**Climate Change Vulnerability of Trees Common to the Boston Region or Likely to Gain Habitat**

DRAFT-January 18, 2019

| **Latin Name** | **Common Name** | **Heat/Hardiness Zone Effect1** | **Tree Atlas-Low Emissions2** | **Tree Atlas-High Emissions** | **Adapt Class-developed/planted sites3** | **Adapt Class-natural areas** | **Vulnerability-developed/planted sites4** | **Vulnerability-natural areas** | **Notes5** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *Abies balsamea* | Balsam fir | negative | extirpated | extirpated | medium | na | moderate-high | na |  |
| *Acer buergerianum* | Trident maple | neutral | na | na | high | na | low | na | ALB |
| *Acer campestre* | Hedge maple | neutral | na | na | high | na | low | na | ALB |
| *‎Acer ginnala* | Amur maple | negative | na | na | medium | na | moderate-high | na | Invasive, ALB |
| *Acer griseum* | Paperbark maple | neutral | na | na | low | na | moderate-high | na | ALB |
| *Acer miyabei* | Miyabei maple | neutral | na | na | high | high | low | na | ALB |
| *Acer pensylvanicum* | Striped maple | negative | large decrease | extirpated | medium | high | moderate-high | moderate | ALB |
| *Acer platanoides* | Norway maple | negative | na | na | high | high | moderate | moderate | invasive, ALB |
| *Acer rubrum* | Red maple | neutral | no change | large decrease | medium | high | moderate | low-moderate | ALB |
| *Acer saccharinum* | Silver maple | neutral | small increase | large increase | medium | high | moderate | low | ALB |
| *Acer saccharum* | Sugar maple | neutral | no change | small increase | medium | high | moderate | low | ALB |
| *Aesculus hippocastanum* | European horsechesnut | neutral | na | na | medium | na | moderate | na | ALB |
| *Amelanchier spp.* | Serviceberry spp. | neutral | na | na | high | high | low | low | GM |
| *Asimina triloba* | Pawpaw | positive | new habitat | new habitat | low  | na | moderate | na |  |
| *Betula alleghaniensis* | Yellow birch | negative | small decrease | small decrease | high | high | moderate | moderate | GM, ALB |
| *Betula lenta* | Sweet birch | negative | small increase | small decrease | medium | medium | moderate-high | moderate-high | GM, ALB |
| *Betula nigra* | River birch | neutral | na | na | medium | medium | moderate | moderate | GM, ALB |
| *Betula papyrifera* | Paper birch | negative | large decrease | large decrease | medium | medium | moderate-high | moderate-high | GM, ALB |
| *Betula populifolia* | Gray birch | negative | no change | no change | low | medium | moderate-high | moderate | GM, ALB |
| *Carpinus caroliniana* | American hornbeam | neutral | small increase | large increase | high | high | low | low |  |
| *Carya alba* | Mockernut hickory | positive | large increase | large increase | high | medium | low | low-moderate |  |
| *Carya cordiformis* | Bitternut hickory | neutral | no change | small increase | medium | medium | low-moderate | low-moderate |  |
| *Carya glabra* | Pignut hickory | neutral | small increase | small increase | medium | high | low-moderate | low |  |
| *Carya illinoinensis* | Pecan | positive | NA | new habitat | low | na | moderate | na |  |
| *Carya laciniosa* | Shellbark hickory | positive | extirpated | large increase | low | medium | moderate | low-moderate |  |
| *Carya ovata* | Shagbark hickory | positive | small increase | large increase | medium | high | low-moderate | low |  |
| *Carya texana* | Black hickory | positive | NA | new habitat | low | na | moderate | na |  |
| *Castanea dentata* | American chestnut | neutral | extirpated | extirpated | low | na | moderate | na | CB |
| *Celtis laevigata* | Sugarberry | positive | NA | new habitat | medium | na | low-moderate | na |  |
| *Celtis occidentalis* | Hackberry | neutral | NA | new habitat | high | high | low | low | ALB |
| *Cercidiphyllum japonicum* | Katsura tree | neutral | na | na | low | na | moderate-high | na | ALB |
| *Cercis canadensis* | Eastern redbud | neutral | new habitat | new habitat | medium | high | moderate | low |  |
| *Chamaecyparis thyoides* | Atlantic white-cedar | neutral | no change | no change | high | na | low | na |  |
| *Cladrastis kentukea* | Yellowwood | neutral | na | na | high | na | low | na |  |
| *Cornus Florida* | Flowering dogwood | neutral | large increase | large increase | medium | high | low-moderate | low |  |
| *Cornus kousa* | Kousa dogwood | neutral | na | na | high | na | low | na |  |
| *Diospyros virginiana* | Common persimmon | neutral | NA | new habitat | high | na | low | na |  |
| *Fagus grandifolia* | American beech | neutral | no change | no change | medium | medium | moderate | moderate | GM, BBD |
| *Fraxinus americana* | White ash | neutral | no change | no change | low | medium | moderate-high | moderate | EAB  |
| *Fraxinus pennsylvanica* | Green ash | neutral | extirpated | large increase | medium | medium | moderate | moderate | EAB  |
| *Ginkgo biloba* | Ginkgo | neutral | na | na | high | na | low | na |  |
| *Gleditsia triacanthos* | Honeylocust | neutral | NA | new habitat | medium | high | low-moderate | low |  |
| *Gymnocladus dioicus* | Kentucky coffeetree | neutral | na | na | high | medium | low | moderate |  |
| *Ilex opaca* | American holly | positive | no change | small increase | high | high | low | low |  |
| *Juglans nigra* | Eastern black walnut | neutral | new habitat | new habitat | medium | medium | low-moderate | low-moderate |  |
| *Juniperus virginiana* | Eastern redcedar | neutral | large increase | large increase | high | medium | low | moderate |  |
| *Koelreuteria paniculata* | Golden raintree | neutral | na | na | high | na | low | na | ALB |
| *Liquidambar styraciflua* | American sweetgum | positive | new habitat | new habitat | medium | na | low-moderate | na | GM  |
| *Liriodendron tulipifera* | Tulip tree | neutral | new habitat | new habitat | low | high | moderate | low | GM |
| *Maackia amurensis* | Amur maackia | negative | na | na | high | na | moderate | na |  |
| *Maclura pomifera* | Osage-orange | neutral | NA | new habitat | high | na | low | na |  |
| *Malus* | Crabapple | neutral | na | na | medium | na | moderate | na | GM, OW  |
| *Metasequoia* | Dawn redwood | positive | na | na | medium | na | low-moderate | na |  |
| *Morus rubra* | Red mulberry | positive | no change | small increase | medium | medium | low-moderate | low-moderate |  |
| *Nyssa sylvatica* | Blackgum/Black tupelo | neutral | large increase | large increase | high | high | low | low |  |
| *Ostrya virginiana* | Eastern hophornbeam/ironwood | neutral | no change | large increase | high | high | low | low | GM |
| *Oxydendrum arboreum* | Sourwood | positive | new habitat | new habitat | high | high | low | low |  |
| *Parrotia persica* | Persian ironwood | neutral | na | na | high | na | low | na |  |
| *Picea abies* | Norway spruce | neutral | na | na | medium | na | low-moderate | na | SB, PSB  |
| *Picea rubens* | Red spruce  | negative | large decrease | large decrease | medium | na | moderate-high | na | SB |
| *Pinus clausa* | Sand pine | positive | new habitat | new habitat | low | na | moderate | na | SPB |
| *Pinus echinata* | Shortleaf pine | positive | new habitat | new habitat | low | na | moderate | na | SPB |
| *Pinus resinosa* | Red pine | negative | small decrease | small decrease | low | na | high | na | SPB |
| *Pinus rigida* | Pitch pine | negative | no change | no change | low | medium | high | moderate-high | SPB |
| *Pinus serotina* | Pond pine | positive | new habitat | new habitat | low | na | moderate | na | SPB |
| *Pinus strobus* | Eastern white pine | negative | small decrease | large decrease | low | medium | high | moderate-high | WPBR, SPB |
| *Pinus taeda* | Loblolly pine | positive | new habitat | new habitat | medium | na | low-moderate | na | SPB |
| *Pinus virginiana* | Virginia pine | positive | new habitat | new habitat | low | medium | moderate | low-moderate | SPB |
| *Platanus occidentalis* | American sycamore | positive | NA | new habitat | medium | medium | low-moderate | low-moderate | ALB |
| *Populus deltoides* | Eastern cottonwood | neutral | NA | new habitat | low | medium | moderate-high | moderate | ALB |
| *Populus grandidentata* | Bigtooth aspen | negative | no change | extirpated | low | high | high | moderate | GM, ALB |
| *Populus tremuloides* | Quaking aspen | neutral | large decrease | large decrease | low | medium | high | moderate-high | GM, ALB |
| *Prunus × yedoensis* | Yoshino cherry | neutral | na | na | high | na | low | na |  |
| *Prunus pensylvanica* | Pin cherry | negative | small increase | large increase | low | medium | moderate-high | moderate |  |
| *Prunus persica* | Peach | neutral | na | na | medium | na | moderate | na |  |
| *Prunus sargentii* | Sargent cherry | neutral | na | na | medium | na | moderate | na |  |
| *Prunus serotina* | Black cherry | neutral | no change | no change | low | medium | moderate-high | moderate |  |
| *Prunus serrulata* | Kwansan cherry | positive | na | na | medium | na | low-moderate | na |  |
| *Prunus 'Snowgoose'* | Snowgoose cherry | neutral | na | na | high | na | low | na |  |
| *Prunus virginiana* | Chokecherry | neutral | decrease | extirpated | medium | medium | moderate-high | moderate-high |  |
| *Prunus x incamp ‘Okame’* | Okame cherry | neutral | na | na | high | na | low | na |  |
| *Pyrus calleryana* | Callery pear | neutral | na | na | medium | na | moderate | na | invasive, GM |
| *Quercus alba* | White oak | neutral | small increase | small increase | medium | high | moderate | low | GM, OW  |
| *Quercus bicolor* | Swamp white oak | neutral | small decrease | large increase | high | medium | low | moderate | GM, OW  |
| *Quercus coccinea* | Scarlet oak | neutral | small increase | no change | high | high | low | low | GM, OW  |
| *Quercus falcata* | Southern red oak | positive | new habitat | new habitat | medium | na | low-moderate | na | GM, OW  |
| *Quercus imbricaria* | Shingle oak | positive | NA | new habitat | high | medium | low | low-moderate | GM, OW  |
| *Quercus laevis* | Turkey oak | positive | NA | new habitat | medium | na | low-moderate | na | GM, OW  |
| *Quercus macrocarpa x robur* | Heritage oak | neutral | na | na | high | na | low | na | GM, OW  |
| *Quercus marilandica* | Blackjack oak | positive | NA | new habitat | medium | na | low-moderate | na | GM, OW  |
| *Quercus michauxii* | Swamp chestnut oak | positive | no change | no change | medium | na | low-moderate | na | GM, OW  |
| *Quercus muehlenbergii* | Chinkapin oak | positive | NA | new habitat | medium | medium | low-moderate | low-moderate | GM, OW  |
| *Quercus nigra* | Water oak | positive | NA | new habitat | medium | na | low-moderate | na | GM, OW  |
| *Quercus pagoda* | Cherrybark oak | positive | NA | new habitat | medium | na | low-moderate | na | GM, OW  |
| *Quercus palustris* | Pin oak | negative | new habitat | new habitat | medium | medium | moderate | moderate | GM, OW  |
| *Quercus phellos* | Willow oak | positive | NA | new habitat | high | na | low | na | GM, OW  |
| *Quercus prinus* | Chestnut oak | neutral | large increase | small increase | high | high | low | low | GM, OW  |
| *Quercus robur* | English oak | neutral | na | na | medium | na | moderate | na | GM, OW  |
| *Quercus rubra* | Northern red Oak | neutral | no change | large decrease | high | high | moderate | moderate | GM, OW  |
| *Quercus stellata* | Post oak | positive | small increase | small increase | medium | na | low-moderate | na | GM, OW  |
| *Quercus velutina* | Black oak | neutral | no change | small increase | medium | high | low-moderate | low | GM, OW  |
| *Robinia pseudoacacia* | Black locust | neutral | large increase | large increase | medium | high | low-moderate | low |  |
| *Salix babylonica* | Weeping willow | positive | na | na | medium | na | low-moderate | na | GM, ALB |
| *Salix nigra* | Black willow | positive | NA | new habitat | low | low | moderate | moderate | GM, ALB |
| *Sassafras albidum* | Sassafras | neutral | small increase | large increase | medium | na | low-moderate | na |  |
| *Styphnolobium japonicum* | Japanese pagoda tree | neutral | na | na | high | na | low-moderate | na | invasive  |
| *Syringa reticulata* | Japanese tree lilac | negative | na | na | high | na | moderate | na |  |
| *Taxodium distichum* | Baldcypress | neutral | new habitat | new habitat | high | na | low | na |  |
| *Thuja occidentalis* | Northern white-cedar | negative | large decrease | large decrease | medium | medium | moderate-high | moderate-high |  |
| *Tilia americana* | American basswood/linden | neutral | extirpated | small increase | medium | medium | moderate | moderate | GM  |
| *Tilia cordata* | Littleleaf linden | negative | na | na | high | na | moderate | na | GM  |
| *Tilia tomentosa* | Silver linden | neutral | na | na | medium | na | moderate | na | GM  |
| *Tsuga canadensis* | Canadian hemlock | neutral | small decrease | large decrease | low | na | high | na |  |
| *Ulmus alata* | Winged elm | positive | NA | new habitat | low | na | moderate | na | DED, ALB |
| *Ulmus americana* | American elm | neutral | small increase | large increase | medium | high | low-moderate | low | DED, ALB |
| *Ulmus crassifolia* | Cedar elm | positive | NA | new habitat | high | na | low | na | DED, ALB |
| *Ulmus parvifolia* | Chinese elm | positive | na | na | high | na | low | na | ALB, invasive  |
| *Ulmus rubra* | Slippery elm | neutral | small decrease | large increase | medium | medium | moderate | moderate | DED, ALB |
| *Zelkova serrata* | Japanese zelkova | neutral | na | na | high | na | low | na |  |

1Effect of heat/hardiness zone is positive if zone shift leads to gain in suitable habitat and negative if it leads to reduction in suitable habitat.

2Tree Atlas ([www.fs.fed.us/nrs/atlas](http://www.fs.fed.us/nrs/atlas)) results are summarized based on projected suitable habitat for the last 30 years of this century vs. current suitable habitat for the Boston region. Change class definitions can be found here: <https://www.fs.fed.us/nrs/atlas/products/>

3Adapt Class has been modified from Matthews et al. 2011 ([treesearch.fs.fed.us/pubs/38643](http://treesearch.fs.fed.us/pubs/38643)).

4Vulnerability is determined based on heat/hardiness zone effect, tree atlas projections (where available), and adaptability. Low: species is likely to adapt to future climate conditions in this area. High: species is likely to face considerable stress due to current and future climate changes.

5Notes: These factors may make a species more vulnerable or less desirable for planting based on other factors. We note when a species is generally considered invasive. Also noted is if it is a host to a particular pest or disease that can lead to considerable stress or mortality. ALB: Asian longhorned beetle, GM: gypsy moth, CB: chestnut blight, BBD: beech bark disease, OW: oak wilt, SB: spruce budworm, SPB: southern pine beetle, WPBR: white pine blister rust, DED: Dutch elm disease

Note this version is in draft. If you have comments or questions, please contact Leslie Brandt (lbrandt@fs.fed.us)