

**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 | 8,532.9 | 3,294.6 | 334       |

**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        | 16           | 11                                      | Increase       | 16                            | 17             | Very Good           | 6           | 6         | Likely  | 0        | 0         |
| Hickory | 0         |           |           | Medium      | 18           | 27                                      | No Change      | 3                             | 4              | Good                | 9           | 10        | Infill  | 4        | 4         |
| Maple   | 5         | Abundant  | 9         | Low         | 14           | 11                                      | Decrease       | 13                            | 11             | Fair                | 5           | 5         | Migrate | 3        | 9         |
| Oak     | 1         | Common    | 11        | FIA         | 2            |   | New            | 16                            | 16             | Poor                | 9           | 9         |         | <b>7</b> | <b>13</b> |
| Pine    | 3         | Rare      | 14        |             |              |   | Unknown        | 2                             | 2              | Very Poor           | 3           | 1         |         |          |           |
| Other   | 23        | Absent    | 16        |             |              |   |                |                               |                | FIA Only            | 1           | 1         |         |          |           |
|         | <b>34</b> |           | <b>50</b> |             | <b>50</b>    | <b>49</b>                               |                | <b>50</b>                     | <b>50</b>      | Unknown             | 0           | 0         |         |          |           |
|         |           |           |           |             |              |   |                |                               |                |                     | <b>33</b>   | <b>32</b> |         |          |           |

**Potential Changes in Climate Variables**

**Temperature (°F)**

|                          | Scenario | 2009 | 2039 | 2069 | 2099 |  |
|--------------------------|----------|------|------|------|------|--|
| Annual Average           | CCSM45   | 39.5 | 41.3 | 43.7 | 43.8 |  |
|                          | CCSM85   | 39.5 | 42.1 | 44.7 | 48.3 |  |
|                          | GFDL45   | 39.5 | 42.2 | 46.2 | 47.8 |  |
|                          | GFDL85   | 39.5 | 42.9 | 47.7 | 53.1 |  |
|                          | HAD45    | 39.5 | 42.7 | 45.7 | 47.4 |  |
|                          | HAD85    | 39.5 | 43.0 | 47.1 | 52.9 |  |
| Growing Season (May—Sep) | CCSM45   | 59.1 | 61.1 | 63.0 | 63.2 |  |
|                          | CCSM85   | 59.1 | 61.4 | 63.7 | 67.6 |  |
|                          | GFDL45   | 59.1 | 62.5 | 66.2 | 67.9 |  |
|                          | GFDL85   | 59.1 | 62.8 | 67.5 | 72.9 |  |
|                          | HAD45    | 59.1 | 61.9 | 64.5 | 66.5 |  |
|                          | HAD85    | 59.1 | 61.7 | 66.1 | 72.1 |  |
| Coldest Month Average    | CCSM45   | 8.8  | 10.3 | 12.2 | 12.6 |  |
|                          | CCSM85   | 8.8  | 11.5 | 13.2 | 15.8 |  |
|                          | GFDL45   | 8.8  | 11.2 | 14.7 | 15.9 |  |
|                          | GFDL85   | 8.8  | 12.5 | 15.9 | 19.2 |  |
|                          | HAD45    | 8.8  | 12.0 | 14.5 | 15.7 |  |
|                          | HAD85    | 8.8  | 13.8 | 16.5 | 20.3 |  |
| Warmest Month Average    | CCSM45   | 65.7 | 67.8 | 69.0 | 69.1 |  |
|                          | CCSM85   | 65.7 | 68.2 | 70.0 | 71.9 |  |
|                          | GFDL45   | 65.7 | 68.9 | 70.7 | 72.0 |  |
|                          | GFDL85   | 65.7 | 68.9 | 71.8 | 74.4 |  |
|                          | HAD45    | 65.7 | 68.7 | 70.0 | 71.3 |  |
|                          | HAD85    | 65.7 | 68.6 | 71.1 | 75.1 |  |

**Precipitation (in)**

|                          | Scenario | 2009 | 2039 | 2069 | 2099 |  |
|--------------------------|----------|------|------|------|------|--|
| Annual Total             | CCSM45   | 41.3 | 40.2 | 41.0 | 44.6 |  |
|                          | CCSM85   | 41.3 | 43.0 | 42.0 | 44.0 |  |
|                          | GFDL45   | 41.3 | 45.5 | 47.6 | 47.0 |  |
|                          | GFDL85   | 41.3 | 45.5 | 46.9 | 48.0 |  |
|                          | HAD45    | 41.3 | 44.2 | 47.5 | 47.9 |  |
|                          | HAD85    | 41.3 | 45.0 | 45.5 | 50.0 |  |
| Growing Season (May—Sep) | CCSM45   | 18.9 | 18.4 | 17.8 | 19.5 |  |
|                          | CCSM85   | 18.9 | 19.9 | 19.0 | 18.2 |  |
|                          | GFDL45   | 18.9 | 18.7 | 18.6 | 18.2 |  |
|                          | GFDL85   | 18.9 | 19.4 | 18.9 | 17.8 |  |
|                          | HAD45    | 18.9 | 20.3 | 20.3 | 22.5 |  |
|                          | HAD85    | 18.9 | 19.6 | 20.3 | 23.0 |  |

**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.

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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  |
|----------------------------|------------------------|-------|--------|-------|--------|-------|-------------|---------------|--------|----------|-------------|-------------|-----------|------------|-----|----|
| balsam fir                 | Abies balsamea         | NDH   | High   | 99    | 2846.2 | 20.5  | Lg. dec.    | Lg. dec.      | Low    | Abundant | Poor        | Poor        |           |            | 0   | 1  |
| northern white-cedar       | Thuja occidentalis     | WSH   | High   | 86.7  | 1407.1 | 11.2  | Sm. dec.    | Sm. dec.      | Medium | Abundant | Fair        | Fair        |           |            | 0   | 2  |
| red spruce                 | Picea rubens           | NDH   | High   | 90.4  | 1254.6 | 10.2  | Sm. dec.    | Sm. dec.      | Low    | Abundant | Fair        | Fair        |           |            | 0   | 3  |
| red maple                  | Acer rubrum            | WDH   | High   | 97.6  | 1043.3 | 7.6   | Sm. inc.    | Sm. inc.      | High   | Abundant | Very Good   | Very Good   |           |            | 1   | 4  |
| sugar maple                | Acer saccharum         | WDH   | High   | 80.4  | 912.5  | 7.2   | Sm. inc.    | Sm. inc.      | High   | Abundant | Very Good   | Very Good   |           |            | 1   | 5  |
| yellow birch               | Betula alleghaniensis  | NDL   | High   | 84.2  | 736.5  | 6.1   | Sm. dec.    | Sm. dec.      | Medium | Abundant | Fair        | Fair        |           |            | 0   | 6  |
| paper birch                | Betula papyrifera      | WDH   | High   | 86.9  | 582.7  | 5.1   | No change   | No change     | Medium | Abundant | Good        | Good        |           |            | 1   | 7  |
| American beech             | Fagus grandifolia      | WDH   | High   | 71.2  | 549.8  | 5.2   | Sm. inc.    | Sm. inc.      | Medium | Abundant | Very Good   | Very Good   |           |            | 1   | 8  |
| quaking aspen              | Populus tremuloides    | WDH   | High   | 55.6  | 543.9  | 6.5   | Sm. inc.    | Sm. inc.      | Medium | Abundant | Very Good   | Very Good   |           |            | 1   | 9  |
| white spruce               | Picea glauca           | NSL   | Medium | 81.7  | 456.9  | 3.8   | Sm. dec.    | Sm. dec.      | Medium | Common   | Poor        | Poor        |           |            | 0   | 10 |
| black spruce               | Picea mariana          | NSH   | High   | 41.8  | 294.9  | 5.3   | No change   | No change     | Medium | Common   | Fair        | Fair        |           |            | 1   | 11 |
| eastern hemlock            | Tsuga canadensis       | NSH   | High   | 43.2  | 189.5  | 3.7   | Lg. inc.    | Lg. inc.      | Low    | Common   | Good        | Good        |           |            | 1   | 12 |
| eastern white pine         | Pinus strobus          | WDH   | High   | 40.7  | 186.2  | 3.3   | Lg. inc.    | Lg. inc.      | Low    | Common   | Good        | Good        |           |            | 1   | 13 |
| white ash                  | Fraxinus americana     | WDL   | Medium | 37.6  | 135.9  | 2.7   | Lg. inc.    | Lg. inc.      | Low    | Common   | Good        | Good        |           |            | 1   | 14 |
| balsam poplar              | Populus balsamifera    | NSH   | Medium | 29.1  | 127.2  | 2.8   | Lg. dec.    | Lg. dec.      | Medium | Common   | Poor        | Poor        |           |            | 0   | 15 |
| tamarack (native)          | Larix laricina         | NSH   | High   | 23.6  | 119.4  | 3.3   | No change   | No change     | Low    | Common   | Poor        | Poor        |           |            | 0   | 16 |
| striped maple              | Acer pensylvanicum     | NSL   | Medium | 67.7  | 119.2  | 1.4   | Sm. dec.    | Sm. dec.      | Medium | Common   | Poor        | Poor        |           |            | 0   | 17 |
| black ash                  | Fraxinus nigra         | WSH   | Medium | 36.7  | 107.8  | 2.0   | Lg. inc.    | Lg. inc.      | Low    | Common   | Good        | Good        |           |            | 1   | 18 |
| eastern hophornbeam; ironw | Ostrya virginiana      | WSL   | Low    | 46.2  | 106.3  | 1.7   | Sm. inc.    | Lg. inc.      | High   | Common   | Very Good   | Very Good   |           |            | 1   | 19 |
| bigtooth aspen             | Populus grandidentata  | NSL   | Medium | 23    | 83.1   | 2.3   | Lg. inc.    | Lg. inc.      | Medium | Common   | Very Good   | Very Good   |           |            | 1   | 20 |
| Norway spruce              | Picea abies            | NSH   | FIA    | 1.2   | 27.4   | 23.4  | Unknown     | Unknown       | NA     | Rare     | NNIS        | NNIS        |           |            | 0   | 21 |
| pin cherry                 | Prunus pensylvanica    | NSL   | Low    | 17.7  | 26.3   | 1.0   | Lg. dec.    | Lg. dec.      | Medium | Rare     | Very Poor   | Very Poor   |           |            | 0   | 22 |
| mountain maple             | Acer spicatum          | NSL   | Low    | 24.5  | 22.2   | 0.5   | Lg. dec.    | Lg. dec.      | High   | Rare     | Poor        | Poor        |           |            | 1   | 23 |
| chokecherry                | Prunus virginiana      | NSLX  | FIA    | 4.3   | 18.7   | 2.4   | Unknown     | Unknown       | Medium | Rare     | FIA Only    | FIA Only    |           |            | 0   | 24 |
| red pine                   | Pinus resinosa         | NSH   | Medium | 4.7   | 14.8   | 3.2   | Sm. inc.    | Sm. inc.      | Low    | Rare     | Poor        | Poor        | Infill +  | Infill +   | 2   | 25 |
| American elm               | Ulmus americana        | WDH   | Medium | 6.8   | 9.8    | 0.8   | Lg. inc.    | Lg. inc.      | Medium | Rare     | Good        | Good        | Infill ++ | Infill ++  | 2   | 26 |
| jack pine                  | Pinus banksiana        | NSH   | Medium | 1.2   | 5.7    | 4.9   | Sm. dec.    | Lg. dec.      | High   | Rare     | Poor        | Poor        |           |            | 0   | 27 |
| American mountain-ash      | Sorbus americana       | NSL   | Low    | 8.2   | 3.3    | 0.3   | Lg. dec.    | Very Lg. dec. | Low    | Rare     | Very Poor   | Lost        |           |            | 0   | 28 |
| serviceberry               | Amelanchier spp.       | NSL   | Low    | 7     | 3.0    | 0.4   | Sm. dec.    | No change     | Medium | Rare     | Very Poor   | Poor        |           |            | 1   | 29 |
| gray birch                 | Betula populifolia     | NSL   | Low    | 3.5   | 2.5    | 0.7   | Lg. inc.    | Lg. inc.      | Medium | Rare     | Good        | Good        | Infill ++ | Infill ++  | 1   | 30 |
| black cherry               | Prunus serotina        | WDL   | Medium | 2.3   | 1.6    | 0.7   | Lg. inc.    | Lg. inc.      | Low    | Rare     | Fair        | Fair        | Infill +  | Infill +   | 2   | 31 |
| northern red oak           | Quercus rubra          | WDH   | Medium | 1.2   | 0.9    | 0.8   | Lg. inc.    | Lg. inc.      | High   | Rare     | Good        | Good        |           |            | 2   | 32 |
| American basswood          | Tilia americana        | WSL   | Medium | 1.2   | 0.4    | 0.3   | Lg. inc.    | Lg. inc.      | Medium | Rare     | Good        | Good        |           |            | 2   | 33 |
| boxelder                   | Acer negundo           | WSH   | Low    | 0.7   | 0.3    | 0.2   | Lg. dec.    | Lg. inc.      | High   | Rare     | Poor        | Good        |           |            | 2   | 34 |
| eastern redcedar           | Juniperus virginiana   | WDH   | Medium | 0     | 0      | 0     | New Habitat | New Habitat   | Medium | Absent   | New Habitat | New Habitat |           |            | 3   | 35 |
| sweet birch                | Betula lenta           | NDH   | High   | 0     | 0      | 0     | New Habitat | New Habitat   | Low    | Absent   | New Habitat | New Habitat | Migrate + | Migrate +  | 3   | 36 |
| American hornbeam; muscle  | Carpinus caroliniana   | WSL   | Low    | 0     | 0      | 0     | New Habitat | New Habitat   | Medium | Absent   | New Habitat | New Habitat |           |            | 3   | 37 |
| bitternut hickory          | Carya cordiformis      | WSL   | Low    | 0     | 0      | 0     | New Habitat | New Habitat   | High   | Absent   | New Habitat | New Habitat |           |            | 3   | 38 |
| pignut hickory             | Carya glabra           | WDL   | Medium | 0     | 0      | 0     | New Habitat | New Habitat   | Medium | Absent   | New Habitat | New Habitat |           |            | 3   | 39 |
| shagbark hickory           | Carya ovata            | WSL   | Medium | 0     | 0      | 0     | New Habitat | New Habitat   | Medium | Absent   | New Habitat | New Habitat |           |            | 3   | 40 |
| green ash                  | Fraxinus pennsylvanica | WSH   | Low    | 0     | 0      | 0     | New Habitat | New Habitat   | Medium | Absent   | New Habitat | New Habitat |           |            | 3   | 41 |
| black walnut               | Juglans nigra          | WDH   | Low    | 0     | 0      | 0     | New Habitat | New Habitat   | Medium | Absent   | New Habitat | New Habitat |           |            | 3   | 42 |
| blackgum                   | Nyssa sylvatica        | WDL   | Medium | 0     | 0      | 0     | New Habitat | New Habitat   | High   | Absent   | New Habitat | New Habitat |           |            | 3   | 43 |
| sycamore                   | Platanus occidentalis  | NSL   | Low    | 0     | 0      | 0     | New Habitat | New Habitat   | Medium | Absent   | New Habitat | New Habitat |           |            | 0   | 44 |
| white oak                  | Quercus alba           | WDH   | Medium | 0     | 0      | 0     | New Habitat | New Habitat   | High   | Absent   | New Habitat | New Habitat | Migrate + | Migrate ++ | 3   | 45 |
| swamp white oak            | Quercus bicolor        | NSL   | Low    | 0     | 0      | 0     | New Habitat | New Habitat   | Medium | Absent   | New Habitat | New Habitat |           |            | 3   | 46 |
| scarlet oak                | Quercus coccinea       | WDL   | Medium | 0     | 0      | 0     | New Habitat | New Habitat   | Medium | Absent   | New Habitat | New Habitat |           |            | 3   | 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    |
|--------------|----------------------|-------|------|-------|--------|-------|-------------|-------------|--------|--------|-------------|-------------|-----------|------------|-----|------|
| chestnut oak | Quercus prinus       | NDH   | High | 0     | 0      | 0     | New Habitat | New Habitat | High   | Absent | New Habitat | New Habitat |           |            |     | 3 48 |
| black oak    | Quercus velutina     | WDH   | High | 0     | 0      | 0     | New Habitat | New Habitat | Medium | Absent | New Habitat | New Habitat | Migrate + | Migrate ++ |     | 3 49 |
| black locust | Robinia pseudoacacia | NDH   | Low  | 0     | 0      | 0     | New Habitat | New Habitat | Medium | Absent | New Habitat | New Habitat |           | Migrate +  |     | 3 50 |