

Climate Change Atlas Tree Species
Current and Potential Future Habitat, Capability, and Migration

	sq. km	sq. mi	FIA Plots
Area of Region	218,546	84,381	6,136

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	3			High	21	23	Increase	23	24	Very Good	7	8	Likely	0	0
Hickory	2			Medium	32	49	No Change	12	11	Good	11	12	Infill	32	30
Maple	6	Abundant	1	Low	34	18	Decrease	12	12	Fair	14	12	Migrate	5	9
Oak	6	Common	22	FIA	9		New	27	30	Poor	9	9		37	39
Pine	4	Rare	33				Unknown	22	19	Very Poor	6	5			
Other	35	Absent	38					96	96	FIA Only	5	5			
	56		94		96	90				Unknown	13	10			
											65	61			

Potential Changes in Climate Variables

Temperature (°F)

	Scenario	2009	2039	2069	2099	
Annual Average	CCSM45	41.6	43.3	46.2	46.7	
	CCSM85	41.6	44.1	47.4	51.0	
	GFDL45	41.6	46.2	47.0	48.6	
	GFDL85	41.6	44.8	48.3	53.3	
	HAD45	41.6	44.7	48.4	50.3	
HAD85	41.6	45.2	49.7	55.3		
Growing Season (May—Sep)	CCSM45	62.8	64.6	67.2	67.7	
	CCSM85	62.8	65.5	68.5	72.6	
	GFDL45	62.8	68.2	69.3	71.3	
	GFDL85	62.8	66.6	70.4	76.2	
	HAD45	62.8	65.8	68.7	70.9	
HAD85	62.8	65.8	70.1	75.6		
Coldest Month Average	CCSM45	7.5	9.3	11.6	12.0	
	CCSM85	7.5	9.1	11.5	13.9	
	GFDL45	7.5	11.1	12.7	13.2	
	GFDL85	7.5	11.5	13.3	16.3	
	HAD45	7.5	9.5	13.6	13.4	
HAD85	7.5	12.9	16.5	20.2		
Warmest Month Average	CCSM45	69.4	71.6	73.1	73.7	
	CCSM85	69.4	73.0	75.0	77.5	
	GFDL45	69.4	72.9	74.4	76.0	
	GFDL85	69.4	73.5	75.6	78.9	
	HAD45	69.4	72.5	74.1	75.8	
HAD85	69.4	73.1	75.4	79.2		

Precipitation (in)

	Scenario	2009	2039	2069	2099	
Annual Total	CCSM45	27.8	28.5	28.5	27.8	
	CCSM85	27.8	27.7	27.9	28.0	
	GFDL45	27.8	30.7	32.6	30.6	
	GFDL85	27.8	31.3	33.5	32.8	
	HAD45	27.8	29.7	28.4	29.3	
HAD85	27.8	29.1	29.2	31.1		
Growing Season (May—Sep)	CCSM45	18.0	18.0	17.4	17.1	
	CCSM85	18.0	17.2	16.7	16.0	
	GFDL45	18.0	20.1	20.8	19.1	
	GFDL85	18.0	20.4	20.9	19.6	
	HAD45	18.0	18.3	16.8	16.9	
HAD85	18.0	17.7	16.2	15.9		

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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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
quaking aspen	Populus tremuloides	WDH	High	54.8	1192.3	24.2	Sm. dec.	Sm. dec.	Medium	Abundant	Fair	Fair			0	1
black spruce	Picea mariana	NSH	High	24.6	399.8	15.6	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor	Infill +	Infill +	0	2
tamarack (native)	Larix laricina	NSH	High	23.4	356.4	15.2	No change	No change	Low	Common	Poor	Poor	Infill +	Infill +	0	3
paper birch	Betula papyrifera	WDH	High	42.2	350.2	7.9	No change	Sm. dec.	Medium	Common	Fair	Poor	Infill +	Infill +	1	4
bur oak	Quercus macrocarpa	NDH	Medium	40.7	323.3	12.3	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good	Infill ++	Infill ++	1	5
balsam fir	Abies balsamea	NDH	High	29.6	308.3	9.8	Sm. dec.	Sm. dec.	Low	Common	Poor	Poor	Infill +	Infill +	0	6
black ash	Fraxinus nigra	WSH	Medium	38.6	302.2	8.6	No change	No change	Low	Common	Poor	Poor			0	7
American basswood	Tilia americana	WSL	Medium	34.8	214.8	9.1	Sm. inc.	No change	Medium	Common	Good	Fair	Infill ++	Infill +	1	8
northern red oak	Quercus rubra	WDH	Medium	27.7	186.2	8.4	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good	Infill ++	Infill ++	1	9
red maple	Acer rubrum	WDH	High	29.9	184.2	6.1	Sm. inc.	Lg. inc.	High	Common	Very Good	Very Good	Infill ++	Infill ++	1	10
balsam poplar	Populus balsamifera	NSH	Medium	25.3	182.3	7.9	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor	Infill +	Infill +	0	11
American elm	Ulmus americana	WDH	Medium	45	175.5	6.3	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good	Infill ++	Infill ++	1	12
northern white-cedar	Thuja occidentalis	WSH	High	14.8	174.7	11.6	No change	Sm. inc.	Medium	Common	Fair	Good	Infill +	Infill ++	1	13
green ash	Fraxinus pennsylvanica	WSH	Low	44.3	172.5	8.5	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good	Infill ++	Infill ++	1	14
red pine	Pinus resinosa	NSH	Medium	16.1	162.8	11.0	Sm. inc.	Sm. inc.	Low	Common	Fair	Fair	Infill +	Infill +	1	15
boxelder	Acer negundo	WSH	Low	31.2	149.5	14.4	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good	Infill ++	Infill ++	1	16
sugar maple	Acer saccharum	WDH	High	23.1	146.8	7.8	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good	Infill ++	Infill ++	1	17
jack pine	Pinus banksiana	NSH	Medium	14	137.4	9.4	Sm. dec.	Sm. dec.	High	Common	Fair	Fair	Infill +	Infill +	1	18
white spruce	Picea glauca	NSL	Medium	23.8	87.9	3.8	No change	No change	Medium	Common	Fair	Fair	Infill +	Infill +	1	19
bigtooth aspen	Populus grandidentata	NSL	Medium	14.5	67.8	4.7	Sm. inc.	No change	Medium	Common	Good	Fair	Infill ++	Infill +	1	20
eastern white pine	Pinus strobus	WDH	High	12.6	66.5	5.3	Lg. inc.	Lg. inc.	Low	Common	Good	Good	Infill ++	Infill ++	1	21
northern pin oak	Quercus ellipsoidalis	NSH	Medium	8.5	55.2	7.5	No change	No change	High	Common	Good	Good	Infill ++	Infill ++	2	22
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	22.5	52.4	3.5	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good	Infill ++	Infill ++	1	23
silver maple	Acer saccharinum	NSH	Low	5.7	44.3	15.2	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	24
black cherry	Prunus serotina	WDL	Medium	15.3	32.4	3.1	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair	Infill +	Infill +	1	25
slippery elm	Ulmus rubra	WSL	Low	10.8	24.3	5.0	Sm. inc.	Sm. inc.	Medium	Rare	Fair	Fair	Infill +	Infill +	2	26
eastern redcedar	Juniperus virginiana	WDH	Medium	5.7	24.2	10.2	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	27
white oak	Quercus alba	WDH	Medium	4.7	22.6	5.5	Sm. inc.	Lg. inc.	High	Rare	Good	Good			2	28
eastern cottonwood	Populus deltoides	NSH	Low	5.4	21.5	14.5	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good	Infill +		2	29
hackberry	Celtis occidentalis	WDH	Medium	8.7	17.4	6.0	No change	Sm. inc.	High	Rare	Fair	Good	Infill +		2	30
black walnut	Juglans nigra	WDH	Low	4.7	17.3	7.1	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good	Infill +		2	31
black willow	Salix nigra	NSH	Low	4.5	14.9	8.1	No change	No change	Low	Rare	Very Poor	Very Poor			2	32
yellow birch	Betula alleghaniensis	NDL	High	5.7	12.4	2.1	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	33
mountain maple	Acer spicatum	NSL	Low	10.5	11.9	1.0	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor	Infill +	Infill +	1	34
chokecherry	Prunus virginiana	NSLX	FIA	15.5	11.0	1.0	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	35
shagbark hickory	Carya ovata	WSL	Medium	1.3	10.3	5.4	No change	Sm. inc.	Medium	Rare	Poor	Fair	Infill +	Infill +	2	36
bitternut hickory	Carya cordiformis	WSL	Low	4.6	9.5	3.7	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	37
Siberian elm	Ulmus pumila	NDH	FIA	1.9	6.1	15.8	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	38
serviceberry	Amelanchier spp.	NSL	Low	7.6	5.5	0.8	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	39
Scots pine	Pinus sylvestris	NSH	FIA	0.7	5.4	6.8	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	40
butternut	Juglans cinerea	NSLX	FIA	3	5.4	2.5	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	41
peachleaf willow	Salix amygdaloides	NSLX	FIA	3	4.6	2.9	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	42
pin cherry	Prunus pensylvanica	NSL	Low	4.9	4.3	0.9	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	43
black oak	Quercus velutina	WDH	High	0.6	3.5	4.4	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	44
white ash	Fraxinus americana	WDL	Medium	1.2	3.1	3.6	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair	Infill +	Infill +	2	45
black locust	Robinia pseudoacacia	NDH	Low	0.4	2.0	5.0	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	46
river birch	Betula nigra	NSL	Low	0.2	1.7	1.7	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
American hornbeam; muscle	Carpinus caroliniana	WSL	Low	1.4	1.4	0.9	Sm. dec.	No change	Medium	Rare	Very Poor	Poor	Infill +		2	48
American mountain-ash	Sorbus americana	NSL	Low	1.6	1.3	0.7	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	49
rock elm	Ulmus thomasii	NSLX	FIA	0.8	1.0	3.2	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	50
swamp white oak	Quercus bicolor	NSL	Low	0	0.5	1.0	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	51
red mulberry	Morus rubra	NSL	Low	1.1	0.5	3.3	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	52
wild plum	Prunus americana	NSLX	FIA	1.4	0.5	2.3	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	53
white mulberry	Morus alba	NSL	FIA	0.5	0.4	4.7	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	54
black maple	Acer nigrum	NSH	Low	0	0.1	2.7	Lg. dec.	Very Lg. dec.	High	Rare	Poor	Lost			0	55
Norway spruce	Picea abies	NSH	FIA	0	0.1	0.2	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	56
ashe juniper	Juniperus ashei	NDH	High	0	0	0	New Habitat	New Habitat	NA	Absent	New Habitat	New Habitat			0	57
slash pine	Pinus elliottii	NDH	High	0	0	0	Unknown	New Habitat	Medium	Absent	Unknown	New Habitat			0	58
eastern hemlock	Tsuga canadensis	NSH	High	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat	Migrate ++	Migrate +	3	59
striped maple	Acer pensylvanicum	NSL	Medium	0	0	0	New Habitat	Unknown	Medium	Absent	New Habitat	Unknown			3	60
Ohio buckeye	Aesculus glabra	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	61
yellow buckeye	Aesculus flava	NSL	Low	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown			0	62
sweet birch	Betula lenta	NDH	High	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			0	63
cittamwood/gum bumelia	Sideroxylon lanuginosum ssp.	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			0	64
pignut hickory	Carya glabra	WDL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	65
pecan	Carya illinoensis	NSH	Low	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	66
shellbark hickory	Carya laciniosa	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	67
black hickory	Carya texana	NDL	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	68
mockernut hickory	Carya alba	WDL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +		3	69
sugarberry	Celtis laevigata	NDH	Medium	0	0	0	Unknown	New Habitat	Medium	Absent	Unknown	New Habitat			0	70
eastern redbud	Cercis canadensis	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	71
flowering dogwood	Cornus florida	WDL	Medium	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	72
American beech	Fagus grandifolia	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	73
blue ash	Fraxinus quadrangulata	NSL	Low	0	0	0	Unknown	Unknown	Low	Modeled	Unknown	Unknown			0	74
honeylocust	Gleditsia triacanthos	NSH	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	75
American holly	Ilex opaca	NSL	Medium	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	76
sweetgum	Liquidambar styraciflua	WDH	High	0	0	0	Unknown	New Habitat	Medium	Absent	Unknown	New Habitat			0	77
Osage-orange	Maclura pomifera	NDH	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	78
cucumbertree	Magnolia acuminata	NSL	Low	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown			0	79
bigleaf magnolia	Magnolia macrophylla	NSL	Low	0	0	0	Unknown	New Habitat	Medium	Absent	Unknown	New Habitat			0	80
mountain or Fraser magnolia	Magnolia fraseri	NSL	Low	0	0	0	Unknown	Unknown	NA	Absent	Unknown	Unknown			0	81
sycamore	Platanus occidentalis	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	82
scarlet oak	Quercus coccinea	WDL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	83
shingle oak	Quercus imbricaria	NDH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +		3	84
laurel oak	Quercus laurifolia	NDH	Medium	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	85
blackjack oak	Quercus marilandica	NSL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			3	86
chinkapin oak	Quercus muehlenbergii	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	87
Nuttall oak	Quercus texana	NSH	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			0	88
pin oak	Quercus palustris	NSH	Low	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat	Migrate +		3	89
chestnut oak	Quercus prinus	NDH	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			0	90
Shumard oak	Quercus shumardii	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			3	91
post oak	Quercus stellata	WDH	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			3	92
live oak	Quercus virginiana	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	93
sassafras	Sassafras albidum	WSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +		3	94

Minnesota

States

Climate Change Atlas Tree Species

Current and Potential Future Habitat, Capability, and Migration

USDA Forest Service
Northern Research Station
Landscape Change Research Group
Iverson, Peters, Prasad, Matthews

Common Name	Scientific Name	Range	MR	%Cell	FIAsum	FIAiv	ChngCl45	ChngCl85	Adap	Abund	Capabil45	Capabil85	SHIFT45	SHIFT85	SSO	N
winged elm	<i>Ulmus alata</i>	WDL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	95
cedar elm	<i>Ulmus crassifolia</i>	NDH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			0	96