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Agroforestry Curriculum for Missouri High School Educators: Exposing Future Agricultural Science and FFA Students to New Career Options

By Hannah Hemmelgarn and Michael Gold, University of Missouri, Center for Agroforestry

A key component of the University of Missouri Center for Agroforestry's (UMCA) mission is the education and training of those who are "empowered to make a difference locally, regionally, and globally" for the "long-term future of rural and urban working farms and forests". Ongoing education and outreach efforts vary in breadth and depth and include field days, conferences, webinars, intensive trainings (e.g., Agroforestry Academy), and an online graduate certificate and master's program. Key target audiences include landowners, natural resource professionals and a wide variety of educators who work in outreach and extension.

In 2016, the Center for Agroforestry's education efforts branched out to reach a new audience: high school agricultural science and FFA educators and students. For over a decade, agricultural education research has recommended a greater focus on "sustainable agriculture" practices in high school agricultural education programs in which students can obtain a foundational understanding of the subject area. However, agroforestry, whose economic, environmental, and social benefits include new career opportunities, greater farm resiliency, increased carbon sequestration, habitat diversification and improved soil and water conservation, has yet to enter the high school arena, until now.

Over the past year, graduate research assistant and agroforestry masters candidate Hannah Hemmelgarn applied her experiential education background to create an agroforestry curriculum unit and teacher training program for the state of Missouri. The unit includes two modules that provide an overview of the five recognized temperate agroforestry practices, and opportunities for students to apply problemsolving skills for planning and management for agroforestry on diversified farms. In July, 2016, Hemmelgarn, with Dr. Michael Gold and Dr. Hank Stelzer, held the first Agroforestry Summer Institute to train a group of 15 high school agricultural educators from across the state to use the curriculum materials. The agroforestry unit, with extended resources, will be included in the FFA-DESE statewide curriculum materials starting fall 2017.

In addition, Hemmelgarn and her team of advisors, Dr. Michael Gold, Dr. Hank Stelzer, and Dr. Anna Ball were awarded a \$70,334 Sustainable Agriculture Research and Education (SARE) Professional Development Program grant to continue the project over the next three years. During that time, the group will expand the curriculum, and train a total of 90 Missouri high school agricultural educators, who in turn will reach thousands of high school agriculture science and FFA students. SARE has formally recognized the project as "the 2016 Paula Ford Professional Development Program Proposal of the Year".

More than half of the students who participate in the Missouri's high school agricultural education program will pursue careers and further education in the field (2015 MO Ag. Ed. Report). Exposing young people to agroforestry practices broadens their understanding of what constitutes a "sustainable agriculture". UMCA aims not only to expose high school students to these concepts, but also to grow a network of agroforestry educators and practitioners. In addition to collaboration with Missouri High School educators, the MU SARE PDP project is partnering with the Savanna Institute (http://www.savannainstitute.org) to grow the knowledge networks for teachers and students using the Savanna Institute's "Perennial Map" (www.perennialmap. org). The Savanna Institute is a 501(c)(3) nonprofit organization focused on production agroforestry in the Midwest US working in collaboration with farmers and scientists to develop perennial food and fodder crops within multifunctional polyculture systems grounded in ecology and inspired by the savanna biome. This online map will locate growers and buyers, researchers and supporters of agroforestrybased products. Looking into the future, the hope is to expand the distribution of these agroforestry educational materials to high schools throughout the US and Canada.

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Mushrooms--From Your Woodlot to the Market Place

By Gregory O. Mori, University of Missouri Center for Agroforestry

Early last year, I shared with Green Horizon's readers some thoughts on the potential benefits of forest-farmed mushrooms (Volume 20, Page 5). We thought it timely to present some additional information on marketing shiitake and other woods-grown mushrooms. Whether you are a small farm adding Shiitake mushrooms as an additional crop or you are approaching shiitake cultivation as a primary enterprise, making it profitable depends both on how efficiently the operation is run and your access to adequate markets.

It is recommended, at least initially, that you structure your log-grown mushroom operation around shiitake as a proven producer with solid market potential. Other mushrooms that can also be grown in a forest farming operation, such as oyster, wine-cap, or more challenging species, such as Lion's Mane, Reishi and Maitake, can be added and expanded as you become more successful at growing and marketing them. After having made the investment and done all the hard work to start producing mushrooms, make sure you don't only then begin asking yourself: "Great, now where am I going to sell them?" As with most any enterprise, it is important to have a thorough understanding of the actual market conditions from the beginning.

Performing a market assessment is essential. This involves a comprehensive analysis of the current environment in which you intend to sell. Ask questions about where and how you sell your product, and who are your customers? Get to know your customers and understand them! How will your product be distributed? What does the competition look like? You may find that the area you are targeting already has many other existing producers or is fully saturated. What are the market trends? Is there untapped potential in the market, do trends look favorable for further expanding the market? Also, make sure you are fully aware of any regulations in your area that might impact your ability to grow and sell mushrooms.

The reality is, your market assessment is never "done." Regular monitoring of market trends and opportunities should be an ongoing effort. Sales is but one, albeit important, component of your marketing efforts. In addition, you will need to consider packaging, presentation, pricing and how to promote and position your product.

Shiitake producers can sell their product at many venues and through many channels. Ask yourself, will you be selling directly to consumers at farmer's markets, at your farm stand or through some other channel such as online sales? The highest prices can be obtained through direct sales at farmer's markets or farm stand sales. Prices can range between \$8 - \$15/lb, with some growers getting as high as \$20/lb in larger east coast cities. However, \$10-12/lb is probably more realistic for most growers. As in all things, refining your packaging, presentation and sales finesse can make a big difference in attracting buyers and obtaining the best prices. All of these take considerable time and effort.

Getting those premium prices, requires engagement with your customers and public education about the su-

perior taste and quality of log-grown mushrooms as well as the many health benefits (cite actual research that documents these). Other options for marketing your product include developing accounts with local restaurants, hotels, gourmet food shops and grocery stores. Remember though, as a producer of log-grown mushrooms, you are always competing against larger indoor commercial sawdust-grown operations able to place a consistent supply of lower priced (but lesser quality) products in the supermarkets. A grower ready to scale up production to larger volumes might consider seeking a wholesale arrangement with a produce distributor. I regularly check in with a grower running a 3,000 log operation who doesn't enjoy direct marketing and engagement with the public. Instead, he has secured a stable contract with a regional produce distributor/trucking company and sells nearly all his production, granted at a lower than retail price, through that channel. He spends almost no time on marketing or engaging with customers. Nice work if you can get it, but with "all his eggs in one basket" he is at significant risk should he ever lose that contract. The reality is, most producers will need to devote significant time and effort to the full range of marketing activities.

Remember also, shiitake mushrooms are easily dried and can be packaged and sold in this form (preferred by many Asian consumers) or further processed into soup mixes, tinctures or other value-added products. Some growers have also added to their business by selling preinoculated logs to hobbyists and enthusiastic customers. As you build your business, don't hesitate to seek appropriate technical guidance from your local extension agent or advice from business development specialists.



A single shiitake mushroom growing on a log. Photo credit Nicola MacPherson, Ozark Forest Mushrooms

NON-TIMBER FOREST PRODUCTS

You Can Keep Bees, Naturally!

By Leo Sharashkin, PhD

Keeping bees can be simpler than growing tomatoes, but many beekeepers' experiences today are downright discouraging. "My mother spent \$5,000 on her bees in the first few years", Alan told me. Indeed, here is a typical scenario: you attend a beginner beekeeping class, buy equipment and protective gear, order a package of bees, install them in the hive, treat against parasites and disease, feed in the fall and then... they do not survive the first winter. You buy more bees the following spring and the cycle repeats itself. Faced with very high bee mortality, even many expert beekeepers hang it up.

What gives? After all, historical records show that a hundred years ago Missouri farmers commonly had multiple hives in their backyards. Bees required hardly any care and yet produced a honey crop five seasons out of six. Georges de Layens, one of Europe's leading beekeepers, once emphasized that sustainable beekeeping rests on two principles: use local bees and keep them in appropriate hives that are matched to the climate of your region. These simple rules still hold today, and following them makes beekeeping what it once was – a joyful and productive occupation that requires relatively little effort and brings great rewards.

But where do you buy local bees? The good news is you don't have to buy them. Sometimes, the best things in life are free, and bees are no exception. Just as birds occupy bird houses, local honeybee swarms will move into large boxes (called 'bait hives') placed in trees in the springtime. Bee colonies multiply by splitting in two or more parts – casting swarms. These swarms send out hundreds of scouts to find a new home, and if they discover your box scented with propolis (bee resin) and lemongrass essential oil (two smells attractive to bees), they will likely move in. For every ten boxes I deploy in April, five will be occupied by bees before June is over. Bait hives quickly pay for themselves with the first swarm you catch, and they can be used for many years.

To maximize your chances of attracting a swarm to your bait hive, it must be between 10 and 15 gallons in volume and should be placed 12-15 feet off the ground in a tree that stands out (on the edge of the woods, in a fencerow, along power lines or roads, in front or back yards, etc.). The box must be highly visible but in full shade to prevent overheating. Check it periodically, and when the swarm moves in (you'll see heavy traffic of bees leaving and entering) bring it down from the tree at nightfall and move it to where your permanent hive will be located.

Starting with colonies of local wild bees offers multiple advantages. Swarms are usually much larger (4-5 lb's) than commercial packages (2-3 lb's) and are free. A commercial package of bees will cost about \$150. And, unlike the mass-produced commercial bees that come largely from the southern (Italian) stocks and may not be suited for your climate, local bees are truly adapted to the region's conditions, are more resilient and more disease resistant.

Once you obtain your first colony, you need to give them a good home – transfer them from the temporary swarm box into a stationary, durable, well-insulated, easy-to-build and easy-to-manage hive. I give preference to Layens horizontal hives that require no heavy lifting and are gentle on the bees, allowing them to live a better life to what they would have in the wild while producing a handsome surplus for you the beekeeper.

So do you have local bees buzzing around a good hive you gave them? You can now rest. The bees will do the rest.

About the author

Leo Sharashkin received his PhD in Forestry from the University of Missouri, Center for Agroforestry. He is editor of Keeping Bees With a Smile, a comprehensive book on natural beekeeping, and is a regular contributor to the American Bee Journal, Bee Culture, Acres U.S.A., and other major publications. He lives on a forest homestead in the Ozarks where he catches wild honeybee swarms and keeps bees in several dozen, easy-to-build horizontal hives. Leo teaches natural beekeeping at his apiary and around the country and internationally. His website (including free hive plans): www.HorizontalHive.com.



"Bait hives" positioned in a tree to attract swarms of local bees!





Ten-year Urban Forestry Action Plan

By Jerry Van Sambeek, USDA Forest Service Center for Agroforestry

The Ten-year Urban Forestry Action Plan: 2016-2026 was published in September, 2015 (see http://www.urbanforestry.subr.edu/FinalActionPlan_Complete_11_17_15.pdf). This 260 page heavily illustrated document was prepared by the National Urban and Community Forestry Advisory Council (NUCFAC) under leadership and funding from the USDA Forest Service. The Plan's purpose is to expand awareness of the benefits urban forests provide to communities throughout the nation and increase investments in urban forest resources for the benefit of current and future generations.

The Plan's vision is to see "Urban and Community Forests Increase Sustainability, Wellness, and Resilience in All Communities". Its mission is to help all communities create urban and community forests that are diverse, healthy, and accessible for all citizens. The plan has seven goals: (1) integrate urban and community forestry into all scales of planning; (2) promote the role of urban and community forestry in human health and wellness; (3) cultivate diversity, equity, and leadership within the urban forestry community; (4) strengthen urban and community forest health and biodiversity for long-term resilience; (5) improve urban and community forest management, maintenance, and stewardship; (6) diversify, leverage, and increase funding for urban and community forestry; and (7) increase public awareness of environmental education to promote stewardship.

The Plan emphasizes that urban forests are the backbone of strong, vital, and healthy communities, enriching the lives of the more than 80 percent of Americans who live in cities and towns. There are an estimated 3.8 to 4 billion urban trees in the US. It reports urban trees are 15 times more effective than forest trees at reducing the buildup of carbon dioxide and promoting energy conservation by mitigating the urban heat island effect and reducing energy consumption. In 2010, Missouri had 2,054 square miles (6.9% of the total land base) of urban forests that are expected to rise to 4,743 square miles by 2050. Nationally, urban forest cover is 3.1% of the total land area and expected to rise to 8.1% by 2050.

Urban forests annually provide an estimated 17 billion dollars in ecosystem service benefits such as improved air quality, reduced heating and cooling costs, greater carbon sequestration, better storm water management, increased property values and improved mental and physical health.

The Plan can serve as a reference guide for those interested in the development and management of their urban and community forests. Most of the goals include 3 to 5 strategies followed by action items that can be used to monitor achievements. Some past successes include development of the i-Tree analytical software which helps communities identify and quantify benefits from their urban trees. Forest ReLeaf of Missouri is highlighted for development of a new tree plotting tool designed to track trees planted by volunteers throughout Missouri. In January 2016, Forest ReLeaf of Missouri, along with the Missouri Community Forestry Council, launched "Vision 20/20 – Plant 1 Million MOre Trees by 2020." Groups from throughout Missouri are being encouraged to plot locations, identify species and collect other details about their newly planted trees.

Project Learning Tree (PLT) has developed and distributed an array of environmental education packages to over 200,000 educators for PreK-12 students focused on trees and forests. From 2006-2016, copies of PLT's PreK-12 Environmental Education Activity Guide, PLT's Environmental Experiences for Early Childhood, and their high school modules, Focus on Forests and Places We Live, have been distributed to educators through in-person PLT workshops. PLT's grant program GreenWorks! has supported more than 520 service-learning projects specifically related to enhancing students' knowledge of trees through planting trees and gardens on school grounds and in communities.

During the last ten years, we have seen a 60% increase in urban forestry plans, a 53% increase in number of communities with professional forestry staff (the number in Missouri increased by more than 100%), and a 58% increase in the number of communities establishing policies and ordinances for managing urban trees. The current investment nationally is approximately 23 million dollars. Currently, for every dollar invested in tree management, benefits of \$1.32 to \$3.04 in ecosystem services are obtained. More than 7,000 communities receive urban and community forestry assistance. Increasing the annual investment to \$85 million, as recommended in the plan, is an important first step towards unlocking its true value and one we all need to support.



Signage in a Chicago park on a 19.7" diameter (dbh) white oak that provides \$168 worth of benefits/yr. (i.e., reduces storm water runoff by 2,510 gals.; reduces carbon by 639 lbs.; creates electrical energy savings of 124 kWh; and increases property value by \$54). Photo courtesy of Cherie Fisher, USDA Forest Service.

Weed Control in New Tree Plantings

By Hank Stelzer, MU Forestry Extension

Controlling weeds in new tree plantings is an important step in successful establishment. If left uncontrolled, weeds compete with young seedlings for moisture, sunlight and nutrients. A variety of control tactics are available to manage undesirable vegetation, and a combination of strategies generally provides the most consistent control.

Successful weed management begins well before the trees are planted. That means last fall. "Great, Hank!" you are probably muttering to yourself. "I'm reading this in January. NOW what do I do?"

Well, you still have options. It is just that your range of choices is a bit more limited and they require that you pay a little more attention to what you are doing. The best method depends upon site characteristics, nature of weed infestation, size of planting, and labor availability.

Before we begin, let's set the record straight. Mowing is not weed control. It fails to eliminate competition for water and nutrients by low-growing weeds and grasses. In fact with grasses, since they grow from the base of the plant, mowing actually stimulates their growth. In addition, there is a high risk of injuring the stems of seedlings through contact with the mower.

Cultivation or hand weeding can be effective if labor is available. It typically requires three-to- five passes through the planting to control weeds mechanically. To avoid damaging roots, do not cultivate closer than 6-12" from the seedling or deeper than 3".

Mulches, both organic and inorganic, can be used to control weeds in new plantings. They control weeds by preventing new weed seedlings from receiving sunlight. Plus, mulches conserve soil moisture by reducing evaporation from the soil.

Existing vegetation needs to be eliminated before spreading the mulch. Organic mulches (sawdust, wood chips, bark, straw) should be spread at least 3-4" thick to effectively control weeds. If straw is used, it should be raked away from the seedlings in the fall since rodents may nest in the straw and feed on the bark. A top dressing of nitrogen may be required to replace nitrogen used in decomposition of the organic mulch.

Landscape fabrics are another option for certain settings. Material should be selected that allows good water penetration and blocks sunlight. Fabric that is at least 4 oz in weight should be used so it will last several years. The edges should be sealed with soil and, staples at least 6" long should be used to secure the fabric. Another option is to spread an organic mulch on top of the fabric.

Chemical control of weeds is yet another option and may be the best option for large plantings. But, herbicides must be carefully selected and applied with precision to avoid injuring the new plantings or sensitive plants in adjacent areas. Appropriate equipment is required to accurately apply the herbicide and the sprayer must be correctly calibrated. The objective is to provide each new seedling with a three-to-five-foot, vegetation-free area as either a strip or circle.

Most herbicides registered for use on new tree plantings have a relatively large margin of safety to trees. However, if the chemical is not applied as directed on the label, the seedlings may be injured.

Common causes of injury are use of excessive rates due to misapplication, or use of a product on a species not listed on the label. Follow all label precautions. In addition, no herbicide is effective against all weeds. Products should be selected based on the weeds that are present. A combination of herbicides may provide the most effective control.

Pre-emergence herbicides are used to control weeds as they germinate. They have little, if any, activity on established weeds.

Spring applications should be made early enough to ensure that rain moves them into the soil profile before weed emergence begins. If weeds become established before rain activates the herbicide, a shallow cultivation can be used to kill the emerged weeds and move the herbicide into the soil profile.

Another important consideration is pre-emergence herbicides should not be applied until after the soil has settled in and around the planting hole. This is because rainfall can move the herbicide into the planting hole and damage the roots.

Simazine/Princep (simazine). Simazine is used to control both grass and broadleaf weed species. Tolerance of seedlings vary so it is important to read the label to determine if it is appropriate for the site and species.

Pendulum (pendimethalin). Pendimethalin is a strong inhibitor of roots, so care must be taken to not apply the material until soil is settled. The product is cleared for a wide range of tree species and has a large margin of safety on established plants. Pendulum is effective against annual grasses and certain small-seeded broadleaf weeds. Combinations with simazine provide broad spectrum control.

Surflan (oryzalin). Oryzalin is in the same chemical family as pendimethalin and is used in a similar fashion with the same precautions. Combinations with simazine provide broad spectrum control.



Tree planting can be a fun family activity in the spring. To ensure that legacy "takes root', one must have an effective weed control program.



Weed Control in New Tree Plantings continued

Oust (sulfometuron methyl). Oust has a lower margin of safety to many deciduous species than other pre-emergence options. It can be used on conifers (but not intended for use in Christmas tree plantations) and selected deciduous plantings. Although it has some activity on emerged weeds, more consistent results will be obtained by applying the product in early spring before emergence begins. In hardwood plantings, oust must be applied before seedlings break dormancy in order to avoid injury. It should not be applied on poorly drained soils or soils with a pH greater than 7.

Post-emergence herbicides are used to control established weeds. Some can be applied over-the-top of seedlings, whereas others need to be directed to minimize contact with trees. Good coverage of weeds is often required, and timely applications to small weeds will provide more effective control than applications to large weeds.

Goal (oxyflourfen). This product has both pre-emergence and post-emergence activity. It can be sprayed over the top of conifer species, but should not be sprayed during bud break or before needles harden off. Applications on deciduous species must be directed to minimize contact with foliage or green bark. Disturbance of the soil following application will diminish pre-emergence activity, and it generally does not provide as long of control as the other pre-emergence herbicides.

Transline (clopyralid). Clopyralid is a growth regulator herbicide that is safe for use on several woody species. Only use on plants listed on the label to avoid injury. Transline is especially effective on Canada thistle and other plants in the composite (sunflower) family.

Fusilade (fluazifop). Fusilade (similar products include Envoy and Vantage) can be used to control emerged grasses in tree plantings. These products have little or no residual activity. All products require the addition of a spray additive to improve absorption into the foliage of target weeds.

Glyphosate products are very effective, but they must be applied in a way to minimize contact with seedlings. Trees can be covered with buckets or a shielded sprayer can be used that minimizes the spray reaching the seedling.

In closing, effective weed management is critical in the first few years after planting trees. For large plantings, herbicides are often the most economical choice, but on smaller plantings, mulching or cultivation may provide an effective alternative. Mulches have the added benefit of conserving moisture, often a limiting factor in the establishment of trees. Before purchasing any herbicide, read the label to ensure that it is appropriate for the intended setting.

The Bid Box

By HANK STELZER | MU Forestry Extension

Gasconade County, MO

- 54 acres
- 697 trees marked for sale
- Estimated volume: 93,900 bd. ft. (Doyle Scale)
- o 59,900 bd. ft. (445 trees) was white oak; of which 10,500 bd. ft. was potential stave quality
- o Remaining 34,000 bd. ft. was a mix of post oak, black oak, northern red oak, and hickory
- Forester valued the sale at \$20,000
- Seven bids received
- o \$27,500 (accepted)
- o \$25,300
- o \$25,100
- o \$23,100
- o \$19,105
- o \$15,177
- o \$12,250
- Return: \$509 per acre

High bidder was a reputable sawmill that has been in business for a long time, but only recently got into logging. After checking references, the consulting forester felt very comfortable recommending the high bidder, which the landowner accepted. The forester held a pre-harvest meeting with both the logger and landowner present where a harvest plan was developed locating skid trails and landings. With dry weather this fall, the timber has already been cut and the sale closed out. Both the forester and the landowner were extremely pleased with the logger's work.

Protecting Land for Future Generations with a Conservation Easement

By Rebecca Landewe, The Nature Conservancy

Conservation easements are one of the most powerful, effective tools available to private landowners for the conservation of land. Collectively, private landowners have permanently conserved millions of acres of land across the globe, providing myriad conservation benefits for wildlife, water quality, and local communities, all while continuing to own and use their property.

Private property rights in the U.S. allow landowners to exercise numerous rights such as cutting timber, subdividing the property and building homes. Through a conservation easement, a landowner can voluntarily agree to forego one or more activities to protect certain qualities of their land. Conservation easements are used to protect a variety of values, including open space, rare habitats, water quality, historical significance, scenic values, recreational trails, or other features of the land. Every easement is specifically tailored to the particular land being protected as well as to the unique circumstances of the landowners.

A conservation easement is a legal document filed and recorded in the public deed records, and as such, it is not easily amended or terminated. It remains with the land and applies to all owners of the land for the duration of the easement, which may be term-limited (e.g., 25 years) or in perpetuity. A qualified nonprofit organization or government agency (known as the easement holder) is responsible for monitoring and ensuring the conservation values are protected by current and future owners.

Each easement holding organization or agency has different goals, and as such, it is important for landowners to discuss their goals with the potential easement holder to determine if they align. A conservation easement can include almost any kind of restriction agreed to by the landowner and the easement holder. Perpetual easements ensure permanent protection of the property and can often be crafted to accommodate a landowner's long-term goals and vision for their property. The landowner retains all property rights except the ones specifically restricted by the conservation easement. The easement can apply to the entire property or to only a portion, such as the land along a stream or other important natural feature (e.g., cave). The landowner still owns the land and can use it in ways consistent with the restrictions. For example, the easement may restrict subdivision and development, but the landowner may continue residential use, hunting, fishing, timber cutting or grazing management. The landowner can also sell the land or leave it by will and restrict public access. In this

way, easements allow continued use by the owner while ensuring the long-term conservation of the land.

When a landowner donates a conservation easement, the value of the easement may be considered a tax-deductible charitable donation and could result in tax savings for the landowner. Though less common, it may be possible for a landowner to sell a conservation easement, which would provide a direct economic benefit to the landowner (e.g., to a conservation organization that needs it to protect land important to its mission).

One important reason families consider conservation easements is to reduce the tax burden on future generations. By restricting certain uses (e.g., development), this lowers the market value and in turn the estate tax burden for family heirs. Working closely with a tax advisor or estate planner can help landowners evaluate various options for passing their land on to the next generation, and a conservation easement may be a helpful tool.

In Missouri, there are numerous organizations working with private landowners to protect a variety of resources, whether that be trails, open space, water quality or forestland. The Nature Conservancy in Missouri has an easement program aimed at protecting clean water and conserving working forests on lands that help sustain the Current and Jacks Fork rivers and their tributaries. The goal is to keep working lands working through easements that allow managed timber harvests and promote the use of best management practices. Many landowners are already demonstrating their stewardship to family, friends, and neighbors. A conservation easement allows them to permanently demonstrate their conservation stewardship by protecting their land for future generations.

For more information about conservation easements, visit www.nature.org/about-us/private-lands-conservation/ conservation-easements/all-about-conservation-easements. xml

[excerpted from A Landowner's Guide to Conservation Options – http://www.nature.org/ourinitiatives/regions/ northamerica/unitedstates/missouri/landowners-guide-toconservation-pdf.pdf]. For more information, contact:

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Returning Fire to Forest Management--Part 3: In the future, fire will...?

By Michael C. Stambaugh, Associate Research Professor, School of Natural Resources, University of Missouri and Daniel C. Dey, Research Forester, U.S. Forest Service

In Part 2 (May issue of Green Horizons), we discussed common challenges and opportunities encountered with using prescribed fire to manage forests. Prescribed fire is fire applied to a predetermined area within a prescribed set of conditions and dates, and with appropriate safety precautions to achieve specific purposes. Here, we provide perspectives on the future of prescribed fire, by outlining current trends and issues.

Current trends relating to fire

Decreased regeneration of oak: Oak regeneration is declining across large regions of the eastern U.S. The primary causal factor is considered to be lack of disturbances that favor oak over other species. Compared to many other trees in the region, oak is resistant or tolerant of drought and

many common forest diseases, valuable to local forest product economies, and an important wildlife food source. Prescribed fire is commonly used to favor oak over other tree species.

Increased acres in prescribed fire: Over the last few decades, prescribed burning has been occurring on increasingly more public and private lands. However, due to past advertising campaigns about preventing wildfires (Smokey the Bear), many people are unfamiliar with the history of fire use, the ecologica role of fire in shaping natural communities, and the benefits of fire will produce smoke, therefore, planning requires understanding, predicting, and managing smoke dispersion to minimize negative impacts to human health. The ability to prescribe burn will be complicated by changes in air quality laws and regulations.

Increased multiple use of lands: Whether on public or private lands, there is often a need or interest in multiple uses such as recreation, timber production, and wildlife management. Certainly, not all uses may be possible or compatible. With prescribed fire, managing for multiple uses presents new challenges and requires careful attention to fire behavior and conditions to minimize conflicting ecological and social resource goals such as conserving biodiversity and producing quality, high value timber.



Experience versus science: Unlike most natural sciences, fire science has only existed for a few decades. For this reason, there is a general lack of scientific-based information related to fire. Fire management occurs regardless and, often times, observers hold knowledge and experience that is not available in books. For this reason, sharing of information between fire managers and scientists is important. Currently, groups like the prescribed fire councils and the National Fire Science Exchange Network, work to promote safety, provide training, and share technical fire information (see

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In the future, fire will...?

in the management, restoration and conservation of forests in their area.

Changing climate conditions affects fire: Fire is fundamentally a chemical reaction that is linked to weather and climate. For thousands of years, fire activity has varied with climate conditions. Fire is projected to increase in activity throughout the eastern U.S. under numerous models used in predicting future climates.

Smoke conflicts with society: In a more populated world, there is increased potential for smoke to effect people. Though temporary, smoke can negatively affect human health (via air quality) and safety (visibility). Prescribed fire Based on the trends discussed above, the future use of fire in forest management hinges on diverse issues. Many of these trends will continue and new ones will emerge that make prescribed fire management more challenging. Nearly all of these trends relate to people, their choices and what they value; be they based on safety, needs, desires or ethics. In any case, utilizing fire in today's forest management is relatively new; both to the public and natural resource professionals alike and there is a lot to learn.

In the future, fire will primarily depend on people working effectively together, just as it has in the past.

FOREST MANAGEMENT

Missouri's Tree Farm System

By Matt Jones, Vice Chair, Missouri Tree Farm Committee

Every year, the Missouri State Tree Farm Committee holds the annual Missouri Tree Farm Conference to honor the Missouri State Tree Farmer of the Year. Twenty-sixteen marks the 75th anniversary of the national Tree Farm program. This year the conference was held in Annapolis on April 29th and 30th to honor Iron County Tree Farmer Steve Lovell. During the indoor session on Friday afternoon, attendees received updates regarding changes to the Forest and Woodland Association of Missouri, Forestkeepers, and the new Missouri Managed Woods program. This was followed by an excellent presentation on the financial aspects of tree farming by Tree Farmer and Certified Financial Planner David Watson. Mr. Watson talked about taxation, establishing a cost basis, and successional planning. While not as much fun or as exciting as doing

never develop into high quality timber. Jones recommended a very heavy cutting that removed most of the poor quality trees and created ample space for a new crop of trees to sprout up. One goal of this management is to identify the best trees at an early age and periodically thin around them to maintain a healthy growth rate. The cutting was done in 2003 and the conference attendees were able to see the results of thirteen years of growth. What was once nearly barren ground just after the cutting, was now a thick area of 20 to 25-foot tall trees.

Participants heard about feral hog issues from Wildlife Biologist Mark McClain. McClain talked about hog reproduction rates, baiting and trapping hogs, and MDC efforts to eradicate feral hogs. Mr. Lovell has a hog trap on his property and with the help of his

work on the ground, these topics can make or break a family legacy. Awards were given to Mr. Lovell as the Tree Farmer of the Year, and to the top inspecting foresters. MDC Resource Forester Jason Severe was honored as the Inspecting Forester of the Year. Mr. Lovell gave a heartfelt speech thanking by name everybody who had ever helped



ing by name everybody Iron County Tree Farmer Steve Lovell and Matt Jones,

him with the management of his Tree Farm.

Due to some good fortune, the rain stopped just in time for the field portion of the conference at Steve Lovell's Tree Farm on Saturday. Mr. Lovell bought his property in 1998 and shortly afterward contacted the Resource Forester Matt Jones for assistance with managing it. Steve has stated that one of his goals was to grow high quality timber. Unfortunately, Jones had to explain to him that growing high quality timber would not be possible right away due to the property being "high graded" before he purchased it. High grading occurs when only the very best trees are cut, leaving poor quality, stressed trees behind. These trees will

neighbor they have trapped and disposed of nearly two dozen feral hogs. Private Lands Conservationist Julie Norris spoke about food plots and wildlife watering holes. Mr. Lovell has five food plots and watering holes on his property. Norris talked about how to locate the food plots and water holes

plots and

throughout the property to maximize their value for the wildlife. She also talked about how to maintain the food plots and what would be good to plant in them.

Feedback from the participants indicated that they really enjoyed the conference. As Tree Farmers and landowners, they like to be out on the land. They really appreciated the opportunity to see firsthand how the trees and the wildlife responded to the work Mr. Lovell has done. A big part of these tours is the discussion the Tree Farmers have amongst themselves about the practices they are seeing and how they compare to their property.





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Dr. Mark Coggeshall is the New Project Leader for the HTIRC

UMCA's Dr. Mark Coggeshall has been hired as the new Project Lead Scientist and Co-Director of the USDA Forest Service Hardwood Tree Improvement Research Center (HTIRC), West Lafayette, IN. Mark will start his new position on January 15th, 2017. Dr. Coggeshall is an Assistant Research Professor of Forestry with MU and UMCA where he focuses on hardwood tree improvement and improved nut tree cultivars for use in agroforestry systems.

Dr. Coggeshall spent twenty years working in Indiana developing genetic improvement programs for a number of fine hardwood tree species. In order to take advantage of a number of research projects he has established in Missouri over the past 17 years, he plans to split his time between West Lafayette and Columbia, Missouri. Many of Mark's UMCA research projects complement studies being conducted at the HTIRC. Dr. Coggeshall hopes to broaden the focus of the current HTIRC research portfolio to include new and expanded collaborations with other institutions throughout the Midwestern U.S. and beyond.



Dr. Coggeshall giving a grafting demonstration during the 2016 Agroforestry Academy. Photo Credit -Christopher W Evans.

Missouri Natural Resources Conference

February 1-3, 2017. Osage Beach, Missouri. http://mnrc.org/Welcome.html

The Missouri Natural Resources Conference (MNRC) is an annual meeting organized and sponsored by the Missouri Chapter of the American Fisheries Society, The Missouri Chapter of the Society of American Foresters, Missouri Chapter of the Wildlife Society and the Show-Me Chapter of the Soil and Water Conservation Society. MNRC promotes wise use and management of Missouri's natural resources. Cooperating agencies include the Missouri Department of Conservation; University of Missouri, School of Natural Resources; Missouri Cooperative Fish and Wildlife Research Unit; U.S. Forest Service and Natural Resources Conservation Service.

Missouri Woodland Conference

Sponsored by Missouri Farm Bureau, Missouri Chapter – Walnut Council, Missouri Forest & Woodland Association, and the Missouri Tree Farm Program, the upcoming Missouri Woodland Conference targets Woodland landowners, foresters, forest products industry, agency resource specialists, soil and water conservation district staff, and students in natural resources. The conference will be held on April 4th and 5th. Both days will be in a classroom setting listening to professionals and landowners speaking on a variety of woodland management topics from tree planting, tools and equipment, mapping your land, forestland succession planning, the revised Missouri Forestry Tax Law and so much more. The program will be provided via email or regular mail to all those inquiring, plus it will be posted at the Missouri Chapter – Walnut Council website: http://www.walnutcouncil.org/state-chapters/missouri.html. Registration information will be up soon.

8th Annual Agroforestry Symposium

On January 26th, 2017, the 8th Annual Agroforestry Symposium will be held. The symposium will be hosted by the Center for Agroforestry at the University of Missouri (UMCA), and the theme for this year's Symposium is: "Enhancing Health, Conservation and Livelihoods: Medicinal Plants in Agroforestry."

The event is free and open to the public, but advance registration is requested. Please register at: http://www.cafnralumni.com/agroforestry2017

For those unable to attend in-person, the event will be livestreamed and available for viewing at: https://goo.gl/IMrujK

green horizons

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

Calendar of Events

8th Annual Agroforestry Symposium "Enhancing Health, Conservation and Livelihoods: Medicinal plants in Agroforestry"

January 26, 2017 | Bond Life Sciences Center, University of Missouri

The event is free and open to the public, but advance registration is requested. Please register at: http:// www.cafnralumni.com/agroforestry2017

MU Forestry Extension Workshops - Understanding and Marketing Your Timber

February 7th - February 21st, 2017 | Laclede County Extension Center, 186-D N Adams Ave. Lebanon, MO MU Forestry Extension Workshops – Understanding and Marketing Your Timber. Laclede County Extension Center, 186-D N Adams Ave. Lebanon, MO

Session 1, February 7th: An in-depth look at your forest's health, how your timber grows, and how it relates to your timber sales.

Session 2, February 14th: How to improve your current timber stand for a quality sale in the future. Session 3, February 21st: How to market your timber, develop a harvest plan, and manage your timber sale taxes

COST: \$10 per session. CONTACT NUMBER: 417-532-7126 or E-MAIL US AT: shaverj@missouri.edu

Missouri Woodland Conference, Missouri Farm Bureau

April 4th – April 5th, 2017 | 701 South Country Club Dr., Jefferson City

For woodland landowners, foresters, forest products industry, agency resource specialists, soil and water conservation district staff, and students in natural resources. Lectures by a variety of woodland management topics from tree planting, tools and equipment, mapping your land, forestland succession planning, the revised Missouri Forestry Tax Law and more.

Thousand Cankers Disease Research & Management Operational Meeting

June 13th -15th , 2017 | Lafayette, Indiana

The purpose of the meeting is to gather and share all research, survey, management methods and regulatory information on Thousand Cankers Disease. Registration will be in March, with more information to come on the organization website. https://htirc.org/thousand-cankers-disease-research-meeting/



Center for Agroforestry University of Missouri