

green horizons

Growing tomorrow's future today.

Spring 2017

A newsletter from the Center for Agroforestry in
conjunction with the Forest and Woodland Association of Missouri
<http://agebb.missouri.edu/agforest/index.htm>

Volume 21 • Number 2
Editors:
Mike Gold, Hank Stelzer and Megan Tyminski

White Oak, Whiskey, and Wine

Hank Stelzer, MU Extension - School of Natural Resources

From scattered woodlots across northern Missouri and throughout the deep forests of the Ozarks, white oak (*Quercus alba*) stave logs are crafted into some 1.5 million-plus barrels annually that then find their way into the rack houses of some of America and Scotland's premier distilleries, and Napa Valley wineries.

In addition to *Q. alba*, coopers (barrel makers) can also use chinkapin (*Q. muehlenbergii*) and swamp white oak (*Q. bicolor*) to make what is known as tight cooperage (barrels) that do not leak. The special anatomical structures these species possess that makes their barrels leak-proof are tyloses. These gum-like substances plug the early-wood pores of the heartwood and prevent the barrels from leaking.

The process of making a barrel begins where all other wood products begin; in the forest. White oak stave logs represent a small amount of the timber harvested in any one timber sale. It is generally less than ten percent on average in oak-hickory stands; the remainder of the harvested timber goes to grade lumber, flooring, railroad ties, pallets and blocking. Suitable white oak stave logs range from 8 feet to 20 feet in length, at least 11 inches in diameter as measured inside the bark at the small end, and are fairly free of defects such as knots. Only veneer logs command higher prices than stave logs.

continued on page 6



Promising Pawpaw

Zhen Cai and Michael Gold, MU Center for Agroforestry

Pawpaw (*Asimina triloba*) is the only temperate zone species in the tropical Custard Apple family (*Annonaceae*). Some of its southern cousins include the tropical fruits Cherimoya (*Annona cherimola*), Soursop (*Annona muricata*) and Custard Apple (*Annona reticulata*). Pawpaw is a common understory plant in hardwood forests of the Midwest and Mid-South eastward to the Mid-Atlantic States.

Pawpaw fruits have been consumed by Native Americans as a nutritious, seasonal food for millennia, and have also been used medicinally. American consumers are fascinated by pawpaws but have very little opportunity to purchase or taste them.

When grown as a grafted "cultivar" in full sunlight, it bears a large edible fruit with large seeds. The mature fruit is yellow or brown when ripe and has a bright yellow or orange custard-like creamy flesh. Its flavor is "tropical-like", described as a combination of banana, mango and pineapple and varies by cultivar.

Pawpaw are higher in protein than bananas, apples or oranges and are a good source of calcium, anti-oxidants, and vitamin C. Pawpaw protein contains all essential amino acids. The fatty acid profile is preferable to that of banana, containing 68% monounsaturated or polyunsaturated fats. Pawpaw is eaten fresh and can be processed into pulp and used fresh or frozen in products such as ice-cream, yogurt, beverages, muffins and pies. The downside to marketing pawpaw is that the fruit is highly perishable, with a short "perfect ripeness window" of only a couple of days at room temperature.

continued on page 9

IN THIS ISSUE

Forest Health	2, 3
Forest Management	4
Species Spotlight	5
Forest Products	6, 7
Urban Forestry	8
Agroforestry	9

The Grand River Basin Project: Hope for the Forests along Lower Locust Creek

Ken McCarty, Missouri State Parks

Pershing State Park, in southern Linn County, is a wetland jewel possessing remnants of every riverine natural community type once native to north Missouri... a rare combination of 2,400 acres native bottomland forest, 600 acres of cordgrass prairie, intermixed by shrub swamp, slough, marsh and oxbow lakes through which an un-fettered Locust Creek meanders.

However, in recent years, large, park-wide swaths of these mature, bottomland hardwood trees are dead or dying. Forest understories that once modelled the historic richness of bottomland woodlands in grasses, sedges and wildflowers are barren mudflats or are covered in reed canary grass and disturbance-tolerant plants. The water is gone, and boardwalk panels from the 1990's describing the birds and amphibians in a natural slough now face a mud-bottomed, silver maple thicket. Seasonal shows of perennial wildflowers and sedges that once defined the park's wet prairies are now known only from photographs. As a result, the area was dropped from Missouri's registry of natural areas.

These impacts are the result of changes on the landscape that began decades earlier. Meandering streams were straightened and channelized to improve drainage. Riparian corridors were narrowed to provide more acreage for agriculture. More water flowed over shorter distances with more energy resulting in severe erosion. Sediment and large woody debris swept down the system during high flow events. At the north end of the park, US 36 crosses the floodplain creating a pinch point when sediment and woody debris blocks Locust Creek creating avulsions that cut across the floodplain, flooding low-lying areas and depositing huge amounts of sediment.

Pershing State Park is just one example of the magnitude of this regional problem. The park is just one parcel in the sprawling 52,000-acre juncture of river floodplains where the Locust and East Yellow creeks join the Grand River in north Missouri. Those unusually broad river bottoms encompass 22,000 acres of natural and managed wetlands at Pershing State Park, Fountain Grove Conservation Area and Swan Lake National Wildlife Refuge, plus multiple private

duck clubs and Wetland Reserve Program project sites.

What's being done? Missouri's Departments of Natural Resources and Conservation have teamed up with the Kansas City District, US Army Corps of Engineers in a major Grand River Basin Project. Over the next two years, a deep examination of the issues behind this ecosystem degradation and stream problems in the lower Grand will produce choices for engineering solutions, with the report being the essential precursor to authorization and funding of construction projects to resolve some of the underlying causes.

Those involved in the Lower Grand's lands and resources welcome this cooperative initiative towards solving the natural resource and farmland loss, stream bank erosion, infrastructure threats, flooding and log jams that continue to challenge this area. For the natural wetlands and forests in Pershing State Park, the hope remains for Locust Creek to resume its meanders through a recovering belt of bottomland hardwood forest and cordgrass prairie with sloughs, marshes and shrub swamps no longer stretched beyond their native resiliency by trapped backwaters, logjams, or feet-thick layers of new mud and silt.



The narrowing and elimination of riparian forest buffers to provide more acreage for agriculture, and the straightening of streams in the Locust Creek watershed have caused increased flooding duration and magnitude resulting in the conversion of hard-mast pin oak forest (above) to lower quality silver maple and willow stands with a highly undesirable reed canary grass understory (below).



SWAT Team of Wasps Sent To Help Save Our Ash Trees

Sarah Phipps, Missouri Department of Agriculture

Tiny wasps swarm inside a clear plastic cup eager for release. A few drops of honey placed on the netting that enclosed the cups have provisioned them along their FedEx journey. These wasps are elite marksmen (...or in this case "markswomen") that have been brought to our state with a specialized role: seek out and find a certain tree-invading pest, the emerald ash borer (EAB).

In the early 2000's, when EAB was decimating millions of ash trees in southeastern Michigan, it seemed like a distant worry for Missouri. Flash forward to today where the green menace has set up shop in 34 Missouri counties and the City of St. Louis.

Controlling and managing for an invasive pest can be a challenging task, especially when the insect is fully established in an area prior to detection. To help counter the impact, natural enemies of EAB from the emerald ash borer's native range in Asia have been introduced into the United States to serve as a biological control.

The three biocontrol agents are a team of parasitoid wasps whose offspring consume the eggs and larvae of EAB. These stingless wasps are harmless to humans and tiny; the largest species is the size of a mosquito. The egg parasitoid, *Oobius agrili*, locates an EAB egg in the bark crevices. The wasp then will insert a single egg into the EAB egg, parasitizing them before given the opportunity to hatch. The two larval parasitoids are *Tetrastichus planipennisi* and *Spathius agrili*. Females walk along the bark to detect vibrations from feeding EAB larvae. Then they lay multiple eggs on or in the EAB larvae and consume the EAB larvae in seven to ten days.

Since 2012, the Missouri Department of Agriculture (MDA), in cooperation with the U.S. Department of Agriculture (USDA), has released over 197,000 wasps at 17 sites in Clay, Platte, Pulaski, St. Charles and Wayne Counties, and the City of St. Louis. The wasps are provided by the USDA-APHIS Biocontrol Production Facility in Brighton, Mich. At least 21 other states with EAB have released parasitoid wasps thus far.

An environmental assessment of the three parasitoid wasps was completed by the USDA to evaluate the risk of non-target damage. To test for specificity, the parasitic wasps were offered insects that are related to EAB or share the same habitat or environmental niche. The USDA concluded that the three selected parasitic wasps are acceptably host-specific and are not expected to attack other insect species besides EAB with the exception of some incidental attack of other wood-boring beetles in the same genus as EAB (*Agrilus*).

To survey for establishment of the parasitoids, wasps were collected by means of yellow pan traps which were adhered to the side of trees in areas where wasps were released from previous years. The color yellow is used since many adult bee and wasp species are attracted to this color. MDA recently received confirmation that



Biocontrol release of parasitoid wasps in Wayne County (March 27, 2012). Photo credit: Collin Wamsley

T. planipennisi, has successfully established in Wayne County.

These little wasps are not a silver bullet for controlling EAB, but they serve as a tool to help in the long-term management strategy to lessen the impact of EAB. With the prospect of losing many more of our ash trees to EAB, it is good to have as many tools as possible. However, educating the public is the most important strategy since humans are the ones most responsible for the spread of EAB.

People can help prevent pests from moving and prolong the introduction of EAB to areas of the state not yet infested by following some simple practices like burning local firewood and purchasing wood for woodworking projects from a local source. Scientists recommend not moving untreated wood farther than 50 miles from where it was harvested, to prevent long distance movement of forest pests. It may be too late to prevent EAB from getting into our state, but it is not too late to prevent other invasive pests from taking residence in Missouri.

More information about Missouri's Emerald Ash Borer Biocontrol Program can be found at:

<http://extension.missouri.edu/treepests/documents/FAQbiocontrol.pdf>

https://www.aphis.usda.gov/publications/plant_health/2014/faq_eab_biocontrol.pdf

Missouri Walnut Council Hosts Woodland Conference

By Bob Ball, Missouri Chapter - Walnut Council and Other Fine Hardwoods



Over one-hundred woodland landowners, foresters, industry specialists and natural resource agency personnel gathered at the Missouri Farm Bureau Center in Jefferson City April 4th and 5th to learn how to grow and manage fine hardwoods. Both days were in a classroom setting listening to and interacting with professionals and landowners speaking on a variety of woodland management topics.

Lisa Allen, State Forester, Missouri Department of Conservation (MDC) kicked off the conference highlighting recent Forestry Division activities. MDC Forest Program Supervisor, Steve Westin, then explained the Missouri Managed Woods program; a vastly improved version of the state's outdated Forest Cropland Law. Other morning presentations covered tree identification tips, managing hardwoods for both timber and wildlife, planning for a successful tree planting. First-day afternoon speakers discussed using cover crops to improve soil health, safety in the woods, and the importance of including the correct herbicides for preparing tree planting sites, using herbicides in woodland management and considerations in buying sprayers for both tree planting and timber stand improvement projects. The first day concluded with a panel discussion on financial assistance opportunities

for landowners by representatives of MDC, Missouri Department of Natural Resources and USDA-NRCS.

The second day of the conference began with planning for passing one's woodland on to his/her heirs. Next up was an insightful presentation on the economic importance of the oak species, past land management practices that have led to a lack of sufficient regeneration, and the importance of active forest management for ensuring the presence of the species on the landscape. Planning for a successful timber sale generated a number of questions from conference participants. After lunch, attendees learned how various online mapping tools could assist them in managing their land. The presentation on timber taxes and timber basis really opened many eyes; especially the importance of selling one's timber "on the stump" and to establish a timber basis in order to reap the benefits of capital gains treatment when it comes time to pay the IRS. Bottom line: Get a professional forester involved in your timber sale!

Another conference highlight were panel discussions. One panel of consulting foresters gave attendees every opportunity to ask questions about how to manage your woods, plus an overview of their fees and services. The second panel of landowners offered their advice and tips based on personal experiences managing woodlands. The conference concluded with a third panel on where to find technical assistance with panelists from several natural resource agencies and nonprofit organizations.

Conference attendees enjoyed the opportunity to visit with several exhibitors: Mike Hoffmann, Executive Director, Forest and Woodland Association of Missouri; Carol Davit, Executive Director, Missouri Prairie Foundation who was manning the "Grow Native" display; Scott Brundage, Consulting Forester, Walnut Council; Jerry Van Sambeek, Forester, Missouri Nut Growers Association; and Mike Gold, Interim Director, University of Missouri Center for Agroforestry.

The meeting agenda and speaker PowerPoint presentations can be found at the Walnut Council website: <http://www.walnutcouncil.org/statechapters/missouri.html>.



White Oak

Hank Stelzer, MU Extension – School of Natural Resources

White oak (*Quercus alba*) is one of the preeminent hardwoods of eastern and central North America. It can be found from Minnesota, Ontario, Quebec, and Nova Scotia south as far as northern Florida and eastern Texas.

Q. alba typically reaches heights of 80 to 100 feet at maturity, and its canopy can become quite massive if growing in a wide-open space, such as a field.

White oak may live 200 to 300 years, with some even older specimens known. Estimated at over 600 years old, the Great White Oak in Basking Ridge, New Jersey, was claimed to be the oldest in the United States. It measured 16 feet in circumference four feet above the ground, was 75 feet tall, and its branches spread over 125 feet from tip to tip. Unfortunately, it had been in decline for a number of years and was taken down this past winter.



Images of leaf, winter bud, acorns, and bark of white oak. Images courtesy of Paul Wray, Iowa State University, and Chris Evan, University of Illinois, Bugwood.org.

Leaves. Alternate, five to nine inches long, three to four inches wide. Oblong shape, seven to nine, rounded lobes; sinuses are rounded as well and their depth can vary from shallow to deep. The white oak is the only known food plant of the *Bucculatrix luteella* and *Bucculatrix ochrisuffusa* caterpillars. Leaves usually turn red or even purple in autumn.

Winter buds. Reddish brown, obtuse, one-eighth of an inch long.

Acorns. Sessile or stalked; nut ovoid or oblong, round at the apex, light brown, shiny, three-quarters to an inch long; cap encloses about one-fourth of the nut. White oak acorns have no dormancy, sending down a taproot in the fall with the leaves and stem appearing the next spring. The acorns take only one growing season to develop unlike a red oak acorn, which require two years for maturation. The acorns are much less bitter than the acorns of red oaks, making them a valuable wildlife food; notably for turkeys, wood ducks, pheasants, grackles, jays, nuthatches, thrushes, woodpeckers, rabbits, squirrels, and deer.

Bark. Light gray, varying to dark gray and to white; shallow fissured and scaly. A distinguishing feature of

this tree is that a little over halfway up the trunk the bark tends to form overlapping scales that are easily noticed and aid in identification.

Wood. Light brown with paler sapwood; strong, tough, heavy, fine-grained and durable. One cubic foot of wood weighs 46.35 pounds. White oak has tyloses that give the wood a closed cellular structure. Because of this characteristic, white oak is used by coopers to make wine and whiskey barrels as the wood resists leaking. It is also used in construction, shipbuilding, agricultural implements, and in the interior finishing of houses. The USS Constitution is made of white oak and southern live oak, conferring additional resistance to cannon fire. Reconstructive wood replacement of white oak parts comes from a special grove of *Quercus alba* known as the "Constitution Grove" at Naval Surface Warfare Center Crane Division in Martin County, Indiana.

State Tree. *Q. alba* serves as the state tree for Connecticut, Illinois, and Maryland. Being the subject of a legend as old as the colony itself, the Charter Oak of Hartford, Connecticut is one of the most famous white oaks in America. An image of the tree adorns the reverse side of the Connecticut state quarter.

White Oak, Whiskey, and Wine

continued from page 1



Quarter-sawn stave bolts (left) are sawed into flat stave blanks and trimmed of defects. The blanks either go into header blanks for the top and bottom of the barrel (top right) or into stave blanks (lower right). The cross-section of each stave is a trapezoid and the wider in the middle to give the barrel its barrel shape.

At the stave mill, logs are cut into approximately 39-inch lengths that are quartered lengthwise into four bolts. The quartered stave bolts are then sawn into flat, “quarter-sawn” stave blanks. Stave blanks are vary in width after defects are trimmed off the edges. Heading bolts (to make the top and bottom of the barrels) are about 20 inches long and are quartered from either larger-diameter logs or from stave bolts that have been trimmed of defects, such as knots.

Stave and header blanks for wine barrels are air-dried for 24 to 36 **months** to allow the tannins in the wood to break down, mellowing the oak in a manner that kiln-drying cannot replicate. Staves used in whiskey barrels, however, are commonly air dried for 30 to 40 **days** and finished in a dry kiln.

Header and stave blanks are planed to bring back the lighter color of the wood and help the finished barrel become more resistant to outside influences. After planing, the end user’s address usually determines whether the barrel is assembled in Missouri or not. It all has to do with transportation costs. If you think about it, you can pack more wine barrel ‘kits’ on a semi destined for the Napa Valley or in a container for oversea markets compared to finished barrels. But, whether in the Show-Me State or in some far away cooperage, the process is basically the same.

To make the headers, a machine drills holes into the sides of the header planks and inserts wooden dowel pins on one side. The boards are then doweled together to a square shape of flat oak wood. No glue is used as this would impart unnatural flavors to the spirits and

wine. This square is then cut into a perfect circle with a rounded edge. The final step in making the headers is charring or toasting. More on this step in a bit.

Stave blanks, on the other hand, are milled into a very complex shape. The cross-section of the final stave is a trapezoid, because the barrel inside circumference is smaller than the outside. Further, the top and bottom of the stave is narrower than the middle, because the barrel is wider in the middle than on the top and bottom.

The most crucial step in making a barrel is the barrel raising. Every barrel raiser assembles 31 to 33 wide and narrow staves into a temporary steel ring that holds the staves into place. He or she has to make sure the wide and narrow staves are distributed evenly around the circle otherwise the forces that hold the barrel together will also be uneven. In that case, the areas with less pressure are likely to leak.

If one were now to simply bend the barrel into shape, the staves would break. To make the staves pliable, the raised barrel is placed upside down with the wide end to the bottom and either placed over an open fire or hot steam is blown through the staves. A second temporary steel ring is then added giving the barrel its eventual final shape. Two more steel rings are added and the barrel now heads to the heat treatment.

The barrel’s next stop is the toasting area. If the barrel is destined for a winery, the inside of the barrel is heated to a specific temperature imparting a light, medium or dark toast to the wood according to the winery’s exact specifications. It is this toasting process that produces the “roasted” aroma in wine.



The barrel raiser brings together 31-33 staves into a temporary steel ring (top left). The raised barrel is then heat-treated by fire or steam (lower left) to allow the staves to be bent into the barrel's final shape. Whiskey barrels are heavily charred whereas wine barrels receive a lighter toasting (top right). Once the top and bottom headers are installed, the hooper (lower center) puts the finished hoops in place. To maximize shipping space, wine barrels are shipped as kits to be assembled at their destination. Missouri's whiskey barrels need only travel to Kentucky and can be shipped fully assembled.

The toasting also enhances the presence of vanillin and creates smokey and spicy notes similar to the oil of cloves.

If the barrel is destined to hold freshly distilled “white dog” whiskey, then the inside of the barrel receives a more severe heat treatment called charring. This is done far hotter and shorter than the toasting. And while the toasting goes deep into the wood, the charring burns only the very top of the wood surface. This charcoal acts like a filter, reacting with the sharp substances of the white dog. The intense heat during the charring process creates a caramelized layer from the natural sugars present in the wood. This layer is responsible for the bourbon’s amber color and caramel and butterscotch flavors. Each year of the aging process, it is the expansion of the whiskey into the wood during the hot summer months and its return back into the barrel during the cold winter months that adds more color and flavor to the spirits.

But, before that complex chemical dance can begin, the final steps in the coopering process must be done.

First, the charred barrel must be cooled down. During the cooling process the barrel shrinks. If one were to put on the finished hoops before the barrel was cool, it would shrink and the hoops would fall off resulting in a collapse of the barrel! After cooling,

a groove is milled into the inside outer ends of the barrels and the prepared headers are joined with the rest of the barrel.

Finally, the heavy, temporary hoops are replaced by thin, metal hoops; pressed down by a machine called the hooper. Because wines are more acidic than spirits, galvanized hoops are used. Wine barrels are sanded smooth for appearance.

The last steps are adding the bunghole and checking for leaks. The bunghole is the entrance and exit for the wine or whiskey. It is placed on the side of the barrel right in the middle of a wide stave. Right after drilling, a gallon of water is filled into the barrel and then rotated, so the water touches all the staves inside. The barrel is then pressurized. If there is a leak, one will see bubbles of water forming at the leak. If the barrel passes the pressure test, a temporary plastic bung is added and the barrel is off to the semi or to be filled. If a barrel does not pass the pressure test, it goes to the cooper station where the most experienced coopers repair the defective headers or staves.

Demand for barrels is increasing with more and more craft distilleries, wineries, and even breweries coming online every day. So, the next time you raise a glass of your favorite fermented beverage or distilled spirit, propose a toast to the Missouri white oaks!

MULCH! A Good Thing For Landscape Trees

Gene Brunk, Missouri Community Forestry Council

Most folks know that mulching around the base of a desirable plant is a good thing. Mulching around a landscape tree is no exception; in many cases, **mulch is a tree's best friend**. The benefits of mulch covering all or part of a tree's root zone can be extremely important to the overall health of that tree. Mulch can reduce soil moisture loss, control weed and grass competition, protect the trunk from lawnmowers and weed whips, and improve soil structure. Mulch also gives landscapes a well-groomed appearance.

However, as valuable as mulch is to a tree's well-being, it can be harmful if applied incorrectly or too deep; or if the wrong material is used.

There are two general types of mulch: organic and inorganic. Organic mulch includes wood chips, pine needles, shredded bark, nut shells, compost mixes, and leaves. Composted wood chips (aged, exposed to aeration), mixed with other composted organics, is the best material for mulching around trees. Some organic materials such as sawdust, straw, freshly cut chips and chips aged in poorly aerated piles are not recommended.

Inorganic mulches include decorative stone, lava rock, pulverized tires, and geotextile fabrics. Such mulches are useful in xeriscape settings and high traffic areas. However, they do not make for good mulch around trees because these materials can reflect radiated heat high enough to kill thin-barked species.

Proper application of mulch is just as important as the type of mulch.

Do not overdo it.

A good rule of thumb is apply two to four inches of mulch in well-drained soils; a little less in poorly drained areas. Replace as necessary (due to decomposition) to maintain the proper depth.

Make the mulch ring as large as possible.

Extending the mulch to the edge of the tree crown is preferred. However, if that takes up more room in your landscape than you desire, then try to have at least a four-foot diameter mulch ring around the tree.

No volcanos!

Do not pile mulch against the tree trunk. Pull mulch back several inches from the base of the trunk so the base of the trunk and top of the root crown are exposed. The mulch ring should resemble a "doughnut" shape rather than a "volcano."

Volcano mulching has been a tree care problem for many years and it seems to be getting worse due to misunderstandings of its ill-effects among landscape and lawn care maintenance people, and homeowners. The Missouri Community Council is piloting a public information campaign aimed at discouraging this undesirable and damaging practice in the Springfield area. Preliminary results indicate the campaign should be expanded statewide.



Image on left is an example of a good mulch ring; at least four feet in diameter, two to four inches deep and arranged in shape of a donut with root flare exposed. Image on right is an example of "volcano" mulching, a practice discouraged by the Missouri Community Forestry Council.



Promising Pawpaw

continued from page 1

In Missouri and other regions of the Eastern USA, pawpaw has the potential to become a high-value, specialty niche crop with multiple avenues for commercialization. Limited data indicate that the market price trend of pawpaw is increasing. In 2015, pawpaw prices were reported to reach \$4.50 per pound in Rhode Island, a 37% increase from 2009 (\$3.28 per pound). Pawpaw orchards can be profitable at wholesale prices greater than \$1.60 per pound. In terms of value-added products (VAPs), like pawpaw muffins, there appears to be good consumer acceptance.

However, prior to becoming a successful specialty niche crop, a large amount of information will be required to reduce producer risk. This includes detailed, long-term pawpaw production and yield information, economic returns, market opportunities and risks, and increased consumer familiarity and acceptance of pawpaw and pawpaw VAPs.

Research scientists with the MU Center for Agroforestry conducted a preliminary studies that collected pawpaw yield data and documented the potential of the Missouri pawpaw market. Their consumer survey results suggested consumer awareness about pawpaw was minimal with approximately 70% of the surveyed consumers never having purchased pawpaw before taking the survey. In contrast to their unfamiliarity with the pawpaw fruit, 93% of the consumers who sampled pawpaw indicated that they would buy pawpaw. These findings indicate the need for more detailed, up-to-date market information to provide sound marketing guidance for current and future Missouri pawpaw producers.

In 2017, the Center for Agroforestry conducted two nationwide surveys to examine the current and potential pawpaw market along with consumer preferences by surveying pawpaw market participants across the value chain and pawpaw consumers, respectively.

Results from the market participant survey indicate that the pawpaw industry has many small-scale market participants and the majority of the participants operate their business as hobbies. Challenges in the industry include lack of production knowledge and skills, short shelf life of fresh pawpaws, and lack of



Test marketing pawpaw at the Columbia Farmers Market

public awareness. Market participants indicated that the pawpaw industry has low levels of competition and there are very few substitutes for pawpaws. Future market demand and product prices are expected to increase.

Results from the consumer survey indicate that consumers' knowledge of pawpaw nutrition does not affect their purchase preferences. Consumers who know that pawpaws are perishable are less likely to purchase pawpaws compared to consumers who lack this information. They prefer organic-certified and pesticide free production compared with pawpaws produced using chemical fertilizers, pesticides or herbicides. Strong preferences were noted for locally produced pawpaw.

Average consumer willingness-to-pay price premiums for organic-certified, pesticide free-certified, and locally produced pawpaw are \$1.72, \$1.40 and \$2.11 per pound (compared to non-certified, non-certified, and unknown origin), respectively. Findings also suggest significant opportunity for future growth of the pawpaw industry. Information on pawpaw production skills and increased consumer education is needed for market growth.

green horizons

editorial board

Megan Tyminski, co-editor
MU Center for Agroforestry

Joe Alley, Resource Conservationist
NRCS, MO SAF

Scott Brundage, Consulting Forester

Eugene L. Brunk, MDC Retiree

Donna Coble, Executive Director
Forest ReLeaf of Missouri

Lynn Barnickol, Executive Director,
Missouri Consulting Foresters Association
Shibu Jose, Professor, Director,
MU Center for Agroforestry

Rebecca Landewe, Current River Project
Manager
The Nature Conservancy – Missouri

Dennis Evans, Chair,
Missouri Walnut Council

Steven Westin,
MDC Private Land Forestry Programs

Clell Solomon,
Mo. Christmas Tree Producers Association

Robert Stout
Mo. Department of Natural Resources
Kim Young, Vice President/General Manager
Forrest Keeling Nursery
Bob Ball, Woodland Landowner

Ann Koenig, Urban Forester
Missouri Department of Conservation

Sarah Phipps
Missouri Dept of Agriculture

Matt Jones, Vice Chair
Missouri Tree Farm Committee

CONTRIBUTORS

CONTACT GREEN HORIZONS

Send story ideas, address
changes and subscription requests
for Green Horizons to:

Mike Gold, Hank Stelzer, co-editors
Green Horizons
University of Missouri
203 ABNR
Columbia, MO 65211

goldm@missouri.edu | (573) 884-1448
stelzerh@missouri.edu | (573) 882-4444

Issued in furtherance of Cooperative Extension Work Acts of May 8 and June 30, 1914, in cooperation with the United States Department of Agriculture. Dr. Michael Ouart, Vice Provost and Director, Cooperative Extension, University of Missouri, Columbia, MO 65211. University of Missouri Extension does not discriminate on the basis of race, color, national origin, sex, sexual orientation, religion, age, disability or status as a Vietnam era veteran in employment or programs. If you have special needs as addressed by the Americans with Disabilities Act and need this publication in an alternative format, write ADA Officer, Extension and Agricultural Information, 1-98 Agriculture Building, Columbia, MO 65211, or call (573) 882-7216. Reasonable efforts will be made to accommodate your special needs.

UNIVERSITY OF MISSOURI
Extension



**MISSOURI
DEPARTMENT OF
NATURAL RESOURCES**



School of Natural Resources
College of Agriculture, Food and Natural Resources



Missouri Tree Farm News

Matt Jones, Missouri Tree Farm Committee

National Leadership Conference. The Tree Farm National Leadership Conference was held February 22-24 in Greenville, South Carolina. Representing the Missouri Tree Farm Committee were Mike Hoffmann, Executive Director of the Forest and Woodland Association of Missouri; Mike Morris, MDC Tree Farm Advisor; Matt Jones, Vice-chair of the committee; and Jim Ball, 2017 Missouri Tree Farmer of the Year. A key goal of the Missouri Committee is to get more Tree Farmer involvement and we were glad Jim could make the trip.

The most interesting presentation at the conference was outreach effort to minority landowners in South Carolina. A coalition developed the Sustainable Forestry and Land Retention Program that is bringing together a wide range of federal and state agencies, industry and conservation partners to help African American forest landowners retain their lands and experience the benefits of forestry. The program has been a great success in the limited focus area and has brought many enthusiastic minority forest landowners into the Tree Farm program.

Third Party Assessment. As part of being a Forest Certification Program, the American Forest Foundation (AFF) is audited every year to make sure they are meeting the certification requirements. Field audits for any given state occur every three years. Missouri will be audited in 2018. Auditors from Pricewaterhouse Coopers (sic) will inspect several randomly selected Tree Farms to make sure they comply with the AFF Standards. They will also look at the structure of the state committee and inspect our database to make sure it is up to snuff. We should be in good shape, but the committee will spend considerable time this year getting things in order.

2017 Missouri Tree Farm Conference. On May 19th and 20th, Jim Ball hosted the annual Tree Farm Conference at his Tree Farm in Caldwell County near Chillicothe, Missouri. Jim had quite a few things to show attendees. But, the most interesting discovery was some apparent herbicide damage to his walnut trees. At the time of this writing, state agricultural authorities are investigating potential herbicide drift from an adjoining neighbor.

The Bid Box

Hank Stelzer, MU Extension – School of Natural Resources

It is a straightforward Bid Box this time around.

Cape Girardeau County, Missouri

- 40 acres
- 324 marked trees
- Estimated volume: 93,656 bd. ft. (International Scale)
 - Over 80% of the volume was in black oak, yellow-poplar, and northern red oak
- Good access to most of the timber along a highway frontage
- 18-month contract period (most contract periods are 12 months)
- Forester valued the sale at \$21,000
- Four bids received
 - \$27,160.24
 - \$22,150.00
 - \$18,030.00
 - \$13,250.00
- Landowner took the high bid
- Return: \$679 per acre

green horizons

The Center for Agroforestry at the University of Missouri
203 Anheuser-Busch Natural Resources Bldg.
Columbia, MO 65211

Calendar of Events

Chestnut Growers of America 2017 Annual Meeting

June 9-11 | Carrollton, Ohio

SHARE: Catch up with fellow growers at social events, share tips and resources, and enjoy great food. LEARN: Hear presentations from industry experts, tour the Route 9 Cooperative chestnut packing facility, orchards, nurseries, seedling trials, and more. PARTICIPATE: Vote on CGA business and share your ideas to grow our organization. For more information or to register, visit: <http://www.chestnutgrowers.org/>

Walnut Council National Meeting

June 11-14 | Courtyard by Marriott, Lafayette, Indiana

Hosted by Hardwood Tree Improvement & Regeneration Center at Purdue University

To register, mail in the enclosed application with a check or register online with a credit card at <http://2017walnutcouncil.eventbrite.com>.

Thousand Cankers Disease Research & Management Operational Meeting

June 13-15 | Lafayette, IN

The purpose of the meeting is to receive and review all survey, research and regulatory activity of the impacted states and agencies. A goal is to determine and suggest direction for TCD research, management and regulation.

For more information, contact: Phillip T. Marshall at 812-358-9034 or PMarshall@dnr.IN.gov

North American Agroforestry Conference

June 26-29 | Virginia Tech Squires Student Center, Blacksburg, Virginia

Agroforestry for a Vibrant Future: Connecting People, Creating Livelihoods, Sustaining Places

The 15th North American Agroforestry Conference is for agroforestry producers, researchers, educators and those involved with related work in the fields of permaculture and agroecology.

Agroforestry Academy

July 23-28 | Columbia, MO

A week-long training that includes integrated classroom workshops, multiple on-farm visits, hands-on demonstrations and content integration into practical on-farm agroforestry planning and design to advance adoption of agroforestry as a cornerstone of productive land use.

For more information, visit:

<http://www.centerforagroforestry.org/academy/>

Managing Your Woodland for Health and Productivity

September 19th, 26th and October 3rd | Eldon, Missouri

First session will focus on why various tree species grow where they do in the forest, forest health, and where to get online information about your woodland. Second session will give you the knowledge to turn your neglected woodland into a healthy and productive forest. The final session will focus on how you can get the highest price for your timber when it is time to harvest trees and leave a healthy forest for future generations, and how to manage your timber sale tax. Sign up for one or all three sessions. Cost is \$25 per person (\$30 per couple) for EACH session. To register, contact Patricia Barrett, Miller County Extension Center, barrettpr@missouri.edu, (573) 369-2394

Wood, Whiskey and Wine Tour

October 28

A fun and informative Mid-Missouri tour that will take attendees from the beginning of a spirit/wine barrel in the woods, through the barrel-making process, and ending with a taste of the cooper's and vintner's efforts! For more information, contact Hank Stelzer, stelzerh@missouri.edu, (573) 882-4444.



The Center for Agroforestry
University of Missouri

A Global Center for Agroforestry, Entrepreneurship and the Environment