

U.S. Census Bureau Urban Areas
Climate Change Atlas Tree Species
 Current and Potential Future Habitat, Capability, and Migration

Area of Region sq. km sq. mi FIA Plots
 8,049.8 3,108.0 77

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 | 13 | 20 | Increase | 13 | 12 | Very Good | 3 | 2 | Likely | 3 | 3 |
| Hickory | 4 | | | Medium | 24 | 32 | No Change | 12 | 8 | Good | 14 | 10 | Infill | 10 | 11 |
| Maple | 5 | Abundant | 1 | Low | 23 | 10 | Decrease | 16 | 21 | Fair | 6 | 10 | Migrate | 3 | 6 |
| Oak | 8 | Common | 25 | FIA | 7 | | New | 17 | 17 | Poor | 8 | 10 | | | |
| Pine | 3 | Rare | 22 | | | | Unknown | 9 | 9 | Very Poor | 6 | 5 | | | |
| Other | 25 | Absent | 18 | | | | | | | FIA Only | 2 | 2 | | | |
| | 48 | | 66 | | 67 | 62 | | 67 | 67 | Unknown | 2 | 2 | | | |
| | | | | | | | | | | | 41 | 41 | | | |

Potential Changes in Climate Variables

Temperature (°F)

| | Scenario | 2009 | 2039 | 2069 | 2099 | |
|--------------------------|----------|------|------|------|------|--|
| Annual Average | CCSM45 | 48.3 | 50.3 | 53.0 | 53.1 | |
| | CCSM85 | 48.3 | 50.9 | 53.6 | 56.9 | |
| | GFDL45 | 48.3 | 52.3 | 54.0 | 55.1 | |
| | GFDL85 | 48.3 | 51.5 | 55.1 | 59.5 | |
| | HAD45 | 48.3 | 51.6 | 55.0 | 56.8 | |
| | HAD85 | 48.3 | 51.7 | 56.2 | 61.5 | |
| Growing Season (May—Sep) | CCSM45 | 65.9 | 67.7 | 70.2 | 70.5 | |
| | CCSM85 | 65.9 | 68.5 | 70.9 | 75.0 | |
| | GFDL45 | 65.9 | 70.6 | 72.8 | 74.3 | |
| | GFDL85 | 65.9 | 69.9 | 74.1 | 79.2 | |
| | HAD45 | 65.9 | 69.4 | 71.8 | 74.2 | |
| | HAD85 | 65.9 | 69.0 | 73.8 | 79.2 | |
| Coldest Month (Average) | CCSM45 | 21.5 | 23.0 | 25.8 | 25.6 | |
| | CCSM85 | 21.5 | 24.1 | 26.0 | 28.0 | |
| | GFDL45 | 21.5 | 24.4 | 25.7 | 26.1 | |
| | GFDL85 | 21.5 | 24.9 | 26.2 | 28.2 | |
| | HAD45 | 21.5 | 23.3 | 27.2 | 27.0 | |
| | HAD85 | 21.5 | 25.3 | 28.2 | 31.8 | |
| Warmest Month (Average) | CCSM45 | 71.9 | 74.2 | 75.8 | 76.1 | |
| | CCSM85 | 71.9 | 75.3 | 76.9 | 79.1 | |
| | GFDL45 | 71.9 | 75.1 | 76.9 | 77.9 | |
| | GFDL85 | 71.9 | 76.0 | 78.2 | 81.3 | |
| | HAD45 | 71.9 | 76.0 | 77.5 | 79.2 | |
| | HAD85 | 71.9 | 76.3 | 79.6 | 83.4 | |

Precipitation (in)

| | Scenario | 2009 | 2039 | 2069 | 2099 | |
|--------------------------|----------|------|------|------|------|--|
| Annual Total | CCSM45 | 32.8 | 32.5 | 31.9 | 33.3 | |
| | CCSM85 | 32.8 | 33.2 | 33.3 | 33.6 | |
| | GFDL45 | 32.8 | 35.6 | 39.2 | 39.3 | |
| | GFDL85 | 32.8 | 35.6 | 39.5 | 41.1 | |
| | HAD45 | 32.8 | 33.2 | 35.4 | 34.8 | |
| | HAD85 | 32.8 | 35.1 | 32.9 | 35.8 | |
| Growing Season (May—Sep) | CCSM45 | 16.4 | 16.3 | 15.6 | 15.9 | |
| | CCSM85 | 16.4 | 15.9 | 16.1 | 15.1 | |
| | GFDL45 | 16.4 | 17.4 | 18.7 | 19.0 | |
| | GFDL85 | 16.4 | 17.8 | 18.2 | 18.6 | |
| | HAD45 | 16.4 | 15.9 | 15.0 | 15.6 | |
| | HAD85 | 16.4 | 16.1 | 12.9 | 14.0 | |

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>.

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 |
|----------------------------|-------------------------|-------|--------|-------|--------|-------|---------------|---------------|--------|----------|-----------|-----------|-----------|-----------|-----|----|
| black cherry | Prunus serotina | WDL | Medium | 48.4 | 802.0 | 20.1 | Sm. dec. | Lg. dec. | Low | Abundant | Fair | Poor | | | 0 | 1 |
| American elm | Ulmus americana | WDH | Medium | 37.3 | 495.2 | 13.9 | No change | Sm. inc. | Medium | Common | Fair | Good | | | 1 | 2 |
| red maple | Acer rubrum | WDH | High | 24.8 | 430.3 | 16.2 | No change | Sm. dec. | High | Common | Good | Fair | | | 1 | 3 |
| black oak | Quercus velutina | WDH | High | 22.4 | 390.8 | 16.4 | No change | No change | Medium | Common | Fair | Fair | | | 1 | 4 |
| sugar maple | Acer saccharum | WDH | High | 11.2 | 326.8 | 27.4 | No change | Sm. dec. | High | Common | Good | Fair | | | 1 | 5 |
| white oak | Quercus alba | WDH | Medium | 27.3 | 314.1 | 12.6 | Sm. inc. | No change | High | Common | Very Good | Good | | | 1 | 6 |
| northern red oak | Quercus rubra | WDH | Medium | 19.9 | 276.8 | 13.1 | No change | Sm. dec. | High | Common | Good | Fair | | | 1 | 7 |
| green ash | Fraxinus pennsylvanica | WSH | Low | 30.4 | 249.6 | 8.9 | Sm. inc. | Sm. inc. | Medium | Common | Good | Good | | | 1 | 8 |
| eastern cottonwood | Populus deltoides | NSH | Low | 18 | 204.1 | 22.3 | Sm. inc. | Sm. inc. | Medium | Common | Good | Good | | | 1 | 9 |
| silver maple | Acer saccharinum | NSH | Low | 7.5 | 169.0 | 21.3 | No change | No change | High | Common | Good | Good | | | 1 | 10 |
| sassafras | Sassafras albidum | WSL | Low | 13.7 | 136.0 | 9.3 | No change | Lg. dec. | Medium | Common | Fair | Poor | | | 1 | 11 |
| scarlet oak | Quercus coccinea | WDL | Medium | 1.2 | 132.5 | 100.0 | Very Lg. dec. | Very Lg. dec. | Medium | Common | Lost | Lost | | | 0 | 12 |
| shagbark hickory | Carya ovata | WSL | Medium | 18.6 | 130.1 | 8.3 | Sm. dec. | Lg. dec. | Medium | Common | Poor | Poor | | | 0 | 13 |
| northern pin oak | Quercus ellipsoidalis | NSH | Medium | 2.5 | 110.6 | 41.8 | Very Lg. dec. | Very Lg. dec. | High | Common | Lost | Lost | | | 0 | 14 |
| American basswood | Tilia americana | WSL | Medium | 22.4 | 106.5 | 7.1 | Sm. inc. | No change | Medium | Common | Good | Fair | | | 1 | 15 |
| quaking aspen | Populus tremuloides | WDH | High | 7.5 | 105.4 | 13.3 | Lg. dec. | Lg. dec. | Medium | Common | Poor | Poor | | | 0 | 16 |
| swamp white oak | Quercus bicolor | NSL | Low | 13.7 | 102.1 | 10.1 | Sm. inc. | No change | Medium | Common | Good | Fair | Infill ++ | Infill + | 1 | 17 |
| red pine | Pinus resinosa | NSH | Medium | 5 | 93.2 | 17.6 | Lg. dec. | Lg. dec. | Low | Common | Very Poor | Very Poor | | | 0 | 18 |
| white ash | Fraxinus americana | WDL | Medium | 21.1 | 84.2 | 8.2 | Lg. inc. | Lg. inc. | Low | Common | Good | Good | | | 1 | 19 |
| boxelder | Acer negundo | WSH | Low | 15.5 | 80.4 | 10.3 | Lg. inc. | Lg. inc. | High | Common | Very Good | Very Good | | | 1 | 20 |
| tamarack (native) | Larix laricina | NSH | High | 2.5 | 80.3 | 30.3 | Sm. dec. | Sm. dec. | Low | Common | Poor | Poor | Infill + | Infill + | 0 | 21 |
| pignut hickory | Carya glabra | WDL | Medium | 11.2 | 66.1 | 5.6 | Sm. inc. | No change | Medium | Common | Good | Fair | Infill ++ | Infill + | 1 | 22 |
| Scots pine | Pinus sylvestris | NSH | FIA | 3.7 | 65.6 | 16.5 | Unknown | Unknown | NA | Common | NNIS | NNIS | | | 0 | 23 |
| bur oak | Quercus macrocarpa | NDH | Medium | 14.9 | 59.9 | 19.2 | Sm. inc. | Lg. inc. | High | Common | Very Good | Very Good | Infill ++ | Infill ++ | 1 | 24 |
| slippery elm | Ulmus rubra | WSL | Low | 3.7 | 52.8 | 13.3 | Sm. dec. | Sm. dec. | Medium | Common | Poor | Poor | Infill + | Infill + | 0 | 25 |
| American beech | Fagus grandifolia | WDH | High | 7.5 | 50.6 | 6.4 | No change | Sm. dec. | Medium | Common | Fair | Poor | Infill + | | 2 | 26 |
| eastern hophornbeam; ironw | Ostrya virginiana | WSL | Low | 7.5 | 48.0 | 6.0 | Sm. dec. | Lg. dec. | High | Rare | Poor | Poor | Infill + | | 1 | 27 |
| bitternut hickory | Carya cordiformis | WSL | Low | 6.2 | 46.2 | 7.0 | No change | No change | High | Rare | Fair | Fair | Infill + | Infill + | 1 | 28 |
| Norway spruce | Picea abies | NSH | FIA | 1.2 | 45.3 | 34.2 | Unknown | Unknown | NA | Rare | NNIS | NNIS | | | 0 | 29 |
| bigtooth aspen | Populus grandidentata | NSL | Medium | 7.5 | 39.3 | 5.0 | Lg. dec. | Lg. dec. | Medium | Rare | Very Poor | Very Poor | | | 0 | 30 |
| black locust | Robinia pseudoacacia | NDH | Low | 3.7 | 36.5 | 9.2 | No change | Sm. inc. | Medium | Rare | Poor | Fair | Infill + | Infill + | 1 | 31 |
| black walnut | Juglans nigra | WDH | Low | 16.1 | 35.8 | 7.8 | Lg. inc. | Lg. inc. | Medium | Rare | Good | Good | | | 1 | 32 |
| white spruce | Picea glauca | NSL | Medium | 2.5 | 31.0 | 11.7 | Very Lg. dec. | Very Lg. dec. | Medium | Rare | Lost | Lost | | | 0 | 33 |
| white mulberry | Morus alba | NSL | FIA | 5 | 30.3 | 5.7 | Unknown | Unknown | NA | Rare | NNIS | NNIS | | | 0 | 34 |
| Shumard oak | Quercus shumardii | NSL | Low | 1.2 | 26.3 | 19.9 | Sm. dec. | Sm. dec. | High | Rare | Poor | Poor | | Infill + | 2 | 35 |
| eastern white pine | Pinus strobus | WDH | High | 1.2 | 20.4 | 15.4 | No change | Lg. dec. | Low | Rare | Very Poor | Very Poor | | | 2 | 36 |
| eastern redcedar | Juniperus virginiana | WDH | Medium | 3.7 | 19.6 | 4.9 | Lg. inc. | Lg. inc. | Medium | Rare | Good | Good | Infill ++ | Infill ++ | 2 | 37 |
| American hornbeam; musclev | Carpinus caroliniana | WSL | Low | 6.2 | 18.2 | 2.7 | Sm. dec. | Sm. dec. | Medium | Rare | Very Poor | Very Poor | | | 0 | 38 |
| chokecherry | Prunus virginiana | NSLX | FIA | 8.7 | 16.1 | 3.2 | Unknown | Unknown | Medium | Rare | FIA Only | FIA Only | | | 0 | 39 |
| mockernut hickory | Carya alba | WDL | Medium | 1.2 | 13.4 | 10.1 | Sm. dec. | No change | High | Rare | Poor | Fair | | Infill + | 2 | 40 |
| Siberian elm | Ulmus pumila | NDH | FIA | 2.5 | 12.8 | 4.8 | Unknown | Unknown | NA | Rare | NNIS | NNIS | | | 0 | 41 |
| black willow | Salix nigra | NSH | Low | 1.2 | 10.1 | 7.6 | No change | Sm. inc. | Low | Rare | Very Poor | Poor | | Infill + | 2 | 42 |
| hackberry | Celtis occidentalis | WDH | Medium | 4.4 | 8.2 | 21.6 | Lg. inc. | Lg. inc. | High | Rare | Good | Good | | | 2 | 43 |
| serviceberry | Amelanchier spp. | NSL | Low | 3.7 | 5.8 | 1.5 | Lg. dec. | Lg. dec. | Medium | Rare | Very Poor | Very Poor | | | 0 | 44 |
| yellow-poplar | Liriodendron tulipifera | WDH | High | 1.2 | 3.7 | 2.8 | Lg. inc. | Lg. inc. | High | Rare | Good | Good | | | 0 | 45 |
| black ash | Fraxinus nigra | WSH | Medium | 1.2 | 3.6 | 2.7 | Very Lg. dec. | Very Lg. dec. | Low | Rare | Lost | Lost | | | 0 | 46 |
| butternut | Juglans cinerea | NSLX | FIA | 1.2 | 2.1 | 1.6 | Unknown | Unknown | Low | Rare | FIA Only | FIA Only | | | 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 |
|------------------|-----------------------|-------|--------|-------|--------|-------|-------------|-------------|--------|---------|-------------|-------------|------------|------------|-----|----|
| Norway maple | Acer platanoides | NSL | FIA | 1.2 | 1.1 | 0.9 | Unknown | Unknown | NA | Rare | NNIS | NNIS | | | 0 | 48 |
| ashe juniper | Juniperus ashei | NDH | High | 0 | 0 | 0 | New Habitat | New Habitat | Medium | Absent | New Habitat | New Habitat | | | 0 | 49 |
| pawpaw | Asimina triloba | NSL | Low | 0 | 0 | 0 | Unknown | Unknown | Medium | Modeled | Unknown | Unknown | | | 0 | 50 |
| yellow birch | Betula alleghaniensis | NDL | High | 0 | 0 | 0 | New Habitat | New Habitat | Medium | Absent | New Habitat | New Habitat | Likely + | Likely + | 3 | 51 |
| black hickory | Carya texana | NDL | High | 0 | 0 | 0 | New Habitat | New Habitat | Medium | Absent | New Habitat | New Habitat | | | 0 | 52 |
| sugarberry | Celtis laevigata | NDH | Medium | 0 | 0 | 0 | New Habitat | New Habitat | Medium | Absent | New Habitat | New Habitat | | | 3 | 53 |
| eastern redbud | Cercis canadensis | NSL | Low | 0 | 0 | 0 | New Habitat | New Habitat | Medium | Absent | New Habitat | New Habitat | | | 3 | 54 |
| common persimmon | Diospyros virginiana | NSL | Low | 0 | 0 | 0 | New Habitat | New Habitat | High | Absent | New Habitat | New Habitat | | Migrate + | 3 | 55 |
| honeylocust | Gleditsia triacanthos | NSH | Low | 0 | 0 | 0 | New Habitat | New Habitat | High | Absent | New Habitat | New Habitat | | | 3 | 56 |
| Osage-orange | Maclura pomifera | NDH | Medium | 0 | 0 | 0 | New Habitat | New Habitat | High | Absent | New Habitat | New Habitat | | Migrate + | 3 | 57 |
| red mulberry | Morus rubra | NSL | Low | 0 | 0 | 0 | New Habitat | New Habitat | Medium | Absent | New Habitat | New Habitat | Likely + | Likely + | 3 | 58 |
| blackgum | Nyssa sylvatica | WDL | Medium | 0 | 0 | 0 | New Habitat | New Habitat | High | Absent | New Habitat | New Habitat | Likely + | Likely + | 3 | 59 |
| sycamore | Platanus occidentalis | NSL | Low | 0 | 0 | 0 | New Habitat | New Habitat | Medium | Absent | New Habitat | New Habitat | Migrate + | Migrate + | 3 | 60 |
| blackjack oak | Quercus marilandica | NSL | Medium | 0 | 0 | 0 | New Habitat | New Habitat | High | Absent | New Habitat | New Habitat | | | 3 | 61 |
| pin oak | Quercus palustris | NSH | Low | 0 | 0 | 0 | New Habitat | New Habitat | Low | Absent | New Habitat | New Habitat | Migrate + | Migrate + | 3 | 62 |
| post oak | Quercus stellata | WDH | High | 0 | 0 | 0 | New Habitat | New Habitat | High | Absent | New Habitat | New Habitat | Migrate ++ | Migrate ++ | 3 | 63 |
| live oak | Quercus virginiana | NDH | High | 0 | 0 | 0 | New Habitat | New Habitat | Medium | Absent | New Habitat | New Habitat | | | 0 | 64 |
| bluejack oak | Quercus incana | NSL | Low | 0 | 0 | 0 | Unknown | Unknown | Medium | Absent | Unknown | Unknown | | | 0 | 65 |
| winged elm | Ulmus alata | WDL | Medium | 0 | 0 | 0 | New Habitat | New Habitat | Medium | Absent | New Habitat | New Habitat | | Migrate + | 3 | 66 |
| cedar elm | Ulmus crassifolia | NDH | Medium | 0 | 0 | 0 | New Habitat | New Habitat | Low | Absent | New Habitat | New Habitat | | | 0 | 67 |