

Delaware Water Gap

National Park 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

Area of Region sq. km sq. mi FIA Plots
8,400.0 3,243.3 214

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	21	Increase	19	22	Very Good	7	8	Likely	2	2
Hickory	4		Medium	25	No Change	11	7	Good	11	15	Infill	14	15
Maple	6	Abundant	Low	26	Decrease	20	21	Fair	11	7	Migrate	7	12
Oak	9	Common	FIA	6	New	18	20	Poor	9	8		23	29
Pine	4	Rare			Unknown	10	8	Very Poor	9	8			
Other	30	Absent				78	78	FIA Only	3	3			
	56	78						Unknown	4	2			
									54	51			

Potential Changes in Climate Variables

Temperature (°F)

Scenario	2009	2039	2069	2099		
Annual	CCSM45	48.6	50.5	52.7	53.0	
Average	CCSM85	48.6	50.9	53.4	56.6	
	GFDL45	48.6	51.9	54.4	55.6	
	GFDL85	48.6	51.9	55.7	59.8	
	HAD45	48.6	51.4	54.8	56.4	
	HAD85	48.6	51.5	55.7	60.7	
Growing Season	CCSM45	65.1	67.2	69.0	69.5	
	CCSM85	65.1	67.4	69.9	73.8	
May—Sep	GFDL45	65.1	68.8	71.8	73.1	
	GFDL85	65.1	69.0	73.2	77.6	
	HAD45	65.1	68.2	71.2	73.3	
	HAD85	65.1	67.7	72.5	78.0	
Coldest Month	CCSM45	23.5	25.3	27.1	27.5	
	CCSM85	23.5	26.0	27.2	29.2	
Average	GFDL45	23.5	26.8	28.0	28.8	
	GFDL85	23.5	26.8	28.3	30.3	
	HAD45	23.5	25.3	27.9	28.2	
	HAD85	23.5	26.4	28.4	31.1	
Warmest Month	CCSM45	71.0	73.4	74.5	74.7	
	CCSM85	71.0	73.7	75.4	77.4	
Average	GFDL45	71.0	73.9	75.9	77.1	
	GFDL85	71.0	75.1	77.6	80.4	
	HAD45	71.0	74.5	76.1	77.4	
	HAD85	71.0	74.3	77.0	80.7	

Precipitation (in)

Scenario	2009	2039	2069	2099		
Annual	CCSM45	48.2	50.2	50.6	55.0	
Total	CCSM85	48.2	50.4	53.6	56.3	
	GFDL45	48.2	53.7	57.2	56.2	
	GFDL85	48.2	51.4	56.0	59.2	
	HAD45	48.2	50.6	51.6	51.6	
	HAD85	48.2	52.7	51.3	54.1	
Growing Season	CCSM45	22.1	25.1	24.9	26.7	
	CCSM85	22.1	23.7	26.0	25.7	
May—Sep	GFDL45	22.1	23.1	23.7	24.9	
	GFDL85	22.1	22.4	23.7	24.7	
	HAD45	22.1	23.5	21.5	21.7	
	HAD85	22.1	22.8	21.4	21.9	

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.

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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	92.9	1454.7	17.9	Sm. dec.	Sm. dec.	High	Abundant	Good	Good			1	1
chestnut oak	Quercus prinus	NDH	High	73.8	920.3	14.8	No change	No change	High	Abundant	Very Good	Very Good			1	2
white ash	Fraxinus americana	WDL	Medium	71.4	632.0	10.2	No change	Sm. dec.	Low	Abundant	Fair	Fair			0	3
white oak	Quercus alba	WDH	Medium	65.5	589.1	9.5	Sm. inc.	Sm. inc.	High	Abundant	Very Good	Very Good			1	4
northern red oak	Quercus rubra	WDH	Medium	76.2	577.4	9.0	No change	No change	High	Abundant	Very Good	Very Good			1	5
sweet birch	Betula lenta	NDH	High	72.6	511.5	8.9	Sm. dec.	Sm. dec.	Low	Abundant	Fair	Fair			0	6
eastern white pine	Pinus strobus	WDH	High	32.1	441.6	13.7	Sm. dec.	Lg. dec.	Low	Common	Poor	Very Poor			0	7
sugar maple	Acer saccharum	WDH	High	44	377.8	9.5	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	8
black cherry	Prunus serotina	WDL	Medium	47.6	270.2	7.6	Sm. inc.	Sm. inc.	Low	Common	Fair	Fair			1	9
yellow-poplar	Liriodendron tulipifera	WDH	High	22.6	235.5	12.8	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	10
eastern hemlock	Tsuga canadensis	NSH	High	27.4	235.2	8.6	No change	Sm. dec.	Low	Common	Poor	Poor	Infill +	Infill +	0	11
eastern redcedar	Juniperus virginiana	WDH	Medium	27.4	222.7	11.4	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good	Infill ++	Infill ++	1	12
scarlet oak	Quercus coccinea	WDL	Medium	31	218.2	7.1	Sm. inc.	Sm. inc.	Medium	Common	Good	Good	Infill ++	Infill ++	1	13
pignut hickory	Carya glabra	WDL	Medium	50	210.0	4.5	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	14
black oak	Quercus velutina	WDH	High	51.2	173.9	4.7	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	15
American beech	Fagus grandifolia	WDH	High	28.6	161.3	6.5	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	16
sassafras	Sassafras albidum	WSL	Low	42.9	148.1	4.2	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	17
yellow birch	Betula alleghaniensis	NDL	High	39.3	123.3	3.6	No change	Sm. dec.	Medium	Common	Fair	Poor			1	18
blackgum	Nyssa sylvatica	WDL	Medium	32.1	118.6	4.2	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	19
black walnut	Juglans nigra	WDH	Low	20.2	110.7	10.8	No change	Sm. inc.	Medium	Common	Fair	Good			1	20
shagbark hickory	Carya ovata	WSL	Medium	26.2	74.1	3.3	Sm. inc.	Sm. inc.	Medium	Common	Good	Good	Infill ++	Infill ++	1	21
bigtooth aspen	Populus grandidentata	NSL	Medium	16.7	65.1	3.9	Sm. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	22
pitch pine	Pinus rigida	NSH	High	22.6	58.4	2.6	Sm. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	23
hackberry	Celtis occidentalis	WDH	Medium	3.6	56.1	15.7	Sm. dec.	Sm. dec.	High	Common	Fair	Fair	Infill +	Infill +	2	24
serviceberry	Amelanchier spp.	NSL	Low	33.3	54.9	1.7	Sm. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	25
swamp white oak	Quercus bicolor	NSL	Low	4.8	40.1	8.4	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			2	26
red spruce	Picea rubens	NDH	High	8.3	40.1	4.8	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	27
ailanthus	Ailanthus altissima	NSL	FIA	4.8	37.8	7.9	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	28
American elm	Ulmus americana	WDH	Medium	15.5	37.6	4.1	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good	Infill +	Infill ++	2	29
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	22.6	32.9	1.8	Sm. inc.	Lg. inc.	High	Rare	Good	Good			1	30
green ash	Fraxinus pennsylvanica	WSH	Low	11.9	32.6	6.4	Sm. inc.	Lg. inc.	Medium	Rare	Fair	Good	Infill +	Infill ++	1	31
flowering dogwood	Cornus florida	WDL	Medium	10.7	29.1	2.7	Sm. dec.	No change	Medium	Rare	Very Poor	Poor			1	32
gray birch	Betula populifolia	NSL	Low	9.5	27.4	2.9	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	33
American basswood	Tilia americana	WSL	Medium	8.3	26.4	3.2	Sm. inc.	Sm. inc.	Medium	Rare	Fair	Fair	Infill +	Infill +	1	34
pin oak	Quercus palustris	NSH	Low	7.1	26.3	9.3	No change	No change	Low	Rare	Very Poor	Very Poor			0	35
black locust	Robinia pseudoacacia	NDH	Low	3.6	25.0	7.0	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	1	36
mockernut hickory	Carya alba	WDL	Medium	22.6	21.7	1.7	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	1	37
American hornbeam; musclev	Carpinus caroliniana	WSL	Low	14.3	15.8	1.6	No change	Lg. inc.	Medium	Rare	Poor	Good	Infill +	Infill ++	1	38
black willow	Salix nigra	NSH	Low	1.2	15.4	13.0	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	39
tamarack (native)	Larix laricina	NSH	High	1.2	14.2	11.9	Lg. dec.	Very Lg. dec.	Low	Rare	Very Poor	Lost			0	40
boxelder	Acer negundo	WSH	Low	6	12.1	11.6	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	41
Norway maple	Acer platanoides	NSL	FIA	2.4	11.3	4.8	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	42
bitternut hickory	Carya cordiformis	WSL	Low	1.2	8.3	7.0	No change	Lg. inc.	High	Rare	Fair	Good	Infill +	Infill ++	2	43
silver maple	Acer saccharinum	NSH	Low	1.2	7.7	6.5	Sm. dec.	No change	High	Rare	Poor	Fair		Infill +	2	44
pin cherry	Prunus pensylvanica	NSL	Low	1.2	5.4	4.6	Very Lg. dec.	Very Lg. dec.	Medium	Rare	Lost	Lost			0	45
Scots pine	Pinus sylvestris	NSH	FIA	1.2	4.9	4.1	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	46
black ash	Fraxinus nigra	WSH	Medium	2.4	4.4	1.9	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	47



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Common Name	Scientific Name	Range	MR	%Cell	FIAsum	FIAiv	ChngCl45	ChngCl85	Adap	Abund	Capabil45	Capabil85	SHIFT45	SHIFT85	SSO	N
slippery elm	Ulmus rubra	WSL	Low	2.4	3.1	1.3	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	2	48
quaking aspen	Populus tremuloides	WDH	High	7.1	3.1	1.0	Very Lg. dec.	Very Lg. dec.	Medium	Rare	Lost	Lost			0	49
striped maple	Acer pensylvanicum	NSL	Medium	4.8	2.6	0.6	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	50
jack pine	Pinus banksiana	NSH	Medium	1.2	2.4	2.1	Sm. dec.	Sm. dec.	High	Rare	Poor	Poor			0	51
American chestnut	Castanea dentata	NSLX	FIA	2.4	2.1	0.9	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	52
white spruce	Picea glauca	NSL	Medium	1.2	1.1	0.9	Very Lg. dec.	Very Lg. dec.	Medium	Rare	Lost	Lost			0	53
bear oak; scrub oak	Quercus ilicifolia	NSLX	FIA	1.2	1.1	0.9	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	54
chinkapin oak	Quercus muehlenbergii	NSL	Medium	1.2	0.7	0.6	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	55
chokecherry	Prunus virginiana	NSLX	FIA	1.2	0.6	0.5	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	56
shortleaf pine	Pinus echinata	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	57
loblolly pine	Pinus taeda	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate ++	3	58
Virginia pine	Pinus virginiana	NDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Likely +	Likely +	3	59
florida maple	Acer barbatum	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			3	60
mountain maple	Acer spicatum	NSL	Low	0	0	0	Unknown	Unknown	High	Absent	Unknown	Unknown			0	61
yellow buckeye	Aesculus flava	NSL	Low	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	62
pecan	Carya illinoensis	NSH	Low	0	0	0	Unknown	New Habitat	Low	Absent	Unknown	New Habitat			3	63
black hickory	Carya texana	NDL	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	64
sugarberry	Celtis laevigata	NDH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			0	65
eastern redbud	Cercis canadensis	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	66
common persimmon	Diospyros virginiana	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	67
sweetgum	Liquidambar styraciflua	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate ++	Migrate ++	3	68
cucumbertree	Magnolia acuminata	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	69
mountain or Fraser magnolia	Magnolia fraseri	NSL	Low	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown			0	70
sourwood	Oxydendrum arboreum	NDL	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	71
sycamore	Platanus occidentalis	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Likely +	Likely +	3	72
southern red oak	Quercus falcata	WDL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +	3	73
cherrybark oak; swamp red o.	Quercus pagoda	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	74
blackjack oak	Quercus marilandica	NSL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +	3	75
willow oak	Quercus phellos	NSL	Low	0	0	0	Unknown	New Habitat	Medium	Absent	Unknown	New Habitat		Migrate +	3	76
post oak	Quercus stellata	WDH	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate ++	Migrate ++	3	77
winged elm	Ulmus alata	WDL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	78