

sq. km    sq. mi    FIA Plots  
Area of Region    14,300    5,521.3    522

### 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	21	26	Increase	30	38	Very Good	9	13
Hickory	5			Medium	26	51	No Change	18	11	Good	22	23
Maple	6	Abundant	6	Low	42	15	Decrease	19	18	Fair	12	10
Oak	14	Common	24	FIA	6		New	14	16	Poor	12	11
Pine	8	Rare	43				Unknown	14	12	Very Poor	11	8
Other	38	Absent	21							FIA Only	3	3
	<b>73</b>		<b>94</b>		<b>95</b>	<b>92</b>		<b>95</b>	<b>95</b>	Unknown	8	6
											<b>77</b>	<b>74</b>

### Potential Changes in Climate Variables

#### Temperature (°F)

Scenario	2009	2039	2069	2099		
Annual	CCSM45	51.8	53.6	55.9	56.1	
Average	CCSM85	51.8	54.0	56.6	59.6	
	GFDL45	51.8	54.5	57.4	58.4	
	GFDL85	51.8	55.1	58.5	62.4	
	HAD45	51.8	54.3	57.7	59.0	
	HAD85	51.8	54.6	58.7	63.2	
Growing Season	CCSM45	66.7	68.6	70.7	71.2	
	CCSM85	66.7	69.0	71.6	75.6	
May—Sep	GFDL45	66.7	69.8	73.3	74.8	
	GFDL85	66.7	70.8	74.8	79.1	
	HAD45	66.7	69.7	73.0	74.6	
	HAD85	66.7	69.8	75.0	79.9	
Coldest Month	CCSM45	29.3	31.3	32.6	33.0	
Average	CCSM85	29.3	31.8	33.0	34.3	
	GFDL45	29.3	32.6	33.1	33.8	
	GFDL85	29.3	31.9	32.9	34.1	
	HAD45	29.3	30.5	32.6	32.7	
	HAD85	29.3	30.9	32.6	34.2	
Warmest Month	CCSM45	72.0	74.2	75.3	75.6	
Average	CCSM85	72.0	74.4	76.2	78.0	
	GFDL45	72.0	75.5	77.3	78.6	
	GFDL85	72.0	76.8	79.2	81.8	
	HAD45	72.0	75.5	77.8	78.8	
	HAD85	72.0	76.2	79.6	82.8	

#### Precipitation (in)

Scenario	2009	2039	2069	2099		
Annual	CCSM45	41.9	45.6	47.0	47.3	
Total	CCSM85	41.9	46.3	47.3	52.7	
	GFDL45	41.9	46.3	48.0	49.3	
	GFDL85	41.9	43.2	48.7	49.7	
	HAD45	41.9	44.4	45.0	44.2	
	HAD85	41.9	46.3	43.9	46.2	
Growing Season	CCSM45	19.6	22.7	23.4	23.2	
	CCSM85	19.6	22.7	22.4	24.7	
May—Sep	GFDL45	19.6	21.1	21.4	22.0	
	GFDL85	19.6	19.3	21.5	21.7	
	HAD45	19.6	21.7	20.4	20.0	
	HAD85	19.6	21.7	19.9	20.7	

**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.

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### 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
chestnut oak	Quercus prinus	NDH	High	91.6	2068.9	22.6	Sm. dec.	Sm. dec.	High	Abundant	Good	Good			1	1
red maple	Acer rubrum	WDH	High	95.1	769.7	8.1	No change	No change	High	Abundant	Very Good	Very Good			1	2
white oak	Quercus alba	WDH	Medium	84.6	706.4	8.4	Sm. inc.	Sm. inc.	High	Abundant	Very Good	Very Good			1	3
northern red oak	Quercus rubra	WDH	Medium	76.2	607.9	8.0	Sm. inc.	Sm. inc.	High	Abundant	Very Good	Very Good			1	4
eastern white pine	Pinus strobus	WDH	High	62.9	600.7	9.5	Sm. dec.	Sm. dec.	Low	Abundant	Fair	Fair			0	5
scarlet oak	Quercus coccinea	WDL	Medium	77.6	531.7	6.9	No change	Sm. dec.	Medium	Abundant	Good	Fair			1	6
blackgum	Nyssa sylvatica	WDL	Medium	84.6	417.8	4.9	No change	No change	High	Common	Good	Good			1	7
Virginia pine	Pinus virginiana	NDH	High	58	392.6	6.8	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	8
yellow-poplar	Liriodendron tulipifera	WDH	High	48.3	377.3	7.8	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	9
black oak	Quercus velutina	WDH	High	76.2	376.0	4.9	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	10
black locust	Robinia pseudoacacia	NDH	Low	65.7	285.9	4.4	No change	Sm. inc.	Medium	Common	Fair	Good			1	11
pignut hickory	Carya glabra	WDL	Medium	72	248.6	3.5	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	12
pitch pine	Pinus rigida	NSH	High	51.7	219.6	4.2	No change	No change	Medium	Common	Fair	Fair			1	13
sweet birch	Betula lenta	NDH	High	46.2	205.9	4.5	No change	Sm. dec.	Low	Common	Poor	Poor			0	14
sugar maple	Acer saccharum	WDH	High	39.9	184.8	4.6	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	15
eastern hemlock	Tsuga canadensis	NSH	High	35.7	178.1	5.0	No change	No change	Low	Common	Poor	Poor			0	16
mockernut hickory	Carya alba	WDL	Medium	53.8	156.3	2.9	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	17
Table Mountain pine	Pinus pungens	NSL	Low	25.9	140.7	5.4	Sm. dec.	Sm. dec.	High	Common	Fair	Fair			1	18
eastern redcedar	Juniperus virginiana	WDH	Medium	20.3	127.7	6.3	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	19
white ash	Fraxinus americana	WDL	Medium	44.1	111.0	2.5	Sm. inc.	Lg. inc.	Low	Common	Fair	Good			1	20
sycamore	Platanus occidentalis	NSL	Low	12.6	82.9	6.6	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good			1	21
American basswood	Tilia americana	WDL	Medium	23.8	80.6	3.4	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	22
loblolly pine	Pinus taeda	WDH	High	7	79.2	11.3	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good	Infill ++	Infill ++	1	23
black walnut	Juglans nigra	WDH	Low	20.3	71.0	3.5	Sm. inc.	Lg. inc.	Medium	Common	Good	Very Good			1	24
black cherry	Prunus serotina	WDL	Medium	28	64.4	2.3	Lg. inc.	Lg. inc.	Low	Common	Good	Good			1	25
sassafras	Sassafras albidum	WSL	Low	39.2	64.0	1.6	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	26
green ash	Fraxinus pennsylvanica	WSH	Low	16.1	61.7	3.8	No change	Lg. inc.	Medium	Common	Fair	Very Good	Infill +	Infill ++	1	27
American beech	Fagus grandifolia	WDH	High	11.9	60.2	5.1	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good	Infill ++	Infill ++	2	28
striped maple	Acer pensylvanicum	NSL	Medium	30.8	53.4	1.7	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	29
serviceberry	Amelanchier spp.	NSL	Low	42.7	50.5	1.2	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	30
cucumbertree	Magnolia acuminata	NSL	Low	21.7	46.8	2.2	No change	No change	Medium	Rare	Poor	Poor			1	31
shagbark hickory	Carya ovata	WSL	Medium	25.9	35.7	1.4	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			1	32
ailanthus	Ailanthus altissima	NSL	FIA	15.4	32.3	2.1	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	33
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	23.1	30.0	1.3	Sm. inc.	Lg. inc.	High	Rare	Good	Good			1	34
sourwood	Oxydendrum arboreum	NDL	High	9.8	29.3	3.0	Sm. inc.	Sm. inc.	High	Rare	Good	Good	Infill ++	Infill ++	1	35
flowering dogwood	Cornus florida	WDL	Medium	30.8	27.4	0.9	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			1	36
yellow birch	Betula alleghaniensis	NDL	High	7.7	26.2	3.4	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	1	37
bitternut hickory	Carya cordiformis	WSL	Low	14	24.5	1.8	Lg. inc.	Lg. inc.	High	Rare	Good	Good			1	38
eastern redbud	Cercis canadensis	NSL	Low	14.7	22.4	1.5	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			1	39
red spruce	Picea rubens	NDH	High	2.1	17.4	8.3	Sm. dec.	Sm. dec.	Low	Rare	Very Poor	Very Poor			0	40
chinkapin oak	Quercus muehlenbergii	NSL	Medium	2.8	15.3	5.5	No change	Sm. inc.	Medium	Rare	Poor	Fair	Infill +	Infill +	2	41
common persimmon	Diospyros virginiana	NSL	Low	5.6	11.5	2.1	No change	Lg. inc.	High	Rare	Fair	Good			1	42
American elm	Ulmus americana	WDH	Medium	9.1	10.9	1.2	No change	Lg. inc.	Medium	Rare	Poor	Good	Infill +	Infill ++	2	43
American hornbeam; muscle	Carpinus caroliniana	WSL	Low	7.7	10.6	1.4	No change	No change	Medium	Rare	Poor	Poor	Infill +	Infill +	1	44
bear oak; scrub oak	Quercus ilicifolia	NSLX	FIA	4.9	10.4	2.1	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	45
southern red oak	Quercus falcata	WDL	Medium	4.2	9.8	2.3	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	46
pin cherry	Prunus pensylvanica	NSL	Low	3.5	9.1	2.6	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	47

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
slippery elm	Ulmus rubra	WSL	Low	7	7.3	1.0	No change	Sm. inc.	Medium	Rare	Poor	Fair	Infill +	Infill +	1	48
American chestnut	Castanea dentata	NSLX	FIA	11.2	7.0	0.6	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	49
bigtooth aspen	Populus grandidentata	NSL	Medium	1.4	6.7	4.8	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	50
butternut	Juglans cinerea	NSLX	FIA	3.5	6.2	1.8	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	51
hackberry	Celtis occidentalis	WDH	Medium	5.6	6.0	1.1	No change	Sm. inc.	High	Rare	Fair	Good	Infill +	Infill ++	2	52
paulownia	Paulownia tomentosa	NSL	FIA	2.8	5.2	1.9	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	53
shortleaf pine	Pinus echinata	WDH	High	3.5	5.1	1.5	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	54
red pine	Pinus resinosa	NSH	Medium	0.7	5.0	7.1	Very Lg. dec.	Very Lg. dec.	Low	Rare	Lost	Lost			0	55
pawpaw	Asimina triloba	NSL	Low	2.8	4.4	1.6	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	56
post oak	Quercus stellata	WDH	High	3.5	4.4	1.3	Lg. inc.	Lg. inc.	High	Rare	Good	Good			2	57
boxelder	Acer negundo	WSH	Low	1.4	4.2	3.0	No change	No change	High	Rare	Fair	Fair		Infill +	2	58
river birch	Betula nigra	NSL	Low	1.4	3.6	2.6	Sm. dec.	No change	Medium	Rare	Very Poor	Poor		Infill +	2	59
blackjack oak	Quercus marilandica	NSL	Medium	2.8	3.5	1.3	Lg. inc.	Lg. inc.	High	Rare	Good	Good			2	60
black willow	Salix nigra	NSH	Low	0.7	2.8	4.0	Sm. dec.	Sm. inc.	Low	Rare	Very Poor	Poor		Infill +	2	61
swamp chestnut oak	Quercus michauxii	NSL	Low	0.7	2.7	3.8	Sm. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	62
mountain or Fraser magnolia	Magnolia fraseri	NSL	Low	0.7	2.4	3.5	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair			0	63
cherrybark oak; swamp red o	Quercus pagoda	NSL	Medium	0.7	1.8	2.6	Sm. dec.	No change	Medium	Rare	Very Poor	Poor		Infill +	2	64
Scots pine	Pinus sylvestris	NSH	FIA	0.7	1.5	2.2	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	65
black maple	Acer nigrum	NSH	Low	0.7	1.1	1.6	Lg. dec.	Lg. dec.	High	Rare	Poor	Poor			0	66
yellow buckeye	Aesculus flava	NSL	Low	1.4	0.8	0.6	Lg. inc.	Lg. inc.	Low	Rare	Fair	Fair	Infill +	Infill +	2	67
winged elm	Ulmus alata	WDL	Medium	0.7	0.8	1.1	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	68
bur oak	Quercus macrocarpa	NDH	Medium	1.4	0.8	0.6	Lg. dec.	Very Lg. dec.	High	Rare	Poor	Lost			0	69
shellbark hickory	Carya laciniosa	NSL	Low	0.7	0.7	1.1	Sm. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	70
pin oak	Quercus palustris	NSH	Low	0.7	0.3	0.5	Lg. dec.	Lg. dec.	Low	Rare	Very Poor	Very Poor			0	71
eastern cottonwood	Populus deltoides	NSH	Low	0.7	0.3	0.4	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	72
mountain maple	Acer spicatum	NSL	Low	0.7	0.2	0.3	No change	No change	High	Rare	Fair	Fair			0	73
northern white-cedar	Thuja occidentalis	WSH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	74
florida maple	Acer barbatum	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	75
gray birch	Betula populifolia	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	76
cittamwood/gum bumelia	Sideroxylon lanuginosum ssp.	NSL	Low	0	0	0	Unknown	New Habitat	High	Absent	Unknown	New Habitat			0	77
pecan	Carya illinoensis	NSH	Low	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat		Migrate +	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
black ash	Fraxinus nigra	WSH	Medium	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat			3	81
honeylocust	Gleditsia triacanthos	NSH	Low	0	0	0	Unknown	New Habitat	High	Absent	Unknown	New Habitat		Likely +	3	82
silverbell	Halesia spp.	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	83
American holly	Ilex opaca	NSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate ++	3	84
sweetgum	Liquidambar styraciflua	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate ++	Migrate ++	3	85
southern magnolia	Magnolia grandiflora	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	86
bigleaf magnolia	Magnolia macrophylla	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	87
red mulberry	Morus rubra	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Likely +	Likely +	3	88
redbay	Persea borbonia	NSL	Low	0	0	0	Unknown	Unknown	High	Absent	Unknown	Unknown			0	89
swamp white oak	Quercus bicolor	NSL	Low	0	0	0	Unknown	Unknown	Medium	Modeled	Unknown	Unknown			0	90
water oak	Quercus nigra	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate ++	3	91
willow oak	Quercus phellos	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	92
Shumard oak	Quercus shumardii	NSL	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +	3	93
bluejack oak	Quercus incana	NSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	94

# George Washington

## National Forests and Grasslands 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
American mountain-ash	Sorbus americana	NSL	Low	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown			0	95