



The Lady-Slipper

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Native Plants in Peril: Rock Climbing is Damaging Cliff-dwelling Plants and Archeological Sites in the Red River Gorge, and Now Threatens Natural Bridge State Park

By Dr. Wilson Francis, Past- President Kentucky Native Plant Society.

Sandstone cliffs are the most unique natural features of Kentucky's Red River Gorge and Natural Bridge State Park. Take away the sandstone cliffs, and the Red River Gorge would be much like the rest of the Cumberland Plateau in Kentucky. The cliffs are widely appreciated for their scenic beauty and natural arches, and from a distance may appear to be barren. Take a closer look and you will find that they aren't barren at all. The cliffs are covered with patches and narrow bands of green: small communities of plants that are capable of surviving in shallow sandy pockets of soil that have accumulated in cliff crevices. The cliffs are home to eight species of vascular plants that are not found in the surrounding forest. The most famous cliff line plant in the Gorge is white-haired goldenrod, *Solidago albobilosa*, which grows in the soil under overhanging cliffs and is endemic to the Red River Gorge; the Gorge is the only place on earth where it grows. Even there, only about 60 populations of this species are known, most of which consist of only a few dozen individual plants. White-haired goldenrod is listed as a federally threatened species, and as such must be protected by government agencies.

Other flowering plants restricted to the rock shelters and cliff lines include rock house alumroot, *Heuchera parviflora*, probably the most common species around cliffs; round-leaved catchfly, *Silene rotundifolia*; cliff rue, *Thalictrum mirabile*; and Lucy Braun's white snakeroot, *Ageratina luciae-brauniae*, that in the Gorge is only known from one site. The White-Haired Goldenrod is an endangered plant that grows at the bottom of cliffs. The Forest Service has had to fence off areas such as this one near D. Boon Hut to protect this plant. Three species of ferns are restricted to the cliff line habitat. These include the filmy fern, *Trichomanes boschianum*, a member of a semi-tropical genus that is able to tolerate Kentucky winters only by growing under the protection of overhanging cliffs. Two species of ferns are found here only in the gametophyte stage, having apparently lost the ability to produce the familiar sporophyte stage. The Appalachian gametophyte, *Vittaria appalachiana*, could easily be confused with a liverwort at first glance, yet it is a vascular plant that is almost certainly a relict from ancient times when Kentucky's climate was considerably warmer than today's. The other species that exists only as a gametophyte is *Trichomanes intricatum*, a vascular plant that resembles a clump of green thread.



UGA2129010

Rock house alumroot by Mel Harte

www.discoverlife.org

There are mosses and liverworts, too. Although easily overlooked, some of them are cliff line specialties in our area. And though we know the drier cliffs are home to patches of lichens, and that many lichens are rare and very specific about their environment, we don't even have

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Ten years ago environmental and archeological groups advocated for tougher restrictions on recreational rock-climbing in the Red River Gorge, which is extremely damaging to cliff-dwelling plants and archeological sites. Although expansion of the practice on National Forest land was halted, rock-climbers have been making inroads with the Kentucky Department of Parks to rescind the decades long ban on climbing at Natural Bridge State Park. We urge you to read this article which originally appeared in a slightly different form in the December 2001 Kentucky Sierra Club *Cumberland* - unfortunately, the issues remain the same - and then take two minutes of your time and contact the Kentucky Department of Parks at either 502-564-2172 or http://parks.ky.gov/contact_us.aspx

The President's Message**By Alan Nations**

It was good seeing many of you at our fall meeting at Cumberland Falls. We combined our activities with the Kentucky Society of Natural History who also held their fall meeting there. The weather was good and there was a surprising number of wildflowers in bloom. Attendance was low but those who came seemed to really enjoy the activities. Many thanks, to the hike leaders and others who made it all fun for the rest of us. Our board met and approved an operating budget for 2012; we expect to end this year with a surplus, therefore there was no increase for next year.

Looking back it has been a good year for the society. We celebrated our 25th anniversary, we successfully completed our first Native Plant Stewardship certification Program class, we operated within our budget and our membership and treasury has grown. Thanks to our members and board for your commitment and hard work in meeting our goals and above all fulfilling our mission.

Best wishes to you all for a joyous holiday and a healthy and prosperous new year!



Greetings and happy holidays from KNPS. As a KNPS supporter, your generosity enables us to provide quality programs such as the successful Kentucky Native Plant Steward Certification class, as well as many great annual events including Wildflower Weekend. We count on your membership support to fund and grow these programs. I am writing to remind you that now is the time to renew your dues for 2012 if you have not already done so. If you have, we greatly appreciate your commitment to our mission. In the coming year we will expand the Stewardship class including two new locations in the state, expand our grant program and continue to promote responsible native plant education and protection. Your membership dues can safely and quickly be renewed by visiting our website at: www.knps.org and clicking the membership tab.

I wish you a happy and healthy holiday season!

Chris Chandler, Membership Chair

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Photos from the 2011 KNPS Fall Meeting at Cumberland Falls State Park



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a list of species of lichens from the area. The cliff line endemics get more attention, but most of the cliff line communities are made up of a number of species that commonly grow in the surrounding forest and are able to colonize the cliff lines and rock shelters under certain circumstances. Taken as a whole, the plant communities of the cliffs constitute natural hanging gardens that are an important part of the biodiversity of this area.

One secret to understanding the cliff line communities is to appreciate that the vertical cliff walls are not smooth, they are lined with narrow crevices and ledges upon which tiny amounts of soil have very slowly accumulated until there is just enough to harbor the life of a plant. Since it never rains under the overhanging cliffs, it must take thousands of years for a teaspoonful of soil to form on one of those ledges, and then that spoonful of soil may wait for many more years until by chance, a seed or a spore capable of germinating and surviving here falls into place. What we are talking about is one of the most fragile plant habitats imaginable, and thankfully, it has been relatively out of reach from impacts of recreational users, until now.

Bolts in Cliffs?

Although state policy has banned rock climbing from Natural Bridge State Park for many years, rock climbing has been a popular activity in the National Forest for decades – however, recent changes in the sport are spelling big trouble for the cliff dwelling plants of the area. Traditional climbers that have used the Gorge for many years rely on natural fractures for handholds, and when necessary they use removable protective devices that are inserted into naturally occurring openings in the rock.

Since traditional climbers can only climb where natural handholds exist, most of the plants high in the cliff lines have remained relatively undisturbed because many of the cliffs have been considered “unclimbable.” Enter a new generation of rock climbers. Using battery powered electric drills they install steel bolts into the cliffs and lay out vertical climbing routes from bolt to bolt. The object is to make climbing safer for the participants, but one of the principal effects has been to make rock climbing much more popular and to cause serious damage to the cliff lines.

Without asking for advice or permission, the first bolts were installed in the Red River Gorge with little fanfare. Anyone with a portable drill could lay out a route on public land, drill the cliffs, install the bolts, write up a description to post at the climbing shop, and enjoy instant fame. In several areas of Natural Bridge State Park, climbers have illegally bolted routes without authorization over the years and the park has been forced to remove them. As the number of routes in the Gorge grew, word spread to other states and the numbers of climbers coming to the area began to blossom. With increased use, the side effects of rock climbing in a natural area became obvious. Plant communities around the bases of cliffs were trampled, including some populations of white-haired goldenrod. White trails of climbing chalk began to mark well used routes. Trees as large as eight inches in diameter have been cut because they blocked access to desirable climbs. Rhododendrons have been uprooted and cast aside. Those ledges and crevices holding spoonfuls of soil have been scraped clean by climbers feeling for handholds. Since ledges and handholds are not always just where they are needed, some climbers “doctor” the routes by chipping or drilling man-made handholds into the rock. One climbing guidebook advocates “cleaning” the rock with herbicide, bleach, and wire brushes.

Although the climbers are increasingly aware of the impacts of their sport on the botanical, zoological, and archaeological resources associated with the cliffs, many insist that their recreational use should not be restricted. It is true that anyone who walks around the base of the cliffs, including hikers, birdwatchers, and yes, native plant enthusiasts will trample the soil and impact the plant communities. It is also true that climbers intensively focus their activities around the base of the cliffs, and no other user group has the ability to impact the plants on the high ledges.

It is difficult to understand why anyone would think that drilling bolts into natural cliffs is a harmless recreational pursuit, but it is legal. The US Forest Service now allows climbing on existing bolted routes but prohibits installation of new bolted routes until they are checked for impacts on rare and endangered species or archaeological resources.

The problem is that there is no protection for ordinary species that make up the bulk of the cliffline communities, so more bolted routes may be allowed on national forest land if no rare species are present—this does not help protect most cliffline plant communities.

Achieve a Balance

There are already over 1,000 routes in the Gorge area. Over 700 of them are on national forest land, and the climbers want more. They are pushing hard to ease restrictions on bolting new routes on the national forest, and now, to allow climbing in Natural Bridge State Park. They are organized, they write letters, they attend meetings about access issues, and these kinds of well-organized user groups usually get the attention. In the meantime, new bolted routes are still being installed. Some are on private land, sometimes without the knowledge or permission of the landowner. Some are on national forest land, and even though they are illegal, it is really hard to catch someone in the act of bolting. Illegal routes are found by Forest Service personnel only after the damage has already been done.

What can we do about it? We probably can't stop climbing on the cliffs, but we can make others aware that rock climbing is damaging the cliffs and destroying fragile plant communities and Native American archeological sites. If we have friends and family members who climb, we can tell them about our concerns. **Most importantly, we can all take two minutes and contact the Commissioner of Kentucky State Parks at http://parks.ky.gov/contact_us.aspx or 502-564-2172 and express our feelings that the long-held ban on rock-climbing at Natural Bridge should not be lifted.** Rock climbers are contacting the Parks Department, now people need to speak out on behalf of the plants, habitats, and archeological resources. There are important decisions to be made about visitor impacts on public land, and there should be a balance between those who believe that public lands were set aside for future generations, and those who seem to believe that public lands were set aside for themselves. If we are truly interested in native plants and the protection of natural communities, there are times when we will have to become a user group ourselves. I believe this is one of those times.



In the 1990s University of Kentucky researchers Kalisz and Francis inventoried rockshelters at Natural Bridge State Park and in the Red River Gorge for rare plant habitats. The focus was on locating the most pristine sites in the entire RRG area. They found that all the watersheds on USFS land in the RRG were already heavily impacted by recreational use. The only truly undisturbed rockshelters on publicly-owned land they could find (and therefore the only ones with some legal protection and stewardship) were on the state park, including the very areas now targeted by rock-climbers. The significance of Natural Bridge State Park as a small island of carefully protected public land in an ocean of heavy recreational use can not be overstated – this is the reason the vast majority of the park is protected by the Kentucky State Nature Preserve Commission. Allowing rock climbing at another state park created for recreational use is one thing, but the Kentucky Department of Parks is also charged with protecting certain historic and natural areas for future generations of Kentuckians and we should not stand by and allow decades of thoughtful management be overturned.

Ample scientific evidence indicates the damage recreational rock-climbing has on cliffline habitats; these links are just a sample:

www.sciencedaily.com/releases/2011/05/110503203822.htm

www.sciencedaily.com/releases/2002/04/020402072635.htm

www.geo.wvu.edu/~pclark/Articles/McMillan%202002-%20effects%20of%20rock%20climbing%20on%20veg..pdf

www.stat.duke.edu/courses/Fall02/sta240/THmidt.dir/rockclimb.pdf

www.geo.wvu.edu/~pclark/Articles/nuzzo1995_Effects%20of%20Rock%20Climbing%20on%20Cliff%20Goldenrod.pdf

Tall Tree Tales: Farewell, For Now, To a Loyal Arboreal Friend

By Dr. Neil Pederson and Dr. Amy Hessel (West Virginia University)

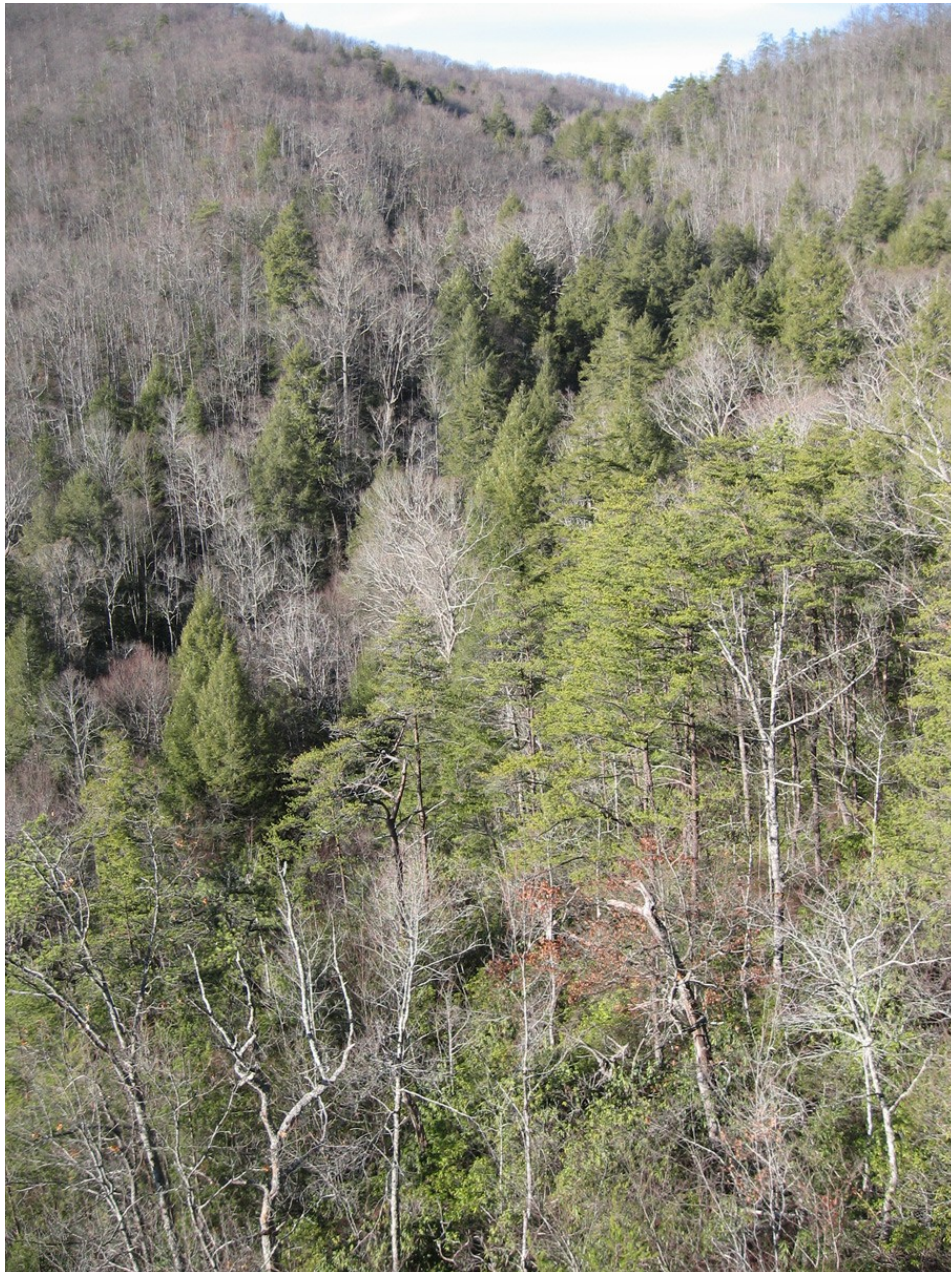
Regular readers might note that the themes here generally revolve around new discoveries or insights into trees of the eastern United States. I assume most of you are aware of the changes going on in our environment – climate change, invasive species, non-native diseases and pests, etc. It is really heavy stuff if you pause and think about it. So, for this reason, I often strive to share a little silver streak in an otherwise dark environmental cloud. My head is not in the sand, though. I just like to give small bits of hope. But, in all honesty, it is hard to ignore or diminish the changes going on in our environment. And, it just isn't the right thing to do.

From an environmental history and dendrochronological perspective, perhaps one of the biggest threats from these dark clouds is the impending loss of hemlock (*Tsuga canadensis* and *Tsuga caroliniana*). Beyond its beauty and role as a foundation species, especially in mixed-mesophytic forests, many might not know that hemlock has been a stalwart and loyal compatriot to those of us studying long-term environmental change. Joining me in this column is Dr. Amy Hessel of West Virginia University. Together, we hope to generate a community-level project to preserve the untapped environmental history in hemlock ring patterns. We are doing this because, in eastern North America, hemlock might be the most important natural archive of high resolution environmental history. More than 100 references can be found in the Bibliography of Dendrochronology; there is little doubt there might be twice as much outside of this specific bibliography across the scientific literature. While we hope that future hemlock can be saved from the decimation wrought by hemlock woolly-adelgid, the writing is on the wall on saving tree species; we've not have much success as a culture. Thus, Amy and I are moved to create a scientific legacy for hemlock. In this column, we aim to honor and salute a great arboreal friend of tree-huggers, environmentalists, lovers of charismatic megafloora and environmental historians.



--- A dying eastern hemlock in the midst of a hemlock forest, Savage Gulf, TN ---

In many ecosystems, hemlock is a foundational species, which means that its structure or function strongly influences or defines the ecosystem in which it resides. Its role as a foundation species might be most vital in the southern portion of its range. These ecosystems are most often dominated by deciduous, broadleaf tree species, especially along streams. Inside the forest, hemlock modifies daily and annual temperature variations. This is especially important to terrestrial and aquatic fauna. Hemlock also strongly influences soil characteristics, for example, through the deposition of its acidic needles onto the forest floor. Its dense canopy and the way it acidifies the soil generally governs the livable space to certain plants and animals. Some species are more commonly found within hemlock-dominated forests. The grip of canopy hemlock on ecosystem structure and function is strong and ecologically important.



--- Eastern hemlock lining Watts Creek in Blanton Forest, KY, January 2007 ---

Setting aside the functional extinction of American chestnut, many old-growth southern forests are again being significantly altered through the rapid loss of hemlock. Hemlock is declining faster than expected in the south compared to observations in the north. The accelerated decline in the south might largely be the result of winter warming. Hemlock woolly-adelgid does not survive well when the temperature drops below -20 F. So, global warming, which in the eastern US has been mostly expressed in the winter, only helps hemlock woolly-adelgid...(head quickly goes back into the sandy, environmental cloud). Coincidentally, or not, a severe drought occurred around the time of recent rapid decline of hemlock in the southern Appalachian Mountains. While the foundation of many forests is being severely disturbed over much of hemlock's range, it is the southern portion of the hemlock forest that is experiencing the brunt of this brutal pest.



--- Dead hemlock in the Smoky Mountains. They appeared to give up the ghost overnight in 2007
(Will Blozan photo used by permission) ---

Natural History and Life History Traits of Hemlock

Hemlock covers roughly 25 million acres, ranging from southeastern Canada to the southern Appalachians and from the eastern seaboard to the midwestern US. Interestingly, hemlock nearly went extinct roughly 5,000 years ago: pollen records show a nearly simultaneous decline across its range at that time. Early evidence suggested that this decline was triggered by an insect outbreak. Subsequent research, however, indicates that the decline and insect outbreak occurred around the time of a megadrought in eastern North America. This decline was so severe that it is often thought that hemlock never recovered to its mid-Holocene stature. Pollen evidence suggests that hemlock only reached its modern range about 1000-2000 years ago.

What makes hemlock a good friend to the climatic and ecological historians that seek its cellulose-based knowledge are its life-history traits. Hemlock might be one of the most shade tolerant species in eastern North America. That, combined with hemlock's slower growth rates, often relegates long-lived individuals to the forest understory; such suppression can make one sensitive to slight changes in the environment. Lacking vital sunlight and having to compete with greedy, canopy dominants for water and nutrients, understory hemlock responds well to any increases in these essential resources (*heck*, hemlock might even cheer if a neighboring giant falls and releases significant amounts of sunlight, moisture and nutrients to the level of the suppressed tree. No one knows for sure). While biding their time in the understory waiting for forest gaps, above and

belowground, hemlocks record canopy disturbance events. When sunlight, moisture and nutrients become available in greater amounts following an opening in the canopy or the mortality of a neighboring tree, the ring widths of understory hemlock can suddenly double, if not triple, in width. These abrupt changes in ring widths, for ecological historians, are signals of past canopy disturbance (...when a tree falls in the woods and no one is there to hear it, hemlocks record it!). Luckily for the ecological historian, because it can be a slow grower, it might take 5, 6, 7 or more canopy disturbances for a hemlock to reach canopy height. This trait of hemlock was first published in 1927 by Dr. Robert Marshall, a great, early forest scientist who championed wilderness for the east. From hemlock's ability to persist in the shade, we have learned much about disturbance history in eastern North America. Thus, hemlock's shade tolerance and slower growth makes it a good ecological historian.

Funny enough, although hemlock typically grows in cool, moist environments, it is particularly sensitive to soil moisture. While a significant portion of this sensitivity can be attributed to its physiology, another portion might be attributed to the fact that hemlock lives in moist environments, such as swamps and areas with a relatively high water table. As oxygen might be the most important element for root survival, trees in wet areas have shallow root systems that are perched above the water table. When drought comes, as it always does and always will, the water table drops, leaving these trees high and dry (yes, pun intended). At the same time, hemlock is almost cosmopolitan – it can live virtually anywhere. The first real tree-ring based reconstruction of drought was based upon ancient hemlock living on a talus slope in the Mohonk Preserve. These thirsty trees allowed Dr. Ed Cook to reconstruct drought history for the New York City Watershed in 1977. Therefore, hemlock's acute drought sensitivity and flexible habitat tolerance also makes it a good climate historian.



---The Humpty Dumpty Talus Slope in the Mohonk Preserve, NY. Unfortunately, the honorable and sacred hemlock trees on this site are on their last legs. ---

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Hemlock's best overall trait in making it a good historian, however, might be its longevity. It is currently recognized as the fourth oldest species in eastern North America. Black tupelo (aka black gum to Yanques and *Nyssa sylvatica* to botanists) is the third oldest tree on this list. However, black tupelo appears to have no consistent sensitivity to drought. Thus, in one way, hemlock moves up on this list. Hemlock has been documented to live at least 555 years in the eastern US. And, hemlock trees of 400-500 years are not uncommon. While there is a record of a 900 year old hemlock in the eastern US in the scientific literature, this record is viewed with skepticism. Hemlock might be the most cored tree in eastern North America, with at least 1000 trees cored, we'd guess. The fact that 600 years, let alone 900 years, has not been bested casts doubt on this earlier claim. That being said, hemlock can live more than a millennium in western North America while in temperate Asia, *Tsuga* has been found to live 600-900 years - hemlock trees 500-750 years old are not unusual in Bhutan, and a *Tsuga dummosa* near 900 years old was recently found in Nepal. Thus, the reference regarding a 900 year old hemlock in eastern North America might be real – it just seems like an outlier at this time. Most importantly and unlike some species, old hemlock can be found across all site types and over much of its range. Thus, hemlock's consistent longevity makes it a great overall environmental historian.

Hemlock is a Critical Paleo Species

These life-history traits make hemlock one of the most important natural archives of environmental information in eastern North America. Unlike many archives of environmental history, tree rings allow us to peer into specific years, like 1774, or events in specific seasons, like that in May 1774 (future column). Many environmental archives do not have such a precise window on history. On top of being one of the first trees giving us insight into how we could reconstruct ecological history, both eastern and Carolina hemlock comprise a significant portion of the North American Drought Atlas. The online drought atlas is a place where anyone with a computer can point and click to instantly download 350-2000 years of drought history. These two species provide nearly 1/3rd of the chronologies used in the eastern portion of the North American Drought Atlas. Therefore, its value as a paleoenvironmental historian cannot be overstated. It has been a long, true and silent partner that we go to often to learn about environmental history. It is truly a critical species.

For this reason, we will soon make a call for action to our fellow scientists, citizen and professional, to join forces in the recovery of samples from our ancient, noble friends before they likely, and sadly, succumb to a non-native pest. The environmental information they have provided in the past and the information currently inscribed in living trees will paint vibrant pictures of climatological and ecological history long after the dominant trees are gone from the landscape. This information is invaluable. While facing the reality, the inevitability that we will likely lose these wonderful beasts, we can at least recover some benefits for society and provide the historical legacy that hemlock so clearly deserves.

Silver Post-script:

We cannot depart without three pieces of silver: First, cooler winters in the northern portion of hemlock's range in recent years seems to have slowed the pace of hemlock woolly-adelgid invasion. Second, people are out and about discovering 'new' pieces of old-growth hemlock forest. Finally, there is something you can do about this right here in Kentucky. Seek out Save Kentucky's Hemlocks. Save Kentucky's Hemlocks is a proactive and diverse group of people committed to save hemlock's legacy within the Commonwealth. It might be the most progressive group of its kind in the eastern US. They could always use a few more hands (or dollars, of course). For more information contact the Kentucky Division of Forestry's Hemlock Woolley Adelgid Coordinator Alice Mandt at alice.mandt@ky.gov.





--- Kacie Tackett emerging from a newly-discovered patch of old-growth hemlock in Cane Creek Wildlife Management Area, KY. ---

http://knps.org/

Kentucky Native Plant Society - www.knps.org

Welcome to The Kentucky Native Plant Society

HOME INFORMATION NEWS/EVENTS MEMBERSHIP LINKS

The Kentucky Native Plant Society was founded in 1986 for everyone interested in the native plants and wildflowers of Kentucky. Plants are essential to both the well-being of our Commonwealth's natural ecosystems and our enjoyment of its unique environment. With members in Kentucky and neighboring states, the Kentucky Native Plant Society is a leader in promoting education about, appreciation for, and conservation of our native flora.

Our mission is to promote education, preservation, and protection of Kentucky native plants and ecological systems.

The Lady-Slipper Archives

Fall 2011 Newsletter

The Lady-Slipper

Number 40-3 Fall 2011

Kentucky's Common Milkweed (*Asclepias syriaca* L.)

KNPS Native Plant Stewardship Certification Program

Explore your website at WWW.KNPS.ORG!

Cultural Industries and Invasive Species: Ecological Threats to Handicraft Production in Central Appalachia

By Amanda Fickey and Dr. Lynne Rieske-Kinney, University of Kentucky

Recognizing and Advocating for Alternative Economic Practices in Central Appalachia

As employment in extractive industries continues to decrease and jobs have been lost throughout Central Appalachia, individuals have often turned to diverse economic practices such as small-scale agriculture and handicraft production to make ends meet (Mencken and Maggard 1997; Oberhauser 2002, 2005; Fickey 2011a). Such practices however, are not new. Woodland agricultural methods prevalent among Native American tribes and early European settlers were comprised of numerous diverse economic activities (Eller 1982, 2008; Williams 2002). Although such activities may have lessened with the rise of industrialization and wage-labor throughout the region, small-scale handicraft and agricultural production has persisted overtime and continues today (Fickey 2011a, 2011b).

Such small-scale practices can be critical to sustaining livelihoods in rural regions with declining resource-based extraction industries (Oberhauser 2005; Carnegie 2008; Pretes and Gibson 2008; Fickey 2011a). For individuals who are no longer employed in mining and timber industries, who rely on state assistance for survival (as a result of injury, Black Lung disease, or retirement), the handicraft industry may serve a last resort that provides the cash needed to make ends meet without becoming disqualified for state programs. And yet, such economic activities are rarely understood as 'development worthy' in Appalachia and beyond (Gibson-Graham 1996, 2006; Carnegie 2008; Fickey 2011a, 2011b). Much work remains in the field of Appalachian Studies with regard to the documentation and fostering of alternative economic practices.

These small-scale practices however, are not simply 'alternative' in that, the handicraft industry and its producers are themselves quite diverse (see Fuller and Jonas 2003 for a discussion of degrees of alterity; Leyshon et al. 2003; Samers 2005). Craft producers may engage in handicraft production in opposition to capitalist wage labor, in substitution to capitalist forms of labor (such as employment in logging or mining) that is no longer available, or in addition to other forms of wage labor. Despite the dominance of neoliberal development strategies within the handicraft industry that promote self-sufficiency and entrepreneurialism, the state as well as regional entities, simultaneously supports self-sufficient entrepreneurs as well as more cooperative handicraft production and distribution (Fickey 2011a, 2011b).

In Kentucky, the state has allocated large sums of funding to the Kentucky Craft Marketing Program since the early 1980s (Barker 1991). Such funding has allowed the state to create a geographical lore for handicraft items produced in Kentucky; a lore which entices consumers – at regional, national, and international scales – with promises of high-quality, authentic products. This geographical lore benefits both cooperative members and entrepreneurs alike. Other states throughout Central Appalachia and Appalachia more broadly, may not have state-supported programs. Western North Carolina, for instance, has been very successful with the Handmade in America program which is primarily regionally based. Funding at the regional or state scale however, may provide a somewhat more stable market for handicrafts, and yet, it does not protect the industry in terms of accessibility to raw materials needed for handicraft production.

Examples of Ecological Threats to Handicraft Production

Financial support at the regional and state level does not necessarily guarantee the sustainability of the handicraft industry over time. Raw materials that crafters use to produce handcrafted products often face



—Image 1 – Reed basket with cherry bottom. The two dark lines that appear in the upper left hand corner of the basket bottom indicate worm damage. Photo by A. Fickey. —

ecological threats which are rarely if ever recognized by arts-related organizations. For example, craft producers working with hardwoods are often unaware of the potential threats of invasive species. Instead, Artisans often recognize and capitalize on qualitative irregularities caused by native insects and pathogens in the form of burls and flag worms, which can provide intriguing irregularities in wood products which enhance product appeal.

However, in recent decades entomologists as well as others have noted threats that originate from exotic invasive species, which disrupt ecosystem processes and threaten tree survival and resource sustainability. Non-native species, including plants, insects and diseases, that have expanded beyond the limits of their native range – often via human transportation – are labeled ‘invasive’ once they begin to cause economic and ecological harm (Lockwood et al. 2007). The following are several examples of invasive species that threaten hardwoods typically used by handicraft producers throughout Central Appalachia. These images, as well as the resource database included at the end of the article, are meant to provide assistance with the identification of invasive species. Contact information for regional, state, and national organizations that can assist with the management/eradication of invasive species has been included.

Oak

Oaks are a dominant component of mixed mesophytic forests of Appalachia, and are tremendously important both economically and ecologically. Forest management strategies over recent decades have favored rapidly growing, shade tolerant species, to the detriment of oaks. These management strategies, conjoined with forest fragmentation, climate change, endemic pests, and recent exotic introductions, have been coupled with an alarming decline in our oak component. For example, the exotic Asiatic oak weevil is an acorn feeder that directly impacts oak regeneration. Invasive defoliating gypsy moth caterpillars can cause extensive oak mortality with a concomitant shift in species composition away from the highly valued oaks, and more recently, the sudden oak death pathogen threatens the sustainability of our red oaks. The decline of oaks in our forest



—Image 2 – Symptoms of Sudden Oak Death (*Phytophthora ramorum*). Location: United States. Photo by Bruce Moltzan, Missouri Department of Conservation, Bugwood.org. —

will affect existing ecological interactions and economic practices, ultimately impacting the availability of this resource for the handicraft industry.

Walnut

Walnut is a high value species under threat from thousand cankers disease (TCD), an emerging insect-associated pathogen complex caused by an unknown exotic fungus that forms coalescing stem and branch cankers on black walnut. TCD is associated with the native walnut twig beetle. Initial reports of black walnut mortality occurred in western states in 2001, but retrospective reports of tree mortality throughout the 1990's suggest that TCD may have been present in the west for over a decade. It has been reported in eight western US states and Mexico, and more recently in neighboring Tennessee. The full host range of the beetle vector

and associated fungi is unknown and disease epidemiology is not fully understood. Though the walnut twig beetle is a western species, questions remain whether the associated fungus might be vectored by other beetles, either native or non-native, whether the western vector could establish in Appalachia, and the extent to which TCD might be transmitted via firewood and wood products. The susceptibility of other nut-producing trees, including closely related butternut and hickories, is unknown.

Given the high value and geographic range of black walnut, and the prevalence of nut production throughout the eastern USA, our southeastern forests are clearly at risk from this emerging disease complex. The insect-pathogen complex associated with TCD threatens the persistence of black walnut, and perhaps butternut, in the southeast.

—Image 3 – Symptoms of Thousand Cankers Disease (*Geosmithia morbida* – proposed name). This image is an example of large trunk cankers





common in end stage infestations of cankers. Location: United States. Photo by Whiney Cranshaw, Colorado State University, Bugwood.org. —

Ash

Ashes are present throughout much of Appalachia, and are threatened by the exotic emerald ash borer (EAB). Since it was first reported in the USA in 2002, EAB has expanded its geographic range dramatically, causing extensive ash mortality and making headlines throughout the US. North American ashes are especially susceptible, and EAB has proved capable of traveling great distances in association with movement of firewood, and to a lesser extent infested nursery stock. Although it has been present in Kentucky since mid 2009, EAB-induced ash mortality is not yet common. Urban forests will be particularly hard hit, and the ash component in Kentucky's forests, particularly in the northern 1/3 of the state, is significant. EAB-induced ash mortality will reduce the ashes available for commercial uses, including the handicraft industry, and markedly change the structure and composition of affected forests.

—Image 4 – Symptoms of Emerald Ash Borer tunneling (*Agrilus planipennis* or *Agrilus marcopoli*). Location: United States. Photo by Eric R. Day, Virginia Polytechnic Institute and State University, Bugwood.org—

Conclusions

Our goal in providing these examples is to generate an awareness of the potential impact of invasive species upon Central Appalachia's handicraft industry. Despite financial support for this industry at both state and regional levels, such economically-driven efforts must be complimented with ecological education with regard to invasive species. Many culturally-based industries, beyond and in addition to handicraft production, such as small-scale agriculture, eco-agro tourism ventures, and preservation initiatives, rely on a stable ecological environment. Yet, non-native species threaten both environments and economies. It is our hope that this brief essay contributes to the continuing dialogue pertaining to alternative economic development and invasive species.

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Other Resources— Online Sources

Center for Invasive Species and Ecosystem Health

<http://www.invasive.org/browse/subthumb.cfm?sub=56599>

Defenders of Wildlife – Invasive Species in Kentucky

<http://www.defenders.org/resources/publications/invasives/kentucky.pdf>

Handmade in America Craft, Architecture, and Design Program

<http://www.handmadeinamerica.org/economic-development%2Fcad>

Kentucky Craft Marketing Program – *Kentucky Crafted*

<http://kycraft.ky.gov/wheretobuy/TopKentuckyRetailers.htm>

Kentucky Exotic Pest Plant Control

<http://www.se-eppc.org/ky/list.htm>

Kentucky Heritage Land Conservation Fund

<http://heritageland.ky.gov/Pages/default.aspx>

Kentucky State Nature Preserves Commission

<http://naturepreserves.ky.gov/pubs/Pages/factsheets.aspx>

Southeast Exotic Pest Plant Council

<http://www.eddmaps.org/tools/>

United States Department of Agriculture National Agricultural Library – National Invasive Species Info Center

<http://www.invasivespeciesinfo.gov/unitedstates/ky.shtml>

United States Department of Agriculture Natural Resources Conservation Service – Invasive and Noxious Weeds

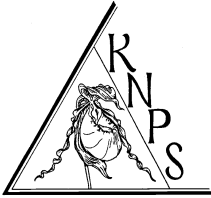
<http://plants.usda.gov/java/noxiousDriver>

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<http://www.ca.uky.edu/anr/>

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