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# THE PURDUE LANDSCAPE REPORT

In This Issue

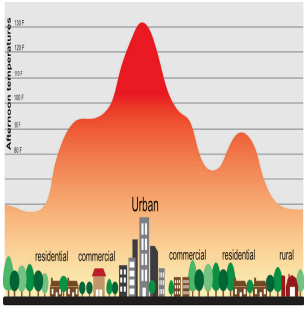


## Urban Trees and Climate Change

*(Lindsey Purcell, lapurcel@purdue.edu)*

Urban Trees and Climate Change… what's going on and what is expected?

It's time to really pay closer attention to the impacts of changing climate on our urban forests. Generally speaking, changes will vary across the Midwest and will be challenging to determine exactly what can be done to protect our trees.  Also, the once simple task of selecting what will be considered a sustainable tree species in the midst of these extreme changes in weather will be equally challenging. The current urban and suburban environments are tough for growing trees and our changing climate is going to make it even tougher.

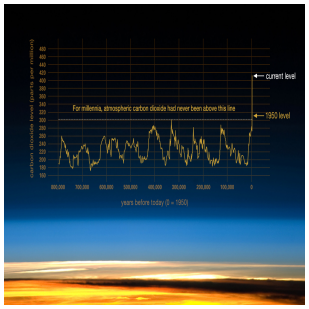



Heat islands can affect communities by increasing summertime air pollution, greenhouse gas emissions, heat-related illness and mortality, and water pollution and tree death.

Increasing temperatures increase water demands and maintenance inputs.

The greenhouse effect is the warming that results when the atmosphere traps heat radiating from Earth toward space. Scientists attribute global warming and climate change to this greenhouse effect. In addition, human expansion has increased carbon emissions and has become one of the major contributors to our ongoing climate change issues which impacts every tree on the planet. Climate change will continue to bring warmer, and more wet winters and warmer, drier summers; consequently, insect disturbances are expected to increase. Additionally, climate change is further aggravated by existing urban stressors such as air pollution, soil compaction and heat island effects. Since it is unlikely that these issues can be prevented in and around the places we live; it is essential that adaptive strategies be identified and implemented by urban forest managers before these impacts take an even larger toll on our city trees. Climate change will present both threats and opportunities, and it is not too early to begin planning for both.

The increasing levels of carbon dioxide is found everywhere on the planet. As of this past year, we have surpassed our all-time high of 412 ppm in the Earth's atmosphere. In some instances, this has found to be favored by certain tree species, especially the older, mature trees. Since trees rely on carbon for energy, this "vitamin-like" increase in carbon resources gives the tree a little boost. However, the evidence so far suggest that it will be temporary and actually have negative long-term consequences. Additionally, with the increasing levels of $CO^2$ we have seen major increases in pest outbreaks, higher levels of reproduction and reduced mortality. Also, exotic insects may be able to flourish where once were not adaptable. That carbon concentration increase in the trees also increases insect feeding activity, making insect outbreaks much worse.




In 2018, CO2 levels surpassed 408 ppm for the first time in recorded history.

One of the major concerns from past years and looking forward will be drought. Water is the most important factor in tree growth

and sustainability. Increases in $CO^2$ levels increases temperatures and drought severity. Regardless of the amount of snow and rain, higher temperatures will result in increased levels of evaporation and transpiration which reduces soil moisture and increase the likelihood of moisture deficits. According to the US Drought Monitor, the past two years have been relatively normal. However, trends from the past thirty years indicate the potential for increase drought potential similar to what we experience in 2011-2013. It is imperative we follow and fund research which explores drought tolerant species and less water-demanding biology in trees.

As the year begins, tree owners and managers should place more consideration into managing the impacts of these increasing environmental stressors. Tree selection is critical and right tree, right place even more important. We may not be able to just pick any tree and it will work in the design. It is more of a selection strategy considering available maintenance inputs, water requirements and exposure. Adaptive management will require a realistic look at our future. Does policy and budget make it possible for urban forest managers to make informed decisions and implement them into a resilient, adaptive forest for our future? Also, on a private level, commercial landscapes and residential tree plantings all contribute to the overall urban forest. Responsible tree selection and realistic management inputs are vital to a flexible and resilient tree canopy which contributes locally, regionally and globally to our health and quality of life.

Trees are vital to improving our environmental conditions. They are the perfect biological machine which provides valuable functional services which can save tree owners and communities millions of dollars in energy costs, storm-water management and air quality. However, these trees have to mature and survive before they can provide these important ecosystem services. Planting trees is part of the solution, but not the answer. We can't just keep planting trees; we have to start growing and sustaining existing trees.

For more information on urban tree care, visit the Purdue Education Store for tree care tips and suggestions.

# Mother Nature Gives Spring Bulbs the Heave-Ho!

*(Rosie Lerner, rosie@purdue.edu)*

Hyacinth bulb with leaves and flower buds emerged January 2020. Photo Credit: Rosie Lerner, Purdue Extension

It's not unusual for Indiana weather to have trouble deciding what season it is. Warm spells during the dormant period often lead to bulbs poking their foliage (and sometimes flower buds) through the soil. While we're more used to seeing this happen during February warm spells, our frigid temperatures arrived a bit early in the Fall of 2019 followed by intermittent unseasonably mild weather.

Indiana temperatures widely fluctuated in November and December, with the low temperature at the Purdue ACRE Farm (West Lafayette) of 25º F on November 7, 3º F on November 14, and 41º F on November 21! And the alternating pattern of below and above freezing continued through December.

Correspondingly, soil temperatures also fluctuated from 63º on November 7, 36º on November 14, and 45º on November 27 at ACRE.

There's not much you can do about bulbs that have sprouted, but the good news is that in most cases, the bulb itself should still be well protected and may bloom as normal, though we still have plenty more weather to endure before bloom time! The degree of potential damage the foliage and possibly the blooms will depend on how advanced the development of foliage and flower buds when they are exposed to sub-freezing temperatures.

Daffodil bulbs emerge December 2019.

Frost-heaved tulip bulbs December 2019.

Photo Credit: Tom Creswell, Purdue Extension

An additional problem that may especially be an issue this year is frost heaving. Repeated cycles of alternate freezing and thawing causes water in soil to expand and contract, which can lead to bulbs and herbaceous perennials being pushed up to the surface of the soil. Most susceptible are shallow-rooted plants or those planted in late fall that didn't have a chance to establish a deep root system before soil freezing. Waterlogged or poorly drained soils will be most affected due to high moisture content.

Frost-heaved plants may have exposed roots that will be further damaged by winter weather. If the ground is not frozen, you could gently tamp the plants back into the soil. Then cover with several inches of mulch such as straw or shredded bark. To prevent frost heaving in the future, mulch susceptible plants after the ground freezes to help lessen fluctuations in soil temperatures. But in a winter like this one, mulch may not be enough to stop the heaving.

# A Look Back at a Challenging 2019 Season

*(Kyle Daniel, daniel38@purdue.edu)*

The 2019 season provided challenges that were unexpected to the Green Industry, which included an abundance of rainfall followed by drought-like conditions, new invasive pests, concerns about glyphosate use, and many others. The Purdue Landscape Report focuses on timely articles that help Green Industry professionals make decisions for their business and keep abreast of looming issues. As we begin the 2020 season, we can take a look back at some of the top stories from 2019. Hopefully this season will be a little less challenging, but be sure we'll be there with relevant, timely information in 2020. Thanks for following along!

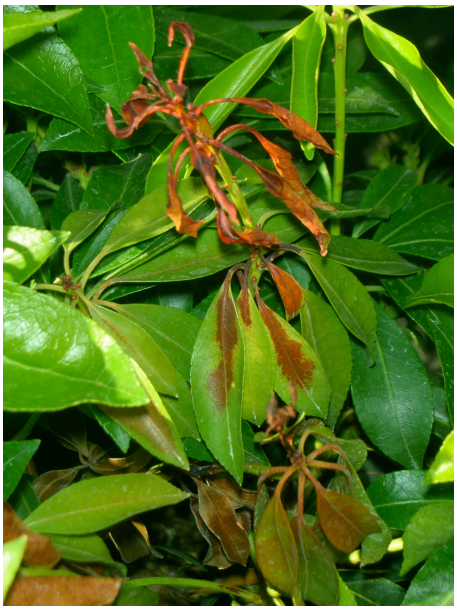
**Boxwood Blight Found in Indiana**

https://www.purduelandscapereport.org/article/boxwood-blight-found-in-indiana/

Boxwood blight by NGregory

**Sudden Oak Death Found in Indiana**

https://www.purduelandscapereport.org/article/special-alert-sudden-oak-death/



Pieris

**Be on the Lookout for Defoliated Viburnums and Viburnum Leaf Beetle**

https://www.purduelandscapereport.org/article/be-on-the-lookout-for-defoliated-viburnums-and-viburnum-leaf-beetle/

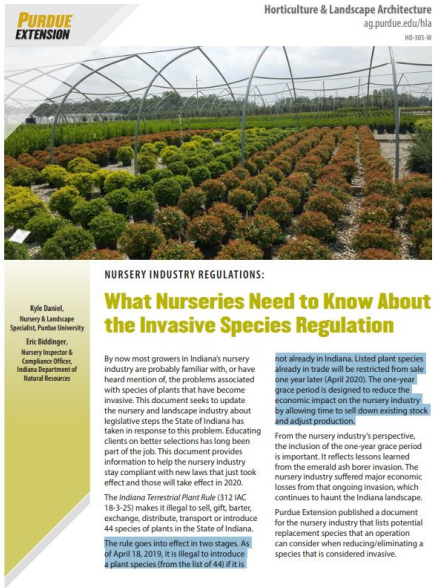

Figure 3. Adult beetles feeding on leaves (Photo by W. Cranshaw, Colorado State University, Bugwood.org)

**Terrestrial invasive species rule signed by Indiana Governor**

https://www.purduelandscapereport.org/article/terrestrial-invasive-species-rule-signed-by-indiana-governor/


**What nurseries need to know about the invasive species regulation**

https://www.purduelandscapereport.org/article/what-nurseries-need-to-know-about-the-invasive-species-regulation-new-publication-for-nursery-growers/



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NURSERY INDUSTRY REGULATIONS:

**What Nurseries Need to Know About the Invasive Species Regulation**

Kyle Daniel, Nursery & Landscape Specialist, Purdue University

Eric Biddinger, Nursery Inspector & Compliance Officer, Indiana Department of Natural Resources

By now most growers in Indiana's nursery industry are probably familiar with, or have heard mention of, the problems associated with species of plants that have become invasive. This document seeks to update the nursery and landscape industry about legislative steps the State of Indiana has taken in response to this problem. Educating clients on better selections has long been part of the job. This document provides information to help the nursery industry stay compliant with new laws that just took effect and those will take effect in 2020.

The *Indiana Terrestrial Plant Rule* (312 IAC 18-3-25) makes it illegal to sell, gift, barter, exchange, distribute, transport or introduce 44 species of plants in the State of Indiana.

The rule goes into effect in two stages. As of April 18, 2019, it is illegal to introduce a plant species (from the list of 44) if it is not already in Indiana. Listed plant species already in trade will be restricted from sale one year later (April 2020). The one-year grace period is designed to reduce the economic impact on the nursery industry by allowing time to sell down existing stock and adjust production.

From the nursery industry's perspective, the inclusion of the one-year grace period is important. It reflects lessons learned from the emerald ash borer invasion. The nursery industry suffered major economic losses from that ongoing invasion, which continues to haunt the Indiana landscape.

Purdue Extension published a document for the nursery industry that lists potential replacement species that an operation can consider when reducing/eliminating a species that is considered invasive.

Figure 1. Click the link above the image to receive a free download of the new publication for growers: What Nurseries Need to Know About the Invasive Species Regulation.

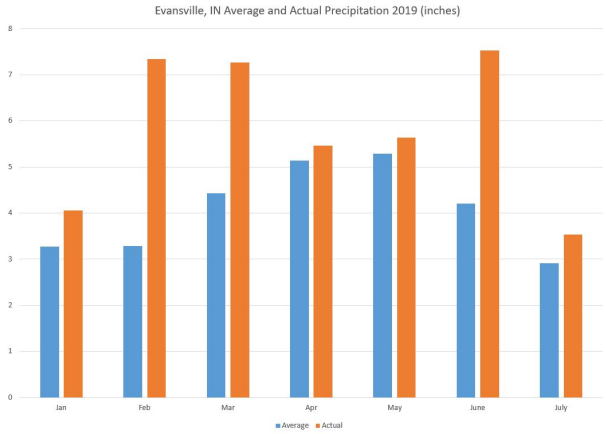
**Beyond Roundup**

https://www.purduelandscapereport.org/article/beyond-roundup-alternatives-to-consider-adding-to-your-weed-management-plan/

Grassy weeds in liriope can be controlled with grass-specific herbicides because liriope is not a true grass.

**Feast or famine: precipitation extremes**

https://www.purduelandscapereport.org/article/feast-or-famine-landscape-plants-are-struggling-due-to-precipitation-extremes/




Evansville, IN average vs. actual precipitation in 2019.

**Winter Injury Update to Michigan Trees and Shrubs**

https://www.purduelandscapereport.org/article/winter-injury-update-to-michigan-trees-and-shrubs/

Early frost injury to Canaan fir. Photo by Dull’s Tree Farm.



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