

**One x One Degree**  
**Climate Change Atlas Tree Species**  
 Current and Potential Future Habitat, Capability, and Migration

|                |         |         |           |
|----------------|---------|---------|-----------|
|                | sq. km  | sq. mi  | FIA Plots |
| Area of Region | 7,313.2 | 2,823.6 | 74        |

**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        | 14           | 21                                      | Increase       | 16                            | 12             | Very Good           | 5           | 3         | Likely  | 1         | 1         |
| Hickory | 3         |           |           | Medium      | 22           | 30                                      | No Change      | 11                            | 14             | Good                | 9           | 11        | Infill  | 13        | 14        |
| Maple   | 4         | Abundant  | 3         | Low         | 23           | 10                                      | Decrease       | 16                            | 17             | Fair                | 13          | 10        | Migrate | 3         | 7         |
| Oak     | 7         | Common    | 19        | FIA         | 4            |   | New            | 13                            | 14             | Poor                | 6           | 9         |         | <b>17</b> | <b>22</b> |
| Pine    | 4         | Rare      | 25        |             |              |   | Unknown        | 7                             | 6              | Very Poor           | 8           | 6         |         |           |           |
| Other   | 26        | Absent    | 15        |             |              |   |                | <b>63</b>                     | <b>63</b>      | FIA Only            | 2           | 2         |         |           |           |
|         | <b>47</b> |           | <b>62</b> |             | <b>63</b>    | <b>61</b>                               |                |                               |                | Unknown             | 3           | 2         |         |           |           |
|         |           |           |           |             |              |   |                |                               |                |                     | <b>46</b>   | <b>43</b> |         |           |           |

**Potential Changes in Climate Variables**

**Temperature (°F)**

|                          | Scenario | 2009 | 2039 | 2069 | 2099 |  |
|--------------------------|----------|------|------|------|------|--|
| Annual Average           | CCSM45   | 47.1 | 49.0 | 52.0 | 51.9 |  |
|                          | CCSM85   | 47.1 | 49.6 | 52.6 | 55.9 |  |
|                          | GFDL45   | 47.1 | 51.7 | 52.9 | 54.1 |  |
|                          | GFDL85   | 47.1 | 50.3 | 54.1 | 58.7 |  |
|                          | HAD45    | 47.1 | 50.4 | 53.8 | 55.7 |  |
| HAD85                    | 47.1     | 50.6 | 55.0 | 60.5 |      |  |
| Growing Season (May—Sep) | CCSM45   | 64.7 | 66.4 | 68.9 | 69.0 |  |
|                          | CCSM85   | 64.7 | 67.0 | 69.6 | 73.6 |  |
|                          | GFDL45   | 64.7 | 70.3 | 71.8 | 73.4 |  |
|                          | GFDL85   | 64.7 | 68.8 | 73.2 | 78.4 |  |
|                          | HAD45    | 64.7 | 68.2 | 70.6 | 73.2 |  |
| HAD85                    | 64.7     | 67.7 | 72.4 | 78.1 |      |  |
| Coldest Month Average    | CCSM45   | 20.3 | 21.9 | 24.8 | 24.7 |  |
|                          | CCSM85   | 20.3 | 23.0 | 25.2 | 27.4 |  |
|                          | GFDL45   | 20.3 | 22.8 | 24.5 | 25.0 |  |
|                          | GFDL85   | 20.3 | 23.5 | 25.1 | 27.3 |  |
|                          | HAD45    | 20.3 | 22.0 | 25.8 | 25.9 |  |
| HAD85                    | 20.3     | 24.1 | 27.0 | 30.9 |      |  |
| Warmest Month Average    | CCSM45   | 70.8 | 73.0 | 74.5 | 74.7 |  |
|                          | CCSM85   | 70.8 | 74.0 | 75.6 | 77.8 |  |
|                          | GFDL45   | 70.8 | 74.1 | 75.8 | 77.0 |  |
|                          | GFDL85   | 70.8 | 74.9 | 77.1 | 80.2 |  |
|                          | HAD45    | 70.8 | 74.8 | 76.2 | 78.0 |  |
| HAD85                    | 70.8     | 75.1 | 78.0 | 82.1 |      |  |

**Precipitation (in)**

|                          | Scenario | 2009 | 2039 | 2069 | 2099 |  |
|--------------------------|----------|------|------|------|------|--|
| Annual Total             | CCSM45   | 32.0 | 31.8 | 30.9 | 32.5 |  |
|                          | CCSM85   | 32.0 | 32.5 | 32.0 | 32.5 |  |
|                          | GFDL45   | 32.0 | 34.1 | 37.7 | 36.9 |  |
|                          | GFDL85   | 32.0 | 34.4 | 37.6 | 38.8 |  |
|                          | HAD45    | 32.0 | 33.0 | 34.6 | 34.1 |  |
| HAD85                    | 32.0     | 34.7 | 32.5 | 36.1 |      |  |
| Growing Season (May—Sep) | CCSM45   | 16.5 | 16.7 | 15.8 | 16.2 |  |
|                          | CCSM85   | 16.5 | 16.7 | 16.1 | 15.4 |  |
|                          | GFDL45   | 16.5 | 16.9 | 18.5 | 18.2 |  |
|                          | GFDL85   | 16.5 | 17.5 | 17.5 | 17.6 |  |
|                          | HAD45    | 16.5 | 16.2 | 15.1 | 15.7 |  |
| HAD85                    | 16.5     | 16.7 | 13.3 | 14.5 |      |  |

**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  |
|----------------------------|------------------------|-------|--------|-------|--------|-------|---------------|---------------|--------|----------|-----------|-----------|-----------|-----------|-----|----|
| green ash                  | Fraxinus pennsylvanica | WSH   | Low    | 65.3  | 1055.1 | 16.0  | Sm. dec.      | Sm. dec.      | Medium | Abundant | Fair      | Fair      |           |           | 0   | 1  |
| red maple                  | Acer rubrum            | WDH   | High   | 55.7  | 824.1  | 16.0  | Sm. dec.      | Sm. dec.      | High   | Abundant | Good      | Good      |           |           | 1   | 2  |
| quaking aspen              | Populus tremuloides    | WDH   | High   | 35    | 504.6  | 14.4  | Lg. dec.      | Lg. dec.      | Medium | Abundant | Fair      | Fair      |           |           | 0   | 3  |
| American elm               | Ulmus americana        | WDH   | Medium | 65.3  | 497.0  | 8.9   | No change     | No change     | Medium | Common   | Fair      | Fair      |           |           | 1   | 4  |
| black cherry               | Prunus serotina        | WDL   | Medium | 30.5  | 294.3  | 10.1  | Sm. inc.      | No change     | Low    | Common   | Fair      | Poor      |           |           | 1   | 5  |
| bigtooth aspen             | Populus grandidentata  | NSL   | Medium | 8.8   | 279.3  | 24.4  | Lg. dec.      | Lg. dec.      | Medium | Common   | Poor      | Poor      |           |           | 0   | 6  |
| paper birch                | Betula papyrifera      | WDH   | High   | 26.9  | 226.1  | 5.7   | Lg. dec.      | Lg. dec.      | Medium | Common   | Poor      | Poor      |           |           | 0   | 7  |
| eastern cottonwood         | Populus deltoides      | NSH   | Low    | 21.1  | 209.2  | 10.8  | Sm. inc.      | Sm. inc.      | Medium | Common   | Good      | Good      |           |           | 1   | 8  |
| eastern white pine         | Pinus strobus          | WDH   | High   | 14.5  | 206.1  | 20.1  | Lg. dec.      | Lg. dec.      | Low    | Common   | Very Poor | Very Poor |           |           | 0   | 9  |
| sugar maple                | Acer saccharum         | WDH   | High   | 21.7  | 204.4  | 9.4   | Sm. inc.      | No change     | High   | Common   | Very Good | Good      | Infill ++ | Infill ++ | 1   | 10 |
| silver maple               | Acer saccharinum       | NSH   | Low    | 20.1  | 198.7  | 13.0  | Lg. inc.      | Lg. inc.      | High   | Common   | Very Good | Very Good |           |           | 1   | 11 |
| boxelder                   | Acer negundo           | WSH   | Low    | 9.8   | 189.7  | 16.3  | No change     | No change     | High   | Common   | Good      | Good      | Infill ++ | Infill ++ | 1   | 12 |
| northern white-cedar       | Thuja occidentalis     | WSH   | High   | 6.5   | 189.1  | 21.5  | Lg. dec.      | Lg. dec.      | Medium | Common   | Poor      | Poor      |           |           | 0   | 13 |
| northern red oak           | Quercus rubra          | WDH   | Medium | 26    | 174.7  | 8.4   | Sm. inc.      | No change     | High   | Common   | Very Good | Good      |           |           | 1   | 14 |
| Scots pine                 | Pinus sylvestris       | NSH   | FIA    | 3.4   | 154.6  | 26.4  | Unknown       | Unknown       | NA     | Common   | NNIS      | NNIS      |           |           | 0   | 15 |
| white ash                  | Fraxinus americana     | WDL   | Medium | 16.6  | 138.1  | 7.3   | Sm. inc.      | Sm. inc.      | Low    | Common   | Fair      | Fair      |           |           | 1   | 16 |
| white oak                  | Quercus alba           | WDH   | Medium | 21.2  | 115.4  | 7.9   | Lg. inc.      | Sm. inc.      | High   | Common   | Very Good | Very Good | Infill ++ | Infill ++ | 1   | 17 |
| American basswood          | Tilia americana        | WSL   | Medium | 18.6  | 105.9  | 6.1   | Sm. inc.      | No change     | Medium | Common   | Good      | Fair      |           |           | 1   | 18 |
| red pine                   | Pinus resinosa         | NSH   | Medium | 4.1   | 77.6   | 18.9  | Sm. dec.      | Sm. dec.      | Low    | Common   | Poor      | Poor      | Infill +  | Infill +  | 2   | 19 |
| jack pine                  | Pinus banksiana        | NSH   | Medium | 3.5   | 66.4   | 15.7  | Sm. dec.      | Sm. dec.      | High   | Common   | Fair      | Fair      |           | Infill +  | 1   | 20 |
| shagbark hickory           | Carya ovata            | WSL   | Medium | 6.1   | 62.6   | 8.8   | No change     | No change     | Medium | Common   | Fair      | Fair      | Infill +  | Infill +  | 2   | 21 |
| bur oak                    | Quercus macrocarpa     | NDH   | Medium | 13.3  | 55.4   | 6.4   | Sm. inc.      | Sm. inc.      | High   | Common   | Very Good | Very Good |           |           | 2   | 22 |
| black walnut               | Juglans nigra          | WDH   | Low    | 11.4  | 41.1   | 12.2  | Lg. inc.      | Lg. inc.      | Medium | Rare     | Good      | Good      | Infill ++ | Infill ++ | 1   | 23 |
| American beech             | Fagus grandifolia      | WDH   | High   | 16.7  | 40.9   | 2.4   | Sm. inc.      | No change     | Medium | Rare     | Fair      | Poor      | Infill +  | Infill +  | 2   | 24 |
| black ash                  | Fraxinus nigra         | WSH   | Medium | 7.4   | 40.2   | 7.8   | Lg. dec.      | Lg. dec.      | Low    | Rare     | Very Poor | Very Poor |           |           | 0   | 25 |
| eastern redcedar           | Juniperus virginiana   | WDH   | Medium | 2.6   | 39.2   | 13.3  | Sm. inc.      | Lg. inc.      | Medium | Rare     | Fair      | Good      | Infill +  |           | 2   | 26 |
| bitternut hickory          | Carya cordiformis      | WSL   | Low    | 8.1   | 33.7   | 3.6   | No change     | No change     | High   | Rare     | Fair      | Fair      | Infill +  | Infill +  | 2   | 27 |
| American hornbeam; muscle  | Carpinus caroliniana   | WSL   | Low    | 14.1  | 28.8   | 4.3   | Lg. dec.      | Lg. dec.      | Medium | Rare     | Very Poor | Very Poor |           |           | 0   | 28 |
| black willow               | Salix nigra            | NSH   | Low    | 7.7   | 25.6   | 3.8   | No change     | No change     | Low    | Rare     | Very Poor | Very Poor |           |           | 0   | 29 |
| slippery elm               | Ulmus rubra            | WSL   | Low    | 2.7   | 21.9   | 8.0   | No change     | No change     | Medium | Rare     | Poor      | Poor      | Infill +  | Infill +  | 1   | 30 |
| pin oak                    | Quercus palustris      | NSH   | Low    | 1.3   | 17.6   | 12.2  | No change     | No change     | Low    | Rare     | Very Poor | Very Poor |           |           | 2   | 31 |
| northern pin oak           | Quercus ellipsoidalis  | NSH   | Medium | 6.4   | 15.0   | 6.8   | No change     | No change     | High   | Rare     | Fair      | Fair      | Infill +  | Infill +  | 2   | 32 |
| serviceberry               | Amelanchier spp.       | NSL   | Low    | 8.8   | 13.9   | 2.1   | Lg. dec.      | Very Lg. dec. | Medium | Rare     | Very Poor | Lost      |           |           | 0   | 33 |
| yellow birch               | Betula alleghaniensis  | NDL   | High   | 4.8   | 13.6   | 2.3   | Lg. dec.      | Lg. dec.      | Medium | Rare     | Very Poor | Very Poor |           |           | 0   | 34 |
| swamp white oak            | Quercus bicolor        | NSL   | Low    | 5.1   | 13.2   | 3.8   | Lg. inc.      | Sm. inc.      | Medium | Rare     | Good      | Fair      |           | Infill +  | 2   | 35 |
| eastern hophornbeam; ironw | Ostrya virginiana      | WSL   | Low    | 4.7   | 11.7   | 2.0   | No change     | Sm. dec.      | High   | Rare     | Fair      | Poor      | Infill +  | Infill +  | 1   | 36 |
| eastern hemlock            | Tsuga canadensis       | NSH   | High   | 1.4   | 5.3    | 3.9   | Lg. dec.      | Very Lg. dec. | Low    | Rare     | Very Poor | Lost      |           |           | 0   | 37 |
| chokecherry                | Prunus virginiana      | NSLX  | FIA    | 6     | 3.5    | 1.1   | Unknown       | Unknown       | Medium | Rare     | FIA Only  | FIA Only  |           |           | 0   | 38 |
| pin cherry                 | Prunus pensylvanica    | NSL   | Low    | 2.7   | 2.6    | 1.0   | Very Lg. dec. | Very Lg. dec. | Medium | Rare     | Lost      | Lost      |           |           | 0   | 39 |
| Siberian elm               | Ulmus pumila           | NDH   | FIA    | 5.2   | 2.6    | 7.3   | Unknown       | Unknown       | NA     | Rare     | NNIS      | NNIS      |           |           | 0   | 40 |
| black oak                  | Quercus velutina       | WDH   | High   | 0.7   | 2.1    | 0.8   | Lg. inc.      | Lg. inc.      | Medium | Rare     | Good      | Good      |           |           | 2   | 41 |
| red mulberry               | Morus rubra            | NSL   | Low    | 5.2   | 2.0    | 5.6   | No change     | No change     | Medium | Rare     | Poor      | Poor      |           | Infill +  | 2   | 42 |
| sassafras                  | Sassafras albidum      | WSL   | Low    | 1.3   | 2.0    | 1.4   | Lg. inc.      | Lg. inc.      | Medium | Rare     | Good      | Good      |           |           | 2   | 43 |
| blackgum                   | Nyssa sylvatica        | WDL   | Medium | 1.3   | 1.9    | 1.3   | No change     | Lg. inc.      | High   | Rare     | Fair      | Good      | Infill +  |           | 2   | 44 |
| balsam poplar              | Populus balsamifera    | NSH   | Medium | 0.3   | 1.6    | 0.3   | Very Lg. dec. | Very Lg. dec. | Medium | Rare     | Lost      | Lost      |           |           | 0   | 45 |
| butternut                  | Juglans cinerea        | NSLX  | FIA    | 5.4   | 1.1    | 3.3   | Unknown       | Unknown       | Low    | Rare     | FIA Only  | FIA Only  |           |           | 0   | 46 |
| pignut hickory             | Carya glabra           | WDL   | Medium | 1.4   | 0.9    | 0.7   | Lg. inc.      | Lg. inc.      | Medium | Rare     | Good      | Good      |           |           | 2   | 47 |

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Climate Change Atlas Tree Species

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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  |
|-----------------------|-------------------------|-------|--------|-------|--------|-------|-------------|-------------|--------|---------|-------------|-------------|-----------|-----------|-----|----|
| black maple           | Acer nigrum             | NSH   | Low    | 0     | 0      | 0     | Unknown     | Unknown     | High   | Modeled | Unknown     | Unknown     |           |           | 0   | 48 |
| black hickory         | Carya texana            | NDL   | High   | 0     | 0      | 0     | New Habitat | New Habitat | Medium | Absent  | New Habitat | New Habitat |           |           | 0   | 49 |
| mockernut hickory     | Carya alba              | WDL   | Medium | 0     | 0      | 0     | New Habitat | New Habitat | High   | Absent  | New Habitat | New Habitat |           | Migrate + | 3   | 50 |
| hackberry             | Celtis occidentalis     | WDH   | Medium | 0     | 0      | 0     | New Habitat | New Habitat | High   | Absent  | New Habitat | New Habitat | Likely +  | Likely +  | 3   | 51 |
| eastern redbud        | Cercis canadensis       | NSL   | Low    | 0     | 0      | 0     | New Habitat | New Habitat | Medium | Absent  | New Habitat | New Habitat |           | Migrate + | 3   | 52 |
| common persimmon      | Diospyros virginiana    | NSL   | Low    | 0     | 0      | 0     | Unknown     | New Habitat | High   | Absent  | Unknown     | New Habitat |           |           | 3   | 53 |
| honeylocust           | Gleditsia triacanthos   | NSH   | Low    | 0     | 0      | 0     | New Habitat | New Habitat | High   | Absent  | New Habitat | New Habitat |           | Migrate + | 3   | 54 |
| sweetgum              | Liquidambar styraciflua | WDH   | High   | 0     | 0      | 0     | New Habitat | New Habitat | Medium | Absent  | New Habitat | New Habitat |           |           | 3   | 55 |
| yellow-poplar         | Liriodendron tulipifera | WDH   | High   | 0     | 0      | 0     | New Habitat | New Habitat | High   | Absent  | New Habitat | New Habitat |           | Migrate + | 3   | 56 |
| Osage-orange          | Maclura pomifera        | NDH   | Medium | 0     | 0      | 0     | New Habitat | New Habitat | High   | Absent  | New Habitat | New Habitat | Migrate + | Migrate + | 3   | 57 |
| sycamore              | Platanus occidentalis   | NSL   | Low    | 0     | 0      | 0     | New Habitat | New Habitat | Medium | Absent  | New Habitat | New Habitat | Migrate + | Migrate + | 3   | 58 |
| blackjack oak         | Quercus marilandica     | NSL   | Medium | 0     | 0      | 0     | New Habitat | New Habitat | High   | Absent  | New Habitat | New Habitat |           |           | 0   | 59 |
| chinkapin oak         | Quercus muehlenbergii   | NSL   | Medium | 0     | 0      | 0     | New Habitat | New Habitat | Medium | Absent  | New Habitat | New Habitat |           |           | 3   | 60 |
| post oak              | Quercus stellata        | WDH   | High   | 0     | 0      | 0     | New Habitat | New Habitat | High   | Absent  | New Habitat | New Habitat |           |           | 3   | 61 |
| black locust          | Robinia pseudoacacia    | NDH   | Low    | 0     | 0      | 0     | New Habitat | New Habitat | Medium | Absent  | New Habitat | New Habitat | Migrate + | Migrate + | 3   | 62 |
| American mountain-ash | Sorbus americana        | NSL   | Low    | 0     | 0      | 0     | Unknown     | Unknown     | Low    | Absent  | Unknown     | Unknown     |           |           | 0   | 63 |