

Autumn 2018

TreeIQ

The Minnesota Tree Inspector Quarterly Newsletter



Table of Contents

- 3 Tree Inspector News & Upcoming Events**
- 4 TreeIQ Featured Tree Inspector:
Stephanie Pazdernik—City of Park Rapids, MN**
- 7 Everything You (might) Need To Know About Leaves: A Tree
Inspector’s Guide To Answering The Most Common Questions**
Gary Johnson, University of Minnesota, Department of Forest Resources
- 10 Betulaceae Buddies: *Carpinus caroliniana* and *Ostrya vir-*
giniana Plant Profiles**
Monica Randazzo, University of Minnesota, Department of Forest Resources
- 14 A Big Year for Wild Cucumber**
Minnesota Department of Agriculture
- 16 Dealing with Urban Ginkgo Seeds: Turning a nuisance into
a new local food product**
Ryan Murphy, University of Minnesota, Department of Forest Resources

Cover photo by Ryan Murphy

Submit photos to treesins@umn.edu

Funding provided by a grant from the USDA Forest Service. This institution is an equal opportunity provider.

Tree Inspector News & Upcoming Events

Electronic Recertification Options Available

Are you out of options to obtain your continuing education credits for 2018? Consider one of our electronic recertification options.

More info at www.mntreeinspector.com/recertification-options.html

DIVERSITY in MFI 2019 - Stipends Available!



The Municipal Forestry Institute (or MFI) in collaboration with Southern University and USDA- Forest Service is pleased to announce DIVERSITY in MFI, a special edition of national diversity leadership training opportunity in Urban and Community

Forestry. Participants including all ethnic origins (African Americans, Asian or Pacific Islanders, American Indians, Hispanics and White) and genders with careers in urban and community forestry and related areas will be recruited to the DIVERSITY in MFI for leadership training and professional development throughout the nation.

DOWNLOAD THE FLYER

VISIT WWW.URBAN-FORESTRY.COM TO LEARN MORE

Other Upcoming Events

Northern Green Expo—January 15-17, 2019

Iowa Shade Tree Short Course—February 19-21, 2019

Minnesota Shade Tree Short Course—March 19-20, 2019

TreeIQ Featured Tree Inspector, Autumn 2018

Stephanie (Steph) Pazdernik

City of Park Rapids, MN

By Gary Johnson, University of Minnesota, Department of Forest Resources

Twelve years ago, Stephanie became a Minnesota Certified Tree Inspector while she was a student at Central Lake College in Brainerd. After she completed her horticulture degree at Central and had accumulated two years of experience in the nursery and landscaping profession, Steph became the city forester for Park Rapids' Parks and Recreation department. It's been 10 years since she assumed that position, and it's been 12 years that she has been renewing her certification at the annual recertification workshops in Brainerd.

Steph is one of the many tree inspectors that has a solid background – academically and work experience – in horticulture and tree care, and it's

reflected in the way she approaches her work in Park Rapids and how she envisions her responsibility for caring for its urban forest. Never shy about speaking her mind and standing up for the right ways to grow and maintain trees, Steph is one more example of the commitment that Minnesota's tree inspectors have to doing the right thing when it comes to their constituency (those would be the trees!).

What's typical? When asked about a "typical" workday in Park Rapids, it's obvious that "it



TreeIQ Featured Tree Inspector, Autumn 2018

depends.” For several previous years when droughty summers were the norm, a typical day was spent struggling to get enough water to the newly planted trees and others that were growing on droughty and hot sites. A pretty basic job but absolutely critical if the trees would ever stand a chance of getting to a size where they looked like the trees in the nursery catalog. More recently with the drought challenge lessening - and like voids in nature - other stress issues replaced the constant demand for water with more tree maintenance and removal tasks. The current stress issues are largely tied to construction projects and the stress they place on trees growing near and within them.

Other challenges that the urban forest in Park Rapids faces include watering newly planted trees (even in non-droughty years), removals of dead or diseased trees, limited budgets



and generally convincing the good people of Park Rapids that their trees are valuable and deserve the care they need. As with almost every community, Steph also witnesses the problems with poor tree selection and placement, as well as poor planting practices...problems that don't seem to ever go away.

Goals for Park Rapids' trees. If Steph has her way (and don't doubt her), there are some things that she would like to see changed before she retires from the profession. First, eliminate poor tree care by getting the word out on how to correctly plant, prune and maintain trees to everyone – professionals and property-owners alike. Second, think real hard before planting trees in hostile (surrounded by concrete and deicing salt) downtown sites. It's too

TreeIQ Featured Tree Inspector, Autumn 2018

difficult and expensive to keep them alive and looking good. Steph believes this to be true for many northern Minnesota's communities; why plant trees if they can't be maintained and grow to sizes that actually contribute to the quality of lives in those towns?

Distractions and plans. Don't make plans any time soon for applying for the city forester position in Park Rapids. Steph has no intention of slowing down her goal of a greener Park Rapids for at least 15 years. If you want to catch up with her when she's not working for the city, you're most likely going to find her with her husband and two boys (budding urban foresters, I hope) on their farm, tending for their animals and enjoying the beauty of northern Minnesota...or, you can say "hi" at the 2019 tree inspector recertification workshop in Brainerd.

Know a Tree Inspector you would like to see featured in TreeIQ? Submit your nominations to treesins@umn.edu

Everything You (might) Need To Know About Leaves:

A Tree Inspector's Guide To Answering The Most Common Questions

By Gary Johnson, University of Minnesota, Department of Forest Resources

Okay, there's a real urge to "geek-out" going on here (I admit it), but the purpose of this little article is not to arm you all for a game of Jeopardy in hopes that one of the categories is "Things about Tree Leaves." Not likely to happen. Nope, this is intended to help answer some of the more common questions you may get from the people in your community that you are trying to help them understand how trees grow and function. So, the geek cloak is removed and we're on to the common questions.

1. Do evergreens have leaves?

Yes, but they are usually called "needles." They have chlorophyll just like maple leaves do, so they are the main way plants capture energy from the sun...shoot, somehow the geek cloak didn't go away. Sorry.

2. I'm sick and tired of raking leaves. How bad would it get if we had trees with no leaves?

You'd have a hard time breathing and your home would be wicked hot in the summer.

3. The needles on my "pine" tree turned brown. Will they green up again?

No, they are dead...forever, unless they are an Eastern red cedar. Its leaves turn various shades of purple to brown in the winter and then green up again in the spring.

This Eastern red cedar (right) looks brown and dead in the winter but will green up and thrive in the spring.

4. Why are the leaves on an ash tree so much smaller than those on an elm?

They aren't, and actually they are bigger. Ash trees have compound leaves made up of 5-9 "leaflets." You are confusing the leaflets with the true, simple leaves of an elm.



Photo courtesy of Minnesotaseasons.com

5. My trees leafed-out later this past spring. Does that mean they are dying?

Not necessarily. Trees start growing when there are enough warm days (roughly, 40° F and above) to help them deacclimate from their winter's rest. April 2018 in Minnesota was one of the coldest Aprils on record and those warm-up days didn't add up enough to get the leaves and shoots growing until late April in southern MN, later in northern part of the state.

6. How much of the tree's weight do leaves make up?

Well, if it hasn't been over-pruned, leaves account for about 5% of the total weight of a tree. Hard to believe when your back is aching after raking up the leaves in the autumn.

7. I have an 'Autumn Blaze' maple that I planted about 15 years ago that turns bright red in July... anything to worry about?

Yes, worry. When trees turn their normal autumn color earlier than normal (in MN, Autumn Blaze should peak at around early to mid- October, depending on the part of the state), it's a symptom that they are stressed. For Autumn Blaze, it could be highly alkaline soils (greater than 7.8 pH), or stem girdling roots (SGRs) that are getting to the point where they are compressing the cells moving water to the leaves, or if the tree is close to a highway or arterial street it's reacting to deicing salt in the soil, or if the soil is water-logged the roots are dying, or if it's very dry the roots are dying. It could be a lot of different things but it's definitely a symptom that something is wrong.

8. We have a lot of poplars and boxelders in our community parks and they seem to drop all of their leaves in mid to late summer quite often. What's wrong?

Drought or drought-like growing conditions like pure sand or gravel for a soil. These plants are actually pretty smart. Instead of holding on to their leaves that continue to demand water that isn't there until they wear down the overall health of the trees, they just shed their leaves and reduce the demand for water. Don't worry, they'll leaf out again (sometimes the same season) and look just fine next year.

9. I've never seen so many leaf spots like tar spot on maples, or insect galls on oaks and hickories. Do they hurt the trees' health and is there anything I can do about it?

Very few leaf diseases or insect damage should worry you because they don't worry the trees. The leaves can still function and photosynthesize. The stomata are still functioning and regulating water mov...darn! I slipped again!!! Anyway, leaf problems like anthracnose, spots, and galls are pretty benign. Complete leaf loss due to gypsy moth or tent caterpillar on an annual basis for a number of years...different thing. It's bad.

10. Now that you mention it, why/how do leaves turn different colors in the autumn?

Actually, they don't turn color as much as they lose color, the color green. As autumn or stresses continue, the green color of chlorophyll normally present begins to break down. It's normal. The tree is actually "mining" all of the good stuff that was in the leaves (nutrients, sugars, starches) and storing it all in the buds, twigs and branches for next year's growth. When its chlorophyll breaks down, other colors present become more obvious, like yellows, oranges and reds. Chlorophyll breaks down normally when the days get shorter in the late summer (second half of August for most of Minnesota). Just not enough sunlight to sustain the green.

BONUS QUESTION:

11. My spouse tells me my time would be better spent using a mulching mower to chop up the fallen leaves and leave them on the lawn rather than bag them up and haul them off. I think leaving leaves even chopped up leaves on the lawn is wrong and kills plants. Who is right? *(There's a foot massage in this for the winner)*

Get out the tub of Udderly Smooth moisturizing cream, your spouse is right. Take a walk in the woods and see what happens when no one rakes up the leaves... they turn into soil. In your lawn, the same thing happens, along with a little bit of nitrogen (1.5% nitrogen) being added courtesy of the decomposing leaves. Plus, it's easier to mulch-mow than to rake and haul away. It gives you more time to bake up that crow for dinner.



(Above) Tar spot on maple, a fungal infection. There is no harm done to the overall health of the tree. To reduce tar spot infections, don't use irrigation systems that keep the leaves wet. Photo courtesy of the Morton Arboretum.



(Right) Pretty spectacular autumn foliage, right? This is the 'Golden Spice' pear in October. Its fruit also ripens in October and is one of the more care-free and cold-hardy fruit trees for Minnesota.

Betulaceae Buddies: *Carpinus caroliniana* and *Ostrya virginiana* Plant Profiles

By Monica Randazzo, University of Minnesota, Department of Forest Resources

As both *Carpinus caroliniana* and *Ostrya virginiana* belong to the Betulaceae (birch) family, they share a number of common characteristics, such as being monoecious (male and female flowers on the same plant) with unisexual flowers, having alternate arrangement, and simple, deciduous, serrated leaves. Despite their similarities, these two understory trees are fairly easy to visually differentiate but due to some overlapping common names, are often mistaken for one another. To dispel any lingering confusion, we can look more closely at their unique characteristics as well as explain the many common names between the two species.

Carpinus caroliniana is a small tree with a mature height between 20 and 30 feet that can form either single or multiple stems. Generally, it grows straight and with a globular form, though horizontal stems can be seen in natural settings. Typically found in late-successional hardwood forests in valleys, along river terraces, and ravine bottoms, though it does not tolerate prolonged flooding (Missouri Botanical Garden). It is associated with



Left to right: fluted bark and stem of *Carpinus caroliniana*, and leafy bracts with umbrella nutlets.

maples, basswood, oaks, black cherry, or paper birch (Smith). Thriving in deep shade, *Carpinus caroliniana* will typically clonally produce stems by root suckering rather than reproducing through seed production. If more light is made available through a gap in the canopy, then *Carpinus caroliniana* will produce flowers and seed, though most trees in late-successional forests will have emerged as root suckers (Smith).

The bark and trunk shape is the most unique characteristic of *Carpinus caroliniana*. It is irregularly fluted and with very thin, smooth bark making trunk and branches notably sinuous. Stems and larger branches have blue-grey bark, while twigs are reddish brown with many small, white lenticels. Both the male and female



Left to right: young stem and wilted leaves in late fall, typical leaf of *Carpinus caroliniana*.

catkins are relatively insignificant, though if female flowers give way to fruit, then unique three-lobed leafy bracts form as umbrellas over light brown nutlets dangling in cone-like clusters. In urban settings, *Carpinus caroliniana* performs best in part-sun to full shade and will remain a compact tree under 30 feet (The Morton Arboretum).

Leaves on *Carpinus caroliniana* are simple, alternately arranged, ovate to ovate-elliptical, deciduous, and have sharply serrated margins and a rounded base. Foliage has an attractive orange-red color in the fall and emerges reddish-purple in the spring before changing to dark green. Leaves will wither and remain on the tree well past the growing season.

Ostrya virginiana is a small to midsize tree, reaching up to 50 feet at maturity and maintaining a globular and finely branched canopy. It can be found in mesic upland forests, in dry soils on rocky slopes, and on bluffs (Missouri Botanical Garden). It is not found in floodplains or swamps, nor does it grow into non-forested areas. It is a common subcanopy tree in Minnesota as it is extremely shade-tolerant. It is most strongly associated with late-successional hardwood forests, typically of red oak, basswood, American elm, or sugar maple (Smith). Because it is able to complete its entire life-cycle from germination to maturity in the shade of larger trees, *Ostrya virginiana* is considered a climax species (Smith, 2008). Due to its aesthetic habit and form, adaptability, and small stature, it is popularly cultivated as an urban tree.

The most notable feature of *Ostrya virginiana* are its “hops,” which are papery, pubescent, inflated bracts each containing a nutlet arranged in a conelike cluster. These pouch-like bracts mature in late summer and dry and brown into the fall. The nutlets are spread individually by wind and gravity through the fall and winter (Smith).

Bark on *Ostrya virginiana* is greyish-brown, very thin and scaled, and peels off in narrow, flat flakes. Twigs are pubescent in the first year, becoming glabrous in the second year (Smith). Young branches have small visible lenticels and are slender throughout the canopy. The male and female catkins are



Left to right: pouch-like bracts emerging in late summer, pouch-like bracts fully formed.



relatively insignificant, though the male catkins are present throughout the winter. *Ostrya virginiana* has oval to lance-shaped leaves which are serrated with a rounded symmetrical base and at first glance may be mistaken for elm leaves. The leaves often will stay on the tree late into the winter.



Left to right: flat ridges of bark on stem, leaf in early fall, and male catkins, dried leaves, and hop-like bracts hanging on past growing season.

With such distinct features, it is difficult to mistake these two species when looking at them side-by-side, but as they have both earned a few coinciding common names in addition to their other similarities, discussing these trees can become a little more unclear. *Carpinus caroliniana* can be referred to as musclewood (due to its sinuous stem and branches), American hornbeam, blue beech, and sometimes ironwood. *Ostrya virginiana*

is most often referred to as ironwood, but it is also called American hop-hornbeam, and Eastern hop-hornbeam. The name hornbeam, as it is applied to both, indicates that the wood can be processed to shine similar to a horn (The Morton Arboretum). Both species have very strong and dense wood, leading to the confusion over the name ironwood, though *Ostrya caroliniana* is considered the “true ironwood” by many. Becoming more familiar with the ecological and morphological characteristics of these species make them much easier to tell apart whether in an urban or wild landscape.

Citations:

Smith, Welby R. 2008. Trees and Shrubs of Minnesota. University of Minnesota Press.

Missouri Botanical Garden. 2018. *Ostrya virginiana*. Found online: <http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=l330>

Missouri Botanical Garden. 2018. *Carpinus caroliniana*. Found online: <http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=h540>

The Morton Arboretum. 2018. American hornbeam. Found online: <http://www.mortonarb.org/trees-plants/tree-plant-descriptions/american-hornbeam>

A Big Year for Wild Cucumber

Originally published August 27, 2018 in the Plant Pest Insider, a newsletter from the Minnesota Department of Agriculture

Wild cucumber is an annual plant that resembles cultivated cucumber plant varieties and is easily distinguished by its five-lobed star-shaped leaves that alternate along smooth branching vines. The vines terminate in stringy tendrils that are used to climb structures. Plants produce many long erect racemes that contain both male and female flowers which are very fragrant and consist of 6 narrow and slightly twisted pale white petals. There are significantly more male flowers per raceme, thus why after seeing the proliferation of flowers this plant produces, many people are confused by the relatively low number of fruits that emerge. The fruit is typically an egg sized oval capsule with noticeable longitudinal veins and covered with soft prickles. Each fruit contains four chambers housing flat brown seeds. Although wild cucumber strongly resembles cultivated cucumber varieties, the fruit is not edible.

Wild cucumber can grow in a variety of habitats, but generally prefers moist soils and access to plenty of sun. Plants are most easily identified in the landscape during mid to late summer when the vines expand ex-



Wild cucumber leaves and fruit (left) and growing into tree canopy (right).

ponentially and flowering begins to occur. It is commonly found growing on the edges of woodlands, shelterbelts, rights-of-ways and stream edges. Vines often climb upward into tree canopies and can form dense mats.

In most years, wild cucumber populations are not predominant in the landscape. However, in years where spring and early summer conditions are preferable, the plant can become an aggressive force in habitats where it is established. The abundant and consistent precipitation across much of Minnesota during the early part of the 2018 growing season has most likely led to the abundance of wild cucumber currently being reported statewide.

The good news is that this native plant can be easily controlled if necessary. The key to preventing vines from covering trees and other structures on properties is to focus on finding young seedlings following germi-

nation in the early spring. The best places to look for seedlings or young vines is to re-visit the locations where vines were present the prior year. Young seedlings look very similar to garden cucumber seedlings and can be hand-pulled fairly easy. Young vines will have the characteristic star-shaped leaves. If large populations of seedlings and young vines are present, herbicides may be useful. However, be very careful not to expose trees or other desirable vegetation to herbicides. To learn more about herbicide application, please consult your local University of Minnesota Extension office, a professional applicator, or a landscape expert.

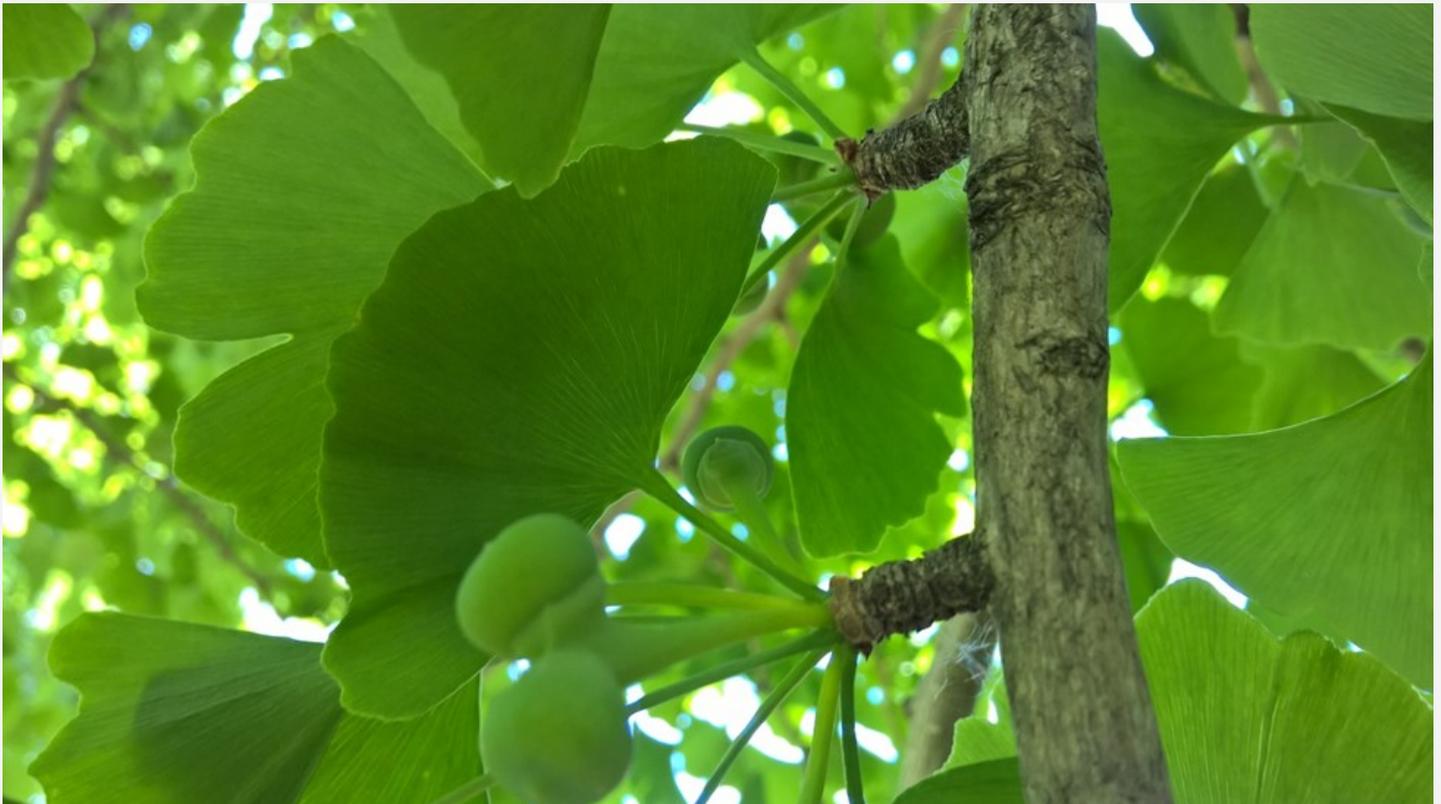
Once vines become too large and begin to crawl-up other vegetation, herbicides treatments should be avoided. Vines can simply be traced back to their source and pulled out of the ground. Often people get overwhelmed with the size of matted vines in trees and other structures and feel that it is an impossible task to control this plant. However, in most cases the highly branched vines lead back to a few source roots. If necessary, matted vines can also be pulled from trees, but after the roots are pulled and the vines die, they will begin to deteriorate.

Although wild cucumber can be aggressive and spread quickly in a growing season, landowners can curb large populations from developing by focusing on spring management of seedlings and hand-pulling vines at their ground source later in the summer. This native plant is an annual that can only reproduce by seed. Therefore, focusing on prevention of seed production will reduce wild cucumber's presence in sensitive landscapes like managed urban areas, orchards, and shelterbelts.

Dealing with Urban Ginkgo Seeds: Turning a nuisance into a new local food product

By Ryan Murphy, University of Minnesota, Department of Forest Resources

Ginkgo biloba can be a divisive tree in the urban environment. Many enthusiasts believe ginkgo to be one of the best urban tree species for the Northern Midwest region. It has seemingly no pest or pathogen issues, resists urban pollutants, puts up with tough planting locations and turns a vibrant golden yellow in the fall. On the flipside, many know of ginkgo simply for its obnoxious seed, which releases a strong odor as the outer seed coat decomposes. It is this odiferous aspect of ginkgo that accounts for the majority of removals in urban locations. But does it need to be this way? A small project housed between the Department of Forest Resources and Department of Horticultural Science is asking this question.



Ginkgo is an important link to the past both botanically and culturally. *Ginkgo biloba* is the only living species of a once diverse division known as Ginkgophyta. These seed plants were common across the northern hemisphere as far back as 300 million years ago (Leistner & Drewke 2010). Now, it is believed there are only two small remaining populations of wild ginkgo trees located in China (Gong et al. 2008). *G. biloba* is currently on the endangered species list - a notion that is odd to comprehend due to the tree's ubiquity in the landscape.

The earliest modern ginkgo trees arrived in the United States in the late 18th century. Ginkgo is a dioecious species, and it became apparent to astute and non-astute observers alike that the seedless male trees are more desirable for the urban environment than the seed producing female trees. In spite of this knowledge, a number of seed producing trees were still planted into the landscape. The reason for the seeming mishap is unclear. One explanation is that selected stock plants were falsely believed to be male cultivars when in fact these trees were females that had yet to reach sexual maturity, a consequence of ginkgo taking multiple decades to reach seed bearing age.



There is also the not too uncommon theory that these seed producing trees resulted from a sex change of males converting to female. This theory is not totally unfounded as there are a number of accounts from around the world of very old male ginkgo trees spontaneously producing seed (Crane 2013). What is common in these accounts, however, is that there does not seem to be a complete canopy wide change of sex, rather isolated branches in the canopy producing some seeds. Interestingly, there are also accounts of monoecious trees. In one research trial of 638 seedling ginkgo, four trees were found to be monoecious, predominated by male catkins with a few female ovules (Santamour et al. 1983). Modern genetic tools have allowed researchers to identify a single marker which can be utilized in determining the sex of ginkgo seedlings (Jiang et al. 2003, Echenard et al. 2008).

Simply stated, the ginkgo seeds for many are a public nuisance. The smell is produced by the release of butanoic and hexanoic acid from the outer-fleshy seed coat known as the sarcotesta (Tredici 2000). Compounding the matter is the fact that ginkgo is a prolific seed producer, with mature trees dropping hundreds of pounds of seed each year. The presence of seed producing trees in the near vicinity of houses and public sidewalks results in a number of requests for ginkgo tree removals each year.

For other residents, however, the seed is seen as a healthful food and medicine. This is especially so for East Asian cultures. Cultivation of ginkgo trees and use of the seed as a food source dates back thousands of years in China. In the present day, commercial seed production is estimated at between 5,000-6,000 tons per year (He et al. 1997). In Western cultures, however, it was the leaf extract that gained popularity as a supplement

with purported neurological benefits.

The historic use of ginkgo seed as a healthful food, paired with the negative public perception of the seed in the urban environment, led university researchers in the departments of Forest Resources and Horticultural Science to undertake a project to assess the potential for urban produced ginkgo seed to be harvested commercially for human consumption. The benefits of collection and subsequent sale of urban ginkgo seed are two-fold; 1) collection of seeds from the landscape will reduce the negative impact on residents, resulting in fewer requests for removals and thereby retain the environmental benefits of these potentially long-lived trees, and 2) the sale of urban ginkgo seed will provide a new local food revenue source.

Work on this project began with a grant from the Minnesota Department of Agriculture's Specialty Crop Block Grant Program to ensure that the urban grown seeds do not pose any health risks to those consuming them. This is being accomplished by assessing seeds for the presence of any heavy metals as well as a compound called ginkgotoxin (4'-O-methylpyridoxine), a known neurotoxin.

So far the results of the food safety research are promising. The challenge moving forward will be creating the mechanisms and supply chain to harvest and sell the seeds. Future research on harvest mechanisms will look at ways to efficiently collect seeds from urban trees. For example, mechanically shaking the trees in the autumn so all the seeds are removed at one time. And, of course, we can't forget a good method for cleaning the seeds.

The other critical piece of the puzzle is public education. It is understandable that citizens are annoyed by the presence of the seed each year. But where problems lie, so does opportunity. Hopefully someday folks will have more than just tree removal as an option for managing the seeds.

For more information on the project, contact Ryan Murphy at murph523@umn.edu.

Citations:

Crane, P. (2013) *Ginkgo: the tree that time forgot*. Yale University Press. New Haven and London.



A. raw ginkgo nuts, **B.** ginkgo nuts (no shell), **C.** honey ginkgo nuts, a dish to nourish the lungs and trachea, **D.** dry fried ginkgo nuts are used to relieve asthma, **E.** salty roasted ginkgo nuts are used as healthy snacks, **F.** ginkgo shrimp is a common Chinese dish, **G.** ginkgo asparagus, another famous Chinese dish

- Echenard, V., Lefort, F., Calmin, G., Perroulaz, R., Belhahri, L. (2008) A New and Improved Automated Technology for Early Sex Determination of *Ginkgo biloba*. *Arboriculture & Urban Forestry* 34(5):300-307
- Gong, W., Chen, C., Dobes, C., Fu, C.X., Kock, M.A. (2008) Phylogeography of a living fossil: Pleistocene glaciations forced *Ginkgo biloba* L. (Ginkgoaceae) into two refuge areas in China with limited subsequent postglacial expansion. *Molecular Phylogenetics and Evolution* 48, 1094-1105.
- He, S.-A., Gu, Y., Pang, Z.-J. (1997) Resources and Prospects of *Ginkgo biloba* in China. *Ginkgo – A Global Treasure: From Biology to Medicine*. Springer-Verlag Tokyo. pp 373-383.
- Jiang, L., You, R.L., Li, M.X., Shi, C. (2003) Identification of a sex associated RAPD marker in *Ginkgo biloba*. *Acta Botanica Sinica* 45:742-747
- Leistner, E. & Drewke, C. (2010) *Ginkgo biloba* and Ginkgotoxin. *Journal of Natural Products*, 73, 86-92
- Santamour Jr., F.S., He, S., Ewert, T.E. (1983) Growth, Survival and Sex Expression in *Ginkgo*. *Journal of Arboriculture* 9(6): June.
- Tredici, P.D. (2000) The Evolution, Ecology, and Cultivation of *Ginkgo biloba*. *Ginkgo biloba*, Hardwood Academic Publishers p. 7-23

About this publication

***TreeIQ - The MN Tree Inspector Quarterly* is a publication produced by the University of Minnesota in collaboration with agency partners. *TreeIQ* is a seasonal electronic newsletter devoted to providing timely technical information and community connections for Minnesota's Certified Tree Inspectors.**

The University of Minnesota offers certification and recertification opportunities and proctors new certification exams at the certification workshops. For more information on the Tree Inspector program, the certification, and other frequently asked questions, please visit us at www.mntreeinspector.com.

Contact treesins@umn.edu with any questions or submissions.

The Minnesota Certified Tree Inspector program was first implemented in 1974 and has since supported hundreds of participating communities around the state.

The Tree Inspector Program is administered by the Minnesota Department of Natural Resources in partnership with the University of Minnesota's Forestry Department.

Funding provided by a grant from the USDA Forest Service. This institution is an equal opportunity provider.