Section 232F

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	53,827	20,783	1,876

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	4
Hickory	7
Maple	4
Oak	22
Pine	5
Other	48
	90

Abundance	
Abundant	4
Common	21
Rare	65
Absent	5
	95

	Model Reliability	Adaptability
High	15	26
Medium	38	55
Low	37	12
FIA	5	
	95	**93**

Potential Change in Habitat Suitability	Scenario RCP45	Scenario RCP85
Increase	35	38
No Change	29	26
Decrease	21	21
New	1	1
Unknown	9	9
	95	**95**

Capability to Cope or Persist	Scenario RCP45	Scenario RCP85
Very Good	12	16
Good	16	15
Fair	15	16
Poor	24	22
Very Poor	17	16
FIA Only	4	4
Unknown	4	4
	92	**93**

Migration Potential	SHIFT RCP45	SHIFT RCP85
Likely	0	0
Infill	19	23
Migrate	0	0
	19	**23**

Potential Changes in Climate Variables

Temperature (°F)

	Scenario	2009	2039	2069	2099
Annual Average	CCSM45	66.5	68.2	69.8	70.0
	CCSM85	66.5	68.5	70.9	73.2
	GFDL45	66.5	69.2	70.6	71.7
	GFDL85	66.5	69.0	72.0	75.2
	HAD45	66.5	68.8	71.5	72.5
	HAD85	66.5	69.1	72.7	76.2
Growing Season May—Sep	CCSM45	79.1	80.6	81.7	82.1
	CCSM85	79.1	80.9	83.1	85.9
	GFDL45	79.1	82.2	83.4	85.6
	GFDL85	79.1	82.1	85.3	89.3
	HAD45	79.1	81.9	84.4	84.8
	HAD85	79.1	82.1	86.5	89.4
Coldest Month Average	CCSM45	47.4	50.0	50.9	50.9
	CCSM85	47.4	50.1	51.3	52.6
	GFDL45	47.4	50.8	50.9	50.9
	GFDL85	47.4	48.4	49.4	50.0
	HAD45	47.4	48.2	49.9	50.7
	HAD85	47.4	49.8	51.2	53.1
Warmest Month Average	CCSM45	83.1	84.2	84.6	84.8
	CCSM85	83.1	84.7	85.4	86.9
	GFDL45	83.1	86.9	86.9	88.4
	GFDL85	83.1	86.7	88.1	90.7
	HAD45	83.1	86.4	87.5	87.5
	HAD85	83.1	86.8	89.1	90.0

Precipitation (in)

	Scenario	2009	2039	2069	2099
Annual Total	CCSM45	55.9	56.9	63.6	61.4
	CCSM85	55.9	58.3	62.2	63.0
	GFDL45	55.9	59.0	68.8	59.6
	GFDL85	55.9	58.4	60.8	60.9
	HAD45	55.9	55.3	54.5	58.9
	HAD85	55.9	58.4	51.1	54.4
Growing Season May—Sep	CCSM45	22.4	23.2	25.1	23.7
	CCSM85	22.4	22.0	22.9	21.9
	GFDL45	22.4	24.9	31.5	25.3
	GFDL85	22.4	25.1	27.1	27.8
	HAD45	22.4	21.6	21.3	22.5
	HAD85	22.4	21.9	18.4	18.8

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.

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.

Section 232F

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

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	95.3	4532.6	41.3	No change	Sm. dec.	Medium	Abundant	Good	Fair			1	1
sweetgum	Liquidambar styraciflua	WDH	High	93.2	854.6	7.8	Sm. inc.	Sm. inc.	Medium	Abundant	Very Good	Very Good			1	2
slash pine	Pinus elliottii	NDH	High	26.3	569.5	20.6	No change	No change	Medium	Abundant	Good	Good			1	3
water oak	Quercus nigra	WDH	High	81.6	554.4	5.7	Lg. inc.	Lg. inc.	Medium	Abundant	Very Good	Very Good			1	4
longleaf pine	Pinus palustris	NSH	Medium	26.6	307.9	11.1	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	5
southern red oak	Quercus falcata	WDL	Medium	64.5	270.8	3.7	Sm. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	6
blackgum	Nyssa sylvatica	WDL	Medium	73	239.6	3.0	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	7
post oak	Quercus stellata	WDH	High	46.5	208.9	3.5	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	8
white oak	Quercus alba	WDH	Medium	51.7	203.4	3.5	No change	No change	High	Common	Good	Good			1	9
shortleaf pine	Pinus echinata	WDH	High	39.1	199.4	4.2	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good			1	10
red maple	Acer rubrum	WDH	High	62	145.3	2.0	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	11
willow oak	Quercus phellos	NSL	Low	30.7	136.8	3.7	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	12
American hornbeam; muscle	Carpinus caroliniana	WSL	Low	43.2	134.2	2.8	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	13
laurel oak	Quercus laurifolia	NDH	Medium	28.4	129.7	4.2	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	14
winged elm	Ulmus alata	WDL	Medium	47.3	127.6	2.2	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	15
cherrybark oak; swamp red o	Quercus pagoda	NSL	Medium	34.3	114.0	2.7	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good			1	16
green ash	Fraxinus pennsylvanica	WSH	Low	30.8	94.4	2.7	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	17
American beech	Fagus grandifolia	WDH	High	23.4	93.7	3.5	Sm. inc.	No change	Medium	Common	Good	Fair	Infill ++	Infill +	1	18
bald cypress	Taxodium distichum	NSH	Medium	12	90.5	5.3	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good	Infill ++	Infill ++	1	19
American holly	Ilex opaca	NSL	Medium	42.4	79.6	1.8	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	20
sweetbay	Magnolia virginiana	NSL	Medium	21	67.2	3.0	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good			1	21
sugarberry	Celtis laevigata	NDH	Medium	15.2	66.3	3.4	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	22
American elm	Ulmus americana	WDH	Medium	26.7	55.2	1.8	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	23
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	32.6	55.1	1.5	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	24
overcup oak	Quercus lyrata	NSL	Medium	12.4	50.6	3.6	Sm. inc.	Lg. inc.	Low	Common	Fair	Good			1	25
mockernut hickory	Carya alba	WDL	Medium	29.9	49.3	1.5	Lg. inc.	Lg. inc.	High	Rare	Good	Good			1	26
swamp chestnut oak	Quercus michauxii	NSL	Low	16.8	39.1	2.1	Sm. inc.	Sm. inc.	Medium	Rare	Fair	Fair			1	27
flowering dogwood	Cornus florida	WDL	Medium	31.9	36.4	1.0	Sm. inc.	Sm. inc.	Medium	Rare	Fair	Fair			1	28
southern magnolia	Magnolia grandiflora	NSL	Low	17.1	34.9	2.0	Sm. inc.	Sm. inc.	Medium	Rare	Fair	Fair			1	29
black willow	Salix nigra	NSH	Low	3.9	31.6	6.3	No change	Sm. inc.	Low	Rare	Very Poor	Poor		Infill +	2	30
pecan	Carya illinoinensis	NSH	Low	3.4	31.4	8.8	No change	No change	Low	Rare	Very Poor	Very Poor			2	31
white ash	Fraxinus americana	WDL	Medium	20.4	30.7	1.2	Sm. inc.	Sm. inc.	Low	Rare	Poor	Poor			1	32
water tupelo	Nyssa aquatica	NSH	Medium	5	30.7	4.8	No change	No change	Low	Rare	Very Poor	Very Poor			2	33
water hickory	Carya aquatica	NSL	Medium	8.8	28.3	2.3	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	1	34
sassafras	Sassafras albidum	WSL	Low	23	26.0	1.0	Sm. dec.	Sm. inc.	Medium	Rare	Very Poor	Fair			1	35
black cherry	Prunus serotina	WDL	Medium	28.2	23.8	0.8	Sm. inc.	Lg. inc.	Low	Rare	Poor	Fair			1	36
redbay	Persea borbonia	NSL	Low	14.5	21.0	1.5	No change	No change	High	Rare	Fair	Fair			1	37
blackjack oak	Quercus marilandica	NSL	Medium	13.7	20.8	1.4	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	1	38
honeylocust	Gleditsia triacanthos	NSH	Low	5.6	20.0	2.6	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	1	39
water elm	Planera aquatica	NSL	Low	3.2	19.7	3.9	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	1	40
sycamore	Platanus occidentalis	NSL	Low	5.5	17.8	3.1	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	41
black hickory	Carya texana	NDL	High	11.6	17.7	1.3	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good	Infill +	Infill ++	1	42
slippery elm	Ulmus rubra	WSL	Low	6.6	14.6	1.9	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	1	43
Nuttall oak	Quercus texana	NSH	Medium	3.8	14.5	2.4	No change	No change	High	Rare	Fair	Fair			0	44
florida maple	Acer barbatum	NSL	Low	7.6	12.8	1.5	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor	Infill +	Infill +	1	45
common persimmon	Diospyros virginiana	NSL	Low	11.4	12.3	0.9	Lg. dec.	No change	High	Rare	Poor	Fair			1	46
swamp tupelo	Nyssa biflora	NDH	Medium	3.7	11.7	3.0	No change	No change	Low	Rare	Very Poor	Very Poor			2	47

Section 232F

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

Common Name	Scientific Name	Range	MR	%Cell	FIAsum	FIAiv	ChngCl45	ChngCl85	Adap	Abund	Capabil45	Capabil85	SHIFT45	SHIFT85	SSO	N
eastern redcedar	Juniperus virginiana	WDH	Medium	8	11.4	1.2	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good	Infill +	Infill ++	1	48
pignut hickory	Carya glabra	WDL	Medium	5.3	11.3	1.9	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	49
river birch	Betula nigra	NSL	Low	3.3	10.5	2.6	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	50
bitternut hickory	Carya cordiformis	WSL	Low	4.5	8.0	1.3	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor		Infill +	2	51
cedar elm	Ulmus crassifolia	NDH	Medium	2.5	7.4	1.6	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair	Infill +	Infill +	2	52
black oak	Quercus velutina	WDH	High	5.2	6.8	1.2	Sm. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	53
eastern cottonwood	Populus deltoides	NSH	Low	1.2	6.8	4.6	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	54
boxelder	Acer negundo	WSH	Low	2.7	6.7	1.7	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	55
Shumard oak	Quercus shumardii	NSL	Low	2.4	5.5	1.8	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor		Infill +	2	56
red mulberry	Morus rubra	NSL	Low	6.1	5.1	0.8	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	57
black walnut	Juglans nigra	WDH	Low	2	4.6	1.9	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	58
cittamwood/gum bumelia	Sideroxylon lanuginosum ssp.	NSL	Low	2.7	4.6	1.2	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	59
eastern redbud	Cercis canadensis	NSL	Low	3.4	4.1	0.8	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	60
yellow-poplar	Liriodendron tulipifera	WDH	High	1.8	3.7	1.8	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	61
Osage-orange	Maclura pomifera	NDH	Medium	1	3.4	1.3	No change	No change	High	Rare	Fair	Fair		Infill +	2	62
sourwood	Oxydendrum arboreum	NDL	High	2.6	3.0	0.8	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor			0	63
waterlocust	Gleditsia aquatica	NSLX	FIA	0.3	2.6	2.8	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	64
bluejack oak	Quercus incana	NSL	Low	1.7	2.6	1.5	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	65
black locust	Robinia pseudoacacia	NDH	Low	0.3	2.0	0.8	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	66
American basswood	Tilia americana	WSL	Medium	1.7	2.0	0.9	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	67
shagbark hickory	Carya ovata	WSL	Medium	1.8	1.4	0.9	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	68
live oak	Quercus virginiana	NDH	High	0.2	1.3	7.1	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	69
pond cypress	Taxodium ascendens	NSH	Medium	0.2	1.2	6.2	Sm. dec.	Lg. inc.	Medium	Rare	Very Poor	Good			2	70
ogeechee tupelo	Nyssa ogeche	NSLX	FIA	1	0.9	1.0	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	71
Carolina ash	Fraxinus caroliniana	NSL	FIA	0.3	0.6	0.4	Unknown	Unknown	NA	Rare	FIA Only	FIA Only			0	72
wild plum	Prunus americana	NSLX	FIA	1.2	0.6	0.3	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	73
black ash	Fraxinus nigra	WSH	Medium	0.4	0.6	1.6	No change	No change	Low	Rare	Very Poor	Very Poor			0	74
swamp white oak	Quercus bicolor	NSL	Low	0.7	0.5	0.7	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	75
pin cherry	Prunus pensylvanica	NSL	Low	1.2	0.4	0.4	No change	No change	Medium	Rare	Poor	Poor			0	76
serviceberry	Amelanchier spp.	NSL	Low	0.4	0.3	0.4	No change	No change	Medium	Rare	Poor	Poor			0	77
bigleaf magnolia	Magnolia macrophylla	NSL	Low	0.6	0.3	0.5	No change	No change	Medium	Rare	Poor	Poor			0	78
pond pine	Pinus serotina	NSH	Medium	0.2	0.3	1.3	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	79
hackberry	Celtis occidentalis	WDH	Medium	0.2	0.2	1.0	Very Lg. dec.	Sm. dec.	High	Rare	Lost	Poor		Infill +	2	80
northern red oak	Quercus rubra	WDH	Medium	0.2	0.2	0.9	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			0	81
white mulberry	Morus alba	NSL	FIA	0.2	0.1	0.7	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	82
pawpaw	Asimina triloba	NSL	Low	0.2	0.1	0.5	No change	Sm. dec.	Medium	Rare	Poor	Very Poor			0	83
chinkapin oak	Quercus muehlenbergii	NSL	Medium	0.2	0.1	0.5	No change	Sm. dec.	Medium	Rare	Poor	Very Poor			0	84
scarlet oak	Quercus coccinea	WDL	Medium	0.2	0.1	0.5	No change	No change	Medium	Rare	Poor	Poor			0	85
turkey oak	Quercus laevis	NSH	Medium	0.2	0.1	0.5	No change	Lg. inc.	High	Rare	Fair	Good	Infill +		2	86
silverbell	Halesia spp.	NSL	Low	0.2	0.1	0.4	No change	No change	Medium	Rare	Poor	Poor			0	87
striped maple	Acer pensylvanicum	NSL	Medium	0.2	0.1	0.3	Sm. inc.	Sm. inc.	Medium	Rare	Fair	Fair			0	88
bur oak	Quercus macrocarpa	NDH	Medium	0.2	0.1	0.3	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			0	89
chestnut oak	Quercus prinus	NDH	High	0.2	0.0	0.2	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			0	90
Atlantic white-cedar	Chamaecyparis thyoides	NSH	Low	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	91
Virginia pine	Pinus virginiana	NDH	High	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	92
silver maple	Acer saccharinum	NSH	Low	0	0	0	Unknown	Unknown	High	Absent	Unknown	Unknown			0	93
shellbark hickory	Carya laciniosa	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	94

Section 232F

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

Common Name	Scientific Name	Range	MR	%Cell	FIAsum	FIAiv	ChngCl45	ChngCl85	Adap	Abund	Capabil45	Capabil85	SHIFT45	SHIFT85	SSO	N
cucumbertree	Magnolia acuminata	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	95