S45 E88

One x One Degree
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	8,686.5	3,353.9	628

Species Information

The columns below provide breif 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
Ash	3
Hickory	1
Maple	4
Oak	5
Pine	4
Other	25
	42

Abundance	
Abundant	7
Common	18
Rare	17
Absent	15
	57

	Model Reliability	Adaptability
High	15	16
Medium	20	28
Low	18	12
FIA	4	
	57	**56**

Potential Change in Habitat Suitability	Scenario RCP45	Scenario RCP85
Increase	18	19
No Change	7	5
Decrease	13	14
New	13	13
Unknown	6	6
	57	**57**

Capability to Cope or Persist	Scenario RCP45	Scenario RCP85
Very Good	6	6
Good	11	10
Fair	9	11
Poor	9	7
Very Poor	3	2
FIA Only	3	3
Unknown	2	2
	43	**41**

Migration Potential	SHIFT RCP45	SHIFT RCP85
Likely	2	2
Infill	5	5
Migrate	3	7
	10	**14**

Potential Changes in Climate Variables

Temperature (°F)

	Scenario	2009	2039	2069	2099
Annual Average	CCSM45	41.3	43.0	46.2	46.1
	CCSM85	41.3	43.8	46.8	50.4
	GFDL45	41.3	44.3	47.3	48.8
	GFDL85	41.3	44.8	48.5	53.7
	HAD45	41.3	44.6	48.0	49.9
	HAD85	41.3	45.0	49.1	55.0
Growing Season May—Sep	CCSM45	60.5	62.2	64.9	64.9
	CCSM85	60.5	62.9	65.7	69.7
	GFDL45	60.5	64.3	68.1	70.3
	GFDL85	60.5	65.0	69.5	75.5
	HAD45	60.5	63.7	65.9	68.3
	HAD85	60.5	63.5	67.4	73.1
Coldest Month Average	CCSM45	11.3	12.6	15.4	15.2
	CCSM85	11.3	13.1	15.4	18.0
	GFDL45	11.3	14.2	16.1	16.5
	GFDL85	11.3	15.2	16.9	19.7
	HAD45	11.3	13.1	17.3	17.4
	HAD85	11.3	16.0	19.1	23.5
Warmest Month Average	CCSM45	66.5	68.6	70.1	70.5
	CCSM85	66.5	69.5	71.3	73.6
	GFDL45	66.5	70.6	72.4	74.0
	GFDL85	66.5	71.4	73.9	76.9
	HAD45	66.5	69.8	70.7	72.4
	HAD85	66.5	70.1	72.0	76.0

Precipitation (in)

	Scenario	2009	2039	2069	2099
Annual Total	CCSM45	30.1	30.9	30.5	31.1
	CCSM85	30.1	30.5	30.7	31.5
	GFDL45	30.1	32.6	34.2	33.4
	GFDL85	30.1	32.6	35.5	35.6
	HAD45	30.1	30.9	32.4	32.6
	HAD85	30.1	31.7	33.0	34.2
Growing Season May—Sep	CCSM45	17.2	17.4	16.5	17.4
	CCSM85	17.2	17.5	17.1	16.5
	GFDL45	17.2	18.2	18.7	18.1
	GFDL85	17.2	18.5	18.9	18.1
	HAD45	17.2	16.9	16.5	16.4
	HAD85	17.2	17.1	15.6	15.9

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.

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.

S45 E88

One x One Degree

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

Common Name	Scientific Name	Range	MR	%Cell	FIAsum	FIAiv	ChngCl45	ChngCl85	Adap	Abund	Capabil45	Capabil85	SHIFT45	SHIFT85	SSO	N
sugar maple	Acer saccharum	WDH	High	85.6	2200.0	17.7	Lg. dec.	Lg. dec.	High	Abundant	Good	Good			1	1
quaking aspen	Populus tremuloides	WDH	High	95	1531.1	11.3	Sm. dec.	Sm. dec.	Medium	Abundant	Fair	Fair			0	2
red maple	Acer rubrum	WDH	High	93.7	979.5	7.4	Sm. inc.	Sm. inc.	High	Abundant	Very Good	Very Good			1	3
balsam fir	Abies balsamea	NDH	High	97.7	943.7	6.3	Lg. dec.	Lg. dec.	Low	Abundant	Poor	Poor			0	4
northern white-cedar	Thuja occidentalis	WSH	High	64.3	694.8	6.9	No change	No change	Medium	Abundant	Good	Good			1	5
American basswood	Tilia americana	WSL	Medium	78.1	647.9	5.9	No change	Sm. dec.	Medium	Abundant	Good	Fair			1	6
red pine	Pinus resinosa	NSH	Medium	54.4	637.0	8.4	No change	No change	Low	Abundant	Fair	Fair			0	7
eastern white pine	Pinus strobus	WDH	High	50.1	440.7	5.2	Sm. inc.	Sm. inc.	Low	Common	Fair	Fair			1	8
eastern hemlock	Tsuga canadensis	NSH	High	53.7	362.8	4.7	Sm. dec.	Sm. dec.	Low	Common	Poor	Poor			0	9
bigtooth aspen	Populus grandidentata	NSL	Medium	63.5	339.9	3.6	No change	No change	Medium	Common	Fair	Fair			1	10
black spruce	Picea mariana	NSH	High	60.2	338.7	3.6	Lg. dec.	Lg. dec.	Medium	Common	Poor	Poor			0	11
northern red oak	Quercus rubra	WDH	Medium	57	319.9	3.7	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	12
paper birch	Betula papyrifera	WDH	High	84.8	319.3	2.6	Sm. inc.	Sm. inc.	Medium	Common	Good	Good			1	13
tamarack (native)	Larix laricina	NSH	High	47.8	289.9	3.6	Sm. inc.	Sm. inc.	Low	Common	Fair	Fair			1	14
northern pin oak	Quercus ellipsoidalis	NSH	Medium	27.7	267.8	7.5	Sm. inc.	Sm. inc.	High	Common	Very Good	Very Good			1	15
black cherry	Prunus serotina	WDL	Medium	90.9	232.0	1.8	Lg. inc.	Lg. inc.	Low	Common	Good	Good			1	16
white spruce	Picea glauca	NSL	Medium	74.1	230.0	1.8	Sm. dec.	Sm. dec.	Medium	Common	Poor	Poor			0	17
white ash	Fraxinus americana	WDL	Medium	69.3	225.1	2.5	Sm. inc.	Sm. inc.	Low	Common	Fair	Fair			1	18
yellow birch	Betula alleghaniensis	NDL	High	71.7	215.4	2.3	No change	No change	Medium	Common	Fair	Fair			1	19
black ash	Fraxinus nigra	WSH	Medium	67.8	211.2	2.0	Sm. inc.	Sm. inc.	Low	Common	Fair	Fair			1	20
jack pine	Pinus banksiana	NSH	Medium	20.8	143.7	4.0	Sm. dec.	Sm. dec.	High	Common	Fair	Fair			1	21
American elm	Ulmus americana	WDH	Medium	61.8	103.5	1.1	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good			1	22
eastern hophornbeam; ironw	Ostrya virginiana	WSL	Low	64.4	83.0	0.9	Lg. inc.	Lg. inc.	High	Common	Very Good	Very Good			1	23
American beech	Fagus grandifolia	WDH	High	18.6	71.8	2.6	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good	Infill ++	Infill ++	1	24
balsam poplar	Populus balsamifera	NSH	Medium	27.9	61.7	1.3	Lg. dec.	Very Lg. dec.	Medium	Common	Poor	Lost			0	25
green ash	Fraxinus pennsylvanica	WSH	Low	21.5	31.5	0.9	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			1	26
serviceberry	Amelanchier spp.	NSL	Low	26.1	29.3	0.9	Lg. dec.	Lg. dec.	Medium	Rare	Very Poor	Very Poor			0	27
white oak	Quercus alba	WDH	Medium	11	23.6	1.5	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	28
pin cherry	Prunus pensylvanica	NSL	Low	25.1	22.4	0.6	Lg. dec.	Very Lg. dec.	Medium	Rare	Very Poor	Lost			0	29
rock elm	Ulmus thomasii	NSLX	FIA	5.9	20.3	2.0	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	30
bitternut hickory	Carya cordiformis	WSL	Low	7.9	16.0	1.0	Lg. dec.	Sm. dec.	High	Rare	Poor	Poor			0	31
eastern cottonwood	Populus deltoides	NSH	Low	2.3	12.8	5.6	No change	Sm. inc.	Medium	Rare	Poor	Fair	Infill +	Infill +	2	32
bur oak	Quercus macrocarpa	NDH	Medium	6.8	9.1	1.1	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	33
slippery elm	Ulmus rubra	WSL	Low	3.3	6.6	1.9	Sm. dec.	Sm. dec.	Medium	Rare	Very Poor	Very Poor			0	34
American hornbeam; muscle	Carpinus caroliniana	WSL	Low	9.2	5.6	0.6	No change	No change	Medium	Rare	Poor	Poor			1	35
boxelder	Acer negundo	WSH	Low	2.3	4.0	1.7	Sm. inc.	Sm. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	36
chokecherry	Prunus virginiana	NSLX	FIA	11.1	3.8	0.2	Unknown	Unknown	Medium	Rare	FIA Only	FIA Only			0	37
black locust	Robinia pseudoacacia	NDH	Low	1.2	2.3	2.0	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	38
butternut	Juglans cinerea	NSLX	FIA	0.7	2.1	1.0	Unknown	Unknown	Low	Rare	FIA Only	FIA Only			0	39
Scots pine	Pinus sylvestris	NSH	FIA	0.7	1.8	0.9	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	40
swamp white oak	Quercus bicolor	NSL	Low	2	1.6	0.6	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good			2	41
mountain maple	Acer spicatum	NSL	Low	2.8	0.6	0.2	Sm. dec.	Lg. dec.	High	Rare	Poor	Poor			1	42
eastern redcedar	Juniperus virginiana	WDH	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate ++	3	43
silver maple	Acer saccharinum	NSH	Low	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat	Likely +	Likely +	3	44
pignut hickory	Carya glabra	WDL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	45
shagbark hickory	Carya ovata	WSL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	46
mockernut hickory	Carya alba	WDL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			3	47

S45 E88

One x One Degree

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

Common Name	Scientific Name	Range	MR	%Cell	FIAsum	FIAiv	ChngCl45	ChngCl85	Adap	Abund	Capabil45	Capabil85	SHIFT45	SHIFT85	SSO	N
black walnut	Juglans nigra	WDH	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate +	Migrate +	3	48
yellow-poplar	Liriodendron tulipifera	WDH	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			3	49
bigleaf magnolia	Magnolia macrophylla	NSL	Low	0	0	0	Unknown	Unknown	Medium	Absent	Unknown	Unknown			0	50
blackgum	Nyssa sylvatica	WDL	Medium	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat		Migrate +	3	51
scarlet oak	Quercus coccinea	WDL	Medium	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat			3	52
post oak	Quercus stellata	WDH	High	0	0	0	New Habitat	New Habitat	High	Absent	New Habitat	New Habitat			0	53
black oak	Quercus velutina	WDH	High	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat	Migrate ++	Migrate ++	3	54
black willow	Salix nigra	NSH	Low	0	0	0	New Habitat	New Habitat	Low	Absent	New Habitat	New Habitat	Likely +	Likely +	3	55
sassafras	Sassafras albidum	WSL	Low	0	0	0	New Habitat	New Habitat	Medium	Absent	New Habitat	New Habitat		Migrate +	3	56
American mountain-ash	Sorbus americana	NSL	Low	0	0	0	Unknown	Unknown	Low	Absent	Unknown	Unknown			0	57