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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	18,067	6,975.6	429

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	5
Oak	11
Pine	6
Other	49
	81

Abundance	
Abundant	6
Common	32
Rare	43
Absent	19
	100

	Model Reliability	Adaptability
High	24	25
Medium	30	57
Low	39	15
FIA	8	
	101	**97**

Potential Change in Habitat Suitability	Scenario RCP45	Scenario RCP85
Increase	24	30
No Change	15	12
Decrease	34	31
New	15	16
Unknown	13	12
	101	**101**

Capability to Cope or Persist	Scenario RCP45	Scenario RCP85
Very Good	12	16
Good	15	14
Fair	11	12
Poor	14	13
Very Poor	19	18
FIA Only	5	5
Unknown	5	4
	81	**82**

Migration Potential	SHIFT RCP45	SHIFT RCP85
Likely	2	2
Infill	3	8
Migrate	3	10
	8	**20**

Potential Changes in Climate Variables

Temperature (°F)

	Scenario	2009	2039	2069	2099
Annual Average	CCSM45	57.3	59.2	61.4	61.5
	CCSM85	57.3	59.6	62.0	64.9
	GFDL45	57.3	60.0	62.5	63.2
	GFDL85	57.3	60.2	63.6	67.1
	HAD45	57.3	59.6	62.7	63.9
	HAD85	57.3	59.9	64.2	68.2
Growing Season May—Sep	CCSM45	71.9	73.7	75.7	76.3
	CCSM85	71.9	74.0	76.6	80.4
	GFDL45	71.9	75.1	78.0	79.3
	GFDL85	71.9	75.4	79.5	83.4
	HAD45	71.9	75.0	77.9	79.4
	HAD85	71.9	75.1	81.2	85.0
Coldest Month Average	CCSM45	35.4	37.6	38.6	38.8
	CCSM85	35.4	38.2	39.0	40.3
	GFDL45	35.4	38.8	38.8	39.2
	GFDL85	35.4	37.2	38.3	38.9
	HAD45	35.4	35.2	37.3	37.7
	HAD85	35.4	36.5	38.0	39.6
Warmest Month Average	CCSM45	76.8	78.8	79.9	80.1
	CCSM85	76.8	79.0	80.6	82.4
	GFDL45	76.8	80.2	81.8	82.6
	GFDL85	76.8	80.7	83.2	85.3
	HAD45	76.8	80.7	82.9	83.7
	HAD85	76.8	81.6	85.9	87.8

Precipitation (in)

	Scenario	2009	2039	2069	2099
Annual Total	CCSM45	49.7	52.3	55.8	54.7
	CCSM85	49.7	54.2	55.7	59.9
	GFDL45	49.7	55.4	56.7	60.8
	GFDL85	49.7	54.8	58.3	60.0
	HAD45	49.7	48.5	52.4	53.3
	HAD85	49.7	52.0	48.0	51.1
Growing Season May—Sep	CCSM45	20.6	21.6	22.8	22.5
	CCSM85	20.6	22.3	21.5	23.3
	GFDL45	20.6	23.8	23.7	25.0
	GFDL85	20.6	22.9	24.4	25.0
	HAD45	20.6	20.2	20.1	20.6
	HAD85	20.6	21.7	17.5	19.1

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.

Cite as: Iverson, L.R.; Prasad, A.M.; Peters, M.P.; Matthews, S.N. 2019. Facilitating Adaptive Forest Management under Climate Change: A Spatially Specific Synthesis of 125 Species for Habitat Changes and Assisted Migration over the Eastern United States. Forests. 10(11): 989. https://doi.org/10.3390/f10110989.

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Common Name	Scientific Name	Range	MR	%Cell	FIAsum	FIAiv	ChngCl45	ChngCl85	Adap	Abund	Capabil45	Capabil85	SHIFT45	SHIFT85	SSO	N
yellow-poplar	Liriodendron tulipifera	WDH	High	76.4	1006.3	8.7	Lg. dec.	Lg. dec.	High	Abundant	Good	Good			1	1
Virginia pine	Pinus virginiana	NDH	High	69.1	989.6	9.7	Lg. dec.	Lg. dec.	Medium	Abundant	Fair	Fair			0	2
chestnut oak	Quercus prinus	NDH	High	47.9	687.4	7.7	Sm. dec.	Sm. dec.	High	Abundant	Good	Good			1	3
eastern redcedar	Juniperus virginiana	WDH	Medium	56.7	679.7	9.4	Sm. inc.	Sm. inc.	Medium	Abundant	Very Good	Very Good			1	4
red maple	Acer rubrum	WDH	High	68.4	679.1	5.9	Sm. dec.	Sm. dec.	High	Abundant	Good	Good			1	5
white oak	Quercus alba	WDH	Medium	64.3	528.8	5.5	Sm. inc.	Sm. inc.	High	Abundant	Very Good	Very Good			1	6
loblolly pine	Pinus taeda	WDH	High	20.3	431.8	12.4	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good	Infill ++	Infill ++	1	7
pignut hickory	Carya glabra	WDL	Medium	62.4	366.8	3.8	Sm. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	8
mockernut hickory	Carya alba	WDL	Medium	53.9	333.4	4.3	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	9
sugar maple	Acer saccharum	WDH	High	52	324.1	4.1	Lg. dec.	Lg. dec.	High	Common	Fair	Fair			1	10
sourwood	Oxydendrum arboreum	NDL	High	56.4	303.7	3.2	Sm. dec.	Lg. dec.	High	Common	Fair	Fair			1	11
blackgum	Nyssa sylvatica	WDL	Medium	62.6	282.5	3.0	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	12
southern red oak	Quercus falcata	WDL	Medium	36.2	275.0	6.7	Sm. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	13
black cherry	Prunus serotina	WDL	Medium	51.7	273.0	3.7	No change	Sm. inc.	Low	Common	Poor	Fair			1	14
black oak	Quercus velutina	WDH	High	54.6	269.0	3.3	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	15
scarlet oak	Quercus coccinea	WDL	Medium	36.7	244.1	3.3	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	16
sweetgum	Liquidambar styraciflua	WDH	High	27.9	228.3	5.6	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	17
sassafras	Sassafras albidum	WSL	Low	42.7	218.8	3.2	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	18
northern red oak	Quercus rubra	WDH	Medium	46.6	216.8	2.9	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	19
shagbark hickory	Carya ovata	WSL	Medium	42.1	213.1	3.9	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	20
black locust	Robinia pseudoacacia	NDH	Low	40.1	209.7	3.5	Sm. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	21
white ash	Fraxinus americana	WDL	Medium	33.7	195.0	4.5	No change	Sm. inc.	Low	Common	Poor	Fair			1	22
flowering dogwood	Cornus florida	WDL	Medium	54.4	193.5	2.3	No change	No change	Medium	Common	Fair	Fair			1	23
shortleaf pine	Pinus echinata	WDH	High	34.6	182.5	4.2	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	24
winged elm	Ulmus alata	WDL	Medium	30.8	159.0	4.4	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	25
American beech	Fagus grandifolia	WDH	High	41.4	153.0	2.8	No change	No change	Medium	Common	Fair	Fair			1	26
black walnut	Juglans nigra	WDH	Low	35.1	137.8	3.2	No change	No change	Medium	Common	Fair	Fair			1	27
green ash	Fraxinus pennsylvanica	WSH	Low	26.8	130.0	4.0	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good			1	28
American elm	Ulmus americana	WDH	Medium	22.5	122.0	3.5	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good			1	29
post oak	Quercus stellata	WDH	High	24.5	121.8	3.5	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	30
eastern redbud	Cercis canadensis	NSL	Low	35.5	107.2	2.3	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	31
hackberry	Celtis occidentalis	WDH	Medium	19.6	103.7	4.5	Sm. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	32
boxelder	Acer negundo	WSH	Low	13.5	92.8	5.5	No change	Sm. inc.	High	Common	Good	Very Good			1	33
eastern white pine	Pinus strobus	WDH	High	5.8	90.1	2.7	No change	No change	Low	Common	Poor	Poor			0	34
chinkapin oak	Quercus muehlenbergii	NSL	Medium	19.3	89.3	3.6	No change	No change	Medium	Common	Fair	Fair			1	35
sycamore	Platanus occidentalis	NSL	Low	12.9	74.3	4.8	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good			1	36
bitternut hickory	Carya cordiformis	WSL	Low	15.4	58.6	2.6	No change	No change	High	Common	Good	Good			1	37
slippery elm	Ulmus rubra	WSL	Low	17.2	54.8	2.2	No change	Sm. inc.	Medium	Common	Fair	Good			1	38
common persimmon	Diospyros virginiana	NSL	Low	13.8	47.4	2.7	Sm. inc.	Lg. inc.	High	Rare	Good	Good			1	39
eastern hemlock	Tsuga canadensis	NSH	High	5.3	43.9	1.5	No change	No change	Low	Rare	Very Poor	Very Poor			0	40
sweet birch	Betula lenta	NDH	High	10.5	40.0	1.2	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	41
red mulberry	Morus rubra	NSL	Low	10.6	35.6	2.5	Sm. dec.	No change	Medium	Rare	Very Poor	Poor			1	42
American basswood	Tilia americana	WSL	Medium	10.3	33.7	1.7	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	43
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	10.5	31.1	1.3	Lg. inc.	Lg. inc.	High	Rare	Good	Good			1	44
ailanthus	Ailanthus altissima	NSL	FIA	8.1	30.8	1.9	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	45
Osage-orange	Maclura pomifera	NDH	Medium	1.1	28.5	25.8	Sm. dec.	No change	High	Rare	Poor	Fair		Infill +	2	46
cucumbertree	Magnolia acuminata	NSL	Low	13	28.5	1.4	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	47

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sugarberry	Celtis laevigata	NDH	Medium	1.8	25.2	9.3	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	2	48
pitch pine	Pinus rigida	NSH	High	4.5	23.4	1.8	No change	No change	Medium	Rare	Poor	Poor			1	49
yellow buckeye	Aesculus flava	NSL	Low	8.1	21.5	1.7	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	50
paulownia	Paulownia tomentosa	NSL	FIA	5.3	20.7	2.3	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	51
silver maple	Acer saccharinum	NSH	Low	1.1	18.6	5.4	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor			0	52
serviceberry	Amelanchier spp.	NSL	Low	10.5	15.0	1.0	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	53
Table Mountain pine	Pinus pungens	NSL	Low	2.5	14.7	4.1	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor		Infill +	1	54
blackjack oak	Quercus marilandica	NSL	Medium	2.1	11.4	5.0	Lg. inc.	Lg. inc.	High	Rare	Good	Good			2	55
mountain or Fraser magnolia	Magnolia fraseri	NSL	Low	3.1	10.1	1.9	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	56
American hornbeam; muscle	Carpinus caroliniana	WSL	Low	4.9	8.2	1.6	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good			1	57
pawpaw	Asimina triloba	NSL	Low	3.7	7.5	1.8	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	58
white mulberry	Morus alba	NSL	FIA	4.4	6.5	1.4	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	59
sand hickory	Carya pallida	NSL	FIA	3.5	2.9	1.0	Unknown	Unknown	NA	Rare	FIA Only	FIA Only			0	60
blue ash	Fraxinus quadrangulata	NSL	Low	1.1	2.8	2.5	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	61
bigleaf magnolia	Magnolia macrophylla	NSL	Low	0.7	2.3	0.3	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	62
Shumard oak	Quercus shumardii	NSL	Low	1.1	2.0	1.8	No change	Lg. inc.	High	Rare	Fair	Good			2	63
yellow birch	Betula alleghaniensis	NDL	High	0.1	1.9	0.6	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	64
willow oak	Quercus phellos	NSL	Low	3.9	1.8	1.2	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	65
black willow	Salix nigra	NSH	Low	1.1	1.7	1.6	No change	Lg. inc.	Low	Rare	Very Poor	Fair		Infill +	2	66
eastern cottonwood	Populus deltoides	NSH	Low	0.6	1.7	3.0	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	67
shellbark hickory	Carya laciniosa	NSL	Low	1.1	1.5	1.4	Very Lg. dec.	Lg. dec.	Medium	Rare	Lost	Very Poor			0	68
striped maple	Acer pensylvanicum	NSL	Medium	1.5	1.4	0.4	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	69
American holly	Ilex opaca	NSL	Medium	1.1	1.2	0.2	Very Lg. dec.	No change	Medium	Rare	Lost	Poor		Infill +	2	70
honeylocust	Gleditsia triacanthos	NSH	Low	0.6	1.0	1.8	Lg. inc.	Lg. inc.	High	Rare	Good	Good			2	71
wild plum	Prunus americana	NSLX	FIA	0.6	0.9	1.6	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	72
Kentucky coffeetree	Gymnocladus dioicus	NSLX	FIA	0.6	0.8	1.4	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	73
river birch	Betula nigra	NSL	Low	0.3	0.8	0.6	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	74
pin cherry	Prunus pensylvanica	NSL	Low	0.4	0.6	0.9	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	75
pecan	Carya illinoinensis	NSH	Low	0.2	0.5	0.3	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair		Infill +	2	76
northern white-cedar	Thuja occidentalis	WSH	High	0.2	0.4	0.2	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	77
butternut	Juglans cinerea	NSLX	FIA	0.6	0.3	0.5	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	78
red spruce	Picea rubens	NDH	High	0.6	0.3	0.5	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	79
American chestnut	Castanea dentata	NSLX	FIA	0.2	0.1	0.1	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	80
silverbell	Halesia spp.	NSL	Low	0.6	0.1	0.2	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	81
ashe juniper	Juniperus ashei	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	82
slash pine	Pinus elliottii	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate ++	3	83
longleaf pine	Pinus palustris	NSH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	84
florida maple	Acer barbatum	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Likely +	Likely +	3	85
mountain maple	Acer spicatum	NSL	Low	0	0	0	Unknown	Unknown	High	Absent	Unknown	Unknown			0	86
Ohio buckeye	Aesculus glabra	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	87
cittamwood/gum bumelia	Sideroxylon lanuginosum ssp.	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate ++	3	88
black hickory	Carya texana	NDL	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	89
black ash	Fraxinus nigra	WSH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	90
southern magnolia	Magnolia grandiflora	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	91
sweetbay	Magnolia virginiana	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	92
swamp tupelo	Nyssa biflora	NDH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	93
cherrybark oak; swamp red o	Quercus pagoda	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	94

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shingle oak	Quercus imbricaria	NDH	Medium	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	95
laurel oak	Quercus laurifolia	NDH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	96
swamp chestnut oak	Quercus michauxii	NSL	Low	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown			0	97
water oak	Quercus nigra	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Likely +	Likely +	3	98
live oak	Quercus virginiana	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate ++	3	99
bluejack oak	Quercus incana	NSL	Low	0	0	0	Unknown	New Habitat	Medium	Absent	Unknown	New Habitat		Migrate +	3	100
cedar elm	Ulmus crassifolia	NDH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	101