HUC 051100 Green

HUC 6 Watershed
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	23,917	9,234.4	459

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	3
Hickory	7
Maple	6
Oak	18
Pine	5
Other	44
	83

Abundance	
Abundant	4
Common	35
Rare	44
Absent	16
	99

	Model Reliability	Adaptability
High	21	27
Medium	34	55
Low	39	16
FIA	6	
	100	**98**

Potential Change in Habitat Suitability	Scenario RCP45	Scenario RCP85
Increase	28	33
No Change	13	13
Decrease	36	31
New	13	14
Unknown	10	9
	100	**100**

Capability to Cope or Persist	Scenario RCP45	Scenario RCP85
Very Good	12	15
Good	18	18
Fair	12	12
Poor	14	15
Very Poor	19	11
FIA Only	4	4
Unknown	4	3
	83	**78**

Migration Potential	SHIFT RCP45	SHIFT RCP85
Likely	0	0
Infill	12	13
Migrate	2	5
	14	**18**

Potential Changes in Climate Variables

Temperature (°F)

	Scenario	2009	2039	2069	2099
Annual Average	CCSM45	52.6	54.1	56.1	56.3
	CCSM85	52.6	54.5	56.8	59.4
	GFDL45	52.6	55.0	56.9	57.5
	GFDL85	52.6	54.9	57.7	60.7
	HAD45	52.6	54.8	57.5	58.6
	HAD85	52.6	55.2	58.9	62.3
Growing Season May—Sep	CCSM45	65.4	66.8	68.5	69.0
	CCSM85	65.4	67.2	69.7	73.0
	GFDL45	65.4	68.0	70.3	71.4
	GFDL85	65.4	68.2	71.6	75.1
	HAD45	65.4	68.1	70.8	72.2
	HAD85	65.4	68.5	73.8	77.0
Coldest Month Average	CCSM45	32.7	34.0	35.3	35.7
	CCSM85	32.7	35.2	36.1	37.4
	GFDL45	32.7	36.1	36.1	36.3
	GFDL85	32.7	34.2	35.1	35.6
	HAD45	32.7	33.3	35.2	35.4
	HAD85	32.7	34.4	35.9	37.3
Warmest Month Average	CCSM45	69.7	71.2	72.2	72.5
	CCSM85	69.7	71.6	73.1	74.6
	GFDL45	69.7	72.3	73.7	74.4
	GFDL85	69.7	72.7	74.7	76.7
	HAD45	69.7	73.2	75.5	76.1
	HAD85	69.7	74.7	78.5	79.9

Precipitation (in)

	Scenario	2009	2039	2069	2099
Annual Total	CCSM45	41.0	42.1	46.4	45.3
	CCSM85	41.0	45.8	46.2	49.3
	GFDL45	41.0	46.5	49.1	51.5
	GFDL85	41.0	46.3	49.8	52.9
	HAD45	41.0	40.3	43.2	43.0
	HAD85	41.0	41.3	39.2	42.9
Growing Season May—Sep	CCSM45	17.2	16.8	18.2	17.7
	CCSM85	17.2	18.4	16.8	17.9
	GFDL45	17.2	19.7	19.5	20.2
	GFDL85	17.2	19.3	19.7	20.3
	HAD45	17.2	16.5	15.5	15.6
	HAD85	17.2	16.6	13.2	13.8

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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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	79.5	891.9	10.7	Lg. dec.	Lg. dec.	High	Abundant	Good	Good			1	1
yellow-poplar	Liriodendron tulipifera	WDH	High	68.9	701.7	9.7	Lg. dec.	Lg. dec.	High	Abundant	Good	Good			1	2
eastern redcedar	Juniperus virginiana	WDH	Medium	58.8	538.5	8.8	Sm. inc.	Sm. inc.	Medium	Abundant	Very Good	Very Good			1	3
white oak	Quercus alba	WDH	Medium	63.2	501.3	7.1	No change	No change	High	Abundant	Very Good	Very Good			1	4
red maple	Acer rubrum	WDH	High	61.4	399.3	6.4	No change	No change	High	Common	Good	Good			1	5
American beech	Fagus grandifolia	WDH	High	45.7	337.6	6.0	Lg. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	6
pignut hickory	Carya glabra	WDL	Medium	53.1	335.3	5.5	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	7
sweetgum	Liquidambar styraciflua	WDH	High	38.2	309.2	8.6	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	8
sassafras	Sassafras albidum	WSL	Low	56	296.9	5.6	Lg. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	9
black oak	Quercus velutina	WDH	High	54.6	262.7	5.1	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	10
green ash	Fraxinus pennsylvanica	WSH	Low	47.5	218.1	4.3	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	11
blackgum	Nyssa sylvatica	WDL	Medium	56.6	217.7	3.7	No change	Sm. inc.	High	Common	Good	Very Good			1	12
northern red oak	Quercus rubra	WDH	Medium	38.1	211.2	4.4	No change	No change	High	Common	Good	Good			1	13
winged elm	Ulmus alata	WDL	Medium	43	201.6	4.2	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	14
mockernut hickory	Carya alba	WDL	Medium	44.3	182.3	3.8	Sm. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	15
black cherry	Prunus serotina	WDL	Medium	52.2	180.1	3.7	Sm. inc.	Sm. inc.	Low	Common	Fair	Fair			1	16
sycamore	Platanus occidentalis	NSL	Low	32.3	178.0	4.6	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	17
white ash	Fraxinus americana	WDL	Medium	37.4	160.1	3.8	Sm. inc.	Sm. inc.	Low	Common	Fair	Fair			1	18
Virginia pine	Pinus virginiana	NDH	High	13.2	156.1	9.5	Lg. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	19
flowering dogwood	Cornus florida	WDL	Medium	50.5	152.8	2.9	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	20
chinkapin oak	Quercus muehlenbergii	NSL	Medium	28.6	143.7	4.2	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	21
shagbark hickory	Carya ovata	WSL	Medium	37.8	129.0	3.2	No change	No change	Medium	Common	Fair	Fair			1	22
American elm	Ulmus americana	WDH	Medium	41.9	122.7	3.0	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	23
post oak	Quercus stellata	WDH	High	23.1	119.8	5.3	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	24
hackberry	Celtis occidentalis	WDH	Medium	31.3	106.9	4.0	Sm. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	25
slippery elm	Ulmus rubra	WSL	Low	35.9	105.6	2.8	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good			1	26
black walnut	Juglans nigra	WDH	Low	33.1	104.0	3.4	No change	Sm. inc.	Medium	Common	Fair	Good			1	27
southern red oak	Quercus falcata	WDL	Medium	22.6	98.3	4.2	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	28
chestnut oak	Quercus prinus	NDH	High	12.2	97.1	5.5	Sm. dec.	No change	High	Common	Fair	Good	Infill +	Infill ++	1	29
loblolly pine	Pinus taeda	WDH	High	3.8	83.7	22.3	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	2	30
bitternut hickory	Carya cordiformis	WSL	Low	29.1	83.5	2.8	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	31
shellbark hickory	Carya laciniosa	NSL	Low	18.6	78.1	4.0	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	32
eastern redbud	Cercis canadensis	NSL	Low	33.9	76.6	2.1	Sm. dec.	No change	Medium	Common	Poor	Fair			1	33
ailanthus	Ailanthus altissima	NSL	FIA	7.3	74.4	6.9	Unknown	Unknown	NA	Common	NNIS	NNIS			0	34
scarlet oak	Quercus coccinea	WDL	Medium	24.4	73.7	3.1	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	35
black locust	Robinia pseudoacacia	NDH	Low	14.5	72.4	4.4	No change	No change	Medium	Common	Fair	Fair			1	36
common persimmon	Diospyros virginiana	NSL	Low	23.4	64.3	2.5	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	37
boxelder	Acer negundo	WSH	Low	15.4	57.5	3.8	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	38
cherrybark oak; swamp red o	Quercus pagoda	NSL	Medium	13.4	56.5	4.6	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good	Infill ++	Infill ++	1	39
sourwood	Oxydendrum arboreum	NDL	High	18.4	53.4	2.3	Sm. dec.	Sm. dec.	High	Common	Fair	Fair			1	40
silver maple	Acer saccharinum	NSH	Low	7.8	45.9	11.5	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	1	41
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	20.8	42.1	1.8	Lg. inc.	Lg. inc.	High	Rare	Good	Good			1	42
yellow buckeye	Aesculus flava	NSL	Low	6.9	37.4	2.8	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	43
red mulberry	Morus rubra	NSL	Low	18	35.1	2.1	Sm. dec.	No change	Medium	Rare	Very Poor	Poor			1	44
Shumard oak	Quercus shumardii	NSL	Low	6.6	25.8	3.2	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	1	45
shingle oak	Quercus imbricaria	NDH	Medium	7.3	23.6	4.0	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	46
American hornbeam; muscle	Carpinus caroliniana	WSL	Low	14.7	17.7	1.4	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			1	47

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black willow	Salix nigra	NSH	Low	5.9	17.2	4.9	No change	Lg. inc.	Low	Rare	Very Poor	Fair		Infill +	1	48
honeylocust	Gleditsia triacanthos	NSH	Low	3.7	12.5	3.6	Sm. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	1	49
eastern white pine	Pinus strobus	WDH	High	0.8	12.3	14.7	Lg. dec.	Very Lg. dec.	Low	Rare	Very Poor	Lost			0	50
shortleaf pine	Pinus echinata	WDH	High	0.7	12.1	14.1	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	51
pitch pine	Pinus rigida	NSH	High	2.6	11.7	6.9	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	52
American basswood	Tilia americana	WSL	Medium	1.9	11.1	3.2	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	53
sugarberry	Celtis laevigata	NDH	Medium	5.3	11.0	2.7	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	2	54
butternut	Juglans cinerea	NSLX	FIA	2.6	10.2	3.4	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	55
swamp white oak	Quercus bicolor	NSL	Low	3.1	9.4	3.9	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	56
pin oak	Quercus palustris	NSH	Low	3.6	8.8	2.9	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			2	57
paulownia	Paulownia tomentosa	NSL	FIA	4.1	7.3	1.7	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	58
pawpaw	Asimina triloba	NSL	Low	8.6	6.8	0.9	Lg. dec.	Very Lg. dec.	Medium	Rare	Very Poor	Lost			0	59
river birch	Betula nigra	NSL	Low	4.7	6.5	3.2	No change	Sm. inc.	Medium	Rare	Poor	Fair	Infill +	Infill +	2	60
eastern cottonwood	Populus deltoides	NSH	Low	1.9	5.5	3.7	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	61
blackjack oak	Quercus marilandica	NSL	Medium	0.5	4.3	2.2	Lg. inc.	Lg. inc.	High	Rare	Good	Good			2	62
Osage-orange	Maclura pomifera	NDH	Medium	1.1	3.9	1.7	No change	Lg. inc.	High	Rare	Fair	Good	Infill +	Infill ++	2	63
blue ash	Fraxinus quadrangulata	NSL	Low	1.2	3.7	2.9	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	64
swamp tupelo	Nyssa biflora	NDH	Medium	0.8	3.0	3.5	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	65
swamp chestnut oak	Quercus michauxii	NSL	Low	2.3	2.9	1.4	Sm. dec.	No change	Medium	Rare	Very Poor	Poor			0	66
serviceberry	Amelanchier spp.	NSL	Low	2.9	2.6	0.5	Very Lg. dec.	Very Lg. dec.	Medium	Rare	Lost	Lost			0	67
cucumbertree	Magnolia acuminata	NSL	Low	0.9	1.2	0.8	Lg. dec.	Very Lg. dec.	Medium	Rare	Very Poor	Lost			0	68
eastern hemlock	Tsuga canadensis	NSH	High	0.4	1.2	2.8	Very Lg. dec.	Very Lg. dec.	Low	Rare	Lost	Lost			0	69
willow oak	Quercus phellos	NSL	Low	2.5	1.1	1.4	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	70
black maple	Acer nigrum	NSH	Low	0.8	1.1	1.3	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor			0	71
Ohio buckeye	Aesculus glabra	NSL	Low	0.3	1.0	0.2	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	72
water hickory	Carya aquatica	NSL	Medium	2.6	0.9	3.2	Sm. dec.	No change	Medium	Rare	Very Poor	Poor			0	73
mountain maple	Acer spicatum	NSL	Low	0.8	0.7	0.9	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor			0	74
pecan	Carya illinoinensis	NSH	Low	2.2	0.6	1.7	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair	Infill +	Infill +	2	75
American holly	Ilex opaca	NSL	Medium	0.4	0.6	1.4	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	76
pin cherry	Prunus pensylvanica	NSL	Low	0.1	0.5	0.4	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	77
northern catalpa	Catalpa speciosa	NSHX	FIA	0.4	0.5	1.2	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	78
bigleaf magnolia	Magnolia macrophylla	NSL	Low	0.1	0.3	0.2	Lg. dec.	Very Lg. dec.	Medium	Rare	Very Poor	Lost			0	79
rock elm	Ulmus thomasii	NSLX	FIA	0.4	0.2	0.6	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	80
bur oak	Quercus macrocarpa	NDH	Medium	0.4	0.2	0.4	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			0	81
overcup oak	Quercus lyrata	NSL	Medium	1.7	0.1	1.4	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair	Infill +	Infill +	2	82
American chestnut	Castanea dentata	NSLX	FIA	0.4	0.1	0.3	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	83
ashe juniper	Juniperus ashei	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	84
red spruce	Picea rubens	NDH	High	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown			0	85
slash pine	Pinus elliottii	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	86
longleaf pine	Pinus palustris	NSH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	87
florida maple	Acer barbatum	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +	3	88
striped maple	Acer pensylvanicum	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	89
cittamwood/gum bumelia	Sideroxylon lanuginosum ssp.	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate ++	3	90
black hickory	Carya texana	NDL	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	91
black ash	Fraxinus nigra	WSH	Medium	0	0	0	Unknown	New Habitat	Low	Absent	Unknown	New Habitat			3	92
silverbell	Halesia spp.	NSL	Low	0	0	0	New Habitat	Unknown	Medium	Absent	New Habitat	Unknown			3	93
southern magnolia	Magnolia grandiflora	NSL	Low	0	0	0	Unknown	New Habitat	Medium	Absent	Unknown	New Habitat			3	94

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bigtooth aspen	Populus grandidentata	NSL	Medium	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown			0	95
laurel oak	Quercus laurifolia	NDH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	96
water oak	Quercus nigra	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	97
Nuttall oak	Quercus texana	NSH	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			0	98
live oak	Quercus virginiana	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	99
cedar elm	Ulmus crassifolia	NDH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	100