

**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 | 9,130.7 | 3,525.4 | 22        |

**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        | 4            | 13                                      | Increase       | 9                             | 9              | Very Good           | 0           | 0         |
| Hickory | 2         |           |           | Medium      | 14           | 19                                      | No Change      | 9                             | 8              | Good                | 7           | 6         |
| Maple   | 4         | Abundant  | 0         | Low         | 17           | 5                                       | Decrease       | 11                            | 12             | Fair                | 5           | 7         |
| Oak     | 5         | Common    | 4         | FIA         | 2            |   | New            | 6                             | 6              | Poor                | 10          | 8         |
| Pine    | 0         | Rare      | 27        |             |              |   | Unknown        | 2                             | 2              | Very Poor           | 5           | 5         |
| Other   | 17        | Absent    | 6         |             |              |   |                |                               |                | FIA Only            | 2           | 2         |
|         | <b>31</b> |           | <b>37</b> |             | <b>37</b>    | <b>37</b>                               |                | <b>37</b>                     | <b>37</b>      | Unknown             | 0           | 0         |
|         |           |           |           |             |              |   |                |                               |                |                     | <b>29</b>   | <b>28</b> |

**Potential Changes in Climate Variables**

**Temperature (°F)**

|                          | Scenario | 2009 | 2039 | 2069 | 2099 |  |
|--------------------------|----------|------|------|------|------|--|
| Annual Average           | CCSM45   | 47.1 | 49.1 | 51.7 | 52.2 |  |
|                          | CCSM85   | 47.1 | 49.8 | 52.6 | 55.9 |  |
|                          | GFDL45   | 47.1 | 53.5 | 52.4 | 53.6 |  |
|                          | GFDL85   | 47.1 | 50.2 | 53.5 | 58.0 |  |
|                          | HAD45    | 47.1 | 49.8 | 53.4 | 55.1 |  |
|                          | HAD85    | 47.1 | 50.5 | 55.0 | 59.7 |  |
| Growing Season (May—Sep) | CCSM45   | 67.0 | 69.3 | 71.7 | 72.4 |  |
|                          | CCSM85   | 67.0 | 70.2 | 72.8 | 76.7 |  |
|                          | GFDL45   | 67.0 | 75.1 | 73.3 | 75.2 |  |
|                          | GFDL85   | 67.0 | 70.9 | 74.5 | 80.2 |  |
|                          | HAD45    | 67.0 | 69.5 | 72.3 | 74.3 |  |
|                          | HAD85    | 67.0 | 70.2 | 74.9 | 79.3 |  |
| Coldest Month Average    | CCSM45   | 15.1 | 17.2 | 19.5 | 20.2 |  |
|                          | CCSM85   | 15.1 | 17.7 | 19.6 | 21.8 |  |
|                          | GFDL45   | 15.1 | 18.7 | 19.9 | 20.2 |  |
|                          | GFDL85   | 15.1 | 18.6 | 20.2 | 22.1 |  |
|                          | HAD45    | 15.1 | 16.7 | 20.6 | 20.6 |  |
|                          | HAD85    | 15.1 | 19.7 | 23.4 | 26.3 |  |
| Warmest Month Average    | CCSM45   | 73.2 | 75.7 | 77.3 | 78.1 |  |
|                          | CCSM85   | 73.2 | 77.3 | 79.1 | 81.4 |  |
|                          | GFDL45   | 73.2 | 76.4 | 77.8 | 79.4 |  |
|                          | GFDL85   | 73.2 | 77.2 | 78.9 | 82.8 |  |
|                          | HAD45    | 73.2 | 75.7 | 77.7 | 78.5 |  |
|                          | HAD85    | 73.2 | 77.4 | 80.1 | 83.0 |  |

**Precipitation (in)**

|                          | Scenario | 2009 | 2039 | 2069 | 2099 |  |
|--------------------------|----------|------|------|------|------|--|
| Annual Total             | CCSM45   | 34.6 | 34.5 | 34.6 | 33.7 |  |
|                          | CCSM85   | 34.6 | 33.9 | 34.9 | 35.5 |  |
|                          | GFDL45   | 34.6 | 37.7 | 41.0 | 39.6 |  |
|                          | GFDL85   | 34.6 | 38.4 | 41.0 | 40.5 |  |
|                          | HAD45    | 34.6 | 37.8 | 37.3 | 37.2 |  |
|                          | HAD85    | 34.6 | 35.3 | 35.4 | 38.1 |  |
| Growing Season (May—Sep) | CCSM45   | 21.8 | 21.4 | 20.9 | 20.8 |  |
|                          | CCSM85   | 21.8 | 20.4 | 20.4 | 20.0 |  |
|                          | GFDL45   | 21.8 | 23.4 | 25.2 | 23.6 |  |
|                          | GFDL85   | 21.8 | 24.0 | 24.5 | 23.3 |  |
|                          | HAD45    | 21.8 | 22.8 | 21.6 | 21.6 |  |
|                          | HAD85    | 21.8 | 20.7 | 19.7 | 19.6 |  |

**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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| Common Name                | Scientific Name        | Range | MR     | %Cell | FIAsum | FIAiv | ChngCl45      | ChngCl85      | Adap   | Abund  | Capabil45   | Capabil85   | SHIFT45   | SHIFT85    | SSO | N  |
|----------------------------|------------------------|-------|--------|-------|--------|-------|---------------|---------------|--------|--------|-------------|-------------|-----------|------------|-----|----|
| silver maple               | Acer saccharinum       | NSH   | Low    | 13.1  | 91.2   | 28.9  | Lg. dec.      | Lg. dec.      | High   | Common | Fair        | Fair        | Infill +  | Infill +   | 2   | 1  |
| American elm               | Ulmus americana        | WDH   | Medium | 24.8  | 74.2   | 14.8  | Sm. inc.      | Sm. inc.      | Medium | Common | Good        | Good        |           |            | 2   | 2  |
| boxelder                   | Acer negundo           | WSH   | Low    | 17    | 68.7   | 11.1  | Sm. dec.      | Sm. dec.      | High   | Common | Fair        | Fair        | Infill +  | Infill +   | 2   | 3  |
| black walnut               | Juglans nigra          | WDH   | Low    | 7.6   | 56.1   | 3.5   | No change     | No change     | Medium | Common | Fair        | Fair        | Infill +  | Infill +   | 2   | 4  |
| eastern cottonwood         | Populus deltoides      | NSH   | Low    | 5.7   | 44.4   | 15.6  | No change     | No change     | Medium | Rare   | Poor        | Poor        | Infill +  | Infill +   | 2   | 5  |
| bur oak                    | Quercus macrocarpa     | NDH   | Medium | 13.9  | 40.4   | 16.4  | Lg. inc.      | Sm. inc.      | High   | Rare   | Good        | Good        |           |            | 2   | 6  |
| hackberry                  | Celtis occidentalis    | WDH   | Medium | 15.6  | 36.7   | 3.6   | Sm. inc.      | Sm. inc.      | High   | Rare   | Good        | Good        |           |            | 2   | 7  |
| slippery elm               | Ulmus rubra            | WSL   | Low    | 18    | 34.1   | 5.5   | Sm. dec.      | Sm. dec.      | Medium | Rare   | Very Poor   | Very Poor   |           |            | 2   | 8  |
| northern red oak           | Quercus rubra          | WDH   | Medium | 11.5  | 31.7   | 5.9   | Sm. dec.      | Lg. dec.      | High   | Rare   | Poor        | Poor        | Infill +  | Infill +   | 2   | 9  |
| white oak                  | Quercus alba           | WDH   | Medium | 3.2   | 28.3   | 16.0  | Sm. dec.      | Sm. dec.      | High   | Rare   | Poor        | Poor        | Infill +  |            | 2   | 10 |
| honeylocust                | Gleditsia triacanthos  | NSH   | Low    | 8.6   | 24.3   | 14.5  | No change     | No change     | High   | Rare   | Fair        | Fair        | Infill +  | Infill +   | 2   | 11 |
| green ash                  | Fraxinus pennsylvanica | WSH   | Low    | 11.1  | 22.4   | 9.8   | Lg. inc.      | Lg. inc.      | Medium | Rare   | Good        | Good        |           |            | 2   | 12 |
| red mulberry               | Morus rubra            | NSL   | Low    | 11.1  | 22.0   | 5.3   | No change     | No change     | Medium | Rare   | Poor        | Poor        | Infill +  | Infill +   | 2   | 13 |
| American basswood          | Tilia americana        | WSL   | Medium | 10.9  | 18.2   | 6.2   | Sm. inc.      | Sm. inc.      | Medium | Rare   | Fair        | Fair        | Infill +  | Infill +   | 2   | 14 |
| eastern hophornbeam; ironw | Ostrya virginiana      | WSL   | Low    | 13.1  | 16.3   | 4.4   | Sm. inc.      | No change     | High   | Rare   | Good        | Fair        |           |            | 2   | 15 |
| shagbark hickory           | Carya ovata            | WSL   | Medium | 13.1  | 16.1   | 9.7   | No change     | Sm. dec.      | Medium | Rare   | Poor        | Very Poor   | Infill +  |            | 2   | 16 |
| bitternut hickory          | Carya cordiformis      | WSL   | Low    | 13.6  | 11.5   | 3.7   | Sm. inc.      | Sm. inc.      | High   | Rare   | Good        | Good        |           |            | 2   | 17 |
| black maple                | Acer nigrum            | NSH   | Low    | 8.1   | 9.6    | 4.0   | Lg. dec.      | Lg. dec.      | High   | Rare   | Poor        | Poor        |           |            | 0   | 18 |
| white ash                  | Fraxinus americana     | WDL   | Medium | 12.7  | 9.4    | 1.7   | Sm. inc.      | Sm. inc.      | Low    | Rare   | Poor        | Poor        | Infill +  | Infill +   | 2   | 19 |
| black cherry               | Prunus serotina        | WDL   | Medium | 7.3   | 7.5    | 2.6   | No change     | No change     | Low    | Rare   | Very Poor   | Very Poor   |           |            | 2   | 20 |
| black willow               | Salix nigra            | NSH   | Low    | 4.5   | 3.7    | 2.5   | No change     | No change     | Low    | Rare   | Very Poor   | Very Poor   |           |            | 2   | 21 |
| eastern redcedar           | Juniperus virginiana   | WDH   | Medium | 10    | 3.2    | 2.5   | Lg. inc.      | Lg. inc.      | Medium | Rare   | Good        | Good        |           |            | 0   | 22 |
| black ash                  | Fraxinus nigra         | WSH   | Medium | 3.7   | 3.0    | 1.0   | Very Lg. dec. | Very Lg. dec. | Low    | Rare   | Lost        | Lost        |           |            | 0   | 23 |
| black oak                  | Quercus velutina       | WDH   | High   | 0.7   | 2.7    | 1.5   | No change     | No change     | Medium | Rare   | Poor        | Poor        | Infill +  | Infill +   | 2   | 24 |
| paper birch                | Betula papyrifera      | WDH   | High   | 2.5   | 1.5    | 3.2   | Very Lg. dec. | Very Lg. dec. | Medium | Rare   | Lost        | Lost        |           |            | 0   | 25 |
| American hornbeam; muscle  | Carpinus caroliniana   | WSL   | Low    | 10    | 1.3    | 1.1   | Lg. dec.      | Lg. dec.      | Medium | Rare   | Very Poor   | Very Poor   |           |            | 0   | 26 |
| serviceberry               | Amelanchier spp.       | NSL   | Low    | 3.7   | 1.2    | 0.4   | Lg. dec.      | Very Lg. dec. | Medium | Rare   | Very Poor   | Lost        |           |            | 0   | 27 |
| sugar maple                | Acer saccharum         | WDH   | High   | 2.5   | 0.5    | 1.0   | Lg. dec.      | Lg. dec.      | High   | Rare   | Poor        | Poor        |           |            | 0   | 28 |
| chokecherry                | Prunus virginiana      | NSL   | FIA    | 3.1   | 0.5    | 1.1   | Unknown       | Unknown       | Medium | Rare   | FIA Only    | FIA Only    |           |            | 0   | 29 |
| chinkapin oak              | Quercus muehlenbergii  | NSL   | Medium | 3.1   | 0.2    | 0.4   | No change     | Sm. inc.      | Medium | Rare   | Poor        | Fair        |           | Infill +   | 2   | 30 |
| wild plum                  | Prunus americana       | NSLX  | FIA    | 2.5   | 0.1    | 0.3   | Unknown       | Unknown       | Medium | Rare   | FIA Only    | FIA Only    |           |            | 0   | 31 |
| pecan                      | Carya illinoensis      | NSH   | Low    | 0     | 0      | 0     | New Habitat   | New Habitat   | Low    | Absent | New Habitat | New Habitat |           | Migrate ++ | 3   | 32 |
| eastern redbud             | Cercis canadensis      | NSL   | Low    | 0     | 0      | 0     | New Habitat   | New Habitat   | Medium | Absent | New Habitat | New Habitat |           |            | 3   | 33 |
| Osage-orange               | Maclura pomifera       | NDH   | Medium | 0     | 0      | 0     | New Habitat   | New Habitat   | High   | Absent | New Habitat | New Habitat | Migrate + | Migrate +  | 3   | 34 |
| sycamore                   | Platanus occidentalis  | NSL   | Low    | 0     | 0      | 0     | New Habitat   | New Habitat   | Medium | Absent | New Habitat | New Habitat |           | Migrate +  | 3   | 35 |
| shingle oak                | Quercus imbricaria     | NDH   | Medium | 0     | 0      | 0     | New Habitat   | New Habitat   | Medium | Absent | New Habitat | New Habitat |           |            | 3   | 36 |
| post oak                   | Quercus stellata       | WDH   | High   | 0     | 0      | 0     | New Habitat   | New Habitat   | High   | Absent | New Habitat | New Habitat |           | Migrate ++ | 3   | 37 |