

HUC 020600 Upper Chesapeake

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 15,207 5,871.6 164

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 RCP45	Scenario RCP85	Scenario RCP45	Scenario RCP85	SHIFT RCP45	SHIFT RCP85				
Ash	3			High	22	25	Increase	18	24	Very Good	2	5	Likely	1	1
Hickory	3			Medium	37	55	No Change	16	11	Good	17	21	Infill	14	15
Maple	5	Abundant	2	Low	33	14	Decrease	23	22	Fair	13	9	Migrate	13	15
Oak	14	Common	21	FIA	6		New	26	28	Poor	13	10			
Pine	5	Rare	40				Unknown	15	13	Very Poor	10	10			
Other	33	Absent	34							FIA Only	2	2			
	63		97		98	94		98	98	Unknown	9	7			
											66	64			

Potential Changes in Climate Variables

Temperature (°F)

	Scenario	2009	2039	2069	2099	
Annual Average	CCSM45	47.8	48.9	50.3	50.4	
	CCSM85	47.8	49.1	50.7	52.7	
	GFDL45	47.8	49.8	51.4	52.1	
	GFDL85	47.8	49.9	52.2	54.8	
	HAD45	47.8	49.4	51.6	52.5	
HAD85	47.8	49.5	52.1	55.1		
Growing Season (May—Sep)	CCSM45	58.3	59.4	60.6	60.9	
	CCSM85	58.3	59.6	61.3	63.7	
	GFDL45	58.3	60.6	62.5	63.5	
	GFDL85	58.3	60.9	63.5	66.4	
	HAD45	58.3	60.2	62.2	63.4	
HAD85	58.3	60.0	63.1	66.3		
Coldest Month Average	CCSM45	32.0	33.3	34.3	34.6	
	CCSM85	32.0	33.6	34.4	35.5	
	GFDL45	32.0	34.0	34.4	34.9	
	GFDL85	32.0	33.8	34.6	35.6	
	HAD45	32.0	33.0	34.5	34.6	
HAD85	32.0	33.4	34.5	35.9		
Warmest Month Average	CCSM45	62.2	63.6	64.1	64.3	
	CCSM85	62.2	63.6	64.8	65.8	
	GFDL45	62.2	64.2	65.3	66.2	
	GFDL85	62.2	65.1	66.5	68.3	
	HAD45	62.2	64.3	65.5	66.2	
HAD85	62.2	64.4	66.2	68.4		

Precipitation (in)

	Scenario	2009	2039	2069	2099	
Annual Total	CCSM45	30.0	32.3	34.0	35.0	
	CCSM85	30.0	32.9	33.8	38.1	
	GFDL45	30.0	33.6	36.2	36.4	
	GFDL85	30.0	31.5	36.0	36.8	
	HAD45	30.0	31.7	32.7	32.0	
HAD85	30.0	34.6	31.2	33.6		
Growing Season (May—Sep)	CCSM45	13.4	15.9	16.7	17.5	
	CCSM85	13.4	15.7	16.0	18.1	
	GFDL45	13.4	14.4	15.9	16.2	
	GFDL85	13.4	13.5	15.5	15.7	
	HAD45	13.4	14.5	13.7	12.7	
HAD85	13.4	15.1	12.7	13.1		

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-DGP30 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>.



HUC 020600 Upper Chesapeake

HUC 6 Watershed 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
red maple	Acer rubrum	WDH	High	72.8	827.8	13.0	Sm. dec.	Sm. dec.	High	Abundant	Good	Good			1	1
yellow-poplar	Liriodendron tulipifera	WDH	High	60.2	820.3	14.9	Lg. dec.	Lg. dec.	High	Abundant	Good	Good			1	2
sweetgum	Liquidambar styraciflua	WDH	High	47.9	489.6	10.9	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	3
white oak	Quercus alba	WDH	Medium	50.9	342.2	6.8	No change	No change	High	Common	Good	Good			1	4
loblolly pine	Pinus taeda	WDH	High	23.7	308.4	16.9	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good	Infill ++	Infill ++	1	5
blackgum	Nyssa sylvatica	WDL	Medium	58.3	284.6	5.6	Sm. dec.	No change	High	Common	Fair	Good			1	6
black cherry	Prunus serotina	WDL	Medium	39.6	263.4	6.4	No change	No change	Low	Common	Poor	Poor			0	7
American beech	Fagus grandifolia	WDH	High	44.4	221.6	5.3	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	8
Virginia pine	Pinus virginiana	NDH	High	22	209.5	9.4	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	9
black oak	Quercus velutina	WDH	High	31.3	149.8	4.8	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	10
mockernut hickory	Carya alba	WDL	Medium	23.4	127.5	5.4	No change	Sm. inc.	High	Common	Good	Very Good			1	11
chestnut oak	Quercus prinus	NDH	High	17.1	120.0	9.8	Lg. dec.	Lg. dec.	High	Common	Fair	Fair			1	12
northern red oak	Quercus rubra	WDH	Medium	32.2	110.4	4.5	No change	Sm. dec.	High	Common	Good	Fair			1	13
scarlet oak	Quercus coccinea	WDL	Medium	22.9	109.0	4.5	Sm. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	14
black locust	Robinia pseudoacacia	NDH	Low	17.7	105.4	8.6	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	15
pignut hickory	Carya glabra	WDL	Medium	23.6	86.8	3.6	No change	No change	Medium	Common	Fair	Fair			1	16
sassafras	Sassafras albidum	WSL	Low	30.8	78.3	2.9	Lg. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	17
southern red oak	Quercus falcata	WDL	Medium	23.3	71.9	3.5	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	18
white ash	Fraxinus americana	WDL	Medium	19.4	63.4	6.2	No change	Sm. inc.	Low	Common	Poor	Fair			1	19
American holly	Ilex opaca	NSL	Medium	25.6	57.9	2.4	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good			1	20
willow oak	Quercus phellos	NSL	Low	14.8	56.5	2.9	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good	Infill ++	Infill ++	1	21
eastern redcedar	Juniperus virginiana	WDH	Medium	8.4	53.4	6.7	No change	No change	Medium	Common	Fair	Fair	Infill +	Infill +	1	22
black walnut	Juglans nigra	WDH	Low	14.5	51.8	6.0	No change	Sm. dec.	Medium	Common	Fair	Poor			1	23
sycamore	Platanus occidentalis	NSL	Low	12.5	46.8	5.4	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good	Infill +	Infill ++	1	24
pin oak	Quercus palustris	NSH	Low	7.5	40.5	4.0	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	25
slippery elm	Ulmus rubra	WSL	Low	6.9	39.7	8.5	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	26
boxelder	Acer negundo	WSH	Low	12.7	39.0	4.8	No change	Sm. inc.	High	Rare	Fair	Good			1	27
cherrybark oak; swamp red o.	Quercus pagoda	NSL	Medium	4.3	36.7	10.2	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	28
American hornbeam; musclev	Carpinus caroliniana	WSL	Low	15.1	36.1	1.9	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			1	29
eastern white pine	Pinus strobus	WDH	High	0.9	24.1	36.7	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	30
ailanthus	Ailanthus altissima	NSL	FIA	5.5	22.8	4.1	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	31
bitternut hickory	Carya cordiformis	WSL	Low	3.4	21.9	5.7	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	1	32
swamp chestnut oak	Quercus michauxii	NSL	Low	8.7	21.3	1.1	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	1	33
flowering dogwood	Cornus florida	WDL	Medium	14.3	15.9	1.2	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good			1	34
common persimmon	Diospyros virginiana	NSL	Low	12.5	15.3	1.8	Sm. dec.	Lg. inc.	High	Rare	Poor	Good			1	35
white mulberry	Morus alba	NSL	FIA	5.1	10.1	1.8	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	36
American elm	Ulmus americana	WDH	Medium	6.5	7.9	4.0	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good	Infill +	Infill ++	2	37
sweet birch	Betula lenta	NDH	High	0.3	7.9	1.0	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	38
river birch	Betula nigra	NSL	Low	3.6	7.8	3.0	No change	Lg. inc.	Medium	Rare	Poor	Good	Infill +	Infill ++	2	39
Norway maple	Acer platanoides	NSL	FIA	2.9	7.6	2.6	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	40
silver maple	Acer saccharinum	NSH	Low	0.9	6.9	10.5	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	41
pawpaw	Asimina triloba	NSL	Low	6.6	6.8	2.1	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	42
shingle oak	Quercus imbricaria	NDH	Medium	1.7	6.8	4.9	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	43
wild plum	Prunus americana	NSLX	FIA	1.7	6.8	4.9	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	44
sweetbay	Magnolia virginiana	NSL	Medium	6.9	5.7	1.8	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	2	45
black willow	Salix nigra	NSH	Low	1.7	4.8	3.5	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair	Infill +	Infill +	2	46
paulownia	Paulownia tomentosa	NSL	FIA	2.6	4.6	2.3	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	47



HUC 020600 Upper Chesapeake

HUC 6 Watershed 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
green ash	Fraxinus pennsylvanica	WSH	Low	2.4	4.5	2.0	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	2	48
shortleaf pine	Pinus echinata	WDH	High	0.1	3.6	0.6	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	49
water oak	Quercus nigra	WDH	High	2.2	2.3	1.1	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	50
pitch pine	Pinus rigida	NSH	High	1.1	1.6	0.7	Very Lg. dec.	Very Lg. dec.	Medium	Rare	Lost	Lost			0	51
black ash	Fraxinus nigra	WSH	Medium	4	1.4	1.7	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	52
swamp white oak	Quercus bicolor	NSL	Low	3.2	1.3	1.9	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	53
quaking aspen	Populus tremuloides	WDH	High	0.7	1.2	1.4	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	54
American chestnut	Castanea dentata	NSLX	FIA	1.7	1.2	0.9	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	55
red mulberry	Morus rubra	NSL	Low	0.9	1.1	1.7	No change	No change	Medium	Rare	Poor	Poor		Infill +	2	56
bigtooth aspen	Populus grandidentata	NSL	Medium	0.8	0.8	1.1	Very Lg. dec.	Very Lg. dec.	Medium	Rare	Lost	Lost			0	57
Osage-orange	Maclura pomifera	NDH	Medium	1.7	0.7	2.2	Sm. dec.	No change	High	Rare	Poor	Fair		Infill +	2	58
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	0.9	0.6	0.9	Lg. inc.	Lg. inc.	High	Rare	Good	Good			2	59
hackberry	Celtis occidentalis	WDH	Medium	2.2	0.6	0.3	No change	Sm. inc.	High	Rare	Fair	Good		Infill +	2	60
sugar maple	Acer saccharum	WDH	High	2.8	0.3	1.3	Lg. inc.	Lg. inc.	High	Rare	Good	Good			2	61
post oak	Quercus stellata	WDH	High	0.4	0.3	0.2	Lg. inc.	Lg. inc.	High	Rare	Good	Good			2	62
eastern cottonwood	Populus deltoides	NSH	Low	1.3	0.2	0.4	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	63
ashe juniper	Juniperus ashei	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	64
red spruce	Picea rubens	NDH	High	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown			0	65
slash pine	Pinus elliotii	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate ++	3	66
longleaf pine	Pinus palustris	NSH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate ++	3	67
pond pine	Pinus serotina	NSH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat		Migrate ++	3	68
bald cypress	Taxodium distichum	NSH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	69
pond cypress	Taxodium ascendens	NSH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	70
striped maple	Acer pensylvanicum	NSL	Medium	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	71
mountain maple	Acer spicatum	NSL	Low	0	0	0	Unknown	Unknown	High	Absent	Unknown	Unknown			0	72
serviceberry	Amelanchier spp.	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	73
cittamwood/gum bumelia	Sideroxylon lanuginosum ssp.	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			0	74
water hickory	Carya aquatica	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	75
pecan	Carya illinoensis	NSH	Low	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat		Migrate +	3	76
shellbark hickory	Carya laciniosa	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	77
shagbark hickory	Carya ovata	WSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Likely +	3	78
black hickory	Carya texana	NDL	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	79
sugarberry	Celtis laevigata	NDH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	80
eastern redbud	Cercis canadensis	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate ++	3	81
honeylocust	Gleditsia triacanthos	NSH	Low	0	0	0	Unknown	New Habitat	High	Absent	Unknown	New Habitat		Migrate +	3	82
cucumbertree	Magnolia acuminata	NSL	Low	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown			0	83
bigleaf magnolia	Magnolia macrophylla	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	84
water tupelo	Nyssa aquatica	NSH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat		Migrate +	3	85
swamp tupelo	Nyssa biflora	NDH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat		Migrate ++	3	86
sourwood	Oxydendrum arboreum	NDL	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +	3	87
redbay	Persea borbonia	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +	3	88
water elm	Planera aquatica	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	89
turkey oak	Quercus laevis	NSH	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			3	90
laurel oak	Quercus laurifolia	NDH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	91
overcup oak	Quercus lyrata	NSL	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat		Migrate +	3	92
blackjack oak	Quercus marilandica	NSL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +	3	93
Nuttall oak	Quercus texana	NSH	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			0	94



HUC 020600 Upper Chesapeake

HUC 6 Watershed 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
live oak	<i>Quercus virginiana</i>	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	95
bluejack oak	<i>Quercus incana</i>	NSL	Low	0	0	0	Unknown	New Habitat	Medium	Absent	Unknown	New Habitat			3	96
winged elm	<i>Ulmus alata</i>	WDL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	97
cedar elm	<i>Ulmus crassifolia</i>	NDH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			0	98