

Section 231A

EcoMap 2007

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 78,969 30,490 2,538

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	Low	RCP45	RCP85	RCP45	RCP85	RCP45	RCP85			
Ash	2			23	29	Increase	31	38	Very Good	12	13	Likely	2	1
Hickory	7			38	62	No Change	30	24	Good	21	26	Infill	20	22
Maple	6	Abundant	5	44	19	Decrease	30	29	Fair	11	10	Migrate	3	3
Oak	22	Common	21	9		New	9	9	Poor	20	15			
Pine	10	Rare	74			Unknown	14	14	Very Poor	25	24			
Other	53	Absent	13						FIA Only	6	6			
									Unknown	5	5			
				114	110		114	114		100	99		25	26

Potential Changes in Climate Variables

Temperature (°F)

	Scenario	2009	2039	2069	2099	
Annual Average	CCSM45	61.4	63.2	65.2	65.3	
	CCSM85	61.4	63.5	66.0	68.7	
	GFDL45	61.4	64.2	66.2	67.0	
	GFDL85	61.4	64.1	67.4	71.0	
	HAD45	61.4	63.7	66.5	68.0	
	HAD85	61.4	63.9	68.0	72.0	
Growing Season (May—Sep)	CCSM45	75.0	76.7	78.4	78.9	
	CCSM85	75.0	76.8	79.4	82.8	
	GFDL45	75.0	78.0	80.1	81.4	
	GFDL85	75.0	78.0	81.6	85.7	
	HAD45	75.0	78.1	80.7	82.4	
	HAD85	75.0	78.0	83.9	87.7	
Coldest Month (Average)	CCSM45	41.4	43.8	44.6	44.6	
	CCSM85	41.4	43.8	44.9	46.1	
	GFDL45	41.4	44.5	44.7	45.2	
	GFDL85	41.4	43.2	44.3	44.8	
	HAD45	41.4	41.5	43.3	43.8	
	HAD85	41.4	42.6	43.6	45.3	
Warmest Month (Average)	CCSM45	79.7	81.6	82.5	82.5	
	CCSM85	79.7	81.7	83.2	85.0	
	GFDL45	79.7	82.5	83.3	84.2	
	GFDL85	79.7	82.7	84.5	86.7	
	HAD45	79.7	83.5	85.2	85.9	
	HAD85	79.7	83.9	87.6	89.5	

Precipitation (in)

	Scenario	2009	2039	2069	2099	
Annual Total	CCSM45	48.5	51.3	54.5	55.1	
	CCSM85	48.5	51.8	55.0	61.3	
	GFDL45	48.5	54.2	57.6	61.1	
	GFDL85	48.5	53.7	58.5	58.8	
	HAD45	48.5	47.7	51.8	53.1	
	HAD85	48.5	53.3	48.3	51.5	
Growing Season (May—Sep)	CCSM45	19.8	21.8	23.6	24.2	
	CCSM85	19.8	21.5	22.6	25.1	
	GFDL45	19.8	24.4	26.8	27.6	
	GFDL85	19.8	23.7	27.5	28.0	
	HAD45	19.8	19.5	20.4	20.5	
	HAD85	19.8	22.1	17.3	18.1	

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
loblolly pine	Pinus taeda	WDH	High	88.8	3674.6	35.1	No change	No change	Medium	Abundant	Good	Good			1	1
sweetgum	Liquidambar styraciflua	WDH	High	91.5	1247.5	11.7	No change	No change	Medium	Abundant	Good	Good			1	2
yellow-poplar	Liriodendron tulipifera	WDH	High	75.9	612.4	7.0	Sm. dec.	Lg. dec.	High	Abundant	Good	Good			1	3
water oak	Quercus nigra	WDH	High	76.6	548.3	6.2	Lg. inc.	Lg. inc.	Medium	Abundant	Very Good	Very Good			1	4
white oak	Quercus alba	WDH	Medium	74.2	521.4	6.0	No change	No change	High	Abundant	Very Good	Very Good			1	5
red maple	Acer rubrum	WDH	High	74.7	385.9	4.1	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	6
shortleaf pine	Pinus echinata	WDH	High	62.4	320.2	4.3	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	7
southern red oak	Quercus falcata	WDL	Medium	66.5	286.4	3.9	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	8
pignut hickory	Carya glabra	WDL	Medium	53.1	172.4	2.7	No change	No change	Medium	Common	Fair	Fair			1	9
sourwood	Oxydendrum arboreum	NDL	High	42.8	171.3	3.0	Sm. dec.	Sm. dec.	High	Common	Fair	Fair			1	10
winged elm	Ulmus alata	WDL	Medium	50	168.6	2.9	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	11
Virginia pine	Pinus virginiana	NDH	High	18.8	157.8	5.9	Sm. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	12
post oak	Quercus stellata	WDH	High	49.1	152.7	2.6	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	13
black cherry	Prunus serotina	WDL	Medium	64.1	151.7	2.1	Lg. inc.	Lg. inc.	Low	Common	Good	Good			1	14
mockernut hickory	Carya alba	WDL	Medium	46.1	149.5	2.8	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	15
eastern redcedar	Juniperus virginiana	WDH	Medium	40.1	148.7	3.1	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	16
flowering dogwood	Cornus florida	WDL	Medium	65.5	142.3	1.9	No change	No change	Medium	Common	Fair	Fair			1	17
scarlet oak	Quercus coccinea	WDL	Medium	30.5	133.3	3.5	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	18
chestnut oak	Quercus prinus	NDH	High	13.1	125.0	5.1	No change	No change	High	Common	Good	Good	Infill ++	Infill ++	1	19
blackgum	Nyssa sylvatica	WDL	Medium	53.6	122.9	1.8	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	20
green ash	Fraxinus pennsylvanica	WSH	Low	25.7	96.4	3.3	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	21
black oak	Quercus velutina	WDH	High	33.1	92.0	2.2	No change	No change	Medium	Common	Fair	Fair			1	22
northern red oak	Quercus rubra	WDH	Medium	30.8	80.4	2.2	No change	No change	High	Common	Good	Good			1	23
longleaf pine	Pinus palustris	NSH	Medium	6.3	53.4	3.8	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good	Infill ++	Infill ++	1	24
willow oak	Quercus phellos	NSL	Low	15.6	52.3	2.5	Sm. inc.	Sm. inc.	Medium	Common	Good	Good	Infill ++	Infill ++	1	25
American hornbeam; musclev	Carpinus caroliniana	WSL	Low	25.1	50.1	1.8	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	26
American beech	Fagus grandifolia	WDH	High	25.1	46.5	1.7	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	1	27
common persimmon	Diospyros virginiana	NSL	Low	27.1	40.1	1.3	No change	Sm. inc.	High	Rare	Fair	Good			1	28
boxelder	Acer negundo	WSH	Low	9.5	36.4	4.0	Sm. dec.	No change	High	Rare	Poor	Fair			1	29
river birch	Betula nigra	NSL	Low	7.6	35.8	4.3	No change	Sm. inc.	Medium	Rare	Poor	Fair			1	30
sycamore	Platanus occidentalis	NSL	Low	7.2	28.8	3.4	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	1	31
blackjack oak	Quercus marilandica	NSL	Medium	8.5	28.3	2.1	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	1	32
black willow	Salix nigra	NSH	Low	5.4	28.0	4.4	No change	Sm. inc.	Low	Rare	Very Poor	Poor		Infill +	1	33
American elm	Ulmus americana	WDH	Medium	13.4	26.0	1.6	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	1	34
florida maple	Acer barbatum	NSL	Low	15.6	25.8	1.4	Sm. inc.	Lg. inc.	High	Rare	Good	Good			1	35
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	13.6	23.6	1.5	Lg. inc.	Lg. inc.	High	Rare	Good	Good			1	36
American holly	Ilex opaca	NSL	Medium	13.9	22.6	1.2	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good			1	37
eastern white pine	Pinus strobus	WDH	High	3	21.4	3.0	No change	No change	Low	Rare	Very Poor	Very Poor			2	38
swamp tupelo	Nyssa biflora	NDH	Medium	3.9	21.0	3.2	No change	No change	Low	Rare	Very Poor	Very Poor			2	39
shagbark hickory	Carya ovata	WSL	Medium	9.8	20.5	2.1	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	40
cherrybark oak; swamp red o.	Quercus pagoda	NSL	Medium	7.5	20.1	2.4	No change	Sm. inc.	Medium	Rare	Poor	Fair	Infill +	Infill +	1	41
black walnut	Juglans nigra	WDH	Low	6.2	17.6	2.5	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	42
sugarberry	Celtis laevigata	NDH	Medium	6.6	16.6	2.1	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	1	43
white ash	Fraxinus americana	WDL	Medium	8.1	15.9	1.6	No change	No change	Low	Rare	Very Poor	Very Poor			0	44
slippery elm	Ulmus rubra	WSL	Low	9	15.2	1.4	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	45
pecan	Carya illinoensis	NSH	Low	3.6	15.1	4.0	No change	Sm. inc.	Low	Rare	Very Poor	Poor		Infill +	2	46
red mulberry	Morus rubra	NSL	Low	11	15.1	1.2	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good			1	47



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laurel oak	Quercus laurifolia	NDH	Medium	9.5	14.9	1.3	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	1	48
sweetbay	Magnolia virginiana	NSL	Medium	2.6	13.0	3.6	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good	Infill +	Infill ++	1	49
bitternut hickory	Carya cordiformis	WSL	Low	4.4	11.5	1.9	Lg. dec.	Sm. dec.	High	Rare	Poor	Poor		Infill +	2	50
eastern redbud	Cercis canadensis	NSL	Low	9.7	11.4	1.0	Sm. dec.	No change	Medium	Rare	Very Poor	Poor			1	51
slash pine	Pinus elliottii	NDH	High	1.5	8.9	2.8	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	52
sassafras	Sassafras albidum	WSL	Low	9.3	8.7	0.7	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			1	53
black locust	Robinia pseudoacacia	NDH	Low	1.9	8.6	1.7	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	54
swamp chestnut oak	Quercus michauxii	NSL	Low	3	8.3	2.5	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	55
turkey oak	Quercus laevis	NSH	Medium	0.5	7.1	3.3	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	56
sand hickory	Carya pallida	NSL	FIA	2	6.5	2.2	Unknown	Unknown	NA	Rare	FIA Only	FIA Only			0	57
eastern hemlock	Tsuga canadensis	NSH	High	0.9	5.0	1.2	No change	No change	Low	Rare	Very Poor	Very Poor			2	58
hackberry	Celtis occidentalis	WDH	Medium	1.6	4.8	1.2	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor	Infill +	Infill +	2	59
sweet birch	Betula lenta	NDH	High	0.5	4.6	1.1	No change	No change	Low	Rare	Very Poor	Very Poor			2	60
cucumbertree	Magnolia acuminata	NSL	Low	2	4.1	1.3	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	61
sugar maple	Acer saccharum	WDH	High	0.4	3.8	5.0	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor	Infill +		2	62
ailanthus	Ailanthus altissima	NSL	FIA	1.3	3.4	2.4	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	63
eastern cottonwood	Populus deltoides	NSH	Low	0.6	3.0	3.9	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	64
honeylocust	Gleditsia triacanthos	NSH	Low	1.9	2.9	1.5	No change	Sm. inc.	High	Rare	Fair	Good	Infill +		2	65
overcup oak	Quercus lyrata	NSL	Medium	1	2.5	2.5	No change	No change	Low	Rare	Very Poor	Very Poor			2	66
paulownia	Paulownia tomentosa	NSL	FIA	1.4	2.5	1.6	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	67
pitch pine	Pinus rigida	NSH	High	0.9	1.9	0.8	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	68
American basswood	Tilia americana	WSL	Medium	1.1	1.8	1.1	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	69
southern magnolia	Magnolia grandiflora	NSL	Low	1	1.8	3.8	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	70
serviceberry	Amelanchier spp.	NSL	Low	1.8	1.7	0.7	Sm. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	71
bigleaf magnolia	Magnolia macrophylla	NSL	Low	0.6	1.4	2.3	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	72
Table Mountain pine	Pinus pungens	NSL	Low	0.2	1.1	4.4	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor	Infill +	Infill +	2	73
wild plum	Prunus americana	NSLX	FIA	1.3	1.0	0.8	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	74
mountain or Fraser magnolia	Magnolia fraseri	NSL	Low	0.4	1.0	0.9	No change	No change	Low	Rare	Very Poor	Very Poor			0	75
pawpaw	Asimina triloba	NSL	Low	0.7	0.9	1.2	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	76
silverbell	Halesia spp.	NSL	Low	0.7	0.9	0.6	No change	Sm. dec.	Medium	Rare	Poor	Very Poor	Infill +		2	77
white mulberry	Morus alba	NSL	FIA	0.7	0.7	0.7	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	78
bluejack oak	Quercus incana	NSL	Low	0.4	0.7	1.8	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	79
shellbark hickory	Carya laciniosa	NSL	Low	0.5	0.7	0.9	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	80
yellow birch	Betula alleghaniensis	NDL	High	0.5	0.4	0.7	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	81
chinkapin oak	Quercus muehlenbergii	NSL	Medium	0.1	0.4	0.4	No change	Sm. dec.	Medium	Rare	Poor	Very Poor			0	82
yellow buckeye	Aesculus flava	NSL	Low	0.3	0.4	0.4	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	83
Atlantic white-cedar	Chamaecyparis thyoides	NSH	Low	0.1	0.3	2.6	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	84
pond pine	Pinus serotina	NSH	Medium	0.1	0.3	0.7	Very Lg. dec.	Very Lg. dec.	Low	Rare	Lost	Lost			0	85
bald cypress	Taxodium distichum	NSH	Medium	0.1	0.3	1.2	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	86
durand oak	Quercus sinuata var. sinuata	NSL	FIA	0.1	0.3	2.0	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	87
butternut	Juglans cinerea	NSLX	FIA	0.2	0.2	0.8	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	88
Shumard oak	Quercus shumardii	NSL	Low	0.3	0.2	0.9	No change	No change	High	Rare	Fair	Fair		Infill +	2	89
silver maple	Acer saccharinum	NSH	Low	0.1	0.2	1.2	Sm. dec.	Very Lg. dec.	High	Rare	Poor	Lost			0	90
American chestnut	Castanea dentata	NSLX	FIA	0.1	0.1	0.3	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	91
loblolly-bay	Gordonia lasianthus	NSH	Medium	0.1	0.1	0.6	Very Lg. dec.	Very Lg. dec.	Medium	Rare	Lost	Lost			0	92
bear oak; scrub oak	Quercus ilicifolia	NSLX	FIA	0.1	0.1	0.6	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	93
redbay	Persea borbonia	NSL	Low	0.1	0.1	0.3	Lg. inc.	Lg. inc.	High	Rare	Good	Good			0	94



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spruce pine	<i>Pinus glabra</i>	NSL	Low	0.1	0.1	0.4	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	95
swamp white oak	<i>Quercus bicolor</i>	NSL	Low	0.1	0.1	0.4	Sm. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	96
Nuttall oak	<i>Quercus texana</i>	NSH	Medium	0.1	0.1	0.4	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			0	97
Osage-orange	<i>Maclura pomifera</i>	NDH	Medium	0.1	0.0	0.2	Lg. dec.	Lg. inc.	High	Rare	Poor	Good			2	98
water tupelo	<i>Nyssa aquatica</i>	NSH	Medium	0.1	0.0	0.3	Sm. inc.	Lg. inc.	Low	Rare	Poor	Fair	Infill +		2	99
striped maple	<i>Acer pensylvanicum</i>	NSL	Medium	0.1	0.0	0.2	No change	No change	Medium	Rare	Poor	Poor			0	100
ashe juniper	<i>Juniperus ashei</i>	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	101
sand pine	<i>Pinus clausa</i>	NDH	High	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat	Likely +	Likely +	3	102
pond cypress	<i>Taxodium ascendens</i>	NSH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate ++	Migrate +	3	103
black maple	<i>Acer nigrum</i>	NSH	Low	0	0	0	Unknown	New Habitat	High	Absent	Unknown	New Habitat			0	104
mountain maple	<i>Acer spicatum</i>	NSL	Low	0	0	0	Unknown	Unknown	High	Absent	Unknown	Unknown			0	105
Ohio buckeye	<i>Aesculus glabra</i>	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	106
cittamwood/gum bumelia	<i>Sideroxylon lanuginosum ssp.</i>	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			3	107
water hickory	<i>Carya aquatica</i>	NSL	Medium	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown			0	108
black hickory	<i>Carya texana</i>	NDL	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	109
black ash	<i>Fraxinus nigra</i>	WSH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	110
pin cherry	<i>Prunus pensylvanica</i>	NSL	Low	0	0	0	New Habitat	Unknown	Medium	Absent	New Habitat	Unknown	Likely +		3	111
pin oak	<i>Quercus palustris</i>	NSH	Low	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown			0	112
live oak	<i>Quercus virginiana</i>	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate ++	Migrate ++	3	113
cedar elm	<i>Ulmus crassifolia</i>	NDH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	114