

A close-up photograph of a bird's head, showing its eye, beak, and feathers. The bird has dark feathers on its head and a lighter, yellowish-brown patch around its eye. Its beak is dark and pointed. The background is blurred.

Land & Water

Kentucky Energy and Environment Cabinet

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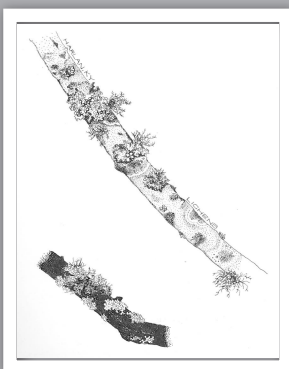
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Land Air & Water

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Our Cover

Beaumont Middle School sixth-grader Griffin Shively, 11, was the winner of the fifth-annual Capture the Earth photography contest in 2015, with this beautiful photograph of a tufted titmouse.



Viewing nature through the lens of a camera

Annual photography contest encourages kids to get outside, make connections

Since 2011, middle school students in Kentucky have had an opportunity to submit their nature photos to the Energy and Environment Cabinet's Capture the Earth photography contest.


The annual contest was initiated in 2011 with 27 entries and has attracted an increasing number of submissions each year. Ninety-two photographs were entered in the 2015 contest.

Christina Howard, winner of the 2014 contest and now a student at West Jessamine High School, said she enjoys taking photos and thought the contest would be a good way to see how other people viewed her photography skills, and to get realistic feedback – and not feedback just from her parents.

"I would encourage middle school students to enter the contest because it allows you to think about your photo's perspectives differently. Instead of just clicking a button, you have to think about the quality and story the picture tells to your audience. Overall, I think the contest improved my photography skills and hopefully did for others who share my same passion."

Ricki Gardenhire, coordinator of the contest, said that the goals of the student photography contest are twofold. "With this annual contest, the cabinet can encourage students to explore their natural surroundings and connect with nature; second, the contest provides an opportunity for students to use their creativity and practice critical thinking skills by taking digital photos and describing -- in writing -- how their photo can encourage others to be better environmental stewards."

The Capture the Earth photo contest is open to all Kentucky middle school students in grades 6-8. Judges look for originality and creativity, photo composition, and a brief explanation of how well the photograph celebrates the beauty and diversity of Kentucky and encourages others to care about the state's environment through stewardship and conservation.

Entries are being accepted now through 4:30 p.m. April 8, 2016. In the past, the winner has received lodging for two nights at a Kentucky State Resort Park of the winner's choosing with his or her family. The 2016 prize has not been determined. Middle school students may email one photograph as an attachment to Kidsphotocontest@ky.gov. Official contest rules are available at <http://eec.ky.gov/Pages/earthday.aspx>. For more information, call Ricki Gardenhire at 502-564-5525 or e-mail Ricki.gardenhire@ky.gov. 

Land Air & Water

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Kentucky's changing energy landscape

By Aron Patrick and Adam Blandford
Division of Carbon Management and
Data Analysis



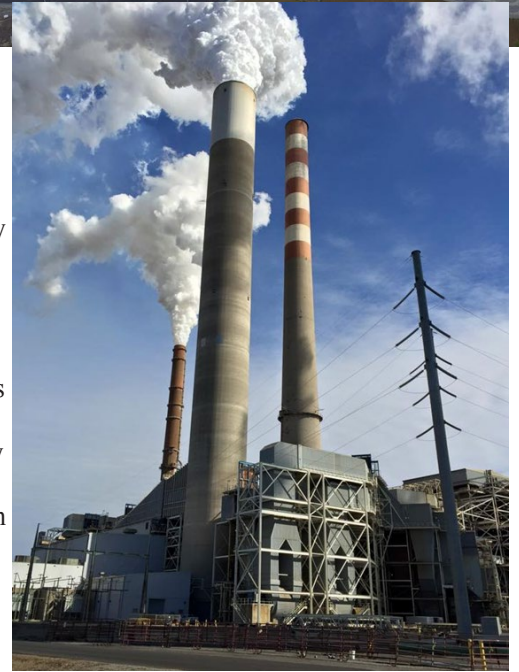
From our coal mines to our factories and distribution hubs, Kentuckians, more than most, are intrinsically connected to the production and consumption of energy. Kentucky's energy landscape is rapidly changing, as increased federal environmental regulation, decreasing energy demand, increased production and use of natural gas and declining coal production are significantly changing energy production and use in Kentucky.

While coal is as synonymous with Kentucky as basketball, bourbon and horses, Kentucky's manufacturing industry remains Kentucky's largest source of income and a leading source of employment. Kentucky coal is used to generate low-cost energy, which in turn powers Kentucky's

larger manufacturing and logistics economy. Kentucky has the lowest industrial electricity prices east of the Mississippi River and has maintained those low electricity costs for decades.

Energy-intensive manufacturing facilities that produce aluminum, glass, steel and chemicals have congregated here and those facilities depend on reliable, low-cost electricity. Similarly, the many trucks that travel the state, as well as the air logistics hubs in Louisville and Northern Kentucky mean energy is central to the way many Kentuckians earn a living. As a result, Kentucky has the 10th most energy intensive and the fifth most electricity intensive economy in the United States.

Despite the common misperception that energy use is growing, Kentucky's energy use is actually declining and Kentucky families, communities and industries are using energy more efficiently than ever before. Kentucky's electricity demand in 2015 has declined by 20 percent since peaking in 2008. In that same period, Kentucky households were spending \$38.87 less annually powering their homes and \$178.48 less annually to fuel their cars. In all, Kentuckians spent \$2 billion dollars less in 2013 than in 2008 for energy. Since 2008, Kentucky's electrical and energy based income has grown by more than 7.4 percent, while its



energy intensity has fallen by 19 percent. With more than 300 ENERGY STAR schools, Kentucky is now ranked second in the United States for the percentage of ENERGY STAR schools.

The air in Kentucky is also cleaner today than in the past, not only because Kentuckians are using less energy, but

Continued on Page 12

TOP RIGHT: An aerial view of Cane Run. Photo courtesy of LG&E. **MIDDLE RIGHT:** Steam billows from stacks at Paradise. Photo courtesy of Aron Patrick. **BOTTOM RIGHT:** Two miners look on as the continuous miner further into the earth. Photo by Aaron Camenisch. **TOP LEFT:** The furnace is aglow at North American Stainless. Photo by Benjamin Corwin.





KHLCF PROTECTS BERNHEIM FOREST

Additional 136 acres purchased

By Zeb Weese and Andrew Berry
Department for Natural Resources

Since 1995, the Kentucky Heritage Land Conservation Fund (KHLCF) has helped conservation agencies throughout the Commonwealth purchase over 87,000 acres of land to protect natural habitats and provide environmental education opportunities. Bernheim Arboretum and Research Forest, the largest privately held forest block dedicated to conservation in Kentucky, has protected over 14,000 acres for nearly 100 years. Recently these two organizations joined together to protect even more ecologically significant land, along with help from the Imperiled Bat Conservation Fund (IBCF) of the U.S. Fish and Wildlife Service (USFWS), the Kentucky Natural Lands Trust (KNLT) and private landowners.

These groups worked together to purchase over 136 acres adjacent to the existing Bernheim property. This area, known as Cave Hollow, is a critical piece of habitat within the Greater Bernheim landscape, containing significant cave habitat and the headwaters of two streams, Long Lick and Pine Creek. “As leaders in ecological stewardship, we are thrilled to be able to protect the land that feeds our region’s waterways,” said Dr. Mark Wourms, Bernheim’s executive director. “It is paramount to not only the people who inhabit the region but also to the native wildlife.”

Cave Hollow, as its name suggests, also protects a small cave harboring wildlife, from salamanders to several different species of bats. The bats are particularly significant to this project.

“These remarkable flying mammals are keystone species in the ecosystem,” said Bernheim Forest Manager Andrew Berry. “Bats feed on a wide range of insects, some of which are pests to agricultural crops and forests. A healthy population will consume tons of insects every night during the summer. These bats then deposit nutrients throughout the forest and caves which many other cave dwelling creatures depend upon.”

The KHLCF and Bernheim also collaborated to inventory the bat populations of the forest, primarily by using ultrasonic acoustic monitors that record bat sounds that are used to identify species. Because cave-dwelling bat populations throughout North America are at risk from white nose syndrome and deforestation of their summer roost sites, the research findings allowed Bernheim to partner with the USFWS to leverage IBCF funds for the land acquisition along with the KHLCF funding. This bat survey will continue now that the site has been protected to determine how the different species utilize habitat.

The acquisition was also the first of its kind under recent state legislation allowing Kentucky Heritage Land Conservation Funds to purchase land for nonprofit land trusts, providing the nonprofit match KHLCF dollar-for-dollar.

Previously, the KHLCF strictly funded natural areas for local governments, state agencies, and Kentucky colleges. “The KHLCF is very excited that Cave Hollow is the first nonprofit project our program has funded,” said Zeb Weese, KHLCF program coordinator. “Bernheim has a remarkable century-long track record managing natural lands and our organizations share the same commitment to protecting Kentucky’s biodiversity.”

Bernheim entered into a conservation easement with KHLCF that states any future use of the land must be consistent with agreed upon conservation goals. This agreement helps protect Cave Hollow by restricting development and fragmentation in the upper watershed. This strengthens the water quality flowing downstream to the cave system and ensures that the landscape will remain in a natural state.

“Because it is privately held, Bernheim has greater latitude to implement innovative practices in land conservation like this,” said Wourms. “We’re proud to test a model that can stretch limited state land conservation funds even further.”

Bernheim may be the most recent natural area protected by the KHLCF, but it is not the last. Over 30 projects are currently in development that will protect thousands of more acres statewide.

The KHLCF is funded in part by the sale of “Nature’s Finest” license plates. For more information, visit the Kentucky Heritage Land Conservation Fund website at <http://heritageland.ky.gov>.

Q&A

Renewable energy- geothermal

Options for Kentucky's energy independence

As part three of an ongoing series of articles on renewable energy, Land, Air and Water talked with assistant director of Renewable Energy, Kenya Stump, to discuss Kentucky's renewable energy landscape. In this issue, Stump discusses geothermal resources in Kentucky.

The root words in geothermal translate to "earth heat." According to the U.S. Department of Energy, a geothermal resource refers to a reservoir of hot water at varying temperatures and depths below the Earth's surface. This resource can be used for electricity generation, direct use or for heating and cooling. Since Kentucky does not have adequate resources for geothermal electricity production, heating and cooling applications are the focus of this series.

When you say "renewable" most people don't think geothermal heating and cooling. Why?

KS: I think it is because the geothermal heat pumps (GeoExchange, earth-coupled, ground-source or water-source heat pumps) have been around since the 1940s and to most people they don't look that different above ground than a traditional heat pump. Most people, when they hear "renewable," think of solar, wind or even hydroelectricity because they can see those things working.

The geothermal heat pump is measured by its coefficient of performance (COP) or the ratio of heat provided by the system per the energy required for operations. A traditional heat pump might have a COP of 1.75- 2.5 but a geothermal heat pump is on the order of 3-6 with most today around 4.5 to 5. That's at least two times the amount of heat provided that is renewable than a traditional heat pump. With geothermal, all the work gets done below the ground and it's easy to forget

you are taking advantage of a renewable resource, the subterranean temperatures to provide heating in the winter and cooling in the summer.

What excites you most about geothermal heating and cooling in Kentucky?

KS: The growth of geothermal heat pumps in Kentucky is a great success and their costs make them one of the most affordable options for those looking to make an investment in renewables. Even though most geothermal heating and cooling systems are more expensive than a traditional system, most homeowners are able to recoup their investment in two to 10 years. When included as part of your mortgage, the geothermal system can result in positive monthly cash flows, meaning energy cost savings could exceed that added mortgage amount over the course of each year.

Even though it only accounts for approximately 1 percent of residential energy consumption, all sectors from government to commercial and manufacturing are installing geothermal heating and cooling systems. In fact, it is great to see that Kentucky is leading the way with the first geothermal neighborhood development. Earlier this year, Norton Commons in



Kenya Stump

Louisville, announced it will construct the largest 100 percent geothermal residential community in the United States.

Are there other examples?

KS: One only needs to look at Fort Knox which relies on geothermal to heat and cool 6 million square feet of space across 109,000 acres. At least 250 of their facilities are on geothermal heat pumps served by over 600 miles of piping. They even have a geothermal pond. On the opposite end of the spectrum, the Waterfront Hampton Inn in Owensboro also boasts

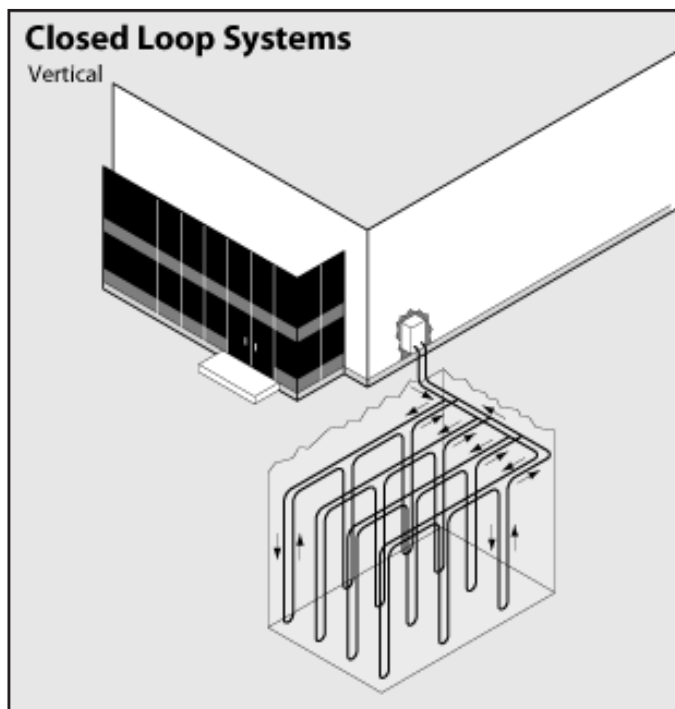


Some probably would also be surprised to learn that one of the oldest geothermal heating and cooling projects was in 1984. The Galt House in Louisville installed a 1,700 ton GeoExchange system and then 10 years later expanded the system to 4,700 tons to be recognized as the world's largest GeoExchange project.

KS: I still get people who say, “Oh, I just don’t think of my geothermal heat pumps as renewable technology.” In a way, that makes it a success, in that it has become so comparable to traditional systems and people no longer think of them as special or different, but rather just part of the building process. However, we still have some work to do in regards to messaging and education if we are going to increase penetration levels.

The other misconception is that you need a lot of land to install geothermal. Today, you can have vertical and horizontal systems that are closed loop which means the amount of fluid circulating is constant and contained. You can even use an existing pond or lake if one is in close proximity. The main idea is that the suitability of the site is a function of the geology, hydrology, and land availability. Horizontal systems (generally the most economical) are typically used for newly constructed buildings with sufficient land. Vertical installations or more compact horizontal installations are often used for existing buildings because they minimize the disturbance to the landscape.

Because specialized equipment is needed for installation and specific technical knowledge, anyone considering geothermal heating and cooling should look for a certified installer through the International Ground Source Heat Pump Association or the Geothermal Heat Pump Consortium. Both groups provide a list of certified installers in a given area. Since the installation will involve drilling, don't forget to ensure that the drilling operator has been certified as well. Always ask for references, check the Better Business Bureau, and find out if there have been any environmental violations against the company.



<http://eec.ky.gov>

Learning with lichens

By Roberta Burnes
Division for Air Quality



Forests can tell us a lot about the air we breathe. On a misty October morning, a group of people gathered in the shadow of Pine Mountain. One by one, each approached a tree with clipboards and hand lenses ready. The clues were there on each tree trunk, hidden in colorful patterns known as lichens.

Susan Brown coordinates environmental education at the Pine Mountain Settlement School (PMSS) in Harlan County. She also leads the Lichen Biomonitoring Project, which focuses on the connection between lichens and the air we breathe. Biomonitoring is the measurement and tracking of organisms, such as lichens, for the purpose of monitoring the long-term effects of environmental pollution or environmental change.

“Lichens have a lot to tell us about air quality,” said Brown. “Some lichens are very sensitive to air pollution, while others can tolerate it quite well. By surveying the lichens found in a particular area over time, we can get a sense of whether certain pollutants are present and how those pollutants might be impacting lichen communities,” Brown added.

Thanks to a grant from Eastern Kentucky University’s Center for Appalachian Regional Engagement and Stewardship (EKU CARES), the Lichen Biomonitoring Project was born.

The grant enables project team members from EKU and PMSS to establish lichen monitoring plots in the James E. Bick-

ford State Nature Preserve, located at Pine Mountain and in the Lilley Cornett Woods, which is part of EKU’s Division of Natural Areas.

Team member Dr. Melinda Wilder is the director of EKU’s Division of Natural Areas. “We chose these sites for two reasons,” said Wilder. “First, these sites are located far from significant sources of air pollution that might influence the results of the data. Second, they are managed natural areas that are readily accessible to the public.”

Accessibility is important, especially since the project utilizes volunteer citizen-scientists to collect the data. “Citizen science offers a chance for people to learn about their environment by getting outdoors and participating in the scientific process,” said Wilder. “This is important because a positive experience in the outdoors directly correlates with increasing environmental stewardship.”

To participate in the project, volunteers must attend a free workshop where they learn the basics of identifying lichens and proper data collection. Ten eager students attended the first workshop that was held last fall at Pine Mountain Settlement School.

Workshop participants learn how to record the presence or absence of pollution-sensitive lichen species on the trunks of forest trees. First, a transparent plastic grid is tied to the side of a tree. Using a hand lens, a volunteer then examines the surface of the trunk through each space on the grid, to determine whether it contains one of three types of lichens (see sidebar). Another volunteer records the data.

At the workshop, staff from the Division for Air Quality helps put the project in context by providing an overview on air quality. Students learn how some pollutants can be transported by the wind over long distances, which means that upwind sources many miles away may possibly contribute to sulfur dioxide pollution, even in these remote sites. Sulfur dioxide and nitrogen oxides are major contributors to acid deposition (typically called acid rain) and certain lichens are especially sensitive to them.

Normal rainwater has a pH value of between 5.0 and 5.5, which is only slightly acidic. However, when rain mixes with sulfur or nitrogen compounds in the air, which are commonly emitted by burning fossil fuels, the rain becomes much more acidic.

Lilley Cornett Woods has operated an acid deposition monitoring station for more than three decades. Data from this site and many others are housed on the National Atmospheric Deposition Program (NADP) website.

When the site began operation in 1984, acid rain was becoming recognized as a serious threat to the health of forests and lakes. Data from the site show that, since 1990, sulfate levels have steadily decreased while rainfall pH has risen (meaning the rainfall has become less acidic). This improvement in acid rain is a direct result of air pollution controls.


But how have the slow-growing lichens responded, and are they still being impacted? These are some of the questions

Brown and Wilder hope to answer.

As volunteers collect lichen data over the coming months and years, project leaders will upload it to a national database known as Hands on the Land. This website provides opportunities for educators to share citizen science data and to see what others are doing and discovering on public lands.

While biomonitoring alone cannot provide an accurate measure of pollution in an area, it can be a useful tool to help scientists gain a more complete picture of the health of the entire forest and how it is responding to air quality trends.

“Biomonitoring takes time and patience, and lots of data collection,” said Brown. “It may take years before we see results.” That however, doesn’t bother Brown, who sees a more immediate benefit to the volunteer citizen scientists and their communities. “Participants in this project will gain a deeper understanding about lichens and air quality, and have the satisfaction of knowing they contributed to something larger than themselves,” said Brown.

If you are interested in joining the Lichen Biomonitoring Project as a citizen scientist, please contact Susan Brown at 606-558-3571 or email sbrown@pinemountainsettlementschool.com to find out more about upcoming workshops. 

What is a lichen?

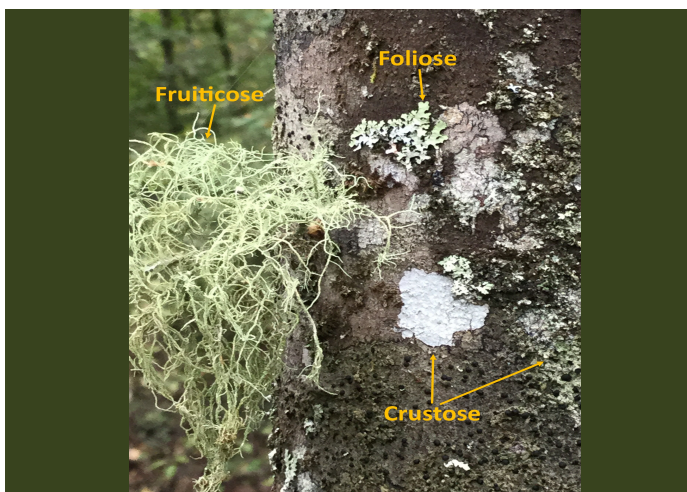
Touch the trunk of any tree in eastern Kentucky and chances are you’ll be touching lichens. Lichens are a diverse group of organisms that combine fungi with algae or other photosynthetic organisms. Lichens are found on every continent and can grow on rocks and buildings as well as on trees.

The relationship between the fungi and the algae is often described as mutually beneficial or symbiotic, but there’s some debate about this among scientists. The algae provide food to the fungi through photosynthesis, while the fungi provide structure and protection to the algae. As one lichenologist described, “Lichens are fungi that discovered farming.”

Taxonomically, lichens are classified as fungi, but they are often grouped by their shape into three broad categories:

- **Crustose** – These crust-like lichens grow flat and are firmly attached to the substrate.
- **Foliose** – These lichens often resemble foliage, anchored to the substrate at one spot in each leafy lobe.
- **Fruiticose** – These delicate, slow-growing lichens often resemble clumps of greenish hairs, dangling from tree branches or trunks.

Lichens are sensitive to sulfur, nitrogen, and fluorine. In general, lichen sensitivity increases with surface area from crustose (which are most tolerant to pollutants) to foliose (less tolerant) to fruticose (highly sensitive).



The workshops are free and will be held at Pine Mountain Settlement School on the following dates:

Jan. 23 (beginning Friday evening the 22nd)

May 7 (beginning Friday evening the 6th)



TOP LEFT OPPOSITE PAGE: A student holds a large piece of *Usnea strigosa*, a fruticose lichen that is highly sensitive to sulfate and nitrate pollution.

ABOVE: Carol Judy examines lichens while Asa Smith records data at Pine Mountain Settlement School.

Photos courtesy of Roberta Burnes.

Kentucky nearing century mark on brownfield property reclamations

Nearly 100 properties reclaimed in less than three years

By Lanny Brannock

Department for Environmental Protection

You may not know what a “brownfield” really is, but you’ve seen them.

It’s the piece of land or old building that used to be something like a pencil factory, a gas station, an old hospital or a dry cleaner that sits empty year after year. Not only is it an eyesore at times, it might sit in what would otherwise be a prime location for a business, a parking garage, or something that could be useful to a public or private entity.

But because brownfields often have a complicated history of real or perceived environmental issues, the sites often sit empty or unused for long periods of time, can become blighted, an insurance liability or have other problems that make them unusable or difficult to obtain financing for purchase.

Through the Department for Environmental Protection’s Division of Waste Management, Kentucky is nearing its 100th completed brownfield reclamation project since the program began in 2012.

“Uncertainty about future liability and associated costs have always restricted brownfields redevelopment in Kentucky. The new Kentucky brownfields law specifically limits that uncertainty for property purchasers who qualify and opens the way for increased redevelopment and reuse. It has been very successful,” said Division of Waste Management Director Tony Hatton.

Why are brownfield reclamation projects so important? By reclaiming brownfield properties, we can simultaneously enhance environmental protections with a site, preserve greenfield space, and help certain areas improve in economic development. Conversely, by leaving a brownfield property idle, it can deter other economic development and possibly harm the property values adjacent to the site.

The U.S. Environmental Protection Agency estimates through fiscal year 2014, on average, \$17.54 was leveraged for each EPA Brownfields dollar and 8.2 jobs were leveraged per \$100,000 of EPA Brownfields funds expended on Assessment, Cleanup, and Revolving Loan Fund cooperative agreements. Brownfield sites tend to have greater location efficiency than alternative development scenarios.

Another EPA study found that residential property values increased by 5.1 percent to 12.8 percent once a nearby brownfield was assessed or cleaned up. The study determined that brownfield cleanup can increase overall property values within a one-mile radius by \$0.5 to \$1.5 million. Initial anecdotal surveys indicate a reduction in crime in recently revitalized brownfield areas.

“The new Kentucky brownfields law is designed to encourage property redevelopment and reuse. It accomplishes this goal but also brings with it enhanced protection of the public and the environment,” Hatton said. “It transforms sites that often become nuisances and can be potentially harmful to trespassers into a

controlled property that is being managed and secured because it now has value.”

Reclaiming brownfield properties became a higher priority for the state in 2012. The Kentucky legislature passed laws during that legislative session to enhance programs aimed at the redevelopment of brownfields in the Commonwealth. To further support and encourage economic redevelopment of properties with real or perceived adverse environmental conditions, lawmakers created the Kentucky Brownfield Redevelopment Program.

The program provides property owners and prospective property owners (who can certify that they did not cause a release or have relationships with those who did, and who develop a plan to reuse the property safely) documentation that they will not be held responsible for conducting site investigation and remediation under Kentucky Superfund laws.

“Because the new law limits liability for purchasers who qualify, it gives these types of properties a more competitive economic edge in many cases when compared to a green property—especially if a brownfield property has established infrastructure such as buildings, utilities, rail access, etc.,” Hatton said.

The technical definition of a brownfield property is: real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.

What is an example of a brownfield success story? Kentucky has several but here some examples: the location of the Mellow Mushroom Pizza on Bardstown Road in Louisville was once occupied by a company called Miracle Dry Cleaner. Dry cleaners are often candidates for brownfields because the chemicals used in the cleaning process can contaminate the site and soil surrounding it.

What was a shuttered business in an unusable building is now a thriving pizza and eatery. But several steps of corrective action had to be taken to allow the business developer to use the site, including remediating the concrete slab after demolition of the building with a synthetic barrier to prevent any contamination from seeping into the environment.

Another brownfield success story comes from Lexington. What do you do with a contaminated brownfield that used to be a light bulb factory? In this case a bus depot was developed there after taking many steps to ensure safety of the public. The former GE factory on Loudon Avenue is soon going to be the new home for Lextran, the transit authority for Lexington, Kentucky.

Current plans include a two-story 20,000 square foot, light steel framed, slab on grade, office and administration and operations facility and a one-story, approximately 23,000 square foot maintenance facility for the bus fleet.

In order to make the site usable for Lextran, several precautions must be taken.

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From fish to fertilizer

A Kentucky company thinks outside of the net with innovation

By Tim Hughes
Division of Biofuels

As kids, many of us were informed that the Native American Squanto instructed the Pilgrims on how to use dead fish to fertilize their corn fields as a means to improve production and crop growth. Whether this is a documentable agronomic history lesson or folklore, it is fitting that today these methods are being used with the invasive Asian Carp. Located in Tri City, Kentucky, the owners of Blue Shore Fishery, Dr. Lan Chi Luu and her partners purchased and renovated the former

Purchase Area Aquaculture Cooperative in Graves County, specifically for the processing of Asian Carp harvested from the region's waterways. Blue Shores Fishery also owns two other fish facilities in Kentucky, RCB Fish Company and Fin Gourmet and are bringing innovation to the Commonwealth.

The Asian Carp have become invasive and a nuisance in many Kentucky tributaries. The fish compete with more desirable aquatic species for the same feedstuffs, have had little market demand and have created dangerous boating environments due to their tendency to jump out of the water when startled. The fish are extremely fast growing and prolific, with some of the harvested fish exceeding 100 pounds. Because of the abundance of the carp and assistance through the Kentucky Cabinet for Economic Development, Luu decided to relocate to western Kentucky and cast her net.

Since Asian Carp are so large and yield considerable waste products that are not desirable for food production, Luu started looking for other options rather than just sending the fish remnants to a landfill. With the help and guidance of Scott Lasowski, of LEI Products of Madisonville, and Loretta Daniel, with Murray State University, they started working on drying various biomass resources and blending the fish carcasses and byproducts of the process with wood chips. Once mixed, the byproducts are then sent through the drying unit or Bioburner®, which is an extremely efficient and environmentally advanced biomass based hydronic heating system. The final result is a very fertile soil amendment that can be marketed to gardeners and other horticulturalists for crop production.

To learn more and to see the process a video can be viewed at <https://www.youtube.com/watch?v=YmcYNBGVdQ4>. They are still testing and perfecting the appropriate ratios and biomass sources, but the collaboration seems to be further improving the business opportunities for Blue Shore Fishery. Learn more about Blue Shores at <http://www.blueshoreusa.com>.



ABOVE: The final product is shown. Photo courtesy of Fin Gourmet.
TOP RIGHT: The Bioburner® sits outside and is portable for use. Photo by Bill Lunsford.

A history of Kentucky's fire lookout towers

By Jennifer Turner
Division of Forestry

Considered a proud symbol of our nation's conservation heritage, fire lookout towers are becoming a fading legacy, giving way to new methods and technology. Fire towers started gaining popularity in the early 1900s as the primary way for spotting wildfires. Perched high on mountain tops, these staffed towers provided an excellent viewpoint to watch for smoke columns and flames.

The key to successful fire observation was the pinpointing of the origin of smoke. Each lookout was designed around a fire spotting apparatus, called an alidade table that was somewhat like a compass. To permit the needed 360 degree observation using the alidade, the main observation deck of the lookout, called the cab, was designed with large windows on all sides.

When smoke was spotted, the observer could take a compass reading from the alidade and call the location into the local dispatch. This single line was not enough information to locate the fire because it could be anywhere along that line, close or many miles away. Lookout towers were situated so that the coverage areas overlapped. The dispatcher would radio the observer in another tower and tell him the general direction of the fire. The observer would then find the fire from his viewpoint and take a reading. Where the two readings crossed would pinpoint the fire and firefighters could be efficiently dispatched. This process is called triangulation and allowed the dispatcher to get an accurate fix on the fire's location.

In 1905, the first United States Forest Service (USFS) fire lookout tower was placed in operation in Greenville, Maine. By 1914, construction standards were in place and soon thereafter, both wooden live-in cabs and steel observation only towers were being built. Two years later, 81 permanent lookout structures stood on key mountain tops across the United States. Clay County was the location of the first forest-fire lookout station in Kentucky. It was established by the then State Forestry Department in 1916.

"During 1916, two lookout stations were established in eastern Kentucky. One is located in Clay County on what is termed Orchard Knob, a point about two miles from Manchester. A 40-foot tower was erected at this point from which it is possible to see a large share of the forest area of Clay County. This lookout station is known as the Orchard Knob Lookout Station. It is not as yet equipped with a telephone line but it is only one mile from telephone communication, and there is a road from the top of the lookout point to the bottom, so that communication is fairly easy." (The State Forester of Kentucky - Third Biennial Report - 1917)

The Kentucky Division of Forestry (KDF) has records of three towers being built in the 1920s. The Artemis Tower in Knox County was erected in 1924. It is no longer standing and when it was dismantled it is not shown in KDF records. The Putney (Berkman) Tower in Harlan County was erected in May of 1929. This 100 foot tower is still standing on Kentenia State Forest, although it is not in use today. The Bernheim Lookout, located on the Bernheim Arboretum & Research Forest in Bullitt County, Kentucky was built in 1929. The 48-foot Aermotor Tower with



ABOVE: Robinson Tower still stands today. Photo courtesy of Jennifer Turner.
TOP RIGHT: The Osborne alidade fire finder. Photo courtesy of USFS. Background photo courtesy of Jay Hamon.

7'x7' metal cab is still standing today. It was regularly staffed until 1980 and was used to monitor a wildfire in 1986. Restoration and maintenance is now handled by the Bernheim Foundation with volunteers from the local community. It is generally open to members of the public on weekends.

Then came the 1930s, when America was in the throes of the Great Depression and President Franklin D. Roosevelt authorized government programs designed to put the unemployed back to work. Labor work forces like the Civilian Conservation Corp (CCC) were assigned to various public works projects and building fire lookouts were one of those. Constructing lookouts became a priority and with the help of the CCC, fire watch towers sprung up across eastern Kentucky. Builders seemed undeterred by the precarious and remote locations of many stations. The tower on Big Black Mountain in Harlan County is on the highest point in Kentucky at 4,139 feet above sea level. It was constructed in 1938 and is still standing on land belonging to Penn-Virginia Land Company.

The 99-foot-9-inch Aermotor Robinson Tower in Breathitt County was built by the CCC in 1934 and replaced two wooden towers at the Tip Rock observation site within the 15,000-acre Robinson Forest. It was staffed until 2000 by the Department of Forestry with the University of Kentucky, which owns the forest. It is still used by forest personnel for telecommunication needs and also adventurers that dare to climb the tower to the platform just under the tower's cab.

The Tater Knob Fire Tower in Bath County is the last remaining operating fire tower in the Daniel Boone National Forest. It was built in 1934 by the CCC. The cab of this 35-foot tower was originally home to the lookout operators who staffed it during fire season. The original space was less than 200 square feet; the cab had just enough room for a wood stove, two cots, a cabinet, storage box, small table and a stool. The all-important alidade table stood in the middle of the room.

The Tater Knob Tower's original wooden cab was reconstructed in 1959 and was reduced to nearly half its original size. The lookouts no longer lived in the tower and instead, they climbed to the peak of Tater Knob Tower every day of the fire season to watch for smoke.

World War II sparked a new development in the history of fire lookouts. In the spring of 1942, the Army Air Force mobilized the Aircraft Warning Service and utilized fire lookouts across the country as enemy aircraft observation points. The towers were staffed 24 hours a day, 365 days a year until the war



ended.

Many of western Kentucky's towers were built during this time. Christian County had two towers, the Crofton Tower and the Pennyryle Tower.

"Erection of a 60-foot fire lookout tower five and one-half miles east of Crofton in Christian County, was under way today," District Forester E.R. Wagoner announced. With the completion of the second tower in Christian County, observers will be able to keep watch over 85 percent of the forest land in the district. There is one tower in Caldwell, two in Hopkins and two in Muhlenberg. The No. 2 tower in this county is located in the Pennyryle Park area. The district forester said that the forest area also helps control erosion and floods and furnishes protection for wildlife." (Kentucky New Era, June 1948)

The Pilot Rock Tower stood on one of Trigg County's most famous natural wonders, Pilot Rock. Pilot Rock is a landmark in Trigg County and in its day had served as a lofty lookout point for both Native Americans and pioneers.

"Charlie Sharber, forest fire guard for Christian County, said today state and government funds are to be used to build a wooden watchtower on top of the 200-foot-tall phenomenon, which is on property owned by Clarence Boyd. Its elevation is around 900 feet above sea level, one of the highest points in West Kentucky." (Kentucky New Era October 17, 1952)

The vigor of the towers however, was not to last. During the 1960s and 1970s, most fire lookouts and their dedicated watchers were phased out. By the mid-1970s, aircraft became the new

Continued on next page

Kentucky's fire towers

Continued from Page 10

method for spotting forest fires. Aircraft could pinpoint fire locations more accurately and could also determine if the smoke was an actual forest fire or some other occurrence that did not require fire crews to respond. The Division of Forestry sold the majority of the state towers in the late 1980s through 1990s through auctions to whoever wanted to bid and buy them.

Many of the new owners dismantled the towers and most of the few remaining are on private property. Towers that are still standing often have steps removed because they are rotten or the tower is unsafe. Of the known 185 towers in Kentucky, only 28 are still standing. There may be others standing, but due to private property issues and the lack of consolidated records, it is hard to tell.

The Robinson Tower in Breathitt County, the Bernheim Tower in Bullitt County and the Pinnacle Knob Tower in Whitley County (restored by the USFS in 2008 and part of Cumberland Falls State Park) are towers that the public can view and climb, if they're daring and brave. For more information about Kentucky's fire lookouts, visit <http://nhlr.org>.

To schedule a visit with the Robinson Center for Appalachian Resource Sustainability, call 606-666-2438 ext. 291. There is a web cam on the top of the tower that is accessible at www.robinsonforestcam.net (User Name: guest—Password: guest).



ABOVE: Helen Dowe is shown using the alidade in 1919. Photo courtesy of USFS.

Kentucky nearing century mark on brownfield property reclamations

Continued from Page 7

First, a geo-membrane vapor barrier system will be installed below all slabs for all structures intended for human occupancy (office and maintenance buildings).

A retaining wall approximately 15 feet tall on the north end of the site will allow development of fuel storage, fueling and wash facilities. The new location, infrastructure and structures will allow Lextran's bus fleet to grow to 100 buses, 30 support vehicles and 150 employee/visitors/drivers automobile parking.

To make sure the area is safe for the human traffic it will receive, the bus parking and circulation areas will be constructed of heavy-duty concrete paving. The employee/visitor parking area will be a combination of permeable pavers and asphalt paving. Pedestrian walks will be constructed with a combination of concrete and pavers. A 4,000 square foot outdoor patio space will be provided for

shared use by drivers, maintenance and administrative staff.

The project will be designed and certified to meet Federal Transit Administration regulations with a goal of meeting LEED Silver status.

Kentucky is getting closer to the 100th brownfield reclamation project in the last three years. It is a number to be proud of because it represents nearly 100 opportunities to revitalize

neighborhoods, communities, and businesses that can better serve the people of the Commonwealth in a safe and environmentally sound manner.



LEFT: The original laundry mat in its original state. **ABOVE:** The revamped building now stands as the Mellow Mushroom. Photos courtesy of Lanny Brannock.

Kentucky's changing energy landscape

Continued from Page 1

due to the investment of more than \$4.5 billion to install environmental controls at power plants to reduce the emissions of harmful pollutants. Since 1995, Kentucky has eliminated 77 percent of all nitrogen oxides and 70 percent of all sulfur dioxide emissions from electricity generation.

These environmental improvements have been made at coal plants while maintaining the fourth-lowest industrial electricity price in the United States and the lowest electrical price east of the Mississippi River.

Power plants are also changing where Kentucky's energy comes from. In May 2015, the Cane Run Generating Station in southwest Louisville powered up the first natural gas-fired baseload generator in Kentucky, which replaced three previous coal units at the site. In the coming years, three other Kentucky coal plants will also make the switch from coal to natural gas. Natural gas units are replacing older, coal-fired units across the United States because natural gas is cleaner burning, cheaper to produce and natural gas prices are currently very low.

Even with all the federal regulation changes, coal remains the Commonwealth's primary energy resource. Changes, however, at power plants across the United States in response to these low natural gas prices, as well as low energy demand, are negatively affecting Kentucky's coal production and employment. The vast majority of Kentucky coal used to generate electricity in the United States and coal-fired power plant closures in recent years have significantly reduced the supply and demand for coal. As a result, Kentucky coal production and employment are quickly declining. During the past five years, Kentucky coal mines have reduced production by 44 percent. Coal production in 2015 was at its lowest level since 1961. Coal production in western Kentucky, where thicker, more productive coal seams yield cheaper coal, produced

more than eastern Kentucky in 2013 through 2015 for the first time since 1911. In 1949, Kentucky coal mines employed 75,707 miners. Today, Kentucky only employs 9,356 coal miners, the lowest number ever recorded. While much of the decline in the latter half of the twentieth century is due mechanization and automation of mining operations, during the past five years alone, Kentucky coal mine employment has declined by 9,716 jobs or 52 percent.

For more detailed information on the coal industry, please check out Kentucky Coal Facts available at: <http://energy.ky.gov/Pages/CoalFacts.aspx>.

You may also be interested in the Kentucky Energy Profile, which offers hundreds of graphs and maps to illustrate the ways Kentucky produces and consumes

energy to further the discussion of the future of energy in Kentucky. This profile includes summaries for each of Kentucky's electric utilities and all of Kentucky's power plants, offering the internal dynamics of each, including changes to electricity prices and pollutant emissions by utility. On the energy production side, the profile highlights the extraction of coal, oil and natural gas in Kentucky and renewable energy potential from hydroelectricity, biomass, wind and solar resources. The Kentucky Energy Profile is available online at <http://energy.ky.gov/Pages/Profile.aspx>.



ABOVE: *An excavator stands in the depths of a coal mine.* Photo courtesy of Aron Patrick.

Conservation districts push revolving loan program

By Kimberly Bartley
Division of Conservation



of the loan, are required use the equipment for conservation purposes at least 65 percent of the time.

This also gives the local conservation district the perfect opportunity to educate landowners and contractors about conservation practices and new techniques by demonstrations or educational materials. It also allows conservation districts to also take advantage of these loans and help promote conservation by demonstrating exactly how the equipment works.

Several conservation districts in particular have utilized this program on numerous occasions. "This program has been essential in providing heavy equipment to many of the local contractors throughout the years. It has boosted our local economy and allowed businesses to grow by being able to perform more conservation work in a rural farming community," said Marion County Conservation District Chairman Joe Bernard Luckett. "There are several companies that use the loan program in Marion County and this program allows them to be successful in providing specialized conservation work. We also believe that the availability

In 1948, the United States was still recovering from one of the worst natural disasters ever, the Dust Bowl. This was also a time when farmers and landowners had started to manage their land on a much bigger scale and were learning a new way of caring for the soil with no-till farming. No-till farming, also called zero tillage or direct drilling, is a way of growing crops or pasture from year to year without disturbing the soil and is essential in eliminating soil erosion.

The equipment required for no-till farming was new, innovative and very expensive. Many landowners were in no financial position to purchase the much needed, new equipment. The Division of Conservation recognized the need in Kentucky for the education of farmers in soil conservation, promotion of conservation practices and equipment that individuals and contractors alike would need. With the support of the Kentucky General Assembly and the Soil and Water Conservation Commission, the Equipment Revolving Loan Program (ERLP) was born. Since then, over 2,200 loans for over \$62 million have been granted to conservation districts, individuals and contractors.

Through this program, interested parties must visit their local conservation district to complete an application and will have the opportunity to purchase conservation equipment at a fixed 2 percent interest rate. The purchaser must pay one-third of the price as a down payment by cash or trade-in, and as a condition

of such equipment has boosted the number of landowners that are able to participate in federal, state and local cost share programs and implement Best Management Practices that benefit both conservation and water quality."

Mercer County Conservation District Chairman Tony Best also feels that these funds are essential in purchasing new and innovative equipment to demonstrate for those that are unsure of



the benefits. “We could not have been successful as a district through the years if it weren’t for those funds,” Best said. “It has enabled the conservation district to not only generate funds through rentals, but has also allowed landowners to be more successful in conservation as a whole. Once a landowner sees the benefits and the savings of doing things a different way, you have healthier soil, healthier food and a happier farmer.”

Many other districts like Marion and Mercer counties have taken advantage of this program. At the Washington County Conservation District, not only have landowners and businesses used this program, but the conservation district has purchased a no-till drill, tree planter, aerator and a hay wrapper available for rent. Conservation districts across the state own a wide variety of specialized equipment for lease such as bulldozers, backhoes, no-till drills, soil aerators, yard seeders, fertilize buggies, tree planters and sprayers for noxious weeds, just to name a few. By having this equipment available for rent, this gives the small landowner and contractors the opportunity to use the equipment and to see the benefits without having the expense of actually purchasing the equipment.

In just the last five years there have been 44 loans for a total of \$2.5 million. In 2007 the Soil and Water Commission expanded the original program to include infrastructure loans. These loans can be used by conservation and watershed conservancy districts to purchase office buildings or upgrade watershed dams.

Six county conservation districts have taken the opportunity to use those funds to purchase office buildings. These offices were previously located in USDA Service Centers and renting office space. The Kentucky Division of Conservation is happy to report that there have been no

lost funds in this program and they continue to feel that it is very beneficial to the state as a whole for the protection and conservation of our natural resources. Director Kimberly Richardson said, “It allows the conservation districts to introduce new methods of caring for our land in a responsible way and provides help to our fellow Kentuckians in the process. The knowledge gained and soil saved speaks volumes about the success of this program and we look forward to this program continuing for years to come.”

To learn more about the ERLP, or other soil erosion, water quality, or land preservation programs provided by the Kentucky Division of Conservation, contact your local county conservation district or the Division of Conservation Assistant Director Johnna McHugh at 502-564-2320 or go to www.conservation.ky.gov.



TOP LEFT: A farmer stands on a Marion County dozer. **BOTTOM LEFT:** A hay wrapper pauses in Washington County. **TOP RIGHT:** Two men work on a Marion County tilling machine. **BOTTOM RIGHT:** The Mercer County no-till driller sits before use. Photos courtesy of Conservation.

KCTCS System Office lessens its carbon footprint

By Mary Jo Harrod
Division of Compliance Assistance

The Kentucky Community and Technical College System (KCTCS) has 16 colleges located on more than 70 campuses across the Commonwealth, offering certificates and diplomas, as well as two-year associate degrees in 700 credit program offerings.

Besides education, the KCTCS System Office has been involved in many activities to reduce its carbon footprint, and encouraged all of the KCTCS campuses to do the same. Some of the KCTCS System Office's activities were used as its annual projects for its membership of KY EXCEL, Kentucky's voluntary environmental leadership program which is open to everyone in the state.

"Tuition is a major portion of our revenue, so we have to be sustainable and accountable," says Billie Hardin, Sustainability Project Manager for KCTCS.

The System Office supports a collaborative culture that respects and preserves the environment, motivates employees and gives back to local communities, becoming more efficient stewards of financial, environmental and social resources. At the System Office, there is a local sustainability team, which meets on a monthly basis to find ways to lessen the facility's carbon footprint. As a result of those meetings, several activities were implemented, including participating in the Commonwealth Energy Management Control System (CEMCS), managed by the Finance and Administration Cabinet. CEMCS is a software application used to track energy usage, monitor and maintain building systems, electronically audit current utility bills and automatically generate alerts if equipment operates outside of preset parameters.

Media equipment and lights are on sensors, and the HVAC system, which is being upgraded, and lights in individual offices are on timers to decrease energy usage. With the HVAC upgrades continuing, including the installation of new boilers, basic changes to its automation system have resulted in estimated energy

savings of 8.7 percent (normalized for weather) for the period of December 2014 through May 2015. According to Hardin, the energy savings result from avoiding the use of 262,900 kWh of electricity and 13,454 scf of natural gas, creating a financial savings totaling \$26,000. More money will be saved after the retrofit is completed by the end of 2015.

KCTCS has made recycling more convenient by locating bins throughout the interior and around the exterior of the 130,000 square-foot building. Aluminum cans, plastic bottles, paper, cardboard, corrugated cardboard and pallets are recycled. In a normal year, the KCTCS System Office recycles 32 tons of materials. In 2014, the facility recycled 125 tons after implementing an imaging system to replace paper documents. Due to the recycling initiative, trash collection has been reduced from twice weekly to once weekly, reducing waste disposal cost. Also, the System Office for KCTCS is on the site of a former brownfield. A brownfield is an abandoned or underutilized site that is contaminated or is perceived to be contaminated. The KCTCS Systems Office property has been cleaned and is in productive reuse.

KCTCS educates its employees on sustainability issues. Many meetings are conducted via computer to decrease travel.

New employees are given a reusable mug and two cloth grocery bags to help them be environmentally friendly. Additional estimated annual savings of \$4,000 result from employees using a reusable mug instead of paper cups.

The facility also created a catch basin for stormwater next to a subdivision in an area that had previously flooded. Excess rainwater now flows into the basin rather than nearby homes.

"Educate the community about the natural environment, and use your campus to be a living laboratory," says Hardin. "It makes your life easier in the long run. It's like delayed gratification—feeling better in the future. The educational component is ongoing. If you drop the ball, you will lose."

KCTCS will continue to focus on being more environmentally efficient and

searching for ways to be more sustainable. Everyone is encouraged to carpool and decrease the pollutants created. Cleaning products used in the system office must be green-certified. As Hardin knows, sometimes it's about taking baby steps to achieve goals, continually educating others about the need to protect our natural resources.

"We have a trust for future generations," explains Hardin. "We have to ask ourselves what we can do today to make tomorrow better. It's imperative that we teach responsible stewardship and work together to build resilient, sustainable communities to ensure a bright future for those following in our footsteps."

KY EXCEL is Kentucky's voluntary environmental leadership program. Setting a positive example, the program's members have committed to a variety of projects that go beyond the environmental regulations to improve and protect Kentucky's environment.

Be an environmental leader and join KY EXCEL! Call 1-800-926-8111 for more information or visit <http://dca.ky.gov/kyexcel/>.



ABOVE: The KCTCS recycling containers are shown. Photo courtesy of KCTCS.

Calling all big tree hunters

By Jennifer Turner
Division of Forestry



Every year skilled hunters head into the woods, but they aren't tracking the usual four-legged game. They're stalking really big trees. Kentucky's big tree hunters find and measure trees in hopes of finding new state and national champions. Big trees can be found almost anywhere. You can certainly see them on farms and in the woods, but you can also find them between the sidewalks and street curbs in urban settings.

In 1940, the American Forests organization began a search of the largest specimen of each species of American trees in an effort to locate and protect them. Trees of the same species are compared using a simple formula to determine total points. Total points are calculated by adding the circumference of the trunk in inches plus the height of the tree in feet plus $\frac{1}{4}$ of the average crown spread in feet. This list, now called the National Registry of Big Trees, contains the names of more than 750 species. Thirteen Kentucky champion trees are also national champions.

The Division of Forestry (KDF) began compiling a list of state champion trees in 1968. The first list contained only 51 species. The current list, which is restricted to native species, has 100 species reported. The list is continually changing as new species are added and former champions are replaced, either because they die or a larger specimen is nominated.

For example, in 2007 former Governor Brereton Jones and his wife Libby were contacted by KDF foresters seeking permission to measure the oldest and largest trees in their woodland savannah on their farm Airdrie Stud in Wood-

ford County. The foresters discovered the Jones' large bur oak, in addition to a butternut hickory, might be potential champions and asked if they could take measurements and nominate them. Both trees turned out to be state champions.

The bur oak on the Airdrie Stud farm totaled 412.75 points. Up until last year it was not only the state champion but also the national champion. In 2015, a bur oak in Indiana was found with a point total of 426 which knocked the Jones' tree out. It's estimated that the Jones' bur oak is around 500 years old.

When asked how she felt about having two state champion trees on her property, Mrs. Jones said, "It's a great honor, but we also see it as a great responsibility. Since 1972, when Brereton and I bought our 245 acres in Woodford County to establish our horse breeding farm, we have worked to conserve Kentucky's farmland."

The Joneses have also donated a "Conservation Easement" on their property which is held, in perpetuity, by a land trust. Their easement is held by the Bluegrass Conservancy and is in place to protect the Jones' great trees and also other outstanding natural features of our extraordinary landscape in other parts of the state.

While the nation's most avid big tree hunters are equipped with relascopes (a multi-use instrument for finding height, basal area and diameter of a tree) and lasers, the amateur tree hunters can still get started by simply looking in their own backyards with a yardstick and tape measure. The KDF webpage has a list of champion trees by common name and by county of location. There is also a link to how to measure your own tree. Check it out at <http://forestry.ky.gov/ChampionTrees/Pages/default.aspx> and happy hunting.



TOP LEFT: The butternut hickory is shown.
BOTTOM RIGHT: The bur oak is shown in all its glory. Photos courtesy of the Jones family.

Why you need an AWQP

By Steven Olt
Division of Conservation

In 1994, the General Assembly passed the Agriculture Water Quality Act in order to protect surface and groundwater resources from pollution resulting from agriculture or siculture activities. Along with this legislation also came the development of the Agriculture Water Quality Plan (AWQP) which is required for any landowner who possesses 10 or more acres of ground and is utilizing it for agriculture or siculture purposes. Since the inception of this plan requirement, many landowners have been reluctant to complete the plan mostly due to their lack of knowledge as to what this plan does, offers or requires.

The AWQP consists of Best Management Practices (BMPs) from six specific areas. These include siculture, pesticides, fertilizers, farmstead, crops, livestock, streams and water sources. These BMPs are best described as guidelines and recommendations on how a landowner should properly manage his agriculture or siculture operation in order to do the least amount of damage to surface or groundwater. One example of a BMP would be, if a producer has streams, rivers, wetlands or other impounded bodies of water adjacent to pasture fields, they should divide large pastures with temporary fences and rotate these pastures to allow rest periods for vegetative recovery. These individual BMPs are all listed in the producer's AWQP and are based on their specific operation.

There are several reasons that a producer should have an AWQP completed and on file. The plan is first and foremost required by law. It also assists producers in having a well aligned plan for implementing BMPs to reduce the operation's environmental impact. The most beneficial part of having an AWQP to the producer however, is that the plans serve as a sort of insurance policy in case of an accidental environmental incident and protects the landowner. In the case of a landowner being cited for a violation by one of the state's regulatory agencies, the AWQP is proof that the owner of the operation has taken the necessary steps to be knowledgeable about their operation's environmental impact and to properly control this. In many instances, having an AWQP on file can result in a cited violation being reduced to a written warning until there is time to implement more BMPs to correct the problem.

The most common misconception about completing an AWQP is that by doing so, the producer puts himself and his operation 'on the radar,' so to speak. It is thought by many that the

state regulatory agencies use these plans to track these operations and target them for violations. This is a completely false conception and causes many producers to remain without plans, and can actually jeopardize their successful operation. The plan itself is meant to help producers, not to harm them.

In the age of Tobacco Settlement funds, which fund programs like the County Agriculture Investment Program, the Kentucky Soil Erosion and Water Quality Cost Share Program, along with separate federal programs like Environmental Quality Incentives Program, the possession of an AWQP can also mean financial assistance to landowners. It has become a requirement to have one of these plans in order to participate in these cost sharing programs, which assist producers financially in improving their operations.

The AWQP is not only a requirement by law, but also an invaluable tool to producers in their struggle to improve environmental impacts that may interfere with their agriculture or siculture operations. These plans are available at your local conservation district office, your local county extension office or online through the University of Kentucky at <http://www.bae.uky.edu/awqpt/>.



ABOVE AND LEFT: *Cattle munching on grass and relaxing in the sun as they each show Best Management Practices in use on a farm in Green County.*
Photo courtesy of Green County Conservation District

EcoART contest seeks nominations

By Mary Jo Harrod

Division of Compliance Assistance



Monet had his enchanted water lilies, Ansel Adams had his breathtaking national parks and Audubon had his colorful birds. It seems that art and nature have always gone hand in hand, and artists have drawn their inspiration from Mother Nature since the first cave paintings. The Kentucky Department for Environmental Protection wants to encourage that tradition

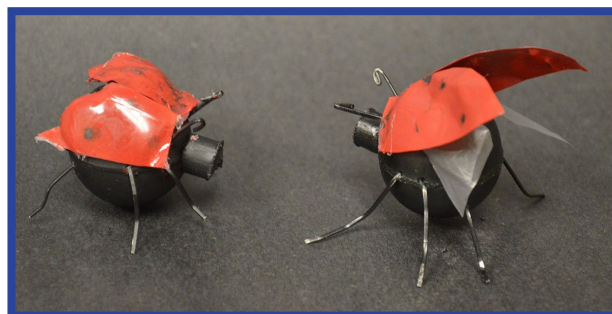


with its annual EcoART Contest. The department is currently soliciting nominations from Kentucky high school students for the contest, now in its seventh year. This year's contest features an exciting change in the environmental themes and a new art media category.

People view and appreciate our natural environment in different ways, and the proof can be found in the variety of entries received each year. In the past, some of the contest entries have included wind chimes and wall hangings made from recycled aluminum cans, a hanging sculpture created from plastic soda bottles that had been colored and cut into spirals, brightly colored nature photographs and an oil painting honoring the artist's grandfather who spent his life protecting the Commonwealth's environment. The artists are also asked about the inspiration behind their works and the thoughts behind many of the pieces that show the concern and respect the teens have for both the Earth and nature. Winning artwork from previous contests can be found at <http://dca.ky.gov/LGGS/Pages/ecoart.aspx>.

This year, students are being asked to create artistic works that are inspired by Kentucky's air, water and land resources and its natural habitats. Students can flex their artistic muscles using any of the five accepted media types including drawing/painting/print, mixed media, sculpture/pottery, photography and the new category of digital artwork. Digital artwork includes imagery or graphic designs created via computer or other digital device though art applications, graphic design software, desktop publishing tools, etc. Multiple winners will be chosen in each of the theme areas and media types. Winning art pieces are proudly displayed at the department's central office in Frankfort.

All nominations are due electronically by midnight on Feb. 28, 2016. For more information about the EcoART Contest and to access a nomination form, visit our website at <http://dca.ky.gov/LGGS/Pages/ecoart.aspx> or call the Division of Compliance Assistance toll-free at 800-926-8111. We look forward to seeing what Kentucky's young artists have in store for us.



TOP LEFT: Mindy Greenwell's, "Reflections."

MIDDLE LEFT: Peyton Hanks', "On the Ohio."

BOTTOM LEFT: Stephanie Stumbur's, "Who Is Winning."

ABOVE: Kennedy Kinkaid, "Ladybugs of Spring."

Photos courtesy of the Division of Compliance Assistance.

Looking, listening and learning about bioenergy

Kentucky and Biomass Power Association celebrate National Bioenergy Event

By Tim Hughes
Division of Biofuels

An estimated 150 attendees participated in Kentucky's third annual National Bioenergy Day event in Campbellsville, Kentucky on October 21. The delegation consisted of state and federal agency personnel, business leaders, university faculty and others interested in finding power from various waste streams. Recast Energy and Murray State University had hosted the two previous Kentucky celebrations and this year's focus was on two distinctly different business models, generating electricity from woody biomass and methane. The activities were being co-ordinated along with over 50 other National Bioenergy Day efforts in North America with the Biomass Power Association.

Participants had the opportunity to visit Cox Interiors and Mac Farms in Campbellsville, to see their generation facilities in operation. Cox Interiors produces premium hardwood millwork products through a dedicated workforce of 400 employees. Much of their timber supply originates from southern Kentucky, further multiplying their economic contributions to the Kentucky region. Their sales team covers eight states with products reaching homes and businesses beyond that territory.

In 1992, Cox Interiors, the forest products company, initiated a project to convert wood waste to steam for their dry kilns and power for their manufacturing. The steam turbines became operational in 1994 with a capacity of 5MW of electrical power. East Kentucky Power Cooperative (EKPC) has a Power Purchase Agreement in place with the firm to accept excess electricity and this is in cooperation with the local utility, Taylor County Rural Electric Cooperative (TCREC). While the initial purpose was to convert their own wood residues into energy, Cox now markets much of their shavings for livestock bedding and relies on other discarded woody materials for their fuel needs.

Cox Interiors facility uses 100 tons of biomass per day for their boiler feedstock and this consists of used pallets, utility right of way clearings, dead trees from local parks, harvest residues from logging operations and other materials. They work closely with neighboring industries and local governments to coordinate the collection and delivery of these resources. The synergies of these relationships help the suppliers avoid landfill expenses, prevent environmental consequences of open burning and lower the energy costs for the company. The University of Louisville's Kentucky Pollution Prevention Center staff was instrumental in helping identify this remedy for several waste concerns.

The tour also included a walk through portions of their 20 acre manufacturing facility where they just converted their light-



ABOVE: A Cox Interiors truck stops before its contents are dumped. Photo courtesy of Tim Huges.

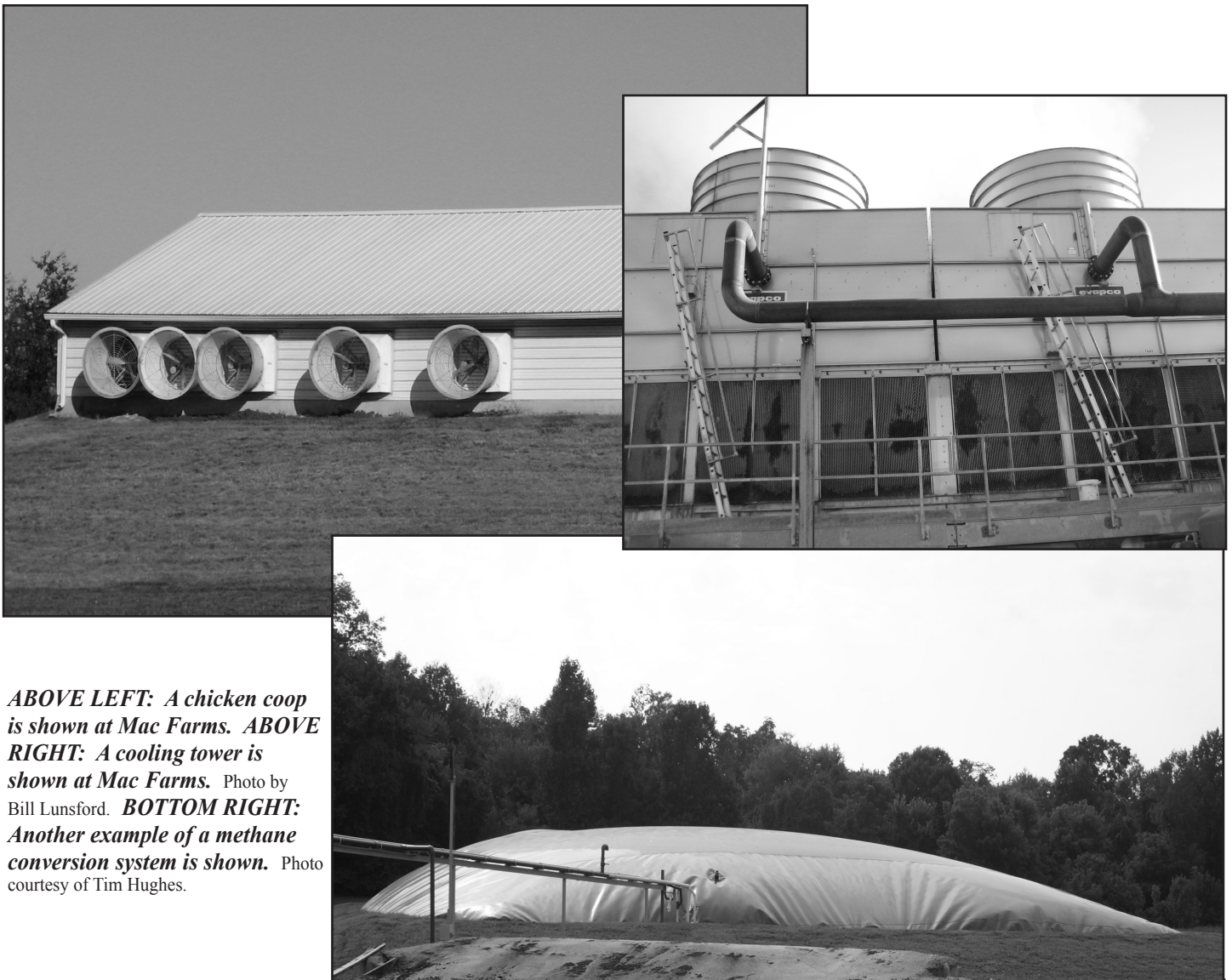
ing to highly efficient LED fixtures. Cox Interiors had received a \$153,469 USDA Rural Energy for America Program grant to offset 25 percent of the conversion costs. The LED lights significantly increased the visibility in the plant which is enhancing product quality, improving worker safety, and boosting morale. Because the lights have greater lumen output while consuming considerably less electricity, the investment is expected to have a very short payback period.

Most of the attendees had the opportunity to visit both businesses and those traveling to Mac Farms were equally impressed with another way of generating power. John McLean, the farm's owner, starting developing the biogas digester system about

three years ago. He wanted to capture the methane gas from litter (chicken manure from his farm's poultry barns) and convert the gas into electricity. As he researched the technology he decided to construct a system where he could receive other waste streams such as distillery byproducts, produce and additional organic materials with energy value.

Each aspect of McLean's project encountered hurdles related to technology, permitting, operations and financing. The field day was a great opportunity for the many partners that had consulted with and assisted McLean to coalesce around the commissioning of the system. One example of this was the farm methane conversion systems that are commonplace in Europe, but this is the first commercial system on a livestock farm in Kentucky. The Division of Compliance Assistance guided him through the permitting process to address any air quality or other environmental concerns. The system harnesses the methane gas, which is considered a very potent greenhouse gas and converts it to electricity while reducing odors and other emission concerns.

Staff from the USDA Food Animal Environmental Systems Research unit in Bowling Green have been working to enhance the microbial activity of the system and help understand the value or limitations of various waste streams being evaluated for digestion. As with the Cox system, EKPC and TCRECC are involved with the purchase of electricity and therefore numerous safety protocols had to be addressed before connecting the 400 KW system to the electrical grid. The Governor's Office of Agricultural Policy provided partial financing for the project through a \$250,000 Kentucky Agricultural Finance Corporation loan and a \$15,000 On Farm Energy grant. McLean is still developing his client list for suppliers of various feedstocks for the system and the field day marked his first day of actually producing electricity with the generator.



ABOVE LEFT: A chicken coop is shown at Mac Farms. ABOVE RIGHT: A cooling tower is shown at Mac Farms. Photo by Bill Lunsford. BOTTOM RIGHT: Another example of a methane conversion system is shown. Photo courtesy of Tim Hughes.



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The Bur oak is a member of the white oak group with lobed leaves. Considered the classic North American savanna tree, bur oak lacks some of the grace and beauty of white oak, but it is a much more adaptable tree. Bur oak offers large, beautiful leaves and acorns. During winter, it fully reveals its rough, gray bark.

Just the Facts: Bur oak (Quercus macrocarpa)

Growth: The leaves are alternate, simple, 6 to 12 inches long with many lobes. The flowers are monoecious; male flowers are yellow-green, borne in long, drooping slender catkins, 2 to 4 inches long; female flowers are green tinged in red and appear as

single, short spikes, both appear shortly after the leaves. Acorns are quite large (1 1/2 inches long) and 1/2 enclosed in a warty cap that has a long-fringed margin, maturing in one growing season in late summer and fall. Bur oak bark is ashy gray to brown in color and quite scaly, but noticeably ridged vertically on large trees. This oak is a large tree that often reaches over 100 feet tall with a long clear bole. In the open it becomes a very wide, spreading tree.

Range: Bur oak is one of the most widely distributed oaks in eastern North America. Its natural range extends from New Brunswick to extreme eastern Wyoming. Bur oak is found as far north as central Manitoba and south to central Tennessee and southern Texas. Bur oak tolerates a wide variety of soil and moisture conditions. It is found along the dry slopes of the Ohio River and the moist bottomlands of the Mississippi River. It is a transitional species between the prairie and the eastern forests.

Wildlife Uses: Bur oak acorns are rich in carbohydrates and fats, and are eaten by turkeys, squirrels and deer. Birds may serve as an important means of dispersing bur oak. Blue jays can carry 3 to 5 acorns at a time and may carry them for several miles. The acorns are cached for a future food supply. Many are forgotten and will germinate to form new bur oaks.

Tree Trivia: Bur oak seedlings cannot survive in the shade of a dense forest. Because the species is not reseeding itself as fast as individuals are dying, planting bur oak in the landscape is encouraged. In Kentucky, bur oak was once common in the Bluegrass region and some stately trees remain standing. 