

One x One Degree
Climate Change Atlas Tree Species
 Current and Potential Future Habitat, Capability, and Migration

	sq. km	sq. mi	FIA Plots
Area of Region	9,549.4	3,687.0	94

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		RCP45	RCP85	RCP45	RCP85	RCP45	RCP85			
Ash	3	Abundant	0	9	21	Increase	20	23	Very Good	6	6	Likely	0	0
Hickory	7	Common	19	25	34	No Change	12	10	Good	9	15	Infill	11	13
Maple	3	Rare	32	28	8	Decrease	16	15	Fair	15	7	Migrate	5	10
Oak	12	Absent	14	3		New	12	13	Poor	7	11		16	23
Pine	1					Unknown	5	4	Very Poor	9	8			
Other	25								FIA Only	1	1			
	51		65	65	63		65	65	Unknown	2	1			
										49	49			

Potential Changes in Climate Variables

Temperature (°F)

	Scenario	2009	2039	2069	2099	
Annual Average	CCSM45	53.5	55.5	57.4	57.8	
	CCSM85	53.5	56.2	58.6	61.6	
	GFDL45	53.5	58.8	58.8	59.8	
	GFDL85	53.5	56.4	59.6	63.6	
	HAD45	53.5	56.3	59.5	61.2	
Growing Season (May—Sep)	CCSM45	71.2	73.4	74.9	75.8	
	CCSM85	71.2	74.4	76.8	80.4	
	GFDL45	71.2	77.7	77.6	79.1	
	GFDL85	71.2	74.8	78.6	83.6	
	HAD45	71.2	74.2	76.9	79.0	
Coldest Month (Average)	CCSM45	25.2	27.3	29.0	29.4	
	CCSM85	25.2	28.3	29.4	31.1	
	GFDL45	25.2	29.6	30.1	30.6	
	GFDL85	25.2	28.3	29.7	30.8	
	HAD45	25.2	26.8	29.6	29.8	
Warmest Month (Average)	CCSM45	77.6	79.9	81.1	81.8	
	CCSM85	77.6	81.2	82.7	84.4	
	GFDL45	77.6	81.0	82.7	83.8	
	GFDL85	77.6	81.6	83.3	86.6	
	HAD45	77.6	80.7	82.7	83.6	
HAD85	77.6	82.4	85.7	87.7		

Precipitation (in)

	Scenario	2009	2039	2069	2099	
Annual Total	CCSM45	39.9	37.7	41.6	39.3	
	CCSM85	39.9	38.7	41.2	40.5	
	GFDL45	39.9	43.8	45.3	46.1	
	GFDL85	39.9	43.5	48.9	49.3	
	HAD45	39.9	41.3	42.6	42.1	
Growing Season (May—Sep)	CCSM45	20.7	19.7	21.6	19.3	
	CCSM85	20.7	19.3	20.5	19.3	
	GFDL45	20.7	22.3	22.0	22.5	
	GFDL85	20.7	22.6	23.9	23.4	
	HAD45	20.7	20.7	20.2	20.3	
HAD85	20.7	20.7	18.2	18.7		

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>.

Current and Potential Future Habitat, Capability, and Migration

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	67	454.5	14.2	Lg. dec.	Lg. dec.	High	Common	Fair	Fair			1	1
shagbark hickory	Carya ovata	WSL	Medium	73.9	371.5	10.8	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	2
shingle oak	Quercus imbricaria	NDH	Medium	59.1	270.7	8.6	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	3
American elm	Ulmus americana	WDH	Medium	71.5	210.5	6.1	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	4
black oak	Quercus velutina	WDH	High	56.3	180.5	6.6	No change	No change	Medium	Common	Fair	Fair			1	5
black walnut	Juglans nigra	WDH	Low	53.4	165.6	6.4	No change	No change	Medium	Common	Fair	Fair			1	6
white ash	Fraxinus americana	WDL	Medium	55.9	154.1	7.2	No change	No change	Low	Common	Poor	Poor			0	7
northern red oak	Quercus rubra	WDH	Medium	54.2	139.4	7.0	Sm. dec.	Lg. dec.	High	Common	Fair	Fair			1	8
sugar maple	Acer saccharum	WDH	High	37.3	139.2	9.1	Sm. dec.	No change	High	Common	Fair	Good	Infill +	Infill ++	1	9
hackberry	Celtis occidentalis	WDH	Medium	63.1	132.6	5.2	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	10
swamp white oak	Quercus bicolor	NSL	Low	29	96.2	4.2	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	11
post oak	Quercus stellata	WDH	High	25	87.1	5.7	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good	Infill ++	Infill ++	1	12
eastern redcedar	Juniperus virginiana	WDH	Medium	42.7	84.1	6.1	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	13
honeylocust	Gleditsia triacanthos	NSH	Low	42.5	74.8	4.1	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	14
pin oak	Quercus palustris	NSH	Low	32.4	74.3	8.0	No change	No change	Low	Common	Poor	Poor			0	15
slippery elm	Ulmus rubra	WSL	Low	40.6	72.4	1.9	No change	Sm. inc.	Medium	Common	Fair	Good			1	16
silver maple	Acer saccharinum	NSH	Low	10.8	65.7	17.3	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	17
black cherry	Prunus serotina	WDL	Medium	58.7	63.6	2.8	Sm. inc.	Sm. inc.	Low	Common	Fair	Fair			1	18
bitternut hickory	Carya cordiformis	WSL	Low	48.2	59.0	3.8	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	19
red mulberry	Morus rubra	NSL	Low	36.4	41.7	2.0	Sm. inc.	No change	Medium	Rare	Fair	Poor			1	20
chinkapin oak	Quercus muehlenbergii	NSL	Medium	25.4	38.6	4.2	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	21
eastern redbud	Cercis canadensis	NSL	Low	23.5	33.9	2.3	Lg. dec.	No change	Medium	Rare	Very Poor	Poor			1	22
black locust	Robinia pseudoacacia	NDH	Low	14.7	33.6	7.3	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good	Infill +	Infill ++	1	23
mockernut hickory	Carya alba	WDL	Medium	36.8	30.2	2.6	Sm. inc.	Lg. inc.	High	Rare	Good	Good			1	24
black hickory	Carya texana	NDL	High	18.5	24.0	3.3	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	1	25
sycamore	Platanus occidentalis	NSL	Low	13.2	22.8	8.2	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	1	26
scarlet oak	Quercus coccinea	WDL	Medium	1	22.7	21.7	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	27
sassafras	Sassafras albidum	WSL	Low	27	20.5	2.0	Sm. inc.	No change	Medium	Rare	Fair	Poor			1	28
American basswood	Tilia americana	WSL	Medium	7.4	13.9	2.8	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	29
Osage-orange	Maclura pomifera	NDH	Medium	7.8	13.4	3.0	No change	Lg. inc.	High	Rare	Fair	Good	Infill +	Infill ++	1	30
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	17.6	12.3	1.8	No change	Sm. inc.	High	Rare	Fair	Good			1	31
bur oak	Quercus macrocarpa	NDH	Medium	8.6	11.5	2.2	No change	Sm. dec.	High	Rare	Fair	Poor	Infill +	Infill +	2	32
pignut hickory	Carya glabra	WDL	Medium	5.2	11.5	0.5	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	33
green ash	Fraxinus pennsylvanica	WSH	Low	23.7	9.9	1.4	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			1	34
white mulberry	Morus alba	NSL	FIA	14.9	9.6	3.2	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	35
river birch	Betula nigra	NSL	Low	9.3	8.7	2.7	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	36
Ohio buckeye	Aesculus glabra	NSL	Low	11.6	6.6	1.9	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	37
flowering dogwood	Cornus florida	WDL	Medium	8.6	6.3	0.6	No change	No change	Medium	Rare	Poor	Poor		Infill +	1	38
shellbark hickory	Carya laciniosa	NSL	Low	20.7	6.0	2.7	Lg. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	39
Scots pine	Pinus sylvestris	NSH	FIA	1	5.5	5.2	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	40
pecan	Carya illinoensis	NSH	Low	1	2.7	2.6	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair	Infill +	Infill +	2	41
butternut	Juglans cinerea	NSLX	FIA	1	2.6	2.5	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	42
eastern cottonwood	Populus deltoides	NSH	Low	3.4	1.9	5.7	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	43
blackjack oak	Quercus marilandica	NSL	Medium	1	1.8	1.7	Lg. inc.	Lg. inc.	High	Rare	Good	Good			2	44
black willow	Salix nigra	NSH	Low	5.6	1.7	0.9	No change	Lg. inc.	Low	Rare	Very Poor	Fair		Infill +	2	45
common persimmon	Diospyros virginiana	NSL	Low	5.2	1.5	1.6	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	1	46
American hornbeam; muscle	Carpinus caroliniana	WSL	Low	0.1	1.4	0.1	Very Lg. dec.	Lg. dec.	Medium	Rare	Lost	Very Poor			0	47

One x One Degree
Climate Change Atlas Tree Species

USDA Forest Service
Northern Research Station
Landscape Change Research Group
Iverson, Peters, Prasad, Matthews

Current and Potential Future Habitat, Capability, and Migration

Common Name	Scientific Name	Range	MR	%Cell	FIAsum	FIaiv	ChngCl45	ChngCl85	Adap	Abund	Capabil45	Capabil85	SHIFT45	SHIFT85	SSO	N
boxelder	Acer negundo	WSH	Low	5.5	1.1	1.8	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++		2 48
blue ash	Fraxinus quadrangulata	NSL	Low	1	1.0	1.0	Very Lg. dec.	Very Lg. dec.	Low	Rare	Lost	Lost				0 49
Shumard oak	Quercus shumardii	NSL	Low	1	0.6	0.5	No change	Lg. inc.	High	Rare	Fair	Good				2 50
serviceberry	Amelanchier spp.	NSL	Low	8	0.5	1.0	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor				0 51
loblolly pine	Pinus taeda	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate ++		3 52
striped maple	Acer pensylvanicum	NSL	Medium	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown				0 53
red maple	Acer rubrum	WDH	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate +		3 54
cittamwood/gum bumelia	Sideroxylon lanuginosum ssp.	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +		3 55
sugarberry	Celtis laevigata	NDH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++		3 56
sweetgum	Liquidambar styraciflua	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +		3 57
yellow-poplar	Liriodendron tulipifera	WDH	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat				3 58
blackgum	Nyssa sylvatica	WDL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +		3 59
pin cherry	Prunus pensylvanica	NSL	Low	0	0	0	Unknown	New Habitat	Medium	Absent	Unknown	New Habitat				3 60
southern red oak	Quercus falcata	WDL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate +		3 61
cherrybark oak; swamp red o.	Quercus pagoda	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +		3 62
water oak	Quercus nigra	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate ++		3 63
winged elm	Ulmus alata	WDL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++		3 64
cedar elm	Ulmus crassifolia	NDH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat				3 65