84
cucumbertree	Magnolia acuminata	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	85
bigleaf magnolia	Magnolia macrophylla	NSL	Low	0	0	0	New Habitat	Unknown	Medium	Absent	New Habitat	Unknown			3	86
southern red oak	Quercus falcata	WDL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +	3	87
laurel oak	Quercus laurifolia	NDH	Medium	0	0	0	Unknown	New Habitat	Medium	Absent	Unknown	New Habitat			0	88
blackjack oak	Quercus marilandica	NSL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			3	89
post oak	Quercus stellata	WDH	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate ++	Migrate ++	3	90
live oak	Quercus virginiana	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	91
bluejack oak	Quercus incana	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	92
American mountain-ash	Sorbus americana	NSL	Low	0	0	0	Unknown	New Habitat	Low	Absent	Unknown	New Habitat			0	93
winged elm	Ulmus alata	WDL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		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
cedar elm	Ulmus crassifolia	NDH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			0	95