



Great Places

Green Spaces

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Key topics: How Heat Effects Your Trees

By Joshua Larson

Trees don't like heat any more than you...

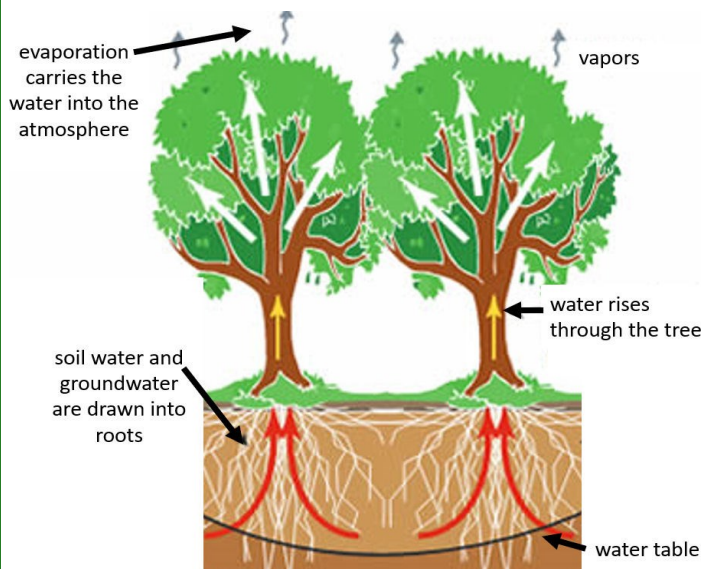
Trees like all living organisms evolved to grow optimally under a certain set of conditions. Trees need a specific range of temperatures, soil types, available moisture, nutrients, and sunlight to be able to grow properly.

When those conditions are not met through normal environmental changes like the sun going down or seasonal rains. Multi-year droughts like in the Southwestern United States, can seriously impact tree growth.

While there is significant scientific literature regarding the impact of droughts and prolonged periods of cold and low sunlight and how that impacts tree growth. Extreme heat is a subject science that hasn't been tested thoroughly yet. In this article we will cover what researchers have found so far. We will also provide advice on how you can support your trees and mitigate any stress caused by any extreme heat.

What conditions trees like to grow in

Trees like all life on earth are dependent on having water for all their biological processes. Without sufficient water a trees ability to make food and keep cool through evapotranspiration is greatly reduced. Like most of us humans they prefer temperatures between 75-85 degrees.



It is in this 75-85 degree range trees are most efficient at using photosynthesis to produce food. It has been found that photosynthesis rates double every 18 degrees until you hit 94 degrees. At that point photosynthesis falls off and trees enter survival mode. They then focus resources on keeping cool vs producing more food.

In more extreme scenarios of extremely high temps 110+ degrees, the cells of trees begin to break down and you can see cases of thermal induced death in individual cells in trees. If too many cells overheat and die, it can severely compromise the health of the tree or kill it outright.

"Water is the driving force of all nature." Leonardo da Vinci



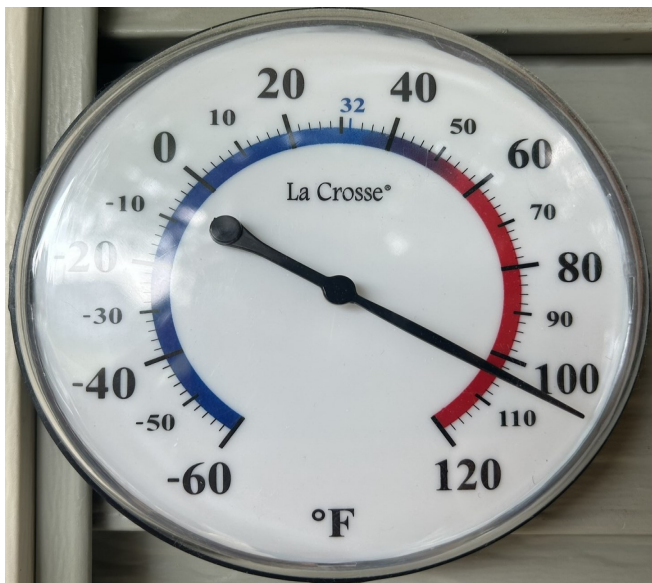
Its Getting Hot Out Here

Ways trees can get to hot

Trees can get too hot in number of ways, the simplest way is the ambient air temperature. When you start seeing Phoenix, Arizona temps (which as I write this is 114 degrees) are already reaching their limits.

Urban areas present a lot of opportunities to add heat to the landscape with something called the Urban Heat Island Effect. The hardscape (cement, concrete, asphalt) both reflect heat intensely onto trees and absorb heat, which can emit for many hours after the ambient temperature has lowered.

Another way trees can get exposed to excess heat is by convective heating from large unshaded areas. As these areas heat up, they generate a bubble of hot air that can hang right at ground level. Consider the difference of a shaded park area as compared to a large outdoor shopping area.



When wind comes in it can take that heated air and move it into adjacent areas causing the temperature to jump dramatically. This can take a hot day that the trees are handling, to an extremely hot day that suppresses their ability to photosynthesis and process high temperatures. A common way you would experience this is a hot breeze blowing off a parking lot.

Symptoms of heat stress in trees

The symptoms caused by heat stress are closely associated with drought stress. Excess heat and drought typically go hand in hand, and they can cause the following symptoms:

- Wilting or cupping of leaves
- Scorching of leaf edges
- Dropping of leaves
- Branch dieback on crown
- Premature leaf coloration



Unfortunately these symptoms can also be caused by many other things so they may not be only caused by heat and drought. You should consult with your regions forester if you have questions.

“If you saw a heat wave would you wave back” –Steven Wright



Protecting Trees From Heat

Protecting existing trees from heat stress

Obviously there is not much you can do about the ambient air temperature unless you have some massive AC units and lot of money to spend, but there are a few things you can do.

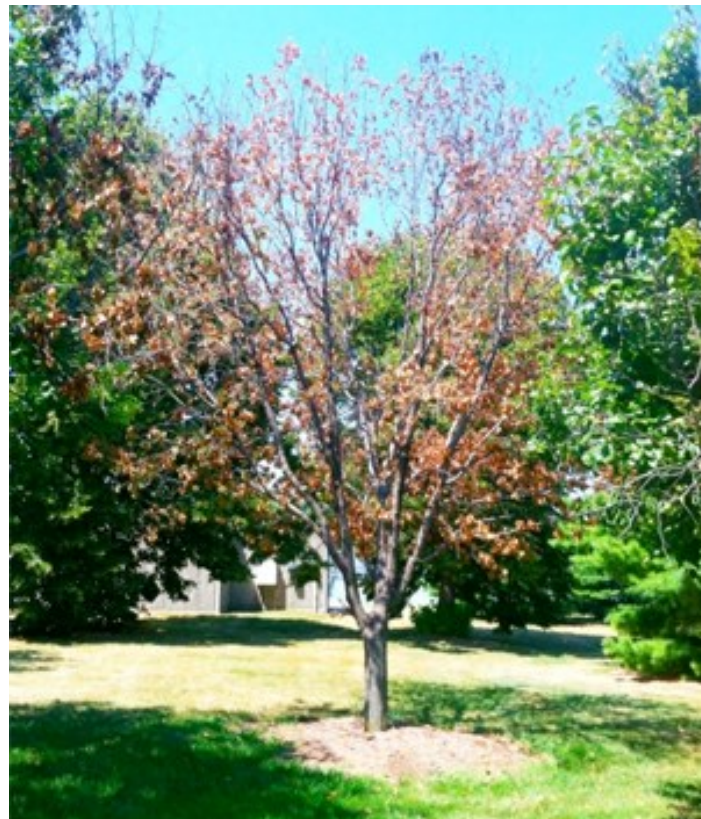
One of the easiest things to do for existing trees is to convert hardscape from around the trees into mulch or other living ground cover. This should aid in moisture retention and reduce heat absorption and reflection. During periods of extreme heat be sure your trees have an ample water supply. A good rule of thumb for most landscapes is an inch of water applied per week, potentially more if your area is also experiencing drought like conditions.

When you are planting new trees make sure they are planted far enough from buildings and hardscapes to reduce the effect of reflected sunlight. Planting in groups can be beneficial as well, since trees can create cooler microclimates in their immediate vicinity.

Planning for the Future

With record breaking heat waves occurring more and more frequently, it is worth considering heat tolerance attributes in the trees you are looking to select, or how much care you are willing to provide.

This doesn't necessarily mean we can plant trees that grow way south of South Dakota, as our Winters are still too cold for most Southern species. It does open the door for expanding our current selection of trees to more heat tolerant species.



Sources

Responses of tree species to heat waves and extreme heat events-<https://onlinelibrary.wiley.com/doi/epdf/10.1111/pce.12417>

<https://extension.psu.edu/heat-stress-in-urban-trees#:~:text=Increased%20temperatures%20escalate%20vapor%20pressure,and%20root%20growth%20become%20inhibited.>

<https://www.sciencedirect.com/science/article/abs/pii/S1618866723001929>

Photo Credits

[3 The Earth's Plumbing System – Groundwater in Our Water Cycle \(gw-project.org\)](#)

<https://droughtresources.unl.edu/heat-drought-hard-on-trees>

“No shade tree? Blame not the sun but yourself.” --Chinese Proverb



Heat Tolerant Tree List

List of trees that are heat tolerant

- Box Elder
- Buckeye
- Bur Oak
- Eastern Red Cedar
- Hybrid Elm- (with sufficient water)
- Hackberry
- Honey locust
- Plains Cottonwood
- Ponderosa Pine
- White Poplar
- Rocky Mountain Juniper

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Contact Us:

John Hartland
Staff Forester
South Dakota Department of Agriculture and Natural Resources
Resource Conservation & Forestry Division
4305 S Louise Avenue
Suite 107
Sioux Falls, SD 57106
Direct: 605.362.2830 | Cell: 605.933.9650