

Upper Delaware Scenic and Recreational River

National Park

Climate Change Atlas Tree Species

Current and Potential Future Habitat, Capability, and Migration

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	sq. km	sq. mi	FIA Plots
Area of Region	8,400.0	3,243.3	232

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	2			High	22	19	Increase	16	23	Very Good	7	8	Likely	2	2
Hickory	4			Medium	23	39	No Change	13	5	Good	10	13	Infill	10	11
Maple	5	Abundant	5	Low	23	14	Decrease	19	20	Fair	7	4	Migrate	5	11
Oak	8	Common	15	FIA	7		New	16	19	Poor	12	12			
Pine	4	Rare	35				Unknown	11	8	Very Poor	10	7			
Other	32	Absent	19							FIA Only	4	4			
	55		74		75	72		75	75	Unknown	4	1			
											54	49			

Potential Changes in Climate Variables

Temperature (°F)

	Scenario	2009	2039	2069	2099	
Annual Average	CCSM45	46.3	48.2	50.5	50.8	
	CCSM85	46.3	48.7	51.2	54.4	
	GFDL45	46.3	49.3	52.3	53.5	
	GFDL85	46.3	49.7	53.6	57.9	
	HAD45	46.3	49.3	52.6	54.3	
HAD85	46.3	49.3	53.6	58.8		
Growing Season (May-Sep)	CCSM45	63.0	65.1	67.0	67.5	
	CCSM85	63.0	65.4	67.9	71.8	
	GFDL45	63.0	66.2	69.9	71.3	
	GFDL85	63.0	67.1	71.4	76.0	
	HAD45	63.0	66.2	69.1	71.4	
HAD85	63.0	65.7	70.6	76.3		
Coldest Month Average	CCSM45	20.6	22.4	24.2	24.7	
	CCSM85	20.6	23.2	24.4	26.5	
	GFDL45	20.6	23.8	25.2	26.0	
	GFDL85	20.6	23.9	25.5	27.7	
	HAD45	20.6	22.5	25.3	25.5	
HAD85	20.6	23.7	25.9	28.9		
Warmest Month Average	CCSM45	68.8	71.4	72.5	72.7	
	CCSM85	68.8	71.7	73.4	75.5	
	GFDL45	68.8	71.8	73.9	75.2	
	GFDL85	68.8	73.1	75.6	78.5	
	HAD45	68.8	72.4	74.0	75.5	
HAD85	68.8	72.3	75.1	79.1		

Precipitation (in)

	Scenario	2009	2039	2069	2099	
Annual Total	CCSM45	46.5	47.6	47.3	51.5	
	CCSM85	46.5	47.9	50.6	52.6	
	GFDL45	46.5	51.5	54.3	53.1	
	GFDL85	46.5	49.0	53.1	56.0	
	HAD45	46.5	48.4	49.6	49.0	
HAD85	46.5	50.1	49.2	52.2		
Growing Season (May-Sep)	CCSM45	21.7	23.6	23.0	24.7	
	CCSM85	21.7	22.6	24.4	23.8	
	GFDL45	21.7	22.4	22.5	23.3	
	GFDL85	21.7	21.7	22.5	23.0	
	HAD45	21.7	22.9	21.0	21.3	
HAD85	21.7	22.0	21.1	22.1		

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.

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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	94	2158.4	24.0	Sm. dec.	Sm. dec.	High	Abundant	Good	Good			1	1
sugar maple	Acer saccharum	WDH	High	70.2	822.8	12.5	No change	No change	High	Abundant	Very Good	Very Good			1	2
eastern hemlock	Tsuga canadensis	NSH	High	57.1	745.2	13.0	Sm. dec.	Lg. dec.	Low	Abundant	Fair	Poor			0	3
American beech	Fagus grandifolia	WDH	High	52.4	647.0	12.4	Sm. dec.	Sm. dec.	Medium	Abundant	Fair	Fair			0	4
chestnut oak	Quercus prinus	NDH	High	39.3	573.5	16.1	Sm. inc.	Sm. inc.	High	Abundant	Very Good	Very Good			1	5
sweet birch	Betula lenta	NDH	High	70.2	488.4	7.5	No change	Sm. dec.	Low	Common	Poor	Poor			0	6
eastern white pine	Pinus strobus	WDH	High	34.5	484.9	14.1	Sm. dec.	Sm. dec.	Low	Common	Poor	Poor			0	7
white ash	Fraxinus americana	WDL	Medium	63.1	477.3	7.6	Sm. inc.	No change	Low	Common	Fair	Poor			1	8
white oak	Quercus alba	WDH	Medium	41.7	473.3	12.5	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	9
black cherry	Prunus serotina	WDL	Medium	56	457.0	8.8	Sm. inc.	No change	Low	Common	Fair	Poor			1	10
northern red oak	Quercus rubra	WDH	Medium	48.8	342.5	7.6	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	11
yellow birch	Betula alleghaniensis	NDL	High	60.7	303.0	5.0	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	12
scarlet oak	Quercus coccinea	WDL	Medium	21.4	217.9	10.2	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	13
pignut hickory	Carya glabra	WDL	Medium	28.6	128.8	5.2	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	14
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	38.1	94.2	2.7	No change	Sm. inc.	High	Common	Good	Very Good			1	15
black oak	Quercus velutina	WDH	High	25	80.8	4.0	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	16
serviceberry	Amelanchier spp.	NSL	Low	31	78.8	2.6	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	17
American elm	Ulmus americana	WDH	Medium	23.8	69.1	4.0	No change	Sm. inc.	Medium	Common	Fair	Good			1	18
American basswood	Tilia americana	WSL	Medium	17.9	56.3	3.2	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	19
pitch pine	Pinus rigida	NSH	High	15.5	50.2	3.3	Sm. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	20
white spruce	Picea glauca	NSL	Medium	3.6	48.5	13.6	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	21
striped maple	Acer pensylvanicum	NSL	Medium	15.5	38.4	2.5	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	22
red spruce	Picea rubens	NDH	High	7.1	36.6	5.1	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	23
quaking aspen	Populus tremuloides	WDH	High	16.7	33.9	2.6	Sm. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	24
shagbark hickory	Carya ovata	WSL	Medium	13.1	33.8	3.6	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	1	25
bigtooth aspen	Populus grandidentata	NSL	Medium	9.5	31.8	3.3	No change	No change	Medium	Rare	Poor	Poor			1	26
sassafras	Sassafras albidum	WSL	Low	10.7	29.1	2.7	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			1	27
red pine	Pinus resinosa	NSH	Medium	2.4	29.1	12.2	Very Lg. dec.	Very Lg. dec.	Low	Rare	Lost	Lost			0	28
gray birch	Betula populifolia	NSL	Low	9.5	28.0	2.9	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	29
American hornbeam; musclev	Carpinus caroliniana	WSL	Low	25	25.8	1.3	Sm. dec.	Sm. inc.	Medium	Rare	Very Poor	Fair			1	30
blackgum	Nyssa sylvatica	WDL	Medium	16.7	23.4	1.8	Lg. inc.	Lg. inc.	High	Rare	Good	Good			1	31
chokecherry	Prunus virginiana	NSLX	FIA	3.6	23.0	6.5	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	32
swamp white oak	Quercus bicolor	NSL	Low	2.4	22.6	9.5	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	33
pin cherry	Prunus pensylvanica	NSL	Low	4.8	21.8	4.6	Lg. dec.	Very Lg. dec.	Medium	Rare	Very Poor	Lost			0	34
Norway spruce	Picea abies	NSH	FIA	3.6	20.9	5.9	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	35
sycamore	Platanus occidentalis	NSL	Low	2.4	16.2	6.8	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	2	36
black walnut	Juglans nigra	WDH	Low	2.4	15.7	6.6	No change	Lg. inc.	Medium	Rare	Poor	Good	Infill +	Infill ++	1	37
black willow	Salix nigra	NSH	Low	1.2	15.4	13.0	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			2	38
eastern redcedar	Juniperus virginiana	WDH	Medium	8.3	12.7	4.1	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	1	39
Scots pine	Pinus sylvestris	NSH	FIA	1.2	11.8	9.9	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	40
bitternut hickory	Carya cordiformis	WSL	Low	6	10.4	1.8	No change	Lg. inc.	High	Rare	Fair	Good	Infill +	Infill ++	2	41
yellow-poplar	Liriodendron tulipifera	WDH	High	3.6	9.4	2.6	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	1	42
green ash	Fraxinus pennsylvanica	WSH	Low	6	7.4	11.9	No change	Sm. inc.	Medium	Rare	Poor	Fair	Infill +	Infill +	2	43
mockernut hickory	Carya alba	WDL	Medium	10.7	7.4	1.1	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	1	44
flowering dogwood	Cornus florida	WDL	Medium	4.8	5.4	1.1	No change	No change	Medium	Rare	Poor	Poor		Infill +	1	45
ailanthus	Ailanthus altissima	NSL	FIA	1.2	4.6	3.8	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	46
butternut	Juglans cinerea	NSLX	FIA	1.2	4.2	3.5	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	47



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pin oak	Quercus palustris	NSH	Low	4.8	2.3	7.8	No change	Sm. inc.	Low	Rare	Very Poor	Poor	Infill +		2	48
boxelder	Acer negundo	WSH	Low	1.2	2.0	1.7	No change	Sm. inc.	High	Rare	Fair	Good	Infill +		2	49
slippery elm	Ulmus rubra	WSL	Low	2.4	1.3	0.5	No change	Sm. inc.	Medium	Rare	Poor	Fair	Infill +		2	50
paper birch	Betula papyrifera	WDH	High	1.2	1.1	0.9	No change	Very Lg. dec.	Medium	Rare	Poor	Lost	Infill +		2	51
bear oak; scrub oak	Quercus ilicifolia	NSLX	FIA	1.2	1.1	0.9	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	52
balsam fir	Abies balsamea	NDH	High	1.2	1.0	0.9	Very Lg. dec.	Very Lg. dec.	Low	Rare	Lost	Lost			0	53
mountain maple	Acer spicatum	NSL	Low	1.2	0.8	0.7	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			0	54
American chestnut	Castanea dentata	NSLX	FIA	1.2	0.8	0.7	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	55
shortleaf pine	Pinus echinata	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate ++	3	56
loblolly pine	Pinus taeda	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate ++	3	57
Virginia pine	Pinus virginiana	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	58
florida maple	Acer barbatum	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			3	59
pecan	Carya illinoensis	NSH	Low	0	0	0	Unknown	New Habitat	Low	Absent	Unknown	New Habitat			3	60
black hickory	Carya texana	NDL	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	61
sugarberry	Celtis laevigata	NDH	Medium	0	0	0	Unknown	New Habitat	Medium	Absent	Unknown	New Habitat			0	62
hackberry	Celtis occidentalis	WDH	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Likely +	Likely +	3	63
eastern redbud	Cercis canadensis	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	64
common persimmon	Diospyros virginiana	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +	3	65
sweetgum	Liquidambar styraciflua	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	66
mountain or Fraser magnolia	Magnolia fraseri	NSL	Low	0	0	0	Unknown	New Habitat	Low	Absent	Unknown	New Habitat			0	67
sourwood	Oxydendrum arboreum	NDL	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	68
southern red oak	Quercus falcata	WDL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +	3	69
blackjack oak	Quercus marilandica	NSL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate ++	3	70
chinkapin oak	Quercus muehlenbergii	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	71
post oak	Quercus stellata	WDH	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	72
black locust	Robinia pseudoacacia	NDH	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Likely +	Likely +	3	73
American mountain-ash	Sorbus americana	NSL	Low	0	0	0	Unknown	Unknown	Low	Modeled	Unknown	Unknown			0	74
winged elm	Ulmus alata	WDL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	75