

green horizons

Growing tomorrow's future today.

Winter 2020

A newsletter from the Center for Agroforestry in
conjunction with the Forest and Woodland Association of Missouri :
<http://www.centerforagroforestry.org/pubs/newsletters.php> :

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Editors: Mike Gold, Hank Stelzer, Hannah Hemmelgarn,
and Raelin Kronenberg

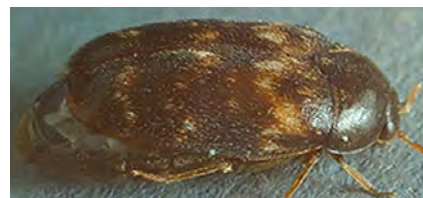
The Hitchhiker's Guide to Invasive Pests

Sarah Phipps, Missouri Department of Agriculture

My grandfather used to pick up hitchhikers as he drove countless miles along highway roads for his work in the 1950's and 60's. He worked as an entomologist with the United States Department of Agriculture and he was on the road a lot! I'm not sure if he picked up the wayward traveler to break up the monotony of the drive or to lend a helping hand... probably a little of both.

While he welcomed hitchhikers into his work sedan, he combated a different type of hitchhiker for his job - invasive pests. He worked with many invasive pests that were always looking to hitch a ride to somewhere new! He worked with the notorious khapra beetle, a grain hobo, the Japanese beetle that hitchhikes on plant material and soil, and the indiscriminate gypsy moth that glues its egg masses on any item found outdoors and truly do hitchhike on our cars and trucks.

As Europeans started coming to America, so did the pests, arriving in the ships' ballast water and in the settlers' supplies. Since those days, the ability for insect interlopers has exponentially increased due to the continuous growth of global trade and containerized shipping. U.S. Customs and Border Protection reports that each year the United States receives more than 11 million maritime containers at our seaports, 11 million by truck, and 2.7 million by rail. The impact has been pronounced. Along with the shipping containers comes many unwelcomed pests: wood borers burrowed into the wood pallets, weed seeds cling to the side and snails glide along. More than 450 nonindigenous forest insects and at least 16 pathogens have colonized United States' forest and urban trees since European settlement. At least 14% of these insects and all 16 pathogens have caused notable damage to trees.



Adult khapra beetle, Image from: <http://www.acgov.org/>



Male (left): female (right) gypsy moths, Image from: <https://www.aphis.usda.gov/>



Japanese beetle, Image from: <https://www.iowapublicradio.org/>

As these invasive pests establish themselves, so does their ability to spread. I remember my grandfather telling me, with a reminiscent chuckle, that he wouldn't pick up hitchhikers today due to safety concerns. How times change! What was once a common practice of picking up a hitchhiker is now considered dangerous and is outlawed in many states.

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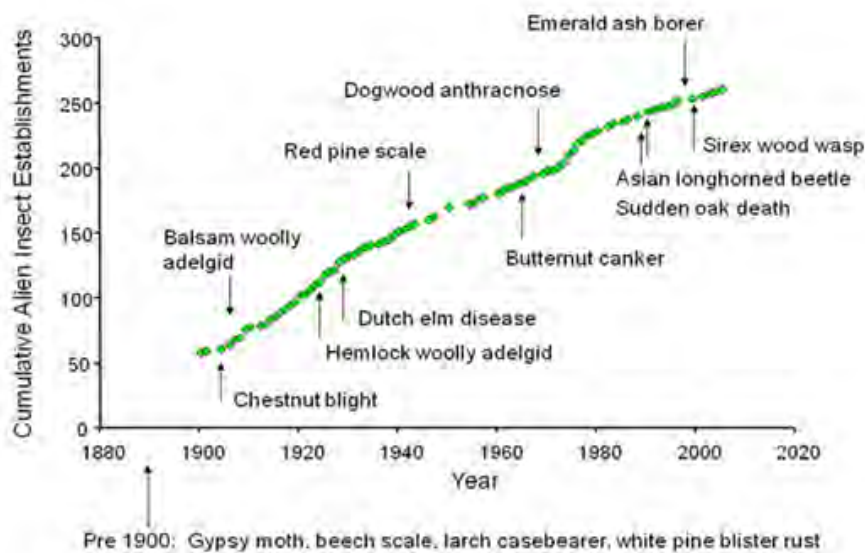
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Rules and ideas are also changing about hitchhiking pests. Moving firewood or plant material from state to state was once considered a relatively safe practice. Now as hitchhiking pest risks increase and more pests are establishing a population, it makes it easier for a pest to be transported from one location to another. Our vehicles, boats, boots, clothing and firewood are just a few of the modes of transport these invaders use to their advantage.

Behaviors must change to prevent invasive pests from hitchhiking across the country on you, me and our belongings. As people witness the Japanese beetle attacking their favorite roses or someone cutting down yet another dead ash tree due to the emerald ash borer, people are witnessing firsthand the consequences of invasive pests. Organizations are forming to bring increased awareness of such movement and they are focusing their message toward hikers, boaters, campers and travelers. People are considering new types of questions: did you inspect your vehicle when moving out of the gypsy moth quarantined area, did you wipe your boat down to prevent movement of zebra mussels, did you buy your firewood where you plan to burn it, did you use the boot brush to wipe off the mud and weed seeds from your boots?

Some Notable Insect & Disease Introductions



(Figure provided courtesy of Andrew Liebhold, USDA Forest Service.)

If you would like to learn more, check out some of these organizations:

- Don't Move Firewood: <https://www.dontmovefirewood.org/>
- Play Clean Go: <https://www.playcleango.org/help-stop-invasive-species-with-playcleango>
- Hungry Pests (USDA): <https://www.aphis.usda.gov/aphis/resources/pests-diseases/hungry-pests/>
- Tread Lightly: <https://www.treadlightly.org/>
- Leave No Trace: <https://lnt.org/>
- Don't Pack a Pest (Customs and Border): <https://www.dontpackapest.com/>
- Plant Heroes: <https://plantheroes.org/>

Elms in America

Meridith Perkins & Cory Knoblauch, Forest ReLeaf of Missouri

It has been 90 years since the Dutch elm disease (DED) first arrived in the United States. At that time native American elm trees (*Ulmus americana*) grew in great numbers across the forested landscape as well as the urban core. The American elm proved tolerant to the challenges of city living and became the go-to tree for park strip plantings along streets. The large, vase shaped elm canopy created green corridors and grew to define neighborhoods everywhere. However, when the United States began importing wood after World War I, the DED fungus (*Ceratocystis ulmi*) and the European elm bark beetle (*Scolytus multistriatus*) vector came along for the ride. Within a few decades hundreds of thousands of American elm trees were dying across the USA. There was and is still no effective treatment for trees once they are infected with DED. Few stately American elms remain in Missouri and many of these are treated annually with a preventative fungicide to keep the disease at bay.

After all this, people are not ready to give up on elms! Researchers continue working to isolate DED resistant American elm cultivars and develop elm hybrids that mimic those iconic American elm traits. If you are looking for an elm tree for your home landscape, consider:



Bark of elm tree infected with DED,
Image from: <https://www.kansasforests.org/>



Image from: <https://moonnurseries.com/>

- **Princeton** (*Ulmus americana* 'Princeton') is one of the most common American elm cultivars. It has good DED resistance and maintains a fairly upright, vase-shaped form.



Image from: <https://plants.oaklandnursery.com/>

- **Frontier elm** (*Ulmus minor* x *parvifolia*) has good resistance to Dutch elm, will reach 30 to 40ft tall at maturity and does best in hardiness zones 4-7. The Frontier elm has been known to live for up to 80 years and is slow growing. This hybrid elm is the rare mixing of a spring and fall flowering elm that exhibits beautiful purple color in the fall.



Image from: <https://landscapeplants.oregonstate.edu/>

- **Accolade elm** (*Ulmus davidiana* var. *japonica* 'Morton') is derived from a hybrid elm that grows very rapidly and can reach 50 ft tall. It is able to tolerate dry soil conditions and drought, making it a hardy variety for the urban environment.

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Image from: <http://plants.wasconursery.com/>

- **Lacebark elm** (*Ulmus parvifolia*) or Chinese elm has unusual mottled bark, and smaller leaves than American elm. It is an Asian elm that reaches 50 ft in height, with good DED resistance. Lacebark elm makes a great landscape tree because it is tough and tolerates harsh conditions.



Image from: <https://moonnurseries.com/>

- **Bosque elm** (*Ulmus parvifolia* 'Bosque') is renowned for its extreme drought tolerance and can withstand the hottest summer temps. Native to Asia, this specimen can reach up to 70 ft and has nice purple foliage in the fall.

- **Caucasian elm** (*Zelkova carpinifolia*) is an Asian species related to the more commonly available Japanese zelkova (*Zelkova serrata*); both are highly resistant to DED. Caucasian elm reaches heights of 60 ft and presents a nice vase form at maturity. This tree does best in rich, well drained soils. *Zelkova* has a nice yellow color in the fall.



Image from: <https://www.vdberk.com/>



Left: American Elm, Right:
White Ash Leaves Source:
<https://nature.mdc.mo.go>



Many elms resistant to DED still suffer from black leaf spot, phytophthora root rot, Japanese beetle, bark beetle, and weak wood structure. For this reason, over the past 50 years a favorite elm tree replacement has been ash. Streets previously lined with American elm were planted with monocultures of green ash (*Fraxinus pennsylvanica*) or white ash (*Fraxinus americana*). Now, we are losing this critical tree canopy to the devastating impact of the emerald ash borer!

What we have learned from decades of tree planting investments is that species diversity is the key to a resilient urban forest canopy. Neighborhoods should have a combination of trees from different species, genus, and families. Some underrepresented native trees that may be appropriate for elm tree replacement include: hackberry, river birch, shumard oak, black gum, and bald cypress. Forest ReLeaf of Missouri has these tree species available for spring planting projects through our free tree giveaway program or private sales. Apply in February at www.moreleaf.org.



White Ash Trees, Image from: <https://www.arboday.org/>

Species Spotlight: Ozark chinkapin

Castanea ozarkensis

Dr. Ron Revord, Center for Agroforestry, University of Missouri

In 1904, a fungal disease was discovered on American chestnut trees (*Castanea dentata*) that abruptly began dying in New York City. The pathogen was new to the United States, and its disease quickly progressed to girdle the tree's trunk and render itself fatal. In the coming years, the disease rapidly spread outward from New York City through the endemic range of the American chestnut. By the 1930's, the American chestnut was imperiled. The species that held a prominent keystone role in Appalachian forests for thousands of years was diminished to a rarity and in danger of extinction. This disease was of course the chestnut blight (*Cryphonectria parasitica*), which was later learned to have been imported on resistant Chinese and Japanese chestnut nursery stock. While the blight epidemic of the American chestnut is well known, and many great strides have been made toward its conservation and breeding blight resistance, the epidemic of its western relative, the Ozark chinkapin (*Castanea ozarkensis*) has trailed in its shadow.

The Ozark chinkapin is a species of chestnut native to the Ozark plateau in Arkansas and southern Missouri. Prior to the introduction of chestnut blight from Asia in the late nineteenth century, the Ozark chinkapin was a fixture in the regional ecology and culture. The trees reached up to 60 feet tall and produced many pounds of sweet, edible nuts enjoyed by wildlife, livestock, and humans alike. However, like the American chestnut, the species has been under severe pressure since the arrival of the blight, and today the Ozark chinkapin is in threat of extinction. Surviving plants have been reduced from canopy trees to diseased shrubs, which persist in a cycle of growth and dieback to shed blight-infected stems. These plants seldom have stems for a period long enough to reach a flowering stage, and consequently, new seedlings are not replenishing these populations as they slowly lose more plants to the blight.

While increasingly rare, diseased Ozark chinkapin can occasionally be found in conservation areas, along roadsides, and on farms. These remnant individuals and populations offer an incredible opportunity to conserve the species despite its recent population decline. Surprisingly, few systematic efforts for plant material conservation have been pursued for the Ozark chinkapin. The Missouri Department of Conservation (MDC) and the Center for Agroforestry have recently partnered to address this conservation gap, and with MDC's support, University of Missouri researchers are organizing a multi-phased plan to facilitate breeding blight resistance into a collection of genetically diverse Ozark chinkapin.



Top: Ozark chinkapin leaves and nuts, Bottom: Ozark chinkapin bark, Image from: <https://ozarkchinkuapinmembership.org/>

Continued on page 6.....



Selecting plant populations and individuals for collection assembly and conservation is complex and involves many factors. However, maximizing genetic diversity is frequently a priority. High levels of genetic diversity will improve the ability for the resulting restorations to adapt to future conditions, leaving them better protected against biological or climatic stressors.

Any effort to conserve or restore Ozark chinkapin has a higher likelihood of sustainable success if the distribution of genetic diversity across its geographic range is well characterized. This information can inform the structure of plant collection, breeding programs, and the eventual distribution of blight-resistant plant materials for restoration. Accordingly, University of Missouri researchers are first taking a thorough approach to finding Ozark chinkapin populations across its native range. With colleagues, we will study the genetic structure of these populations and reduce the studied plant populations down to a pool representative of the species' genetic variation. These plant selections will then be propagated and preserved in a field repository at the University of Missouri so they can be used in an organized breeding effort to develop blight resistant populations. We are currently organizing Ozark chinkapin collection trips for 2020. If you have information about plant populations in your area, please contact Dr. Ron Revord at r.revord@missouri.edu.



Photo credit: Ron Revord

Chinkapin or chinquapin?

According to Webster's dictionary, both forms of this tree's name are correct. Chinquapin is the older of the two spellings derived from an Algonkian word which meant *great seed*. The Ozark Chinquapin Foundation lays out the unique history of the name on their Facebook page saying:

Captain John Smith was the first person to record the name Chinkuapin in his 1624 General Historie of Virginia. In it Smith states, "They {the Indians} have a small fruit growing on little trees, husked like a chestnut, but the fruit most like a very small Acorne. This they call Chechinkuamins, which they esteeme a great daintie." The chinkuapins Smith observed were likely the Allegheny chinkapin based on geography.

Within the last decade, scientists determined the Allegheny (*Castanea pumila*) and Ozark (*Castanea ozarkensis*) chinkapins are different species. Therefore, it would be fitting to differentiate the two by spelling. Officially, both versions of the name are acceptable!

Range of the Ozark chinquapin



Image from: Ozark Chinquapin Foundation

Winter Weather and Wet Soil Conditions Hinder Missouri Logging

Lynn Barnickol, Consulting Forester

The storm of January 10, 11, and 12, 2020 produced torrential rain, ice, and snow that saturated soils. Foresters previously reported having timber sales on hold because of wet soils, and the recent precipitation events only magnified the problem of poor logging conditions. The rain and flooding during the summer of 2019 prevented mill yards from receiving the usual supply of logs for the winter, making the current moist soil conditions even more detrimental to the timber supply.

The Old Farmer's Almanac and NOAA Weather Service both predict below normal to seasonal temperatures and precipitation for the winter months of 2020. This offers hope of improved logging conditions, but Missouri weather is, as usual, difficult to predict.

When muddy conditions prevail, logging becomes difficult and can cause ruts which damage tree roots and the soil. The harvest of timber when soils are wet also causes additional maintenance problems for equipment. Hauling from mud-filled landings drags the wet, slick soil onto roads and presents a hazard for drivers. Processing mud-caked logs in the mills can damage the debarker teeth, saws, the carriage set works, chipper knives, and bearings and increase cost of production. Ultimately, muddy logs are friends to no one.

The best hope for improved logging conditions is freezing temperatures that allow some timber harvest to take place. For the logger, it likely means starting early in the morning when the ground is still frozen and quitting by noon when the surface thaws. Adding rock to soft places in forest roads and the entrance to highways can also help to contain mud. If weather and soil conditions do not quickly improve, there will be considerable pressure to get logs to mills or face lay-offs and slow-downs. Perhaps for now, it is best to continue planning for a future harvest but wait for better logging conditions. We can continue with management planning, forest inventories, and marking trees for sale knowing that when the weather breaks, the harvest will be of interest to loggers and mills.



Working on frozen ground reduces the formation of ruts and is less damaging to the soil.

Photo credit: Turner Logging, LLC



To avoid a poor situation later, anticipate wet soil conditions and have road rock delivered prior to hauling logs.

Photo credit: Doug Enyart, Clearwater Forest Consultants LLC



A Missouri Family's Experience Making Maple Syrup

John Stolwyk, Missouri Maple Syrup Initiative

Maple syrup was a major source of sugar for early Missourians, as cane sugar from the tropics was very expensive or unavailable and the beet industry of the great plains had not yet developed. Syrup, and the sugar from it, were commercially important in many rural areas. According to Missouri Bureau of Labor statistics, Missouri produced 16,317 gallons of maple syrup in 1870, 16,225 gallons in 1880, and 8,333 gallons in 1890. In addition to these amounts, large quantities of syrup were further processed into sugar. Missouri's syrup production today is only a fraction of those years and is mostly from family hobby operations such as ours.

Our family taps about 200 sugar maple trees on a remote tract of land in Cole County. We collect sap over a 4-6 week period beginning in mid-January. In a typical year, we make between 15 and 25 gallons of syrup for family and friends. The process starts by drilling a 5/16" hole, about 1" to 1.5" into the sapwood of each tree. We then insert a plastic spile for directing the sap into either plastic sacks hanging on the spile, or a short tube directing sap into a plastic bucket on the ground near the tree. We transfer the sap to 4 gallon cooking oil totes for transporting with our ATV and trailer out of the woods. Our first filtration occurs at this transfer to eliminate insects and bits of tree bark. Sap that freezes in the sap sacks eventually melts and we collect it when making the rounds. Sometimes the sap partially freezes in the buckets. This is a natural method of concentrating sugar, so we can simply discard the ice disk, provided that the bucket has not frozen throughout.

Maple sap requires some management to prevent spoilage, which can be a challenge during the highly variable Missouri winter weather conditions. Sap contains minerals, a variety of organic compounds, including up to 4% sugar, and often mold and bacteria, which could ruin the syrup. That's why it's important to store sap between 32 and 45 degrees Fahrenheit before boiling. The old adage is to treat sap like milk: if it can't be stored under these conditions, it may be best to begin boiling immediately after harvest or to freeze it. I know several Missouri syrup making families with large freezer capacity who freeze all their sap when collected. They wait for a weekend with pleasant spring weather when they can have a big overnight boil and make a social event out of the syrup making.

Our boiling site is at a farmhouse a few miles from our trees, so we have significant manual labor in lifting totes from the ATV to a truck and again onto the ground near our evaporator. However, totes give us some flexibility in sap temperature control; our totes are small enough that they can be moved into a garage to avoid freezing or warming in sunlight. I have met other Missouri syrup makers who collect their sap in large tanks and transport the tank to the boiling site on a tractor or truck. These large tanks can present a challenge in managing sap temperature.



Above: drilling hole into sapwood, Below: Sap dripping from spile



Boiling of sap to evaporate water

The process of boiling is simple: evaporate as much water as quickly as we can without overcooking or scorching the syrup to concentrate the sugar and flavor compounds. Typically, to make one gallon of syrup requires 40 gallons of sap. When we have collected at least 80 gallons of sap, we boil outdoors in large stainless-steel pans. These pans rest on a temporary concrete block structure on firm ground over a wood fire, and we add sap and firewood as needed. Missouri syrupmakers use a variety of boiling equipment, from a simple evaporator with steam table trays over a wood fire to elaborate commercial evaporators with temperature monitoring instruments capable of yielding syrup right "off the fire". Most Missouri syrupmakers use firewood; some very small producers may use a turkey fryer or camp stove fueled by propane.

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Because we don't have good temperature control over our wood fire, when we get the sap close to the desired density (when it is known as "nearup") we transfer the liquid to pots on the kitchen stove where we use digital thermometers and the hydrometer to determine when boiling is complete, which is at about 219-220 degrees F. A hydrometer is the superior method of determining syrup status; it is a calibrated device that floats in the liquid to indicate density. We also incorporate some old-timer methods of syrup-watching that confirm the instruments conclusions. We look at the type of bubbles that form on the syrup surface and how the syrup drops stretch into small "sheets" as they fall off a spoon.



Sap at 'nearup' finishes boiling on the stove

The process of boiling sap generates some impurities, known as maple nitre or sugar sand. It consists of small particles of sediment and soluble compounds, that will make syrup cloudy and causes an unpleasant texture on the tongue. There are two methods of eliminating sugar sand, settling or filtration. If the syrup is allowed to cool and remain still for a few days, most of these compounds will settle out, and the clearer portion of syrup can be decanted from the storage vessel. The drawbacks of this method are that 1) a significant portion of the syrup will be left at the bottom loaded with the sand, 2) syrup can begin molding when the sand is settling, and 3) the syrup will have to be reheated before bottling. Our alternative is to filter the syrup using special filters. We use a two-fabric, conical filter where the inner portion is a pellon fabric cone with an outer wool one. As we pour freshly finished syrup into the filter, the pellon filter clogs up with sand quickly, so we remove it and place another pellon liner into the wool filter. The liquid draining out of the wool filter is beautifully clear syrup, and the solids collected in the pellon are rinsed out so that the liner can be re-used. For storage of syrup, we bottle it in canning jars while it is still above 180 degrees, and it can be stored for years in this manner.



Left: syrup is filtered after boiling, Right: filtered syrup stored in jars. Note the range in color due to changes in sap chemistry. As the season progresses, sap gets darker and more flavorful.

**Hello!
My
Name is
John
Stolwyk**



I started the Missouri Maple Syrup Initiative in 2019 as an effort to encourage more Missourians to make syrup, with the goal of eventually establishing a network or association of producers. The Initiative website address is mosyrup.com and has helpful links for syrup making beginners, suggestions for those who might want to sell syrup, and photos and profiles of several Missouri syrupmakers. Please share information about the website with anyone who has sugar maple trees or has interest in this hobby. I also want Missouri syrupmakers to be aware of the Missouri Tapping blogsite on Mapletrader.com, which is where we can share information about our syrupmaking activities and ask questions. This is a great forum for building a communication network.

I look forward to working with University of Missouri Extension and the Center for Agroforestry to explore ways to increase Missouri's maple syrup production and perhaps formalizing communication among Missourians who participate in this "first harvest" each year.



Land of the Osages Research Center: Opportunity and Partnership at the Center for Agroforestry

Hannah Hemmelgarn, Center for Agroforestry, University of Missouri

Doug Allen, pictured right, was a tremendous friend and supporter of the Center for Agroforestry. On his passing, he bequeathed his farm and an endowment to support the farm to the University of Missouri Center for Agroforestry. This farm, now officially named the Land of the Osages Research Center, is the first new MU research center farm in over 30 years.



Doug's wishes for the farm to be a point of connection between the Center for Agroforestry and the people Native to this land is guiding the direction of this special place. On Tuesday, October 29th, MU and the Center for Agroforestry, with delegates from the Osage Nation including Chief Standing Bear and several members of the Osage Congress and Traditional Cultural Advisors, came together at the Land of the Osages Research Center to formally recognize this important new relationship.



The event featured an opening ceremony that paid tribute to the Center's partnership with the Osage Nation, including prayers from Osage singers, insightful and inspiring words from Chief Geoffrey Standing Bear, Osage Speaker Joe Tillman, Osage Traditional Cultural Advisors Chairman Norman Akers, MU Chancellor Alexander Cartwright, CAFNR Dean Chris

Daubert, and UMCA Director Sarah Lovell. Christopher Daubert, Dean of the College of Agriculture, Food and Natural Resources shared that "CAFNR is so proud to be opening the Land of the Osages Research Center... [the donor] wished to build a partnership between the Osage Nation and agroforestry, which is something CAFNR is thrilled to continue". Despite below freezing temperatures, nearly 200 people including representation from MU, the nearby community, supporters of the Center for Agroforestry, and the Osage Nation attended the morning grand opening ceremonies, a warm hearty lunch, and an afternoon field day, abbreviated due to weather.



"This is such an exciting day, and we're so thankful for Doug's willingness to pave the way for this center to become a reality" said Sarah Lovell, co-superintendent of the research center with Dusty Walter, and director of the University of Missouri Center for Agroforestry. "His gift will allow us to further our already strong agroforestry programs and research, as well as build collaborations with the Osage Nation." Lovell is also the current H.E. Garrett Endowed Chair Professor, established by Doug Allen in 2006. Future plans for the 550 acre Ozark farm include demonstration trials, internship opportunities and workshops with relevance to Osage partners and rural Missouri communities.

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Calendar of Events

11th Annual UMCA Agroforestry Symposium

January 30, 2020 | 8:30am – 6:00pm | University of Missouri Bond Life Sciences Center, Columbia, MO

This year's Agroforestry Symposium will focus on value-added processing for Missouri agriculture and forestry products. The keynote speaker, Lt. Governor Mike Kehoe, will be joined by knowledgeable presenters including Kiruba Krishnaswamy, Assistant Professor of Food Science and Bioengineering at the University of Missouri; Brian Hammons, President of Hammons Black Walnuts; Sara Low, Associate Professor of Regional Economics at MU; Nicola Macpherson of Ozark Forest Mushrooms, and many more. The symposium is free and open to the public, but advanced registration is requested: <http://www.centerforagroforestry.org/events/symposia.php>.

Food Tank 2020 Summit: The Wisdom of Indigenous Foodways

January 22, 2020 | Swette Center for Sustainable Food Systems | Scottsdale, AZ

Traditional indigenous knowledge is not front and center in most food system transformation conversations, and this needs to be rectified according to Food Tank, with the Swette Center and the Sustainable Community Food Systems Program at the University of Hawaii West Oahu. The summit will feature native voices in three hours on biodiversity, wild foods, landrace property rights, inspiring models of strength and innovation within indigenous communities, and much more. The summit will be livestreamed free online at <https://foodtank.com/events>.

Agroforestry in Action Webinar: The Appalachian Harvest Herb Hub

January 23, 2020 (rescheduled from December 18) | 11:00am CST | Center for Agroforestry | online

If you missed last month's webinar date, you're in luck; the scheduled date was postponed. Katie Commender will present on the Appalachian Harvest Herb Hub: Empowering Plant Conservation through Profitable Cultivation on January 23rd. Register for the webinar at <https://agroforestryinaction.wixsite.com/agroforestryinaction> to receive the login link. Past webinars are also available on this site.

Nutshell Webinar with Matt Wilson: Goals and Site Evaluation

January 28, 2020 | The Savanna Institute | Online webinar

Nutshell webinars are live, online discussions with experts on practical topics in agroforestry and perennial agriculture. Limited space is available; registration and more details are available at www.savannainstitute.org/events.html. Matt Wilson is the Small Farm Production Advisor at Grow Appalachia, and will share insights in this webinar about goals and site evaluation for agroforestry planning.

Missouri Nut Growers Association Annual Meeting and Nut Show

February 7-8, 2020 | Missouri Nut Growers Association | Jefferson City, MO

The MNGA annual meeting will take place at the Conservation Employees Credit Union (2901 W. Truman Blvd., Jefferson City, MO), with introductions, nut show results and awards, a season harvest report and marketing roundtable, and presentations. Presenters include Ron Revord, detailing hazelnut and pecan research at the Center for Agroforestry; Lupe Rios with a grafting demonstration; Rachel Owen sharing about the MU Soil Team and National Contest; and Doug Wallace, on soil health for nut growers. More information and RSVP at <https://missourinutgrowers.org/news>.

Calendar of Events Continued

Nutshell Webinar with Keefe Keeley: The Power & Opportunity of Agroforestry

February 11, 2020 | The Savanna Institute | Online webinar

Nutshell webinars are live, online discussions with experts on practical topics in agroforestry and perennial agriculture. Limited space is available; registration and more details are available at www.savannainstitute.org/events.html. Keefe Keeley, Co-Executive Director of the Savanna Institute, will share in this Nutshell about the impact and opportunities in agroforestry.

Midwest Cover Crops Council Annual Conference

February 11-12, 2020 | Midwest Cover Crops Council | KCI Expo Center, Kansas City, MO

The 2019 Annual MCCC Meeting (Feb. 11) and Conference (Feb. 12) will host numerous workshop sessions on crop production, livestock and grazing, environment and economics. Opportunities for networking and learning include a poster session, panels, seminars, and vendor exhibits. More information is available at <http://mccc.msu.edu/about/meetings/>.

Midwest Organic & Sustainable Education Service Farming Conference

February 27-29, 2020 | MOSES | La Crosse, WI

The Midwest Organic Farming Conference brings together farmers of all kinds to learn the latest organic production methods and build a supportive community with resilient sustainable farms. The weekend is packed with informative workshops, organic food, a bookstore and exhibit hall, roundtable sessions, and social gatherings. More information and registration at <https://mosesorganic.org/conference/>.

Great Lakes Indigenous Farming Conference

March 5-8, 2020 | White Earth Land Recovery Project | Callaway, MN

The 17th Annual Indigenous Farming Conference is focused on “Living the Good Life through Knowledge and Community” Mino-Bimaadiziwin-Gikendaasowin-Oodenang. Early bird registration is open until February 7th at <https://www.welrp.org/indigenous-farming-conference/>. Included in the program is the 3rd Annual Indigenous Hemp Conference, March 4th, also at the Maplelag Resort in Callaway, Minnesota. For IFC questions, call 218-375-2600 or email IFC@welrp.org. There are limited scholarships available for elders, locals, tribal members and students.

Midwest School for Beginning Apple Growers

March 6-8, 2020 | UW-Madison Center for Integrated Agricultural Systems | Madison, WI

This is an intensive three-day course demonstrating what it takes to set up and run a successful orchard business. The unique program combines knowledge from experienced growers and UW faculty, with opportunities to understand a holistic approach, and to network and learn from fellow orchardists and entrepreneurs. More information and registration at <https://www.cias.wisc.edu/midwest-school-for-beginning-apple-growers/>.

Soil Health Innovations Conference

March 30 – 31, 2020 | National Center for Appropriate Technology | Bozeman, MT

The National Center for Appropriate Technology (NCAT), with USDA Rural Development, Western Sustainable Agriculture Research and Education (SARE), and Montana State University, are cosponsors of the 2020 Soil Health Innovations Conference. Leading experts and innovative farmers from around the US will share the latest in soil science, best practices, and emerging technologies that are driving sustainable and regenerative agriculture. Topics include connections between soil and human health, large scale management for soil health and water management, regenerative grazing, biology based soil testing, markets for soil carbon sequestration, and much more. Information and registration is available at <https://soilinnovations.ncat.org/>.