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The Ohio Woodland Journal

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On the Cover

Eastern hemlock (Tsuga canadensis) is a foundation species, regulating ecosystem processes by creating microclimates and unique habitat in eastern Ohio forest drainages. Hemlock is of ecological, aesthetic, and even spiritual importance, as well as a significant draw for tourism. Please enjoy reading about the importance of this graceful species in this issue of The Ohio Woodland Journal. Hemlock at Hocking Hills State Park cover photo by Greg Smith.
In the Winter 2011 Ohio Woodland Journal, there was an article by Adam Conway highlighting the use of wood in the Ohio State University’s Thompson Library renovation project. Not long after this article was printed, Ohio Tree Farm Committee member Jim Pry said, “We need to see the beautiful use of wood from Ohio’s forests there for millions to enjoy.”

As we move into 2017, the American Tree Farm System has wrapped up a year of 75th anniversary celebrations. I got a glimpse of perspective on that time in history this morning as the local radio station was also celebrating its 75th year on the air. For many years they were the only radio station covering northwest Ohio. I can hardly imagine…76 years ago, there were no radio stations in this quarter of the state – then there was a choice of one station. A lot has changed.

Just as the radio world has changed, so has the forestry world, and much of that is based on information and communication. We have a much stronger understanding of forest management science and techniques, known as silviculture, and Best Management Practices (BMPs) for water quality. Resources for getting that information to landowners to make wise decisions are readily available from private consulting foresters, industry foresters, and ODNR service foresters.

Another difference is that somebody can host a Tree Farm Tour in southwest Ohio and every part of Ohio is represented in attendance. If you missed the Duckworth Tree Farm of the Year Tour, you missed a beautiful day in the woods with an excellent tour of a fascinating farm.

In the forestry world, a lot has also stayed the same. Many of the trees you are growing are the same trees that were growing 75 years ago. Oak and walnut remain the most sought after species. Invasive pests were threatening or wiping out entire species of trees, like Dutch elm disease and chestnut blight then, and emerald ash borer now. Pests were threatening or wiping out entire species of trees, like Dutch elm disease and chestnut blight then, and emerald ash borer now.

You are part of a nationwide network that has grown from 75 years ago. And finally, the American Tree Farm System is still encouraging, educating, and recognizing exceptional forest management. You are part of a nationwide network that has grown from 75 years ago. And finally, the American Tree Farm System is still encouraging, educating, and recognizing exceptional forest management.

As John and the others on his committee continued to work with the library, it came to be that the library itself would fund the display. The grants and contributions were used to hire an OSU Forestry student intern with a background in archiving to help organize the display materials.

Please take time this winter to visit the library display and witness the beautiful use of wood from Ohio’s forests there for millions to see. The special display is featured from now until May 14, 2017 (see page 20 for more details about the display).

I hope you had the chance to enjoy some of Ohio’s woodland during the recent holiday season and these winter months. Here are a few updates about some of the ODNR Division of Forestry’s programs:

**Armintrout Fire Lookout Tower**

Thinking back on the warmer months last summer, did you visit the Ohio State Fairgrounds? If so, I hope you saw one of the new additions to the Division of Forestry’s area in the ODNR Natural Resources Park – the Armintrout Fire Lookout Tower.

In 1934, William L. and Harriet B. Armintrout of Union Township, in Pike County, Ohio, sold .35 acres to the State of Ohio for the sum of $1 for the express purpose of erecting a forest fire lookout tower. In 1933, the Civilian Conservation Corps (CCC) camps in Ohio were placed under the direction of Ohio’s State Forester, and in 1934, Armintrout Fire Lookout Tower was one of 11 steel fire lookout towers constructed by CCC crews over the course of 18 months. It was erected on Armintrout Road overlooking Pike County near Piketon, Ohio. This once 80-foot tower stood at its original location from 1934 to 2016. The Pike County Public Service Trust maintained ownership of the tower for civil defense purposes from 1978 to 2016, when the ODNR re-acquired the tower for display on the Ohio State Fairgrounds.

Refurbishment of the tower included sandblasting, acid dipping, and re-galvanization of the metal legs, as well as replacement of the wooden landing and stair treads utilizing wood grown and sawn on Ohio’s “green certified” state forests. The cab was completely refinished and new glass was installed by state forest craftsmen at Scioto Trail State Forest. The height was shortened to 60 feet.

This tower stands as a testament to the young men of the Ohio CCC and the hard work they accomplished during their service. Citizens of Ohio can use this opportunity to learn about, remember, and pay respect to these individuals, without whom Ohio’s natural resources would not be the beautiful, natural wonders they are today. This fire lookout tower is in remembrance to all former CCC members everywhere. Thank you for all your hard work!

**Trees to Textbooks**

Last November, 16 rural Ohio school districts and their corresponding counties and townships shared $2,038,898. Continued on page 6
from the sale of timber from Ohio’s state forests, through the ODNR Division of Forestry’s Trees to Textbooks program. Through this program, a percentage of the revenue generated from state forest management activity goes to the county, township and school district in which the activity took place. To see which local communities received Trees to Textbooks funding, go to: bit.ly/TreesToTextbooksFY16.

State forestry experts manage the care of nearly 200,000 acres of state forests for overall health and diversity, soil and water conservation, improved wildlife habitat, and a variety of recreational opportunities. Selected trees or areas of woodland are harvested through a competitive bid process, which includes requirements for sound management practices. All work is conducted by certified master loggers under strict monitoring. Wisely managed forests are renewable natural resources. We all benefit from sustainable forests, and these revenues can be invested in the education and maintenance of local communities.

The ODNR Division of Forestry has been distributing timber revenues to counties and townships since the early 1980s. In 1999, the Trees to Textbooks program was started, and since then, more than $27.2 million has been distributed to Ohio school districts and their corresponding local governments.

Wildfires

2016 was a busy firefighting season for the division’s interagency firefighter crews and individuals. I’d like to extend my appreciation to all those who assisted with wildfire suppression in Alabama, North Carolina, Tennessee, Pennsylvania, Colorado, Idaho, Utah, and Wyoming as well as right here in Ohio.

Continued from page 5

View of the ODNR Pavilion and Smokey Bear from atop the lookout tower at the Ohio State Fairgrounds.
Subscription Form

The Ohio Woodland Journal

You may subscribe to The Ohio Woodland Journal for $15.00 per year. You can also sponsor a school (see page 34).

Four issues per year are printed: February, May, August, November.

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Name ____________________________________________________________
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Calendar

February 2017

22-24
National Leadership Conf.
American Tree Farm System
Greenville, SC
www.treefarmsystem.org

March 2017

1
Ohio Woodland, Water, & Wildlife Conf.
Mid-Ohio Conference Center
Mansfield
woodlandstewards.osu.edu

1-2
Ohio Forestry Association Annual Meeting
Embassy Suites
Dublin, Ohio
www.ohioforest.org

4-5 & 11-12
Maple Madness Driving Tour
Ohio Maple Producers Assn.
www.ohiomaple.org

14
Northwest Ohio Woodland Workshop
Swanton Community Center
woodlandstewards.osu.edu

25
Ohio River Valley Woodland and Wildlife Workshop
University of Kentucky
woodlandstewards.osu.edu

April 2017

12
Wildlife Diversity Conference
Ohio Union, OSU Campus
Columbus
ohiodnr.gov/Wildlife/DiversityRegistration/

Ohio's 2016 Tree Farm of the Year

Duckworth Tree Farm Tour

November 2016 Fayette County

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Photos by ODNR

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Winter 2017 | 11

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OFA provides information and services to members through:
• Networking Opportunities
• Financial Benefit Programs
• Educational Programs
• Trade Shows
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Join Now! Enjoy the benefits of being a member of Ohio’s oldest and largest forestry related group.
The quality of the field trips was uniformly fantastic. It was clear that we had the best as far as hosts, sites, and trip leaders. The speakers knew their facts and communicated well. The itinerary was jam-packed; it was like visiting two National Tree Farmer of the Year field days every day for two weeks.

Many of the private forests we visited had been under the same family ownership for 500 or more years! Additionally, vast tracts of land are owned and managed by individual towns or states. Professional foresters make the harvesting decisions on behalf of the public and the proceeds are used for specific things like schools or just general expenses.

A common theme throughout the tour was the effort that land managers are taking to reverse decades of conifer monoculture-planting mentality. Due to dramatically increasing labor costs, they now are favoring natural regeneration. Aggressive deer management is a key to success of that strategy.

All the forests we toured in Germany and many in France are much more manicured than we are used to in Ohio – to the point where it was very difficult to find any dead snags or logs laying on the ground. Private land ownership rights are very different in Europe than the U.S. In all three countries that we visited, the public is permitted to hike and bike (no motor vehicles) on private land. In some areas they are even allowed to hunt and to collect firewood and mushrooms.

There are significant differences in forest management between Europe and here in Ohio. Generally, the use of herbicides is banned. Interestingly, at least in the areas that we visited, they had no problems with invasive species. Timber harvests are done much more frequently; nearly all the forests we visited do a light harvest every 6-8 years. Because of that, having a permanent road system is essential to avoid soil compaction. Almost all harvests are done by contracted cutting crews who are responsible for placing the logs at the roadside where the bidding occurs.

The tax treatment of forestland varies from country to country. Germans pay no real estate tax on forestland but pay a severance tax upon harvest. The Swiss government actually pays forestland owners for the watershed quality, public access, and ecosystem benefits provided in exchange for following state-approved management plans.

Despite an itinerary that was heavily loaded with forestry activities, there was time in the schedule for good food, excellent beer and wine, and some sightseeing. It was a trip that will be fondly remembered.
Eastern Hemlock

Eastern hemlock (Tsuga canadensis), also known as spruce hemlock and Canada hemlock, is found extensively in much of the eastern United States and Canada. In Ohio, its natural range is confined to the eastern portion of the state, but it is planted as an ornamental statewide. It is one of the most shade tolerant trees and can survive with as little as five percent sunlight. In Ohio’s forests, eastern hemlock can live for more than 300 years suppressed in the understory by overtopping vegetation, and respond to release from this shade with renewed vigor. Hemlock has been known to live in excess of 800 years under ideal conditions, and 300 to 400 year-old stands of hemlock are not uncommon.

Hemlock can survive on a variety of sites and soils. It grows best on moist, well drained sites with an acidic soil. The conditions under a hemlock forest are cooler than under adjacent stands of hardwoods. The acidic nature of the soil, leaf litter, and cooler conditions benefit water quality and a variety of wildlife species, some of which do not occur anywhere else in nature. Many of the organisms living within this unique ecosystem would cease to exist without the deep shade created by the hemlock over-story.

Management techniques for the maintenance, perpetuation, and regeneration of hemlock should be confined to uneven-aged silvicultural practices. Single tree selection and small openings would allow increased growth of superior hemlock stems, removal of diseased or dying trees, and opportunity for the understory hemlock to work its way into the forest canopy. Excessive release of hemlock trees can contribute to ring shake and should be avoided. Even-aged management such as clear-cutting and large group openings should also be avoided as they are likely to result in the regeneration of hardwood species that could out-compete the hemlock regeneration.

Eastern hemlock wood has been used for construction, framing, crates, pallets, paper pulp, and many other uses. The wood is somewhat brittle, but relatively light and strong with good nail holding ability. Many old barn and covered bridge timbers were made from hemlock in parts of Ohio where hemlock was abundant. Since hemlock has a low resin and oil content, it paints and stains well. Hemlock can be found in Ohio in pure stands or mixed with white pine or hardwoods. A few of the more common hardwood species found in combination with hemlock in Ohio are black cherry, yellow poplar, cucumber tree, ash, black birch, basswood, white oak, chestnut oak, and red oak as major and minor components. Some pure hemlock stands are naturally occurring, and some are a result of the loss of American chestnut in the early 1930s. Where chestnut was a minor component, the hemlock in the understory was able to find its way to the forest canopy creating nearly pure hemlock stands. In situations where hemlock was a minor component and chestnut was a major component, hardwoods likely out-competed the understory hemlock creating mixed stands of oak, hickory, and hemlock.

The biggest concern regarding eastern hemlock is the hemlock woolly adelgid (HWA). Adelgids are soft bodied aphid-like insects that feed by sucking sap from trees. The hemlock woolly adelgid is an introduced pest from Asia, and has few predators in America. Hemlocks and woolly adelgids native to Asia coevolved over thousands of years. This provides the hemlocks in Asia with a biological tolerance to HWA. Hemlocks in eastern North America have not had the opportunity to develop these biological tolerances and therefore succumb to infestation. Hemlock woolly adelgids suck sap from the base of hemlock needles robbing the trees of the carbohydrates they need to sustain growth. Over a relatively short period of time, an eastern hemlock tree can die from a HWA infestation.

Hemlock woolly adelgid can be found in most of the range of eastern hemlock, and has been extremely destructive to hemlocks in eastern North America. When HWA populations are high enough, entire stands of hemlock can be decimated within four to five years. With the loss of hemlock, these stands will change considerably and become dominated by hardwoods commonly found in the area.

Hocking State Forest and Hocking Hills State Park contain some of the most majestic eastern hemlock stands in the state of Ohio. HWA was first observed in the Canwell Cliffs area in 2013. Efforts to eradicate it from the state park were undertaken by Ohio Department of Natural Resources Division of Forestry and Division of Parks and Watercraft and Ohio Department of Agriculture personnel in 2013, but HWA was found again in 2014.
Don and his wife Shirley live in Columbus, Ohio. His duties with the ODNR Division of Forestry have included both field work and administration in state land management and service forestry. As a service forester, one of Don’s cooperators was B.B. Duckworth, a dedicated forest landowner and the grandfather of the 2016 Tree Farmer of the Year Chris Duckworth. Don currently works with the Division of Forestry Carpenter Shop and the Information and Education program.

This article was excerpted from the ODNR Division of Forestry brochure “Eastern Hemlock” by Don Karas, which can be found on the web link http://forestry.ohiodnr.gov/hemlock. Also featured in the brochure is the story of a hemlock “tree cookie,” or narrow cross section cut, of an Eastern hemlock that once stood majestically in the popular Old Man’s Cave area of Hocking Hills State Park. That tree cookie was preserved by the Division of Forestry for display in a conference room at ODNR’s central headquarters in Columbus.

ODNR Division of Forestry’s Roger Hendershot and Lisa Bowers are shown measuring a prospective state champion eastern hemlock in Little Rocky Hollow State Nature Preserve. To learn more about Ohio’s Big Tree Program, state champion tree measurements, and nominating trees for listing consideration, visit http://forestry.ohiodnr.gov/championtrees.

The current state champion eastern hemlock is located in Little Rocky Hollow State Nature Preserve in the Hocking Hills Region. In April of 2015, the tree measured 137 inches in circumference, 141.6 feet tall, and had a crown spread of 55 feet, for a total of 292.4 points. By comparison, the former champion grew in the same hollow and measured 144 inches in circumference, 146 feet tall, and boasted a 49 foot crown spread, for a total of 302 points. That tree had structural failure, breaking at ten feet from the ground. Shown with the new champ is Urban Forester Lisa Bowers, ODNR Division of Forestry.
Tom Macy  
Forest Health Program Administrator  
ODNR Division of Forestry

Ohio Hemlock Happenings

There have been some exciting developments lately in the world of hemlock conservation and pest management in Ohio. Among them are a recent partnership with several organizations to inventory hemlock stands and survey for hemlock woolly adelgid (HWA), collaboration with Ohio University to monitor HWA and biological control agents in southeastern Ohio, current chemical and biological control efforts, and progress made on the ODNR Hemlock Conservation Plan.

Background

Hemlock woolly adelgid is an invasive insect native to hemlock forests of Asia and the Pacific Northwest. Genetic research has revealed that there are several different biotypes of HWA around the world, and that the biotype that was introduced to eastern North America came from Japan. Importation of ornamental trees from Japan was likely the pathway for invasion. Since being discovered in the 1950s in Virginia, the insect has slowly spread across much of the southern Appalachian Mountain region and north into New England, leaving millions of dead eastern and Carolina hemlocks in its wake.

Ohio Hemlock Conservation Partnership

In late 2015, the Hocking Hills Tourism Association (HHTA), the Nature Conservancy (TNC), Crane Hollow Nature Preserve, and the ODNR Division of Natural Areas and Preserves (DNAP) contributed funding to the ODNR Division of Forestry to hire Ben Rechel and Ryan Long as temporary conservation aides. Additional training and assistance were provided by the Hocking Hills Conservation Association, Ohio State University Extension, and the ODNR Division of Parks and Watercraft. The goals of this effort were to perform a detection survey for HWA in high-priority hemlock forests in Ohio and to collect baseline forest stand information to assist planning and management.

Ben and Ryan worked from December 2015 through July 2016, visiting sampling plots located within hemlock stands. Along with assistance from volunteers working in Crane Hollow Nature Preserve, they collected data on the size and numbers of hemlocks on over 2,000 acres and closely examined more than 12,000 hemlock trees for HWA. The majority of this work was conducted within hemlock stands in the Hocking Hills area, but they also traveled to TNC preserves in Ashtabula and Washington counties as well as Mohican State Park and Mohican-Memorial State Forest in Ashland County. On ODNR- and Crane Hollow-owned lands in the Hocking Hills, they covered an impressive 78 percent of the hemlock stands. Fortunately, they found no new HWA infestations in their survey.

This partnership could not have been possible without the funding provided by the fine folks at the HHTA, TNC, Crane Hollow Nature Preserve, and DNAP, and it would not have been successful without the hard work of Ben and Ryan. Hopefully this is just the beginning of a proactive and productive partnership.

Ohio University HWA and biological control monitoring

As part of a U.S. Forest Service funded grant, the ODNR Division of Forestry is working together with Ohio University on HWA projects. While there is a general understanding of the lifecycle of HWA, more information is needed to understand the timing of the development of the different life stages. Continued on page 22
From Forest to the Renovation of the Thompson Library

The William Oxley Thompson Memorial Library, Ohio State University’s main library, reopened in 2009 after a complete renovation that not only transformed the building into a 21st century research library and campus hub but also restored the original 1913 library to its historical grandeur. White oak lumber harvested from Ohio’s Zaleski State Forest was incorporated into the design as a part of this renovation. How the white oak from Zaleski helped to re-envision Thompson Library is just one of the fascinating stories that the exhibit Building Ohio State will tell.

Starting February 1 and running through May 14, 2017, the Thompson Library Gallery will showcase the unique connections and history shared between The Ohio State University and Ohio’s forests. Learn about Dr. Edmund Secret, sent to Ohio to become the first state forester and set up a forestry department that was eventually housed at the Ohio Agricultural Experiment Station (today’s Ohio Agricultural Research and Development Center) in Wooster; and Dr. John Warder, a physician from North Bend, Ohio who gave up being a doctor to follow his passion for trees and became a nationally recognized forestry advocate. The exhibit highlights how the university used the power of being the state’s land grant university to foster forestry research, extend that knowledge out to the citizens of Ohio, and ultimately educate young men and women into the career of forestry.

The exhibit explores what we know about the state’s forests today, from Ohio’s pre-settlement forests to the near-complete removal at the beginning of the 20th century and the promotion of conservation efforts that eventually led to their comeback. The role of Ohio white oak in the library renovation is highlighted, as well as current forestry research and outreach and the important economic impacts of forests on the state. Featured is historical forestry equipment along with a cross section of the tree that inspired the use of white oak in the library renovation. A veneer tree will also be shown along with interactive display items presenting Ohio’s forests.

The exhibition is free to the public and the gallery is open during normal university business hours Monday to Friday from 10 a.m. to 6 p.m. and Saturday and Sunday from 12 p.m. to 6 p.m. For more information, visit http://sent.osu.edu/about-us/events/building-ohio-state.

From an article printed in the Winter 2017 issue of The Ohio Woodlands, Water, and Wildlife Newsletter published by OSU’s Ohio Woodland Stewards program. For more information, articles, fact sheets, publications, and workshops about forestry and wildlife available for landowners, visit woodlandsstewards.osu.edu. For program information, contact Mary Styly at 614-688-3421, or by email: ohiowoods@osu.edu.
stages of the insect, specifically in Ohio, which is at the edge of its known distribution in eastern North America. This knowledge can help with a number of management aspects, including education and outreach messaging, detection surveys, and optimizing biological control.

Dr. Jim Dyer, Professor and Chair of the Department of Geography at Ohio University, chose a group of undergraduate students to visit several sites in Washington County (in the cities of Belpre and Marietta) every two weeks to collect data on adelgid development. Data collection protocols were developed with assistance of Ohio State University Extension. Photos are taken of adelgids on the same flagged branches each visit using a mobile digital microscope. These photos will aid in determining when adelgids break their summer dormancy and begin to produce white “wool,” when eggs are laid, and when eggs hatch, as indicated by the presence of crawlers, the only mobile stage of the adelgid lifecycle. This work began in the autumn of 2016 and is expected to continue until June of 2017.

In addition to the monitoring of HWA, the Ohio University students are also assisting with the monitoring of biological controls that have been released for the suppression of HWA. Several insect predators of HWA have been identified from both Asia and western North America over the past few decades. Two beetle species, both in the genus Laricobius, one native to western North America (L. nigrinus), and one native to Japan (L. osakensis), have been released in Ohio since 2013. The release sites, or field insectaries, are generally hedgerows or landscape plantings of hemlocks that are moderately infested by HWA, where the beetles will hopefully establish breeding populations.

These field insectaries provide convenient sites for releasing and collecting beetles to provide future sources for establishing biological control populations in forested settings. At these sites, students are sampling using the beat-sheet technique (beating HWA-infested hemlock branches with a stick above an opened, upside-down umbrella) to dislodge any insects and record the presence of predator beetles. This frequent sampling is necessary, as the beetles are highly mobile, and depending on weather conditions, may not always be present out on the branches where adelgids occur. This important work will help us evaluate the success of establishment of these biocontrol agents.

Other recent HWA efforts

In May 2016, eastern hemlock trees were chemically treated within the 0.3 acre HWA-infested area at Lake Katharine State Nature Preserve in Jackson County and in October and November 2016, eastern hemlock trees were treated within the 3.4 acre infested area at Dean State Forest in Lawrence County. In October 2016, 408 Laricobius nigrinus predator beetles were collected by the U.S. Forest Service near Seattle, Washington and sent to Ohio and were released at a field insectary in Belpre, Ohio.

The only new finding of an HWA infestation in Ohio in 2016 was on private land adjacent to Canter’s Cave 4-H Camp in Jackson County. HWA was previously found in Jackson County at Lake Katharine State Nature Preserve in 2015.

At this time, there are no government programs to assist private landowners in managing forest infestations of HWA; however, the ODNR Division of Forestry is exploring options, including possible grant funds, to provide assistance to private landowners.

Finally, the first draft of the ODNR Hemlock Conservation Plan is nearly complete. The Director of ODNR identified personnel from several land-managing ODNR divisions (Forestry, Wildlife, and Parks and Watercraft) to develop the plan, which will guide the detection and management efforts of HWA and other pests of eastern hemlock on ODNR properties. A major component of the plan is a ranking of hemlock stands based on the presence of high-quality streams, rare or threatened species, recreational trails, and roadways. In the event that HWA infestations become widespread in Ohio, this prioritization will help to focus resources on the higher-ranking hemlock areas.

More information on HWA and other forest health issues can be found on the web at http://ohiodnr.gov/hwa and http://forestry.ohiodnr.gov/treehealth.
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REVISED:
2016 Tax Tips Bulletin

Linda Wang, National Timber Tax Specialist with the U.S. Forest Service, has revised Tax Tips for Forest Landowners for the 2016 Tax Year. The revisions reflect changes in law as of December 2016.

This publication reviews the major Federal income tax laws to help you file your 2016 income tax return. Although tax laws on timber transactions are not common knowledge, they are an important part of the ongoing cost of owning and managing timber, engaging in forest stewardship activities, and complying with tax law.

Activities for Thursday, March 2:

- Several good speakers on the status of activities on the state’s forests and the Ohio and the State Forest system where this wood eventually came from. You won’t want to miss this!
- There will be an Exhibitor Reception at the Embassy Suites following these two tours.

Activities for Wednesday, March 1:

- Bob Boyles, Ohio’s State Forester and Deputy Director of ODNR, will give us his annual update on the status of activities on the state’s forests and within the ODNR Division of Forestry and their plans for the upcoming year.
- Steve Hillard of the Appalachian Partnership for Economic Growth (APEG) will talk to us about who APEG is and what they have to offer our industry, such as services, grants, matching fund opportunities, training, and industry databases.
- Josh Koch, Founder and CEO of EcoChem Alternative Fuels, LLC will present information on an exciting new product called High Performance Clean Diesel (HPCD) that could lead to increased fuel efficiencies and maintenance savings for anyone using diesel engines.
- President’s Reception

Ongoing activities for the two days include:

- Industry Exhibits
- Tree Farm Silent Auction
- Networking Opportunities

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Plan a walk down a tree-lined city sidewalk, in a park, or in the woods, paying particular attention to trees and their symptoms along the way. Children can use the images on this page to identify some signs of unhealthy trees. They should take notes and make sketches of their findings to try and identify what caused the damage.

Make Learning Fun!
For more activity ideas and materials, attend a PLT workshop:
• Visit www.plt.org/ohio
• Contact your Ohio PLT State Coordinator, Sue Wintering at Sue.Wintering@dnr.state.oh.us, 614-265-6657

Trees in Trouble

Become “tree-tectives” (tree detectives) by first examining neighborhood trees for signs of poor health and then investigating actions to help trees in trouble.

When a person is ill, we look for symptoms to help identify what is wrong. Help children brainstorm causes, symptoms, and cures for their past ailments, or perhaps those of a family member. Together, explore:

• What caused the illness and what were its symptoms?
• How did the person get better? What was the cure?
• Could this illness be prevented in the future? If so, how?

Now, work with children to compare elements that keep humans healthy with those that keep trees healthy. For example, trees require some of the same things people need to grow and thrive. They need plenty of water, nutrients, room to grow, and a stress-free environment. When a tree is stressed, it exhibits symptoms that can help determine the problem.

Protecting Trees and Forests

• Investigate the similarities and differences between an unhealthy tree and healthy trees nearby
• Adopt an unhealthy tree as a community project
• Revisit an unhealthy tree over time to document any change or decay
• Invite a tree expert from a garden center or forestry department to help

In Ohio, PLT is sponsored by the Department of Natural Resources — Division of Forestry and Project Learning Tree — Ohio

© American Forest Foundation. Adapted from Activity 77: Trees in Trouble from Project Learning Tree’s PreK-8 Environmental Education Activity Guide.
Winter Adaptations

For many, winter is a time for huddling in warm blankets and sweaters, and dreaming of warmer weather. Of all the seasons, I hear the most complaints about winter. It makes me wonder, without being overly anthropomorphic, if wildlife species share the same dour attitudes towards Old Man Winter. Or is winter to them just another time of the year that requires certain strategies to be successful? Let’s take a closer look…

Think warm thoughts

Unfortunately, thinking warm thoughts will not ‘get it done’ for critters living in the woods during winter. They need a better strategy, which thankfully they have - many adaptations that help them manage the cold. Perhaps one of the most well-known winter adaptations is migration, especially among birds. Species like the scarlet tanager and American goldfinch travel to warmer climates to avoid not just the cold temperatures, but also a lack of food.

Yet not all birds migrate, like our state bird, the northern cardinal. Cardinals are able find enough food left in plants (i.e. seeds and berries) and will readily visit bird feeders to keep their bellies full during the winter. But when it gets too cold for comfort, cardinals need only to put on their coats! Ok, in reality cardinals are already wearing their coats so it would be more accurate to say they fluff up their coats of feathers. Cardinals and other birds can puff out their feathers, effectively creating air pockets that trap body heat and insulate them from cold temperatures. Birds can also control how warm they want their winter coat to be. Muscles in their skin allow them to control the amount of puff. Feathers that are puffed farther out will create larger air pockets, and thus more warmth.

Bats also migrate, some traveling to protective places to spend the winter, such as a cave or old mine. There they hibernate, dropping their metabolism and body temperatures in order to survive several months with no food. Unfortunately for bats, these hibernacula are no longer safe due to a deadly disease called white-nose syndrome (for more information, visit www.whitenosesyndrome.org).

Other wildlife species do not hibernate nor migrate, and instead must adapt in other ways in order to survive the cold temperatures, lack of food, and high demand for energy. Many mammals rely on a thick coat of fur to keep them warm, such as white-tailed deer, coyotes, and fox. Different types of hair make up their fur coats, such as dense underfur and hollow shafted guard hair. Both types of hair serve to create and trap insulating pockets of air, just like birds and their feathers. In addition, glands secrete oil to waterproof fur, and blood circulation is reduced to the skin surface which increases tissue insulation below the fur.

Reducing blood circulation to extremities (tail, arms, and legs) also prevents excessive heat loss. When outside temps drop, superficial veins are constricted, forcing more blood through veins closer to the arteries. In case you need an anatomy refresher, the arteries carry warm blood from the core. When cool venous blood from the extremities passes closer to the arteries, it is warmed on its way into the body, and likewise, arterial blood is cooled on its way to the extremities. This adaptation is called countercurrent heat exchange, and it keeps the extremity at a lower temperature than the core, thus reducing heat loss, not to mention freezing damage. It is how a beaver can swim in icy waters during the winter with no damage to its broad, flat tail, how a duck can paddle around

A tiny bat surviving the winter (white-nose syndrome aside) is impressive, but perhaps more impressive are the adaptations of woodland amphibians. Some, such as the wood frog, overwinter on the forest floor with only a bare covering of leaves, bark, and other debris. How then do they avoid freezing? The answer is - they don’t. Wood frogs, as well as spring peepers, chorus frogs, and gray tree frogs, can survive repeated freezing and thawing of their bodies. As winter approaches, frogs build up urea and glucose within their bodies that essentially act as anti-freeze, limiting the amount of ice that can form. But they do have their limits; even freeze-tolerant frogs cannot survive the freezing of more than 65 percent of their water. If you want to learn more about freeze tolerance in amphibians, please revisit Wild Wonders in the Woods: Ohio’s Amphibians in the Winter 2014 OWJ.

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in water a few degrees above freezing, and how a fox’s skinny legs keep from freezing during a winter hunt in deep snow.

The importance of snow

It is a simple fact that as body size decreases, the ratio of surface area to volume increases. This means that small mammals are at a greater risk from heat loss than large mammals, and they can’t rely on just fur and countercurrent heat exchange to keep them warm. So what is a small mammal to do? Some, like the southern flying squirrel, abandon their solitary life in favor of sharing body heat with other flying squirrels. Flying squirrels can save up to 30 percent of their energy budget when bunking over with fellow squirrels in tree cavities and nest boxes during the winter. These groups are called aggregate nests, and can hold up to 20 often-unrelated squirrels.

Other small mammals will rely on snow to keep them warmer. Wait…what? When we think of snow we automatically think cold, which is accurate. Yet snow can also provide pockets of air that are warmer than air above the snow. Mice, shrews, voles, and many invertebrates can be found foraging underneath the snow, protected from the fluctuating temperatures above. This space between the snow cover and the ground surface is called the subnivian space. If you have ever had problems in your lawn from voles, you are familiar with this space. Voles remain active throughout the winter underneath the snow, and we often have no evidence of this until the snow melts to reveal their network of trails.

Wrapping it up

Just as humans have adapted to winter with central heating, snow tires, extra layers of clothing, and sometimes fat, so too have our wild wonders in the woods. In fact, their adaptations are often more impressive than ours. Despite that, I will still take an electric blanket and hot cup of coffee any day over life in the subnivian space! Stay warm this winter!

Marne was recognized as Ohio’s 2016 Outstanding Educator by Project Learning Tree for her commitment to environmental education, PLT, and natural resources.
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