THE SHADE TREE

A BI-MONTHLY BULLETIN DEVOTED TO NEW JERSEY'S SHADE TREES

Volume 95 — March - April 2022 – Issue 3 & 4

This Issue Presents…

William J. Porter Arboriculture Scholarship Awardee Announced
Some Species of Trees Green-up Earlier than Others
Each Spring, Forests Turn Green From the Ground Up
Trees Spring into Action Earlier in Cities
Is Your Favorite Tree an Invasive Species
We Calculated How Much Money Trees Save For Your City

WILLIAM J. PORTER ARBORICULTURE SCHOLARSHIP AWARDEE ANNOUNCED

The 2021 William J. Porter Arboriculture Scholarship was awarded to Ryan Schmidt, an Ecology, Evolution and Natural Resources major at Rutgers with a specific interest in trees. The presentation was made at the NJ Shade Tree Federation's Annual Conference in October 2021.

Ryan is the president of the Rutgers University Forestry Club and was the Teaching Assistant for the Dendrology Class this year. Ryan has been a key contributor to several projects within the Forestry program at Rutgers, including a research project titled An Analysis of The Accuracy of Photo-Based Plant Identification Applications on 55 Tree Species, which was published in the January 2022 issue of the Journal of Arboriculture and Urban Forestry, as well as work on guidelines for municipal tree inventories that is being used to inform the development of new NJ Urban & Community Forestry Program guidelines. He has also done urban forestry work for the NJ towns of South Orange and Summit and is planning to attend graduate school following his graduation from Rutgers. Ryan has an enthusiasm for trees and for learning, and the NJ Shade Tree Federation was proud to present him with this scholarship in Bill Porter's memory. We look forward to seeing what Ryan will do next!

Information on this scholarship can be found at the NJ Shade Tree Federation's website: NJSTF.Org

BULLETIN OF THE NEW JERSEY SHADE TREE FEDERATION
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SOME SPECIES OF TREES GREEN-UP EARLIER THAN OTHERS

By Julie Crick, Michigan State University Extension • March 23, 2017

Each spring, forests turn green from the ground up encourages folks to take note of the natural areas in and around the neighborhood as they transform from winter to spring green. The process takes place as plants, shrubs and trees begin to flower and leaf-out in response to warming air and soil temperatures and longer days. This article summarizes some of the general reasons that explain why different species of trees begin to green-up at different times over a three to four week period.

Microclimates

One factor that should be noted when explaining the timing of different tree species greening-up, or flowering and leafing out, is location. A variety of local factors can create microclimates. These are small areas that, for multiple reasons, may experience slightly different weather conditions than another location nearby. Some of those reasons include:

- A south-facing slope that receives more direct sun than its north-facing counterpart
- Small, isolated depressions that tend to collect cooler, denser air
- The air in a sunny, open field with full sun warming faster than the air in the adjacent woodlot

As a result, the trees growing within a microclimate can experience variable timing in flowering and leafing out when compared with the trees growing outside of it. For simplicity, the information in this article describes timing variations between tree species growing within the same general woodlot, under similar conditions.

Describing the sequence of spring green up in a woodlot is fairly easy to generalize for understory plants and becomes more complicated when it comes to the trees. For example, not all of the small (either young or suppressed) trees flower and leaf out first, nor is it that the tall (either older or dominate) trees green-up last. Yet, trees of the same species do tend to flower and leaf out within a few days of one another when growing in similar conditions. One of the many factors that has been found to be significant is the structure of the wood.

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TREES GREEN-UP EARLIER

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Greening-up early

The tree species that are first to flower and leaf out are typically trees that have diffuse-porous wood anatomy. The diffuse porous wood anatomy means that the vessels that carry water and nutrients up and down the tree are individually small and numerous. This characteristic helps to protect these vessels from rupturing during harsh winter temperatures and allows the tree to begin conducting water and nutrients as soon as the warmer temperatures permit. A few examples of trees in this category are: maples, cherry, buckeyes, most popples, birches, willows, and alder. The diffuse porous wood structure explains why maples are tapped to obtain the early flowing sap.

Some of the trees with diffused porous wood anatomy also have an indeterminate or sustained growth pattern along each twig. This means that the tree will continue to grow leaves along a twig that is growing until the tree senses regrowth is no longer profitable and stops the growth, usually in response to dropping fall temperatures and limited day length. The ability for the tree to grow in this manner allows the tree to quickly recover from late spring frosts or insects that might damage leaves that have flushed out.

In science, there is always an exception to the rule. According to Martin Lechowicz in "Why do Temperate Deciduous Trees Leaf Out at Different Times?," not all trees with a diffuse porous wood anatomy leaf out early. Species like blackgum, sycamore, sweetgum, basswood and beech have diffuse-porous wood and tend to leaf out later than the aforementioned species. Research suggests this is due to their historic linkages to tropical and semitropical environments that require warmer weather to stimulate the flowering and leafing out process.

Later is better for some trees

Species that tend to flower and leaf out later in the spring green-up period have ring-porous wood anatomy. Ring-porous wood has fewer, large diameter vessels that conduct the water and nutrients up and down the tree. These larger diameter vessels easily rupture in harsh winter temperatures and the trees must repair the tissues before producing flowers or leaves.

Think of each vessel as a straw and the fleshy parts of the tree (flowers and leaves) as needing to draw up water and nutrients from the roots to photosynthesize and produce starchy sugars. Cold winter temperatures can cause the straw to break, or even tear, reducing its effectiveness to transport the water and nutrients under the suction created by the flowers and leaves. So, in effect, the tree takes the time to repair these straws, or vessels, to ensure the flowers and leaves can drink from the roots. In reality, the process is much more complicated than this. The flow goes both up and down the tree, maintained by turgor pressure in the cells, which can rupture in very cold temperatures. Still, it's a good analogy to make the point.

Most of the trees that have ring-porous wood anatomy also have a

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TREES GREEN-UP EARLIER *Continued from page 19*

determinate growth pattern, where tiny leaves are formed within a bud at the tip of the branch. When conditions are right, the bud opens up and the leaves elongate and "flush out". The tree can do this once or twice a season; it takes time and considerable nutrients to support consecutive flushes of leaves. Determinate growth means the tree typically cannot as easily recover from late spring frosts or insect damage to its leaves without significant costs. Examples of tree species that have both ring porous wood anatomy and determinate growth include, but are not limited to, oaks, elms, sassafras, mulberry, hickories, walnuts and ashes.

The characteristics that affect the timing of flower and leaf production also apply to trees growing outside of a forested ecosystem. Regardless of their location, most diffuse porous species will flower and leaf out earlier than ring-porous species. This will become evident by closely comparing the leafing out progress of the maple and oak trees in your yard or neighborhood. Typically, the maples will leaf out and flower at least one to two weeks before the oaks trees, sometimes longer. Keeping a mental or written journal helps to keep track of what you see.

EACH SPRING, FORESTS TURN GREEN FROM THE GROUND UP

By Julie Crick, Michigan State University Extension • March 23, 2017

One of the most notable transformations that take place during the spring months in Michigan is the conversion of our forests from winter dormancy to full summer activity. This transformation is best witnessed by looking at the same forest from a distance over the course of several weeks. At first, the green color appears at the ground level, as wildflowers begin to grow and quickly flower. Then, the shrubs and understory trees begin to flower and leaf out, giving off the illusion that the green color is creeping upwards. Finally, the trees take on a green hue, as tiny leaves expand out of the protective bud scales.

The reason for the green up can be explained because of phenology, or the study of the correlation of biological occurrences, weather conditions and climate. Phenology applies to anything from a bird migration to an insect hatching just after its host plant grows leaves. In the case of the greening of forest vegetation, phenology relates to the warming of the soil and warmer ambient air temperature, as well as days growing longer.

The coordinated process of the forest greening up in layers allows all the flowers, shrubs and trees to temporarily experience full sun conditions on their leaves. This begins the process of photosynthesis, which creates food starches that are used to develop seeds and support growth. The process of leafing out and creating flowers can be nutritionally expensive to vegetation, with most of the nutrients coming from starches stored in roots during the previous season. The

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warm temperatures and full sun help start-up plant biological systems and individual metabolism to produce nutrients for annual growth and seed production and to replenish the starches in the roots.

Greening from the ground up

It all begins with the spring ephemerals, which is another name for the early wildflowers that provide the first spring-green on the floor of hardwood forests. The word ephemeral means lasting for a short time; and that is exactly what these first plants do. These short-lived plants take advantage of the full sunlight that reaches their green leaves near forest floor in early spring.

At the same time the spring ephemerals leaf out and flower, the low shrubs also flower and leaf out. Then, after a few weeks, the trees begin to flower and leaf out extending the green hue into the forest canopy. Research has shown that different tree species in a forest typically flower and leaf out at different times over a two to four week period, gradually increasing the amount of green color throughout the branches in the forest. For example, a birch tree tends to leaf out much earlier than a walnut tree. To learn more, please also read a second article by Michigan State University Extension that summarizes research to explain some of the reasons for the difference in timing.

To learn more about the conditions that affect plants greening up, visit the United States Geological Service-led USA National Phenology Network (USGS NPN). The USGS NPN created the Daily Spring Index Leaf Anomaly maps to demonstrate how earlier than normal spring green-up is occurring this year in the United States. The USGS-led NPN website also features a static version of areas that have experienced green-up, or "spring" so far in 2017, and a phenology visualization tool. The maps and tools can be useful to scientists as well as citizens in the planning of seasonal and educational activities.

This year, as we all look forward to spring, keep an eye on your favorite forest and see if you can spot the greening of the forest from the ground up!

TREES SPRING INTO ACTION EARLIER IN CITIES FASTER URBAN HEATING LEADS TO EARLIER TREE GREENING

By Verner Viisainen, The NakedScientists.com • December 1, 2021

Trees turn green 6 days earlier in cities compared to rural areas...

That's the finding from a new study by University of California, Berkeley, researcher Lin Meng and published in the journal PNAS.

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DOGGETT . . . Liquid asset for trees and tree care companies.

The fastest growing segment of the tree care industry is liquid tree fertilization and Doggett is leading the way. The spectacular growth in this field has come from the fact that the fertilizing method that helps trees the most also helps tree care companies the most.

Liquid fertilizing is right for trees because the fertilizer is injected into the soil. This fractures and aerates the soil so that water, oxygen and fertilizers are made available to the feeder roots. Doggett's forty years of experience have resulted in XL Injecto Feed—a solid in a liquid—suspended particles of concentrated nutrition which you mix with water. Its slow release formula provides nourishment for up to two years and is available in five formulations for varying fertilizing situations.

Liquid tree fertilizing is a liquid asset for tree care companies because it lets you do a thorough and professional job in very little time with hardly any investment in equipment. It requires about one fourth the labor of the dry granular application.

It's no surprise that the leading tree care professionals in the country come to Doggett for tree fertilizer. From Central Park in New York, where XL Injecto Feed is the fertilizer of choice for dependable results, to the highly respected Shade Tree Laboratories at the University of Massachusetts, XL Injecto Feed is demonstrating its value and proving that it really is a liquid asset for trees and tree care companies.

Doggett Corporation, Lebanon, NJ 08833 Tel: 908-236-6335

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The effect occurs, she says, because cities are warming at faster rates than the rest of the planet since artficial materials ubiquitous in urban settings, like concrete, absorb heat more readily than natural materials like wood. The temperatures in the cities she investigated were, on average, 1.3 degrees warmer than surrounding rural areas, although Meng found the difference could even be as large as 3 degrees.

Inspired to study the effect of warming environments on tree greening due to a personal experience with cherry blossoms in Beijing, China, when an unexpected snowstorm wiped out all the flowers she had hoped to see in full bloom, Meng used satellite data to compare the start of tree greening in 85 major cities and their neighbouring rural areas across the United States, including New York City and Washington DC. Trees in built up areas, she found, typically start to grow earlier during the spring and stop growing later into the autumn. Their growing period over the day is also extended too, owing to the effects of artificial light.

While the key finding of earlier greening was consistent across all investigated cities, Meng noted that there was some variation. In particular, trees in southern cities near the coast were more susceptible to earlier greening compared to northern cities that are dryer and more inland. “This is because trees in northern cities [are] mainly regulated by temperature change, but trees in southern cities [are] more in response to water condition changes,” Meng explains.

Furthermore, while the effects of urban warming and climate change are thought to be largely negative, Meng points out that it is not clear whether the earlier greening of trees in cities is a good or a bad thing. The longer growing season “could increase the risk of spring frost”, and these changes “could also impact the timing and severity of pollen season,” leading to a higher risk of pollen allergy for humans. In contrast, the earlier greening could be beneficial, because “trees could absorb more carbon dioxide from the atmosphere,” and they could have a greater cooling effect in urban environments as they would be leafy for longer stretches of the year and thus be able to counteract some of the urban warming locally.

IS YOUR FAVORITE TREE AN INVASIVE SPECIES?

Jstor Daily • By Olivia Box • Chip Somodevilla/Getty Images • April 24, 2021

The seasons are marked by changing trees. In the fall, red leaves drop from the Norway maple. Washington, D.C., is known for its pink cherry blossoms, a symbol of spring. What do these trees have in common? They are both invasive to the United States.

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IS YOUR FAVORITE TREE

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Cherry blossom trees are native to Japan, while Norway maple are European. Cherry blossoms are now a strong presence in botanical gardens and parks, and Norway maples are frequently planted on city sidewalks because they are fast-growing.

Trees were not considered to be as much of a threat as invasive plants until recently. But invasive trees can be just as damaging to ecosystems and can displace native trees in both urban and forest environments very quickly.

Four thousand invasive species introduced to the United States via horticulture have become established outside of their range.

Researchers David M. Richardson and Marcel Rejmánek note that while currently only 0.5–0.7 percent of the world's trees species are invasive, these invasions are on the rise and are a reason for concern.

Trees and shrubs can become invasive in several ways. Horticulture is a leading cause, with trees being transported outside their range for their beauty. Horticulture extends beyond botanical gardens, to places including backyards, parks, and city streets. According to Richardson and Rejmánek, four thousand invasive species introduced to the United States via horticulture have become established outside of their range, displacing native species and disrupting numerous ecosystems.

Managing invasive species is no easy task. As Richardson and Rejmánek sum it up: "Conflicts of interest abound… The demand for popular ornamentals also has strong cultural ties, and the demand is difficult to change quickly." In 2001, landscape architect Don Brigham Jr. noted that the cost of managing invasive species in the United States was around $35 billion per year. Even with those efforts, according to Brigham, the US Fish and Wildlife Service estimates that nearly half of the country's native endangered plant and tree species have declined due to the encroachment of exotic plants and animals.

Landscape architects have some power to change this. Landscape designers and planners can consider native trees and plants when planning new projects—which is good for native ecosystems, pollinators, and climate.

WE CALCULATED HOW MUCH MONEY TREES SAVE FOR YOUR CITY

The Conversation April 27, 2018

By Theodore Endreny • Professor of Water Resources & Ecological Engineering, State University of New York College of Environmental Science and Forestry

Megacities are on the rise. There are currently 47 such areas around the globe, each housing more than 10 million residents.

More than half the global population now lives in urban areas, comprising about 3 percent of the Earth. The ecological footprint of this growth is vast and there's far more that can be done to improve life for urban residents around the world.

When it comes to natural spaces, trees are keystone species in the urban ecosystem, providing a number of services that benefit people. My research team has calculated just how much a tree matters for many urban areas, particularly megacities. Trees clean the air and water, reduce stormwater floods, improve building energy use and mitigate climate change, among other things.

For every dollar invested in planting, cities see an average US $2.25 return on their investment each year. Analysis of the world, from experts.

Measuring trees

Our team, led by Dr. David Nowak of the USDA Forest Service and Scott Maco of Davey Institute, develops the tree benefits software i-Tree Tools.

These tools simulate the relationship between trees and ecosystem services they provide. These services can include food, clean air and water, climate and flood control, pollination, recreation and noise damping. We currently don't simulate many services, so our calculations actually underestimate the value of urban trees.

Our software can simulate how a tree's structure – such as height, canopy size and leaf area – affects the services it provides. It can estimate how trees will reduce water flooding; or explore how trees will affect air quality, building energy use and air pollution levels in their community. It can also allow users to inventory trees in their own area.

Our systematic aerial surveys of 35 megacities suggest that 20 percent of the average megacity's urban core is covered by forest canopy. But this can vary greatly. Trees cover just 1 percent of Lima, Peru, versus 36 percent in New York City.

We wanted to determine how much trees contribute to human well-being in the places where humans are most concentrated, and nature perhaps most distant.

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WE CALCULATED HOW MUCH *Continued from page 26*

In addition, we wanted to calculate how many additional trees could be planted in each megacity to improve the quality of life.

How tree density affects a city

We looked in detail at 10 megacities around the world, including Beijing, Cairo, Mexico City, Los Angeles and London. These megacities are distributed across five continents and represent different natural habitats. Cairo was the smallest, at 1173 square kilometers, while Tokyo measured in at a whopping 18,720.

For most cities, we looked at Google Maps aerial imagery, randomly selecting 500 points and classifying each as tree canopy, grass, shrub and so on.

We calculated that tree cover was linked to significant cost savings. Each square kilometer saved about $0.93 million in air pollution health care costs, $20,000 by capturing water runoff, and $478,000 in building energy heating and cooling savings.

What's more, the median annual value of carbon dioxide sequestered by megacity tree cover was $7.9 million. That comes out to about $17,000 per square kilometer. The total CO2 stored was valued at $242 million, using a measure called the social cost of carbon.

The sum of all annual services provided by the megacity trees had a median annual value of $505 million. That provides a median value of $967,000 per square kilometer of tree cover.

Trees in your city

An entire urban forest can provide services for a good life.

All of the cities we studied had the potential to add additional trees, with about 18 percent of the metropolitan area on average available. Potential spots included areas with sidewalks, parking lots and plaza areas. The tree's canopy could extend above the human-occupied area, with the trunk positioned to allow for pedestrian passage or parking.

Want to conserve forests and plant more trees in your area? Everyone can take action. City and regional planners can continue to incorporate the planning for urban forests. Those who are elected to office can continue to share a vision that the urban forest is an important part of the community, and they can advocate and support groups that are looking to increase it.

Individuals who cannot plant a tree might add a potted shrub, which is smaller than a tree but has a leafy canopy that can contribute similar benefits. For the property owner wanting to take charge, our i-Tree software can assist with selecting a tree type and location. A local arborist or urban forester could also help.

SAVE THE DATE:

2022 NJ Shade Tree Federation

Annual Meeting Scheduled For

October 13 & 14th. Cherry Hill, NJ

The New Jersey
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