ua 68509

U.S. Census Bureau Urban Areas
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

	sq. km	sq. mi	FIA Plots
Area of Region	9,200.0	3,552.1	46

Species Information

The columns below provide breif 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
Ash	2
Hickory	5
Maple	4
Oak	8
Pine	2
Other	25
	46

Abundance	
Abundant	0
Common	7
Rare	39
Absent	10
	56

	Model Reliability	Adaptability
High	9	19
Medium	22	32
Low	25	7
FIA	3	
	59	**58**

Potential Change in Habitat Suitability	Scenario RCP45	Scenario RCP85
Increase	19	23
No Change	12	6
Decrease	12	14
New	10	10
Unknown	6	6
	59	**59**

Capability to Cope or Persist	Scenario RCP45	Scenario RCP85
Very Good	0	0
Good	14	20
Fair	11	6
Poor	9	8
Very Poor	8	6
FIA Only	2	2
Unknown	3	3
	47	**45**

Migration Potential	SHIFT RCP45	SHIFT RCP85
Likely	2	2
Infill	28	28
Migrate	2	7
	32	**37**

Potential Changes in Climate Variables

Temperature (°F)

	Scenario	2009	2039	2069	2099
Annual Average	CCSM45	51.2	53.2	55.4	55.7
	CCSM85	51.2	53.9	56.4	59.1
	GFDL45	51.2	57.3	56.6	57.6
	GFDL85	51.2	54.2	57.6	61.7
	HAD45	51.2	54.0	57.4	59.2
	HAD85	51.2	54.3	59.1	63.5
Growing Season May—Sep	CCSM45	69.4	71.7	73.6	74.3
	CCSM85	69.4	72.6	74.9	78.1
	GFDL45	69.4	76.9	75.7	77.3
	GFDL85	69.4	73.1	76.9	82.0
	HAD45	69.4	72.4	75.2	77.4
	HAD85	69.4	72.6	78.1	82.5
Coldest Month Average	CCSM45	21.6	23.1	25.4	25.5
	CCSM85	21.6	24.6	26.1	27.6
	GFDL45	21.6	25.9	26.7	27.4
	GFDL85	21.6	25.3	26.8	28.0
	HAD45	21.6	23.1	26.5	26.6
	HAD85	21.6	25.4	28.5	30.8
Warmest Month Average	CCSM45	75.3	77.5	78.9	79.7
	CCSM85	75.3	79.1	80.9	82.3
	GFDL45	75.3	78.5	80.2	81.3
	GFDL85	75.3	79.4	81.2	84.3
	HAD45	75.3	78.5	80.7	81.6
	HAD85	75.3	80.0	83.3	86.0

Precipitation (in)

	Scenario	2009	2039	2069	2099
Annual Total	CCSM45	37.1	35.6	36.5	36.1
	CCSM85	37.1	36.1	36.5	37.0
	GFDL45	37.1	40.3	43.5	44.4
	GFDL85	37.1	40.6	45.9	46.0
	HAD45	37.1	39.0	40.8	40.4
	HAD85	37.1	40.1	38.5	41.8
Growing Season May—Sep	CCSM45	18.9	18.3	18.2	17.0
	CCSM85	18.9	17.4	17.2	16.7
	GFDL45	18.9	19.8	20.9	21.3
	GFDL85	18.9	20.2	21.7	20.9
	HAD45	18.9	19.4	18.4	18.9
	HAD85	18.9	19.3	16.7	16.9

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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Common Name	Scientific Name	Range	MR	%Cell	FIAsum	FIAiv	ChngCl45	ChngCl85	Adap	Abund	Capabil45	Capabil85	SHIFT45	SHIFT85	SSO	N
white oak	Quercus alba	WDH	Medium	34.8	118.4	12.5	Sm. dec.	Lg. dec.	High	Common	Fair	Fair	Infill +	Infill +	1	1
American elm	Ulmus americana	WDH	Medium	60.9	114.5	10.5	No change	Sm. inc.	Medium	Common	Fair	Good	Infill +	Infill ++	1	2
sugar maple	Acer saccharum	WDH	High	20.7	86.6	16.6	No change	No change	High	Common	Good	Good	Infill ++	Infill ++	2	3
black cherry	Prunus serotina	WDL	Medium	54.3	67.2	9.0	Sm. dec.	Sm. dec.	Low	Common	Poor	Poor	Infill +	Infill +	0	4
black walnut	Juglans nigra	WDH	Low	50	60.2	11.5	Sm. inc.	Sm. inc.	Medium	Common	Good	Good	Infill ++	Infill ++	1	5
black willow	Salix nigra	NSH	Low	26.1	53.7	26.2	Lg. dec.	No change	Low	Common	Very Poor	Poor		Infill +	0	6
northern red oak	Quercus rubra	WDH	Medium	25	52.9	10.7	Sm. dec.	Sm. dec.	High	Common	Fair	Fair	Infill +	Infill +	1	7
white ash	Fraxinus americana	WDL	Medium	28.3	46.6	8.0	No change	Sm. inc.	Low	Rare	Very Poor	Poor		Infill +	1	8
hackberry	Celtis occidentalis	WDH	Medium	46.7	40.4	7.1	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	1	9
red mulberry	Morus rubra	NSL	Low	18.5	40.3	18.0	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	1	10
shingle oak	Quercus imbricaria	NDH	Medium	15.2	35.6	6.7	No change	Sm. dec.	Medium	Rare	Poor	Very Poor	Infill +		2	11
eastern white pine	Pinus strobus	WDH	High	8.7	31.3	45.7	Lg. dec.	Very Lg. dec.	Low	Rare	Very Poor	Lost			0	12
Osage-orange	Maclura pomifera	NDH	Medium	31.5	31.1	7.7	Sm. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	1	13
shagbark hickory	Carya ovata	WSL	Medium	20.7	28.7	4.8	Sm. inc.	No change	Medium	Rare	Fair	Poor	Infill +	Infill +	1	14
honeylocust	Gleditsia triacanthos	NSH	Low	30.4	27.5	11.5	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	1	15
black oak	Quercus velutina	WDH	High	23.9	27.5	6.1	Sm. inc.	Sm. inc.	Medium	Rare	Fair	Fair	Infill +	Infill +	1	16
bitternut hickory	Carya cordiformis	WSL	Low	19.6	25.2	5.1	Sm. inc.	Sm. inc.	High	Rare	Good	Good	Infill ++	Infill ++	1	17
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	20.7	24.6	4.1	No change	Sm. dec.	High	Rare	Fair	Poor	Infill +	Infill +	1	18
silver maple	Acer saccharinum	NSH	Low	8.7	24.1	35.2	Sm. inc.	Sm. inc.	High	Rare	Good	Good	Infill ++	Infill ++	1	19
American basswood	Tilia americana	WSL	Medium	14.1	18.6	6.2	Sm. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	20
black locust	Robinia pseudoacacia	NDH	Low	13	18.5	18.0	No change	Lg. inc.	Medium	Rare	Poor	Good	Infill +	Infill ++	1	21
northern catalpa	Catalpa speciosa	NSHX	FIA	8.7	15.9	23.3	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	22
green ash	Fraxinus pennsylvanica	WSH	Low	15.2	15.0	6.9	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	1	23
mockernut hickory	Carya alba	WDL	Medium	6.5	14.6	5.3	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	24
slippery elm	Ulmus rubra	WSL	Low	20.7	14.5	3.0	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	1	25
bur oak	Quercus macrocarpa	NDH	Medium	8.7	8.8	12.9	No change	Sm. inc.	High	Rare	Fair	Good	Infill +		2	26
white mulberry	Morus alba	NSL	FIA	14.1	8.2	3.8	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	27
eastern redcedar	Juniperus virginiana	WDH	Medium	5.4	5.1	2.1	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	2	28
red pine	Pinus resinosa	NSH	Medium	1.1	5.0	3.6	Lg. dec.	Very Lg. dec.	Low	Rare	Very Poor	Lost			0	29
sassafras	Sassafras albidum	WSL	Low	5.4	4.8	2.7	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	30
post oak	Quercus stellata	WDH	High	8.7	4.5	6.6	Lg. inc.	Lg. inc.	High	Rare	Good	Good			2	31
sycamore	Platanus occidentalis	NSL	Low	8.7	4.1	6.0	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good	Infill +	Infill ++	2	32
Ohio buckeye	Aesculus glabra	NSL	Low	9.8	2.8	1.1	Very Lg. dec.	Very Lg. dec.	Medium	Rare	Lost	Lost			0	33
chinkapin oak	Quercus muehlenbergii	NSL	Medium	13	2.4	2.3	Sm. inc.	Sm. inc.	Medium	Rare	Fair	Fair	Infill +	Infill +	2	34
eastern cottonwood	Populus deltoides	NSH	Low	4.3	2.4	6.9	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	2	35
flowering dogwood	Cornus florida	WDL	Medium	1.1	1.9	1.4	No change	Lg. dec.	Medium	Rare	Poor	Very Poor			0	36
black maple	Acer nigrum	NSH	Low	4.3	1.9	5.5	Sm. dec.	Lg. dec.	High	Rare	Poor	Poor			0	37
eastern redbud	Cercis canadensis	NSL	Low	8.7	1.0	1.5	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good	Infill +	Infill ++	2	38
pin oak	Quercus palustris	NSH	Low	4.3	1.0	2.9	Sm. inc.	Lg. inc.	Low	Rare	Poor	Fair	Infill +	Infill +	2	39
black hickory	Carya texana	NDL	High	4.3	0.6	1.7	No change	Lg. inc.	Medium	Rare	Poor	Good			2	40
boxelder	Acer negundo	WSH	Low	4.3	0.4	1.3	Lg. inc.	Lg. inc.	High	Rare	Good	Good			2	41
bigtooth aspen	Populus grandidentata	NSL	Medium	4.3	0.3	1.0	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	42
shellbark hickory	Carya laciniosa	NSL	Low	4.3	0.3	0.9	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	43
sugarberry	Celtis laevigata	NDH	Medium	4.3	0.3	0.8	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	44
chokecherry	Prunus virginiana	NSLX	FIA	4.3	0.2	0.7	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	45
serviceberry	Amelanchier spp.	NSL	Low	4.3	0.2	0.4	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	46
yellow birch	Betula alleghaniensis	NDL	High	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown			0	47

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American hornbeam; muscle	Carpinus caroliniana	WSL	Low	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown			0	48
pignut hickory	Carya glabra	WDL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	49
pecan	Carya illinoinensis	NSH	Low	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat	Likely +	Likely +	3	50
common persimmon	Diospyros virginiana	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +	3	51
sweetgum	Liquidambar styraciflua	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	52
yellow-poplar	Liriodendron tulipifera	WDH	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +	3	53
blackgum	Nyssa sylvatica	WDL	Medium	0	0	0	Unknown	Unknown	High	Modeled	Unknown	Unknown			0	54
swamp white oak	Quercus bicolor	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Likely +	Likely +	3	55
blackjack oak	Quercus marilandica	NSL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +	3	56
water oak	Quercus nigra	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	57
Shumard oak	Quercus shumardii	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	58
winged elm	Ulmus alata	WDL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate ++	3	59