

HUC 040301 Northwestern Lake Michigan

HUC 6 Watershed Climate Change Atlas Tree Species

USDA Forest Service
Northern Research Station
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Iverson, Peters, Prasad, Matthews

Current and Potential Future Habitat, Capability, and Migration

	sq. km	sq. mi	FIA Plots
Area of Region	31,463	12,148	1,484

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	20	22	Increase	24	21	Very Good	6	7	Likely	3	3
Ash	3			Medium	29	41	No Change	9	12	Good	17	14	Infill	9	11
Hickory	2			Low	25	14	Decrease	12	12	Fair	8	9	Migrate	8	12
Maple	5	Abundant	5	FIA	5		New	25	28	Poor	9	11			
Oak	7	Common	23				Unknown	9	6	Very Poor	5	4			
Pine	4	Rare	22							FIA Only	3	3			
Other	29	Absent	28							Unknown	4	1			
	50		78		79	77		79	79		52	49		20	26

Potential Changes in Climate Variables

Temperature (°F)

Scenario	2009	2039	2069	2099		
Annual	CCSM45	39.9	41.3	43.8	43.7	
Average	CCSM85	39.9	41.9	44.3	47.1	
	GFDL45	39.9	42.4	44.8	45.9	
	GFDL85	39.9	42.7	45.7	49.8	
	HAD45	39.9	42.6	45.2	46.8	
	HAD85	39.9	42.8	46.1	50.8	
Growing Season	CCSM45	54.8	56.1	58.1	58.2	
	CCSM85	54.8	56.6	58.8	61.9	
May—Sep	GFDL45	54.8	58.1	61.1	62.8	
	GFDL85	54.8	58.5	62.2	66.9	
	HAD45	54.8	57.4	59.1	61.0	
	HAD85	54.8	57.2	60.3	64.8	
Coldest Month	CCSM45	16.9	18.0	20.2	20.0	
	CCSM85	16.9	18.5	20.3	22.3	
Average	GFDL45	16.9	19.0	20.5	20.9	
	GFDL85	16.9	19.8	21.1	23.3	
	HAD45	16.9	18.5	21.7	21.8	
	HAD85	16.9	20.7	23.1	26.6	
Warmest Month	CCSM45	59.7	61.3	62.5	62.7	
	CCSM85	59.7	62.0	63.4	65.1	
Average	GFDL45	59.7	63.1	64.5	65.7	
	GFDL85	59.7	63.7	65.7	68.0	
	HAD45	59.7	62.4	63.0	64.5	
	HAD85	59.7	62.5	64.1	67.2	

Precipitation (in)

Scenario	2009	2039	2069	2099		
Annual	CCSM45	24.0	24.6	24.3	24.7	
Total	CCSM85	24.0	24.3	24.4	25.1	
	GFDL45	24.0	25.8	27.4	26.8	
	GFDL85	24.0	25.9	28.4	28.7	
	HAD45	24.0	24.8	25.8	26.0	
	HAD85	24.0	25.4	26.3	27.5	
Growing Season	CCSM45	13.2	13.4	12.7	13.3	
	CCSM85	13.2	13.3	13.1	12.6	
May—Sep	GFDL45	13.2	14.0	14.5	14.2	
	GFDL85	13.2	14.2	14.7	14.3	
	HAD45	13.2	13.0	12.6	12.6	
	HAD85	13.2	13.3	12.0	12.4	

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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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	67.7	1440.3	15.9	Sm. dec.	Sm. dec.	High	Abundant	Good	Good			1	1
northern white-cedar	Thuja occidentalis	WSH	High	67.5	1137.8	13.2	Sm. dec.	Sm. dec.	Medium	Abundant	Fair	Fair			0	2
quaking aspen	Populus tremuloides	WDH	High	76.1	956.4	10.7	No change	No change	Medium	Abundant	Good	Good			1	3
red maple	Acer rubrum	WDH	High	77.7	940.1	9.4	No change	No change	High	Abundant	Very Good	Very Good			1	4
balsam fir	Abies balsamea	NDH	High	73.8	782.9	8.4	Lg. dec.	Lg. dec.	Low	Abundant	Poor	Poor			0	5
green ash	Fraxinus pennsylvanica	WSH	Low	36.8	391.6	9.6	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	6
eastern white pine	Pinus strobus	WDH	High	43.9	374.3	6.7	Sm. inc.	No change	Low	Common	Fair	Poor			1	7
red pine	Pinus resinosa	NSH	Medium	35.2	365.6	8.5	Sm. inc.	Sm. inc.	Low	Common	Fair	Fair			1	8
black spruce	Picea mariana	NSH	High	48.2	336.0	5.4	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	9
black ash	Fraxinus nigra	WSH	Medium	57.3	295.4	4.4	No change	No change	Low	Common	Poor	Poor			0	10
American basswood	Tilia americana	WSL	Medium	46.4	290.0	5.1	Sm. inc.	No change	Medium	Common	Good	Fair			1	11
paper birch	Betula papyrifera	WDH	High	72.3	282.3	3.2	Sm. inc.	No change	Medium	Common	Good	Fair			1	12
white spruce	Picea glauca	NSL	Medium	62.2	260.7	3.4	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	13
tamarack (native)	Larix laricina	NSH	High	41.4	241.0	5.0	Sm. inc.	Sm. inc.	Low	Common	Fair	Fair			1	14
balsam poplar	Populus balsamifera	NSH	Medium	32.8	187.4	4.9	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	15
eastern hemlock	Tsuga canadensis	NSH	High	37.1	184.7	3.8	No change	Sm. dec.	Low	Common	Poor	Poor			0	16
white ash	Fraxinus americana	WDL	Medium	38.3	181.6	4.0	Sm. inc.	Sm. inc.	Low	Common	Fair	Fair			1	17
American elm	Ulmus americana	WDH	Medium	47.2	181.0	3.5	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	18
northern red oak	Quercus rubra	WDH	Medium	32.9	180.6	4.5	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	19
bigtooth aspen	Populus grandidentata	NSL	Medium	36	178.4	4.2	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	20
black cherry	Prunus serotina	WDL	Medium	57	177.6	2.4	Lg. inc.	Lg. inc.	Low	Common	Good	Good			1	21
jack pine	Pinus banksiana	NSH	Medium	17.2	167.8	7.7	Sm. dec.	Sm. dec.	High	Common	Fair	Fair			1	22
yellow birch	Betula alleghaniensis	NDL	High	51.3	159.2	2.4	No change	No change	Medium	Common	Fair	Fair			1	23
northern pin oak	Quercus ellipsoidalis	NSH	Medium	13.9	108.2	7.1	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good	Infill ++	Infill ++	1	24
boxelder	Acer negundo	WSH	Low	9.4	75.2	8.4	No change	No change	High	Common	Good	Good	Infill ++	Infill ++	2	25
silver maple	Acer saccharinum	NSH	Low	6.3	71.9	10.0	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good	Infill ++	Infill ++	2	26
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	43.3	71.7	1.3	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	27
American beech	Fagus grandifolia	WDH	High	18.7	70.9	3.3	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good	Infill ++	Infill ++	1	28
eastern cottonwood	Populus deltoides	NSH	Low	3.9	63.1	8.0	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	29
Scots pine	Pinus sylvestris	NSH	FIA	1.8	24.8	7.2	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	30
black willow	Salix nigra	NSH	Low	4.2	23.4	8.5	No change	No change	Low	Rare	Very Poor	Very Poor			2	31
bur oak	Quercus macrocarpa	NDH	Medium	9.2	18.8	2.3	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	32
white oak	Quercus alba	WDH	Medium	7.1	15.0	2.2	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	33
serviceberry	Amelanchier spp.	NSL	Low	14	12.9	0.8	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	34
pin cherry	Prunus pensylvanica	NSL	Low	8	11.4	1.2	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	35
swamp white oak	Quercus bicolor	NSL	Low	3.9	9.2	3.2	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	36
shagbark hickory	Carya ovata	WSL	Medium	4.1	8.8	3.4	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	37
bitternut hickory	Carya cordiformis	WSL	Low	3.6	7.8	1.5	Sm. inc.	Sm. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	38
slippery elm	Ulmus rubra	WSL	Low	3.3	7.8	2.0	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	39
chokecherry	Prunus virginiana	NSLX	FIA	7.7	7.4	0.8	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	40
American hornbeam; muscle	Carpinus caroliniana	WSL	Low	5.7	6.4	1.0	Sm. dec.	No change	Medium	Rare	Very Poor	Poor		Infill +	2	41
peachleaf willow	Salix amygdaloides	NSLX	FIA	1.1	6.1	4.7	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	42
rock elm	Ulmus thomasii	NSLX	FIA	1.3	4.1	3.2	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	43
Norway spruce	Picea abies	NSH	FIA	0.3	3.9	12.2	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	44
eastern redcedar	Juniperus virginiana	WDH	Medium	1	3.6	10.3	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	45
mountain maple	Acer spicatum	NSL	Low	4.9	3.0	0.5	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			1	46
black oak	Quercus velutina	WDH	High	0.2	1.0	1.6	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	47



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pin oak	Quercus palustris	NSH	Low	0.3	0.8	2.5	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair		Infill +	2	48
black locust	Robinia pseudoacacia	NDH	Low	0.3	0.6	2.0	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	49
American mountain-ash	Sorbus americana	NSL	Low	0.3	0.1	0.2	Lg. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	50
red spruce	Picea rubens	NDH	High	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			0	51
striped maple	Acer pensylvanicum	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Likely +	Likely +	3	52
Ohio buckeye	Aesculus glabra	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +		3	53
sweet birch	Betula lenta	NDH	High	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			0	54
pignut hickory	Carya glabra	WDL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	55
black hickory	Carya texana	NDL	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	56
mockernut hickory	Carya alba	WDL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +	3	57
sugarberry	Celtis laevigata	NDH	Medium	0	0	0	Unknown	New Habitat	Medium	Absent	Unknown	New Habitat			2	58
hackberry	Celtis occidentalis	WDH	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate ++	Migrate ++	3	59
eastern redbud	Cercis canadensis	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	60
flowering dogwood	Cornus florida	WDL	Medium	0	0	0	Unknown	New Habitat	Medium	Absent	Unknown	New Habitat			3	61
honeylocust	Gleditsia triacanthos	NSH	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Likely +	Likely +	3	62
American holly	Ilex opaca	NSL	Medium	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown			0	63
black walnut	Juglans nigra	WDH	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate ++	Migrate ++	3	64
sweetgum	Liquidambar styraciflua	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	65
yellow-poplar	Liriodendron tulipifera	WDH	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +	3	66
Osage-orange	Maclura pomifera	NDH	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	67
bigleaf magnolia	Magnolia macrophylla	NSL	Low	0	0	0	Unknown	New Habitat	Medium	Absent	Unknown	New Habitat			0	68
red mulberry	Morus rubra	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Likely +	Likely +	3	69
blackgum	Nyssa sylvatica	WDL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +	3	70
sycamore	Platanus occidentalis	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	71
scarlet oak	Quercus coccinea	WDL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	72
shingle oak	Quercus imbricaria	NDH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	73
blackjack oak	Quercus marilandica	NSL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			0	74
chinkapin oak	Quercus muehlenbergii	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	75
chestnut oak	Quercus prinus	NDH	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			0	76
Shumard oak	Quercus shumardii	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			3	77
post oak	Quercus stellata	WDH	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			3	78
sassafras	Sassafras albidum	WSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	79