



Land Air & Water

Kentucky Energy and Environment Cabinet

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Land Air & Water

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DCA and DAQ present air permit reporting workshops

By Mary Jo Harrod
Division of Compliance Assistance

The Division of Compliance Assistance (DCA) and the Division for Air Quality (DAQ) teamed up to present two workshops offering guidance on annual compliance certifications and semiannual monitoring reports. The free training was specific to air quality compliance reports, and approximately 130 people attended the workshops.

Offered in December and January, this training featured presentations on how to read air quality permits and understand what they mean, as well as explanations on annual compliance certifications, semiannual monitoring reports and their purpose.

Participants were given time to fill out portions of their annual compliance certifications and semiannual monitoring reports, while several DAQ field inspectors were available for hands-on assistance.

"It is pretty clear that the participants learned a lot from the presentations," said Aaron Keatley, director of DCA, who received many positive comments from workshop attendees.

Prior to the workshops, DCA received an average of 86 calls each December and January regarding these topics. As a result of the training, the number of calls has dropped to 12 during this same time period. Several consultants who write air permit reports for companies also attended the workshop.

This training was part of DCA's environmental compliance training program that began in the summer, utilizing the Department for Environmental Protection's new training center. Each event was created to address specific issues and educate sectors to enable compliance with environmental regulations.

For a list of future training events, go to <http://www.dca.ky.gov/Training-Events/>. If you need more information about the programs within DCA or have suggestions for training topics, contact Aaron B. Keatley at envhelp@ky.gov.



Haight canoes the Licking River

April Haight, a member of the Licking River Water Watch, paddled 125 miles on a mission to make people more aware of water quality issues within the basin. Read her story on Page 1.

Visit Land, Air & Water online at <http://www.eec.ky.gov>

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Our Cover

Wild blue phlox (*Phlox divaricata*) grows along the hiking trails at Cove Spring natural area in Frankfort. Photograph by David M. Hargis, Division of Conservation



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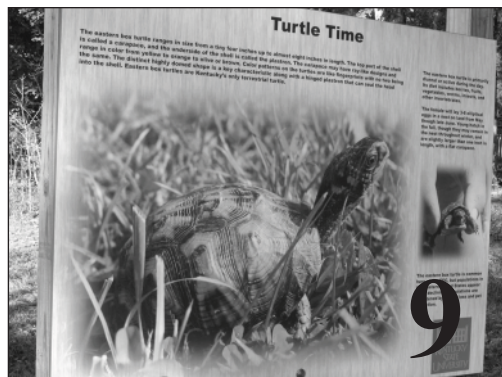
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*January trip
raises year-round
public awareness*



ABOVE: *Osprey take flight as Haight approaches in her canoe.*

FAR LEFT: *Trash is evident along stretches of the Licking River Watershed.*

LEFT: *Haight's son, Nodin, was introduced to the water at an early age.* Photos submitted by April Haight

Haight canoes the Licking River

**By Allison Fleck
Division of Water**

The Licking River in northern Kentucky is a popular destination for canoeing and kayaking enthusiasts. The scenic river rises in the Cumberland Plateau in southeastern Magoffin County and meanders 320 miles before emptying into the Ohio River near Covington. The Licking River provides a unique ecosystem for several unique fish species and more than 50 species of mussels, 11 of which are endangered. The watershed also provides wetland stopover habitats for about 250 species of migratory birds.

Sounds like a great outing for a warm summer day, but April Haight, an environmental educator at Morehead State University (MSU), chose the depths of winter for her 125-mile excursion over seven days in January. She paddled another 120

miles in March and early April.

Haight's motivation for the project was multidimensional. As an avid paddler, she made the trip for the sheer enjoyment and physical challenge of the experience. As director of the MSU Environmental Education Center, she sees the river as an outdoor classroom. As a volunteer with the Licking River Watershed Watch, she hopes to make people more aware of water quality issues in the Licking River Basin. And as a mother, she strives to preserve the natural environment for future generations.

"The first time I took my son, Nodin, out on the river, he was just 4 weeks old," said Haight. "Now, at age 5, he has his own kayak and our family paddles nearly every week all year long. You get to see parts of the countryside from the water that you wouldn't see otherwise."

The first day Haight launched her canoe, the temperature was 37 degrees and ice patches had formed.

Haight made stops along the way to collect water samples using her LRWW water sampling kit to supplement existing

water quality data.

"Once we get the bacterial analysis, we'll have a better idea for targeting best management practices to reduce nonpoint source pollution," she said.

Nonpoint source (NPS) pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away pollutants, finally depositing them into lakes, rivers and even groundwater.

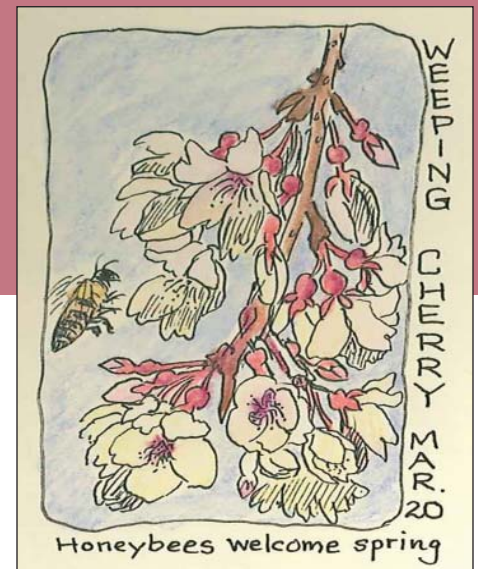
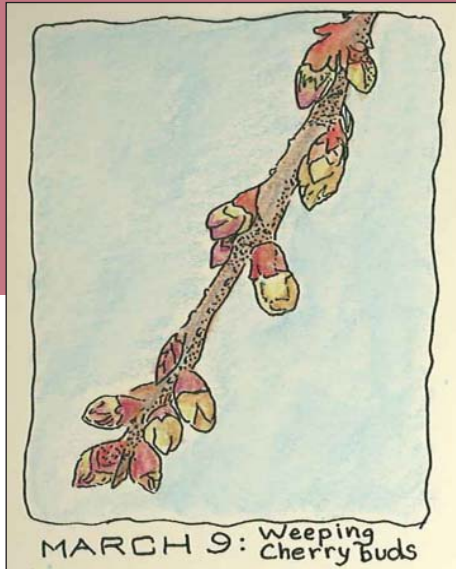
Haight is active in the battle against NPS. She co-wrote a \$1.1 million, five-year Clean Water Act Section 319(h) grant awarded last year to Morehead State University by the Kentucky Division of Water (DOW) to protect healthy streams and improve streams in the Triplett Creek Watershed that have already been designated as polluted by the DOW.

The documented pollutants include pathogens (bacteria), nutrients (fertilizers) and organic enrichments/low dissolved oxygen and sediment (eroded soil). Haight said evidence of these same problems was

Continued to Page 8

Tracking nature through the seasons: the Science of Phenology

Article and sketches by Roberta Burnes
Division for Air Quality



When does the first dogwood blossom appear? When do the last monarchs leave or the first hummingbirds return to Kentucky? When do the maples reach their peak color in the fall?

These are the questions scientists seek to answer in the study of *phenology*. The timing of these biological events is crucial to understanding how nonliving components in the environment—such as weather and climate—impact living components.

Phenology is quite literally the “science of appearing.” Scientists who study these life cycle events—such as blooming, migration and reproduction—are called phenologists. Long ago, humans used phenological observations to predict weather, seasonal changes, and when to plant and harvest. These observations were a form of collective wisdom passed down through generations. Even today, humans still mark the passage of the seasons by watching for these signs. The science of phenology can help us understand long-term trends in the Earth’s climate and track the current and potential future impacts of climate change on living things.

Climate is more than just weather. Think of climate as the sum total of weather for a given region, averaged over a period of time. Weather records, patterns and extremes are all part of the equation. Global climate is the average of all regional climate data. Understanding global climate helps us understand what is happening to the Earth as a whole.

Data from the Intergovernmental Panel on Climate Change shows that the Earth’s average global temperature has increased by 1 degree Fahrenheit during the 20th century. Even a small change on a global scale can dramatically impact species in the local environment—especially plants, which can’t move easily from one place to another. Time and again, scientists have detected recent shifts in the timing of phenological events like blooming and migration.

Washington D.C.’s famous cherry trees are a good example. Records indicate that the trees are blooming six to seven days earlier now than they were in 1970. In Michigan’s Upper Peninsula, more than 143 different species of birds, mammals, mollusks, trees and grasses have changed their ranges in the past 30

years. Around the world, spring arrivals of migrating birds, mammals and insects are gradually happening earlier. All of these changes, and many others, appear to be happening in response to warmer temperatures and changing patterns of rainfall.

Like any science, phenology relies on data, and lots of it. Citizen scientists—people who record and share their observations—can make all the difference in collecting this data. Anyone, young or old, can be a citizen scientist, and there are several programs that make participation easy and fun.

Project BudBurst operates a national network that engages the general public in the scientific process, providing online plant guides and reporting forms. Teachers will especially like its educational resources and suggestions for getting children involved; phenological data collection makes a great classroom activity that connects to core content and virtually all subjects.

If you would like to become a phenology citizen scientist, now is a great time to begin. No fancy equipment is needed—

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DMRE samples water wells at citizens' requests

By Kristin Gale

Division of Mine Reclamation and Enforcement

Wells bubbling with flammable methane gas... corrosive, foul-smelling water ... red slime coating every sink and bathtub... it sounds like terrifying scenes of a low-budget sci-fi flick. However, these descriptions are characteristic of some of the most serious calls received by the Division of Mine Reclamation and Enforcement (DMRE) from citizens who believe their water wells have been affected by coal mining.



Geologist Donna Schartung measures the depth of a well with assistance from the well owner.
DMRE photo

Although such detrimental effects of mining on private wells are rare, occasional unanticipated impacts to the hydrologic balance of aquifers surrounding mine sites are inevitable. Any hydrologic changes to an aquifer in which a well is located can result in the disruption of the quality or quantity of water produced by that well. When these problems arise, the DMRE provides assistance to citizens by performing investigations to determine the nature and source of possible hydrologic impacts and taking enforcement action when necessary to rectify the situation.

Citizens may request an investigation into a number of potential mining violations through the Citizen's Request for Inspection (CRI) program. DMRE inspectors are required to respond to CRIs within 10 days. However, when a citizen's water supply is potentially threatened,

inspectors give these urgent requests top priority.

In order to determine the nature and source of problems associated with water wells, inspectors receive assistance from the DMRE geologists who collect and analyze a variety of information, including water data from local mine sites, monitoring wells and public and published sources; geological, hydrologic and mine maps; current and historic activities of mine sites in the area; and any reports of previous investigations.

The geologist then speaks with the well owner to obtain important facts such as the age and depth of the well, the type and depth of the pump, drilling methods, proximity to any septic systems, quality and quantity of water produced, maintenance schedules and whether there has been a change in color, taste or odor of

the water from the well.

Once the geologist has a firm understanding of the situation, a site visit is conducted and water is tested for pH, conductivity and temperature. Samples are also collected for laboratory analysis of iron, magnesium, manganese, sulfates and total suspended solids, which can affect the quality and safety of drinking water. Often, a down-hole video camera is used to document the depth of geologic strata or any cracks in the well casing.

After testing is complete, a report is issued outlining the results of the investigation and identifying any water problems. Any enforcement action taken is based on the inspector's findings in the geologist's report.

Consequently, most of the problems encountered are not the result of mining activity, but rather a lack of routine well maintenance.

DMRE staff provides each citizen with a Routine Well Maintenance Guide that includes instructions for proper well sanitation methods, which can reduce the occurrences of bacteria associated with water quality problems and well equipment malfunctions.

"It is very rewarding when I am able to help a citizen of the Commonwealth find the solution to their groundwater problems," said Donna Schartung, geologist with the DMRE.

Last year, geologists completed 83 water well investigations in response to CRIs. Of these, they determined that 15 wells were negatively impacted by active coal mining. As a result, mine permittees are obligated by regulation to replace any damaged water supplies and pay for excess operational costs of replacement systems for 20 years. Mine permittees have two years to meet this obligation, but must supply well users with drinking water within two days and a temporary water source hooked into existing plumbing within two weeks of receiving notification of the violation.

If you suspect that your water well has been negatively impacted by coal mining, you may request an investigation by contacting the DMRE at any of the six regional offices in Frankfort, Madisonville, Middlesboro, Prestonsburg, Pikeville and London or visit their Web site at www.dmre.ky.gov.



Company volunteers inspire environmental leadership

By Mary Jo Harrod
Division of Compliance Assistance



TOP: Employees try out high-speed hand dryers that reduce paper towel use.

ABOVE: An exhibit of hybrid vehicles was on display during Earth Day.

Photos provided by E.D. Bullard Co.

The E.D. Bullard Co., of Cynthia, at the suggestion of its board of directors, formed its Green Team in 2007 to regulate, document and improve the company’s environmental efforts. Consisting of company volunteers, the Green Team achieved its goals and inspired the company’s 220 employees to become environmental leaders. Bullard is a member of KY EXCEL, Kentucky’s environmental leadership program.

While Bullard has always strived to be energy efficient and environmentally friendly, the Green Team implemented recycling, consumption and waste reduction measures and energy-saving devices and processes that improved previous efforts.

“One of the company’s KY EXCEL projects was the waste reduction policy on paper towel usage,” explains Becky Allan, Bullard payroll benefits manager. “Each month the company used eight cases of paper towels in the cafeteria, coffee areas and restrooms. In August and September of 2009, we installed high-powered hand dryers in the restrooms. The goal was to reduce paper towel usage and waste by 65 percent. Instead, the reduction has been a more dramatic 87 percent. The payback for the installation of the hand dryers will only take seven or eight months.”

A second KY EXCEL project was held on Earth Day at the Hard Hat Café (company cafeteria) for the Bullard employees, which featured an exhibit of hybrid cars from Toyota, Saturn and Ford.

Representatives from the Kentucky Division of Forestry and Blue Grass Energy were also among the

experts on hand to provide information and answer questions.

“We invited several experts in the fields of soil conservation, composting, organic gardening and groundwater flow to talk about these areas,” says John Cooper, Bullard safety manager. “We gave away a rain barrel and bird feeders. Every one of the 120 people who attended received a reusable grocery bag and a packet of flower or vegetable seeds. After attending the event, people were saying, ‘I want to go home and do this.’”

The Green Team mascot, Woody Green, was also on hand to meet with attendees.

“As a result of the Green Team efforts and the KY EXCEL projects, we now have employees that will remove recyclables from the trash because they see the impact this has on the environment,” says Cooper, “and the company has made money from things that used to go into the garbage.”

Current collection and recycling efforts include mixed office waste (paper, cardboard), dry cell batteries, cell phones, raw production materials, packaging from vendors (plastic, shipping peanuts, cardboard, stretch wrap) and brass and stainless steel screens. Bullard has reduced consumption and waste by unsubscribing from unwanted periodicals, implementing use of standby mode on computers and equipment, distributing reusable drink cups instead of disposable cups and using motion sensors to turn lights on only when needed. The company has set up an electronic disposal program to ensure that electronics are disposed of properly at their end destination. Bullard has also implemented energy-saving devices and processes, discontinued use of styrofoam plates in the cafeteria, now manufactures urethane foam liners without the use of CFCs and uses NiMH batteries over NiCd batteries, due to the absence of toxic cadmium.

New KY EXCEL members

The following businesses and organizations have recently joined KY EXCEL. These members committed to a variety of projects to improve and protect Kentucky’s environment. Call 1-800-926-8111 for more information or visit <http://www.dca.ky.gov/kyexcel/>.

Advocate

Governor’s Mansion—Frankfort
Job Corps—Lexington

Leader

Webasto Roof Systems Inc.—Lexington

In October, the U.S. Department of Energy hosted the fourth, biennial Solar Decathlon, a competition for college and university teams to design, build and operate a home with net-zero energy usage. Twenty teams from across the globe competed in the decathlon, each seeking to produce the most attractive, effective and energy-efficient solar-powered house.

Kentucky was well represented by the University of Kentucky's (UK) S•KY BLUE House, which took ninth place. The Kentucky Department for Energy Development and Independence joined UK's team as a major sponsor of the project.

Premiered in 2002 on the National Mall in Washington D.C., the Solar Decathlon seeks to push colleges and universities to educate students about the benefits of energy-efficient design and construction as they enter the workplace as engineers, architects, builders and communicators. The Solar Decathlon seeks to raise public

What is a net-zero home?

A net-zero home is designed to produce at least as much energy as the house consumes in a year by using a renewable energy source, like solar panels.

awareness regarding renewable energy and energy efficiency by demonstrating how solar energy technologies can reduce energy use, thereby saving money and conserving valuable natural resources. Competing teams showcase their houses on the National Mall so that the public is able to observe first-hand the powerful combination of solar

S•KY BLUE house promotes green living



By Brooke Smith

Department for Energy Development and Independence

Photo courtesy of Steve Patton, UK College of Agriculture

energy, energy efficiency and the best in progressive home design.

The Team

Led by Donald Colliver, professor of biosystems and agricultural engineering at the College of Agriculture, and Gregory Luhan, associate dean for research at the College of Design, S•KY BLUE's team was an interdisciplinary group comprised of students, faculty and staff from six colleges and 16 centers and departments within UK, as well as faculty from the College of Communications and Information Studies and College of Engineering.

The Idea

According to the university's Web site, the S•KY BLUE House embodies Kentucky's historic breezeway house design—a rectangular building with a central open space that naturally ventilates the house on warm days. Photographic images of Kentucky landscapes

are integrated into a series of perforated screens on its exterior walls, with a sky-viewing ribbon of continuous clerestory windows around the top of each wall, and a selection of native plants. As a whole, the house is meant to have a light and spacious feel.

How It Works

The university's Web site goes on to describe the mechanics of the S•KY BLUE House as featuring a unique computer monitoring system that receives input from a weather-monitoring system developed at UK. The system receives zip code-specific, short-term (24- to 72-hour) weather forecasts at three-hour intervals, uses an energy model to evaluate the data and calculate the best scenarios for operating building systems in response, and chooses settings and recommendations for the house's components. The system manages the house's heating and cooling, the solar

thermal system, and a series of pumps connected to thermal storage tanks to make heating, cooling and ventilation as efficient as possible. Occupants can view their energy consumption and change their behavior or their system settings to meet changing conditions. The house's photovoltaic (PV) system is designed to produce at least as much energy as the house consumes in a year (making it net-zero). Two PV arrays—a single-axis tracking roof array and a fixed array on the south façade—supply direct current to four inverters, which transform it to the alternating current on which the systems and appliances draw.

House Highlights

- Designed to exceed LEED Platinum standards for homes.
- A unique weather-monitoring system makes decisions about building system operations.

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What does LEED certification mean?

Leadership in Energy and Environmental Design (LEED) is an internationally recognized green building certification system, designed by the U.S. Green Building Council, that provides third-party verification that a building or community was designed and built using strategies aimed at improving performance across all the metrics that matter most: energy savings, water efficiency, carbon dioxide emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts.

Cabinet unveils spoil disposal protocol

By Paul Rothman and Richard Wahrer
Department for Natural Resources

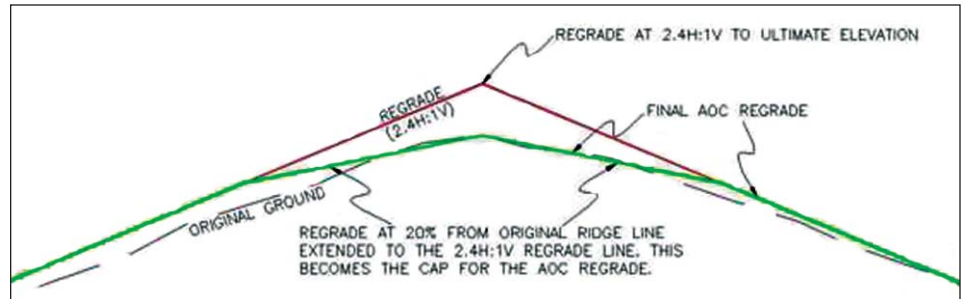
The Kentucky Department for Natural Resources (DNR) recently approved a major policy and design protocol crafted to minimize the impact to streams from mining operations, while maintaining the approximate original contour (AOC) that existed prior to mining.

A technical study group comprised of the DNR, the U.S. Army Corps of Engineers, the mining industry, a citizen's group and the federal Office of Surface Mining (OSM) recently completed development of the Fill Placement Optimization Process (FPOP) and recommended its approval to DNR Commissioner Carl Campbell. The group's goal was to develop a sound engineering spoil handling protocol that meets the federal Surface Mining Control and Reclamation Act (SMCRA), AOC requirements and minimizes stream impacts required by the Clean Water Act.

With DNR spearheading this multi-agency collaboration from the design phase to publication in less than seven months, the process will address and alleviate concerns regarding the footprint of mining within the mountainous areas of eastern Kentucky. Implementation of the process should reduce the number and size of excess spoil fills, reduce stream length impact and enhance re-graded reclamation contours (see diagram), thereby avoiding the flattened appearance to the state's mountaintops. These reductions will be accomplished by returning more spoil to the mining areas and selecting fill locations that either avoid stream impact or significantly minimizing the length of the stream affected.

An added benefit will be realized through the reduced number of pre-law orphan benches used for fill storage as well as substantial savings from reclamation costs normally incurred by the Kentucky Abandoned Mine Lands program. Commissioner Campbell formalized the FPOP in a Reclamation Advisory Memorandum (RAM) 145 that will accomplish the following:

- Achieve AOC while ensuring stability of backfill material and



ABOVE: This diagram illustrates that the FPOP will result in the placement of more excess spoil back on the mine site rather than in hollowfills, thus providing for a site that more closely resembles original contour.



LEFT: This completed and reclaimed hollowfill blends into the landscape and satisfies the post-mining land use chosen by the property owner. Images by DNR

minimization of sediment to streams.

- Minimize the quantity of excess spoil that can be placed in excess spoil disposal sites such as valley fills.
- Minimize watershed impacts by ensuring compliance with environmental performance standards imposed by SMCRA.
- Minimize impacts to aquatic and terrestrial habitats.
- Provide an objective process for use in permit reviews, as well as field inspections, during mining and reclamation phases.
- Maintain the flexibility necessary to address site specific mining and reclamation conditions that require discretion by the regulatory authority as intended by SMCRA and Congress.

“The Fill Placement Optimization Process developed for Kentucky mining operations will provide a consistent and comprehensive procedure that will be supported by federal review agencies, resulting in an efficient and timely permit

application review,” said Energy and Environment Cabinet Secretary Len Peters. “This Kentucky protocol can be used as a template for other Appalachian coal states in developing alternatives analyses and maximizing environmental protection.”

“The protocol detailed in RAM 145 will have significant impacts on the way surface mining is conducted in steep slope areas of eastern Kentucky,” said Joe Blackburn, Lexington field office director for OSM. “It serves as an outstanding example of what can be achieved when state and federal regulatory agencies work together with environmental advocacy groups and the mining industry.”

By developing the FPOP, Kentucky is once again on the leading edge of developing mining protocols that meet the stringent environmental requirements of the SMCRA and the Clean Water Act, while ensuring the continued viability of the coal industry. Coal companies that use this method will reclaim their sites to a configuration that more closely resembles the original mountain slopes that existed prior to mining, while minimizing water quality impacts to streams and aquatic communities.

Recycling e-scrap

Keeping discarded electronics out of Kentucky's landfills

By Tom Heil
Division of Waste Management

In today's society, buying electronics and keeping them for more than a couple of years is a thing of the past. The demand for new technology, along with marketing strategies that tempt us with new color choices and exclusive offers persuade us to upgrade our devices at an ever-increasing rate. Kentucky alone disposes of millions of pounds of electronic scrap, or e-scrap, each year. E-scrap includes end-of-life cell phones, computers, keyboards, cables and speakers, VCRs, DVD players, video game consoles, printers and iPods.

In January, more than 300 state government employees in Frankfort recycled 17,822 pounds of their personal unwanted electronics during a two-day e-scrap recycling event sponsored by the Finance and Administration Cabinet and the Energy and Environment Cabinet (EEC). The e-scrap will be recycled in an environmentally sound manner with less than 5 percent (effectively zero) of the remaining scrap going to a landfill.

E-scrap recycling complements Gov. Steve Beshear's green government initiative. The Finance and Administration Cabinet's Commonwealth Office of Technology introduced the Green IT Program Initiative to identify and prioritize projects and investments with the greatest potential for energy efficiency, environmental stewardship and cost savings. The initiative addresses the entire life cycle of electronic hardware and related components procured and used across state government.

A major accomplishment of the initiative is an all-state contract with Creative Recycling Systems Inc. of Tampa, Fla., which collects and handles Kentucky's large volume of e-scrap. Their hub is located in Jefferson County.

"This contract provides assurances that surplus scrap will be recycled or reused in a manner safe for the environment," said Tony Hatton, director of the EEC's Division of Waste Management. "It also ensures the proper sanitization of any data remaining on hard drives and in memory."

The contract allows all state agencies to participate including executive, judicial and legislative branches of government, school

Collaborating agencies include:

- Division of Waste Management
- Division of Surplus Properties
- Office of Education Technology
- Counsel on Post-Secondary Education
- Office of Procurement Services
- Commonwealth Office of Technology



ABOVE: Mark Nethery with Creative Recycling Systems Inc. takes inventory of the e-scrap.

RIGHT: Gordon Sanders with the Division of Surplus Properties unloads an unwanted processing unit from a state employee's vehicle during January's e-scrap event.

Photos by Cindy Schafer



districts, post-secondary education institutions and any public not-for-profit entity. The contract also provides for statewide pickup and recycling services.

Last year, Creative Recycling picked up 3,007,348 pounds of electronics for a total year-end payment of \$82,159. The total charge was \$23,487, resulting in a net revenue of \$58,672, which was returned to participating government agencies.

"This recycling event was a great idea. We were able to keep nearly 18,000 pounds of electronic items out of the landfills, and these items will be recycled and used in a variety of ways," said Gordon Sanders of the Finance and Administration Cabinet's Division of Surplus Properties. "The Division of Surplus Properties has been recycling computers long before it was considered a 'cool' thing to do."

The Finance and Administration Cabinet plans to host additional e-scrap collections in the future. For additional information about Creative Recycling Systems Inc., visit their Web site at <http://www.crsercycling.com/>

Tracking nature through the seasons *Continued from Page 2*

just a journal, a pen and your own observation skills.

First choose a plant to observe that's likely to be found in your area (BudBurst has a list of recommended plant species). Decide what you'll be watching for—first bloom, first leaf or first fruit, for example. Observe your plant on a regular basis and report your findings online. Many people (including the author of this article) like to supplement their observations with sketches or photographs.

Phenology is a fascinating and fun activity that reconnects us to the cycle of the seasons. Springtime is filled with phenological "firsts," making it a great time to get outside, observe and contribute to the body of knowledge about our changing climate.

For more information, visit Project BudBurst at http://www.windows.ucar.edu/citizen_science/budburst/ and the USA National Phenology Network at <http://www.usanpn.org/>

Here are samples of "phenological phrases," many of which are still in use today. How many do you recognize?

- *Plant peas on St. Patrick's Day.*
- *Spring is here when the first robin appears. (New England)*
- *Plant your corn when oak leaves are the size of a mouse's ear.*
 - *Red sky in morning, sailors take warning; red sky at night, sailor's delight.*
 - *April showers bring May flowers.*
- *Spring advances at the rate of 100 miles a week. (New England)*
- *Knee-high by the Fourth of July (used in the Midwest to describe how tall corn is supposed to be)*
- *Expect a harsh winter when hornets build nests near ground level.*
 - *"When bees to distance wing their flight, Days are warm and skies are bright. But when the flight ends near their home, Stormy weather is sure to come."*

Haight canoes the Licking River *Continued from Page 1*

visible during her trip on the Licking. Dirt seeped into the water where banks had been stripped of their plant growth. The smell of raw sewage indicated the proximity of straight pipes and failing septic fields. The absence of fencing allowed cows to stand in the waterway.

Haight said education is essential to improving water quality. The MSU grant provides for extensive community outreach and education, including roundtables to involve the community in water quality issues within the watershed. Topics will include methods of erosion control, the use of rain gardens to capture storm water and the importance of improving residential sanitation systems. Haight said she also hopes to encourage others to get outdoors and on the water.

"From a boat, there is so much to see and to enjoy," she said. "Even in winter I saw bald eagles, raccoons, coyotes, wild turkey, great blue herons, osprey and magnificent trees. We need to work together to preserve the beauty and health of our watershed."

Watershed Watch volunteers receive training in field chemistry, grab sample collection and sampling event logistics as well as habitat and macroinvertebrate assessment techniques. They learn to use pH kits and indicators, dissolved oxygen kits, conductivity meters, dip nets and other field methods. The results of sampling events provide essential data to DOW on water quality. Learn more about becoming a Watershed Watch volunteer where you live at <http://kywater.org/watch/default.htm>.

Important air quality updates

Greenhouse gas reporting rule update

On Oct. 30, 2009, the U.S. EPA made the federal Greenhouse Gas Reporting Rule final. The rule does not require emission reductions, but rather sets the stage to benchmark how many greenhouse gases are actually being released by industry. Facilities report directly to the EPA, and began monitoring on Jan. 1, 2010. The first reports are due on March 31, 2011. In order to report, facilities must release at least 25,000 metric tons per year of carbon dioxide or carbon dioxide equivalent. To determine if your business is required to report for this rule, visit the EPA's Web site at <http://www.epa.gov/climatechange/emissions/ghgrulemaking.html>.

Air toxics sampling update

In July 2009, the Division for Air Quality launched an air quality monitoring effort at three Ashland area elementary schools, in partnership with the EPA, to determine if hazardous levels of toxic air pollutants may be present in the air around the schools. The initial monitoring period ended in September, but due to a widespread equipment problem some samples in the region were contaminated. Hence, to ensure the integrity of the data, a second round of sampling began in January 2010 and is expected to conclude in March. Results from many of the monitored areas in this nationwide study are already available on the EPA Web site at www.epa.gov/schoolair.

KSU and Heritage Land partner to create the Environmental Education Center

By Lisa Wellings, Heritage Land Conservation Fund, and Linda Potter, Department for Natural Resources

Nestled on 306 acres amid the rolling hills of Henry County, the Kentucky State University (KSU) Environmental Education Center (EEC) transports visitors to a special place to explore and learn about our natural world. On land purchased with funding from the Kentucky Heritage Land Conservation Fund Board, the EEC has flourished into a resource benefiting school children of the Commonwealth, providing field instruction and research opportunities for higher education and protecting Kentucky's natural resources. Since 2005, EEC has welcomed more than 6,400 visitors.

What makes EEC special?

- The center features many amenities allowing individuals with disabilities to experience nature as never before. KSU employed an architectural landscape firm to ensure that most paths and pavilions are handicap accessible. Pervious concrete walkways provide a safe and easy access to the picnic area and wheelchair accessible wooden learning platforms extend out over five spring ponds on the property. For the visually impaired, a majority of signs are equipped with audio buttons and descriptions in Braille.

- Private companies, returning war veterans, volunteer groups, scout troops, student classes and government agencies have banded together to provide manpower, materials and funding for the development and land management of the property. For example, seventh and eighth graders planted a butterfly garden; other groups weeded and planted native species near the streams and ponds; returning war veterans constructed and placed wood duck boxes; an Eagle Scout troop constructed a teaching platform overlooking one vernal pond; and Girl Scout volunteers planted saplings donated by the Kentucky Division of Forestry along the perimeter of the property.

- The biological diversity of the property provides a variety of environmental educational opportunities. Since vernal ponds



ABOVE: Members of KSU, Heritage Land Conservation Fund and Department for Natural Resources stroll across a platform over a vernal pond on the property.



LEFT: Most signs are equipped with audio buttons and Braille to accommodate visitors with disabilities.

BELOW: A teaching platform built by Eagle Scouts along a water feature. Photos by Tod Porter, KSU



hold water all year, red salamanders thrive among the cattails on the property. Thirty-four acres of warm season grasses provide sanctuary for the bob-white, a native bird whose habitat has greatly disappeared in Kentucky. The eastern box turtle, Kentucky's only terrestrial turtle, is common at EEC even though it continues to decline in other parts of the country.

- For 90 years, much of the acreage was devoted to pastureland. Evident now is the natural succession of forests with the pastureland abandoned and replaced by a cedar thicket that will eventually evolve into a deciduous forest of oak, maple and hickory trees.

- Research on native plants and animals is conducted on the property. A rare willow species with the designation of 'special concern' on the federal rare and endangered species list is located by the pond and is monitored carefully by EEC staff. The center

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The cutting edge in 'green' lawn mowers



By Roberta Burnes
Division for Air Quality

If you're like most Americans, you probably use a gas-powered lawn mower to keep your lawn looking good. But growing concerns about air quality, along with a host of other benefits, should be more than enough reason to consider going electric.

Each year, Americans burn more than 800 million gallons of gasoline mowing their lawns, according to the U.S. Environmental Protection Agency (EPA). Our love affair with the perfect lawn comes at a hefty price for public health and the environment. Gas mowers emit hydrocarbons (a major source of smog), particulate matter (causing lung and heart damage), carbon monoxide (a poisonous gas), and carbon dioxide (a greenhouse gas). Surprisingly, the smaller engines in lawn mowers burn fuel less efficiently and emit far more of these pollutants than the family car.

According to the EPA, 5 percent of annual air pollution emissions for the entire U.S. comes from lawn mowers. A single gas-powered push mower emits as much hourly air emissions

as 40 cars. Spilled fuel is another problem; the EPA estimates Americans spill some 17 million gallons of fuel every year while refueling lawn equipment—more than all the oil spilled by the Exxon Valdez in Alaska. Spilled fuel releases volatile organic compounds into the air, which also contributes to



smog-forming ozone.

Air pollution is unhealthy for everyone, but it can cause particular harm to the developing bodies of children as well as the elderly and those with existing health problems like asthma. Since most mowing takes place in the warmer months of the year—when our children are more likely to be outdoors, and when smog is more likely to form—gas mowers can add significantly to the problem. Ground-level ozone forms under hot and sunny conditions, so if you do use a gas mower, mowing in the evenings (after 6 p.m.) can reduce your contribution to the asthma-triggering pollutant.

A growing number of health-minded and eco-conscious consumers are turning to electric mowers. They are quiet; need no gas, oil changes or tune-ups; and turn on with the push of a button. Best of all, electric mowers produce no at-source emissions and have a much smaller carbon footprint (see inset) than gas-

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TOP: The Neuton battery-powered mower uses no oil or gas and produces no emissions to pollute the air. Neuton mowers can get about one hour of mow time on a Duracell battery between charges.

Photos provided by Alyssa Camacho of J. Roderick Inc.

Ecological footprint or carbon footprint?

Like it or not, many of our activities and choices negatively impact the health of our environment. For example, the energy we use to transport ourselves, our food and the things we use in our daily lives emits pollution and consumes resources. Eating locally-grown food, biking or using public transportation, and recycling are some of the ways we can reduce our ecological impact. Your ecological footprint is a measure of the amount of land, energy and resources it takes to support your consumption of food, housing and the products and services you use every day. The Earth Day Network has an ecological footprint calculator at <http://www.earthday.net/footprint2/flash.html>.

A carbon footprint is more specific. Since most of our energy comes from burning fossil fuels, many of our energy-related activities produce greenhouse gases (GHG) that contribute to climate change. A carbon footprint is the measure of how many tons of GHG are emitted by a person, organization or product. Electric mowers still contribute to GHG emissions because they require electricity to recharge their batteries. However, compared to gas mowers, they ultimately have a smaller carbon footprint. A carbon footprint calculator for kids is available at <http://www.epa.gov/climatechange/kids/calc/>.

OSM's Pizarchik listens to Kentucky

By Evan Satterwhite
Department for Natural Resources



OSM Director Joseph Pizarchik (left) and Dr. Chris Barton, researcher and associate professor of forest hydrology at the University of Kentucky, discuss stream construction at Guy Cove near Robinson Forest. Photo provided by Gayle Smith, OSM

In February, Joseph Pizarchik visited Kentucky for the first time since being appointed director of the U.S. Department of the Interior's Office of Surface Mining (OSM) by President Barack Obama. He was confirmed by the Senate in November, and has been engaged in "listening tours" for the first part of his appointment. Pizarchik ventured to Kentucky to hear presentations by Department for Natural Resources (DNR) employees and traveled to the coalfields to listen to groups' and citizens' concerns of the state.

Already well versed on the daily activities and challenges of department employees and the mining industry, Pizarchik was presented with the cutting-edge initiatives that highlight how Kentucky differs from other states:

- Kentucky's e-permitting program has gained recent popularity among engineers who submit permitting applications. The paperless system saves time and is gradually replacing traditional mining application methods.
- Kentucky's Geographic Information System (GIS) is employed in nearly every aspect of daily operations in the department, from displaying precise permit locations and geographic features during field visits to viewing permit locations, topographic maps, aerials and satellite

imagery in-house.

- Electronic mine inspection reports are now completed onsite via wireless tablets used in the field. Inspectors can view maps, handle complaints and perform office-related duties from their mobile office, saving valuable time and fuel costs.

During his three-day sojourn, Pizarchik visited the London and Hazard regional offices and toured two active mine sites in the eastern part of the state. He also toured the University of Kentucky's research operation, the "Guy Cove Project," which is a re-constructed stream

on a surface mine site near Robinson Forest. This project studies the effects of mining on streams and aquatic life forms.

As part of his listening tour, Pizarchik met with Governor Steve Beshear, Energy and Environment Cabinet Secretary Len Peters and various other representatives and interest groups concerned with Kentucky's coal mining industry.

"DNR's collaboration with the Army Corp of Engineers, EPA, OSM, the coal industry, environmental groups and citizens is a good example of how to reach a scientifically sound consensus to better protect the environment while helping meet our energy needs," said Pizarchik. "OSM will continue to work with Kentucky to improve and maintain an effective regulatory program."

"It was a pleasure to host our new OSM director, to show him our state, and to tout the many recent achievements of Kentuckians," said DNR Commissioner Carl Campbell. "He is well aware of the challenges we all face, and I believe he was very pleased with our direction."

S•KY BLUE house promotes green living

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- A 13.0-kW PV system that consists of two arrays: a single-axis tracking roof array and a fixed array on the south façade.
- Lighting strategies that balance natural and artificial light through an adaptive and controllable system.

The S•KY BLUE team hopes that the house will work as a catalyst for future solar and sustainable energy architectural projects to the Bluegrass. S•KY BLUE House will be open for tours at the 2010 Alltech FEI World Equestrian Games this September.

For more information on the S•KY BLUE House, visit the team's Web site at www.uky.edu/solarhouse. For more information on the 2009 Solar Decathlon, visit www.solardecathlon.org. For information on other energy efficiency projects happening in Kentucky visit www.energy.ky.gov.

EPA revises multiple national standards for criteria air pollutants

By Elizabeth Robb Schmitz
Division for Air Quality

Every five years the U.S. Environmental Protection Agency (EPA) is required to review and update the standards for air pollutants that are nationally regulated, based on new information made available about the health impacts of these pollutants. However, some of these standards have not been changed in decades, while another (ground-level ozone) is currently being reconsidered. The standards are set for six criteria pollutants—particulate matter, ozone, sulfur dioxide, nitrogen dioxide, lead and carbon monoxide.

These pollutants are called “criteria pollutants.” Counties are not allowed to have pollution levels that are higher than what the EPA has designated as safe for human and environmental health. People with asthma, children and the elderly are especially sensitive to criteria air pollutants.

Ground-Level Ozone—Proposed Changes

The pollutant standard for ground-level ozone, often linked to asthma, chronic bronchitis, and Chronic Obstructive Pulmonary Disease, is currently 0.075 parts per million (ppm). However, the new standard has been put on hold and is being reconsidered due to concerns that the standard was set in contravention of the Clean Air Scientific Advisory Committee’s (CASAC) recommendations to EPA. The CASAC had shown that current data about the health impacts of ground-level ozone indicated that the standard should be set in a range between 0.060 and 0.070 ppm, but ultimately the 2008 standard was set at 0.075 ppm, after the EPA took comments on a range of between 0.060 and 0.080. Currently under consideration for the new standard is a range from 0.060 to 0.070 ppm, the original range recommended by CASAC.

A large number of counties will be affected by the more stringent standard, expected to be set at 0.070 ppm. The Division for Air Quality (DAQ) has used 2007-2009 data to project the impact of this new standard on Kentucky counties. However, the division anticipates being

able to use data from 2008-2010 to make these recommendations, so these projections are subject to change.

At the 0.070 ppm level, 13 counties have monitors that would trigger a violation of the standard and be classified as in “non-attainment” of the standard. Those counties are Christian, Daviess, Edmonson, Greenup, Hardin, Hancock, Henderson, Jefferson, Jessamine, Kenton, McCracken, Oldham and Simpson.

The EPA plans to release the new standard by Aug. 31, 2010. States make recommendations to the EPA regarding which counties should be listed as not meeting the standard, using locally obtained monitoring values. Those recommendations are due to the EPA in January 2011, and EPA intends to list final designations no later than August 2011. Depending on the severity of the problem, counties will be expected to come into compliance between 2014 and 2031.

Sulfur Dioxide—Proposed Changes

In December 2009, the EPA proposed to strengthen the standard for sulfur dioxide that was first set in 1971. The last review of the standard was completed in 1996, and no revisions were made at that time, although many of the changes proposed today were also considered then. The proposed standard is more stringent in two ways—first by lowering the acceptable amount of pollution, and also by shrinking the amount of time that the pollutant can stay in the air.

Previously, acceptable sulfur dioxide concentrations were set at 140 parts per billion (ppb), measured on a 24-hour scale. The new standard is proposed in a range of between 50 and 100 ppb measured on a one-hour scale, since scientific data indicates the standard is better protective of public health by limiting people’s exposure to high, short-term concentrations of sulfur dioxide.

The rule also changes the monitoring and reporting requirements for sulfur dioxide, which means that the DAQ will be required to significantly revise its monitoring network to accommodate the changes.

These network changes make it nearly impossible for DAQ to predict the impact of the new standard on our counties. The agency must first reconfigure the network and collect data before it will be able to assess the impact of the new standard.

The final rule is expected from the EPA no later than June 2010. States will make designation recommendations in June 2011, the EPA will make the designations final in June 2012, and counties will be expected to meet the new standards by the summer of 2017.

Nitrogen Dioxide – Final Changes

On Feb. 9, 2010, the EPA finalized a strengthened health-based standard for nitrogen dioxide from an annual standard of 53 ppb to a one-hour standard of 100 ppb. This standard has been reviewed twice by the EPA since it was established in 1971, but no changes to the standard have been made until now. While it may seem less stringent to have the standard set at 100 ppb as compared to 53 ppb, an hourly standard is actually more stringent than a yearly standard and better protects the public from high exposures over a short period of time.

The new standard, much like the proposed sulfur dioxide standard, will require DAQ to reconfigure its monitoring network by moving monitors to be near major highways and in areas with large populations. The EPA expects states to establish new monitors and have them operating by January 2013, then the EPA will designate counties as meeting or not meeting the new standard. The date for announcement of designations for the nitrogen dioxide standard is 2016 or 2017.

In summary, the EPA is rapidly updating the National Ambient Air Quality Standards for a number of criteria pollutants. While no formal announcement has been made, air agencies have been notified that EPA also intends to update the rules for carbon monoxide. The changes will pose challenges for state agencies and county officials around the nation. The

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International Year of Biodiversity

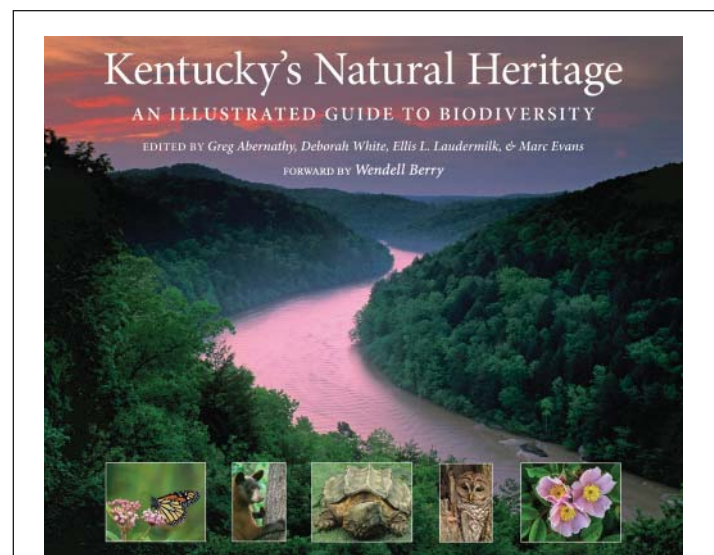
By Greg Abernathy
Kentucky State Nature Preserves Commission

Biodiversity is set to take center stage globally this year with the United Nations declaration of 2010 as the International Year of Biodiversity. The Secretariat of the Convention on Biological Diversity is promoting this event with the intent of raising awareness of the importance of and threats to biodiversity worldwide. Learn more by visiting www.cbd.int/2010.

Kentucky's contribution to global biodiversity is often overlooked. From the summit of Black Mountain to the cypress swamps of western Kentucky there is a diversity of life that may surprise you. Black-throated green warblers, firebelly darters, lizard skin liverworts and small yellow lady's-slippers along with more than 19,000 other species are a part of our natural heritage. These unique and interesting species form natural communities across the state and collectively represent the environmental support system upon which we depend.

The state boasts a diverse aquatic fauna of global and national significance; ranks in the top five nationally for fishes, mussels and crayfishes, as well as total number of obligate cave-dwelling species; is home to 102 taxa (species, subspecies and varieties) believed to be found nowhere else in the world; and lies within the southeastern United States, which has some of the greatest salamander diversity in the world.

ABOVE: *Martin's Fork Watershed*. Photo by Marc Evans, KSNPC
BELOW: *Red Salamander*. Photo by John R. MacGregor



The Kentucky State Nature Preserves Commission (KSNPC) has always been focused on biodiversity protection. Over the last few years, KSNPC staff has worked on a publication that highlights the state's biodiversity. This August, *Kentucky's Natural Heritage: An Illustrated Guide to Biodiversity* will be published by the University Press of Kentucky (UPK). The book is an exploration of wild Kentucky that highlights the species and the natural communities found throughout the Commonwealth. This synthesis of the current state of biodiversity knowledge is accompanied by more than 250 photographs, maps and illustrations. View UPK's catalog by visiting www.kentuckypress.com/newsite/pages/catalog.html

URBAN DWELLERS ‘DIG’ THEIR GARDENS

A safe, environmentally conscious way to promote sustainability in your city

By Herb Petitjean
Division of Compliance Assistance



ABOVE: Last fall, Western Hills High School FFA students pick turnips from the Governor's Garden. **LEFT:** Students plant a tree near the garden.

Photos courtesy of the Education and Workforce Development Cabinet

Consumer awareness continues to grow regarding the distance that fresh foods travel across country before they arrive on supermarket shelves. On average, most fruits and vegetables travel about 1,500 miles from field to table.

Community or urban gardens provide another option for producing fresh produce, plus, they save money and provide great personal satisfaction.

Gardening is no longer limited to rural and suburban residents; it is also being practiced in urban settings.

Urban gardening is about using your space wisely, while

Public gardens provide a unique way to get neighbors together, while shedding light on the important issues of sustainability and environmental awareness.

Governor Steve Beshear
Community Gardening Week, August 2009

also bringing a closer connection to your food and your neighbors.

Before starting a garden, pick a location with lots of sunlight and good drainage. Test the soil for nutrients as well as for potential soil contamination (particularly found in urban settings).

The Center for Environmental Policy and Management at the University of

Louisville has written a guide to help urban gardeners learn more about the dangers of soil contamination, how to test their soil and how to apply agricultural best practices.

Download the guide, as well as other print resources, at <http://cepm.louisville.edu/publications/publications.htm>.

Last spring, first lady Jane Beshear joined leaders from the Finance and Admin-

istration Cabinet, Western Hills High School FFA, Kentucky Proud and Access Food Pantry to plant an inaugural Governor's Garden near the Berry Hill Mansion in Frankfort that promotes sustainability, energy efficiency and environmental preservation.

This spring, make it your mission to start an urban garden in your community.

There are many helpful publications and Web sites available to help you get started or contact your local cooperative extension service for more information.

Design Branch equipped with new tricks of the trade

Reclamation design improvements result in increased efficiency

By **Corey Ann Howard**
Division of Abandoned Mine Lands

The Design Branch of the Kentucky Division of Abandoned Mine Lands (AML), armed with improved technology and updated agency procedures, is ready for the challenges of the decade.

What does the Design Branch do?

The Design Branch provides engineering services for many of the division's reclamation projects. During fiscal year 2008-2009, the branch completed 20 design projects totaling \$6 million in estimated future construction costs.

The design phase of each project generally takes several months to complete. First, branch personnel perform field walks of project areas using surveying and survey-grade Global Positioning System equipment to determine the extent of any AML-related problems and to collect information needed for the design.

Back in the office, technical computer design programs (AutoCAD and SurvCADD) process the site survey information, investigation data and other design elements into two-dimensional or three-dimensional design plans that will be used during construction. These three-dimensional models include site features noted during the field walk such as buildings, drainage, access roads, and they



often create a contour map and/or slope cross-sections that can be used to calculate earthwork volumes. Photogrammetric maps are often also included in design drawings.

The Design Branch uses various other engineering software programs such as ARCGIS for mapping support and HEC RAS for river hydraulics, and others for slope stability, hydrology, sediment control, rock falls, waterlines and drainage.

Design projects are reviewed in house by the AML Program Development Branch to assure compliance with the National Environmental Protection Act, along with authorization to proceed from the federal Office of Surface Mining Reclamation and Enforcement. In the end, final contract documentation is submitted to and published by the Kentucky Finance and Administration Cabinet so that contractors can bid on the projects.

ABOVE: *Design Branch employees (left to right) Jerry O'Bryan, Danny Young, Jennifer Taimi and John Mark Clements discuss final revisions on an AML reclamation project.*

LEFT: *Robert Cammack and Jennifer Taimi set up surveying equipment and recording data during a field visit.* AML photos

What reclamation design improvements have been made?

- The Design Branch continues to improve their electronic filing system to enable cataloguing and georeferencing of low-altitude aerial photography.
- Internal network drives have been created for AML regional offices to utilize technical data.
- The branch also continues to improve its technological skills by participating in various training programs.
- Electronically published and updated AML standard technical specifications and drawings contribute to the streamlining of construction contract procedures.
- Use of applied design technology continues to improve, resulting in functional, attractive, and/or reduced cost of final products.

"Our work continues to become more technical as new technologies are developed. The Design Branch continues to adapt to this change by incorporating these technologies into our workplace—both in the office and field," said Joe Manley, Design Branch manager. "Our use of these advancements has increased the branch's efficiency, saving both time and money, and improved our final product—of which we are very proud."



Area sources of air toxics

By Kenya Stump
Division of Compliance Assistance

What do an animal feed mill, a gas station and a chemical preparations plant have in common? According to the U.S. Environmental Protection Agency (EPA), they are a part of the 70 area source categories identified by the EPA in the Urban Air Toxic Strategy. These source categories represent 90 percent of the emissions of the 30 urban air toxics associated with area sources.

As part of the strategy, the EPA is tasked with developing standards to control air toxics from these area sources. Officially, the EPA defines area sources as those that emit less than 10 tons annually of a single hazardous air pollutant or less than 25 tons annually of a combination of hazardous air pollutants.

So, what does this mean in simple language? These sources are often small sources of toxic emissions, but are numerous in location. Separately, these sources seem insignificant, but when you aggregate them, they can become a significant source of air pollution, locally, regionally and nationally.

Until recently, a large segment of air toxic regulations focused on large emitters of pollution. Now, with the area source regulations, small sources and often small businesses are being regulated and are faced with complying with these new requirements. For many area sources, these regulations can be intimidating and confusing. To help minimize the impact of these requirements, the Division of Compliance Assistance (DCA) and the Division for Air Quality are working together to ensure that affected businesses are notified of the applicable requirements and are given the appropriate resources to comply. Through direct mailings, training, online resources and operation of a compliance assistance hotline, affected sources have a resource to answer any compliance questions.

For more information on area source regulations, visit the EPA's Urban Air Toxic Strategy Area Source Web page at <http://www.epa.gov/ttn/atw/area/arearules.html#court>.

For information on how Kentucky is implementing the area source regulations, visit www.air.ky.gov.

The staff of DCA's Environmental Compliance Assistance Program can be reached for questions regarding area sources at 800-926-8111 or via e-mail at envhelp@ky.gov.

Examples of area source categories:

Aluminum Foundries
Auto Body Refinishing
Copper Foundries
Dry Cleaning Facilities
Forging
Industrial Boilers
Lead Acid Battery Manufacturing
Medical Waste Incinerators
Municipal Landfills
Oil and Natural Gas Production
Paint Stripping
Pharmaceutical Production
Portland Cement Manufacturing
Prepared Feeds Manufacturing
Synthetic Rubber Manufacturing
Wood Preserving

For a complete list of area source categories, visit <http://www.epa.gov/ttn/atw/area/arearules.html#area>.

The cutting edge in 'green' lawn mowers *Continued from Page 10*

powered mowers. Electric mowers are not emissions-free; the electricity used to recharge their batteries has to come from somewhere, and in Kentucky, that somewhere is more than likely a coal-fired power plant. Nonetheless, the emissions from power plants are controlled through a series of emission reducing technologies, and the end result is less pollution and cleaner air in your neighborhood.

A variety of electric lawn mowers are now available, some with cords and some without. Purchase prices are generally equal to or less than gas models, but operating cost is where electric mowers really shine. A typical electric mower costs only about \$5 to \$6 in electricity to power each year. Electric mowers tend to be lighter than gas mowers, making handling easier. Mulching is generally their strong suit, but that varies depending on the type of mower.

In terms of power, the technology is improving. Electric mowers are rated in watts instead of horsepower (hp), with 1 hp equaling 746 watts, indicating that most electric mowers run in the 1.5 hp to 2 hp range for the basic model. Most gas mowers have at least 3 hp. Unless you're mowing extra long or extra wet grass, the difference is probably negligible. The size of your yard may be your biggest limitation; electric mowers with cords are limited by their 100-foot cord length. Cordless models are more convenient but only hold a charge for 30 to 45 minutes. This can be solved by selecting a model with the capacity to easily switch batteries, then having an extra battery on hand to switch out if energy runs low.

Individuals who use the mowers employ different strategies with the sometimes limited range of an electric mower.

"I live on a quarter of an acre, and in optimal conditions I can mow the entire lawn with my mower," says Elizabeth Robb Schmitz, a battery-powered electric lawn mower fan. "However, there have been occasions when I made it only halfway or two-thirds of the way through when my mower's charge ran low. I simply strategize in my mowing pattern, so that the entire front or back of the lawn is mowed, rather than half the front, or half of the back.

"What I love best about my mower is that when I am working up a sweat and breathing hard, I am not inhaling fumes. I also appreciate the quietness of the mower—it won't wake up the neighbors in the early morning," she said.

For more information about electric mower options including side-by-side comparisons of several cordless models, see the April/May 2009 edition of Mother Earth News at www.motherearthnews.com

Kentucky's Underground Storage Tank Program helps bring new life to communities

New life for UST properties

By Virginia Lewis
Division of Waste Management

I have fond childhood memories of one of my neighborhood gas stations. It was a busy spot on Main Street with people always waiting in line to fill up their cars with gasoline and their trucks with diesel. After filling up our '69 Chevelle, my father often took my brother and me inside where we were treated to big green pickles and blue slushies. That was more than 20 years ago. Through the years, that neighborhood gas station changed. The parking lot grew quiet, the gas pumps were removed and the building sat empty.

On properties like this, over time the tanks or the piping that connects the tanks to the gas pumps can leak fuel into the soil and groundwater. The damage done by these leaks to the property and neighboring properties can be very expensive and difficult to clean up. The expense is often so great that in many cases underground storage tank (UST) owners do not have the financial means to self-fund the cost of removal and cleanup.

Through Kentucky's UST Program, people with UST properties can get a much-needed helping hand. The UST Program offers financial assistance to eligible



ABOVE: The author of this article, Virginia Lewis, recalls her visits to this old gas station on Main Street in Morehead. The property was redeveloped by the owner into a credit union (left). Photos submitted

applicants for cleanup costs and, in certain cases, the removal of old UST systems. The funds come from the Petroleum Storage Tank Environmental Assurance Fund and are from a \$0.014 fee assessed on each gallon of gasoline and special fuels imported to Kentucky.

"We have to continue to reach out to underground storage tank owners to make them aware of the program, and the opportunity to address potential petroleum contamination on their property that could otherwise prevent the sale or redevelopment of the property," said Rob Daniell, manager of the UST Branch.

Former UST properties can be an asset to their communities. Old vacant properties in cities and towns are often on busy street corners and main thoroughfares.

This makes them potential opportunities for economic and community development and neighborhood revitalization. In working with the Kentucky UST Program and the resources provided through it, removal and cleanup has taken place and new businesses and public facilities have been developed on the sites where unused gas pumps, old canopies and vacant buildings once stood.

From large fueling stations to little country stores to UST properties that are being repurposed and reused, the UST Program has offered assistance to Kentuckians for over 20 years. For more information, contact the UST Branch at 502-564-5981 or visit their Web site at www.waste.ky.gov/branches/ust.

Rain gardens

Transforming storm water from waste to resource

By Allison Fleck
Division of Water



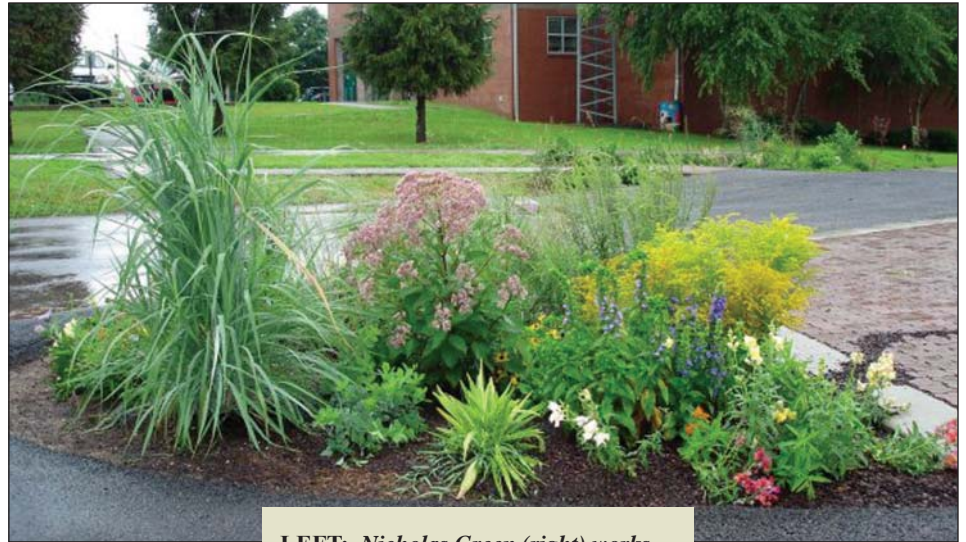
Rain gardens are becoming increasingly popular as a natural way to use storm water as a resource rather than a waste.

When storm water runs across hard surfaces, it picks up whatever is in its path—oil, salt, fertilizer, pesticides, pet waste, transportation chemicals, sediment and litter—and eventually carries it into a storm drain. Unlike sewer pipes, which carry household wastewater to a treatment center, storm water empties directly into streams, rivers and lakes. Too much storm water from developed areas can erode stream banks, pollute drinking water sources and harm aquatic life.

Studies indicate that up to 70 percent of the pollution in our streams, rivers and lakes is carried there by storm water. Rain gardens can reduce the pollution reaching our streams by up to 30 percent.

A rain garden is a natural or dug shallow depression designed to capture and soak up runoff from hard surfaces such as a roof or driveway. It serves as a small bioretention cell where potentially harmful nutrients such as nitrogen and phosphorus are broken up and made inert. Multiple rain gardens over an area will have a positive cumulative effect on both the volume and quality of storm water runoff.

The Coca Cola rain garden in Lexington is a 3,000-square-foot area built



LEFT: *Nicholas Green (right) works with neighbor David Gabbard on the construction of a rain garden at his school.* Photo by Kim Green

ABOVE: *One of nine gardens planted with native species flank the parking lot near the Georgetown Fire Department.* Photo courtesy of the city of Georgetown

to capture storm water runoff from a three-fourths acre parking lot. Shaped like a Coke bottle, the garden catches sediments, oils, greases and pollutants from the asphalt during a rain event, keeping it from washing into South Elkhorn Creek.

Native plants are the best choice for a rain garden since they generally do not require fertilizer and are more tolerant of the local climate, soil and water conditions.

At the Georgetown Fire Station No. 3 in Scott County, best management practices are showcased in the forms of permeable pavers, porous asphalt, rain gardens, rain barrels and vegetated swales. Nine rain gardens featuring native plants flank the parking lot, adding curb appeal and enhancing infiltration.

In addition to reducing runoff and flooding, rain gardens recharge local groundwater, remove standing water, enhance sidewalk appeal and reduce garden maintenance. Rain gardens also encourage wildlife and biodiversity by providing valuable habitat for birds, butterflies and beneficial insects, while enhancing the beauty of the landscape.

In Woodford County, Eagle Scout Nicholas Green built a rain garden at his high school campus to demonstrate the

benefits of recycling storm water.

“I learned about rain gardens from my neighbour, who is a civil engineer,” said Green. “He advised me on where to place the garden so that it would

catch and filter water flowing off of the parking lot in front of the school.”

Green’s neighbor, David Gabbard, a watershed management consultant, works closely with the Bluegrass Rain Garden Alliance to promote a grassroots movement encouraging the installation of rain gardens as a way to improve central Kentucky’s water resources.

“Nick’s rain garden will provide an opportunity to inform other Woodford Countians that they too can filter and reduce water runoff from their properties, thereby reducing pollution and recharging the region’s groundwater supply,” said Gabbard in an article that appeared in *The Woodford Sun*.

While an individual rain garden may seem like a small thing, collectively they produce substantial neighborhood and community environmental benefits.

For more information about rain gardens, visit the Bluegrass Rain Garden Alliance at <http://www.bluegrassraingardenalliance.org/>

Awards

Maehr receives posthumous award for biodiversity protection

By Zeb Weese and Leslie Isaman
Kentucky State Nature Preserves Commission

Dr. Dave Maehr, a professor of conservation biology at the University of Kentucky (UK), Department of Forestry was a tireless advocate for wild creatures and places. Maehr was an accomplished wildlife biologist on several fronts—academic researcher, resource agency manager, popular author, teacher and classic naturalist who called Kentucky home for the last 10 years of his life.

Maehr tragically passed away in a single-engine plane accident in Lake Placid, Fla., in 2008 while monitoring radio-collared black bears. The Kentucky State Nature Preserves Commission (KSNPC) recently awarded Maehr with the Biological Diversity Protection Award during their commission meeting. This is the first time the award was presented posthumously.

Maehr worked professionally in conservation for almost 30 years. After receiving his bachelor of science from Ohio State University in 1977 and his master of science in 1980 from the University of Florida, Maehr went to work for the Florida Game and Fresh Water Fish Commission. While there, he conducted research on black bear, river otter and bobcat before beginning his ground-breaking field studies on the endangered Florida panther. He returned to the University of Florida and completed his doctorate in 1996.

In 1997 Maehr came to Kentucky where his research focused on biodiversity and conservation-related issues. His work included studies of Kentucky's elk introduction, bison ecology in Yellowstone National Park, neotropical migrant songbirds in eastern Kentucky, university-owned natural areas throughout the nation and black bear ecology in southeastern Kentucky, Florida and Mexico.

In addition to his research, Maehr influenced many students, citizens and fellow scientists both in Kentucky and throughout the nation with his enthusiasm for biodiversity issues. While at UK he mentored interns, undergraduates and graduate students, taught conservation biology and other courses, served on numerous committees, and authored more than 100 scientific articles on wildlife subjects and conservation topics.

His devotion and service to his profession was reflected in his peer-review of hundreds of books and journal articles, and involvement on numerous panels and committees, ranging from species recovery to certification of his fellow wildlife professionals.

Maehr was a Fellow of the Rewilding Institute, a group of conservationists



dedicated to returning large carnivores to North American landscapes.

Maehr was an award-winning author and talented artist whose illustrations and drawings have appeared in over a dozen books and articles.

KSU and Heritage Land partner to create the Environmental Education Center *Continued from Page 9*

has been the site for other higher education research of the leaf beetle, paw paw genetics and certain kinds of bats.

During last year's Governor's Conference on the Environment, the Kentucky Heritage Land Conservation Fund Board presented KSU with the 2009 Stewardship Award. The award recognizes excellent land management and stewardship of a Kentucky Heritage Land Conservation Fund (KHLCF) competitive project as well as the hard work and dedication of the program's staff and volunteers in not only providing educational opportunities to connect students and faculty with nature but also conserving and protecting one of Kentucky's natural treasures.

Individuals can help protect Kentucky's natural lands by choosing a nature license plate when registering their car, light truck or SUV. The \$10 fee above normal registration is tax deductible and goes directly to the KHLCF to help make projects such as the KSU Environmental Education Center possible.

Art and writing contest winners announced

By Kimberly Richardson
Division of Conservation

Since 1944, Kentucky's teachers have instructed their students on various conservation topics provided by the Kentucky Association of Conservation Districts. The students use the knowledge they gain from their studies to create posters and write essays for the Jim Claypool art and writing contests.

Each year, thousands of students participate in the contests where they learn about conservation and their environment. In 2009, the Kentucky Association of Conservation Districts and the Kentucky Farm Bureau reported a 10-percent increase in student participation. Students from kindergarten through grade 12 created 43,885 art entries and 16,534 essay entries based on the theme "Water! Every Drop Counts."

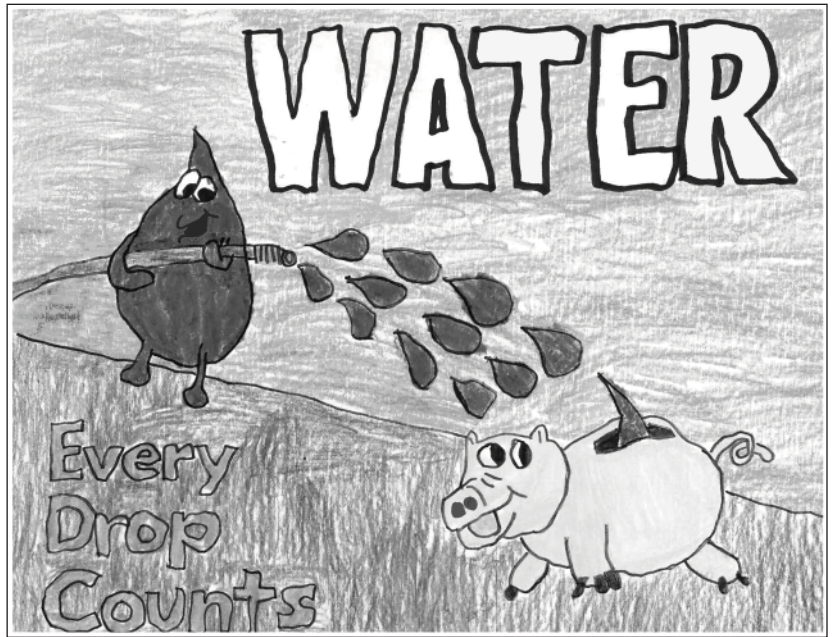
Resource materials included a study guide from the Kentucky Farm Bureau (www.kyfb.com) and the Kentucky Division of Conservation (www.conservation.ky.gov), with descriptions of water cycles, watersheds, water use on the farm, in the city, in the home and outside the home, green infrastructure and many other topics.

All contest entries were judged first at the county level by members of the local Farm Bureau, local county officials and conservation district supervisors. Winning entries from each county were chosen to represent the state level, where they were reviewed by a distinguished panel of judges with various environmental backgrounds. State, area and county winners received monetary awards sponsored by the Kentucky Farm Bureau, along with recognition from their local conservation district.

"These two contests have been conducted in our school systems across the Commonwealth for well over 65 years. Many of us now working in the conservation profession can remember creating our first essay or poster," said Steve Coleman, director of the Division of Conservation. "These students represent the future of Kentucky's environmental and conservation leaders."

The state winners for the Jim Claypool Art Contest were:

- First Place: Brayden Noah Mills, Bell County, Lone Jack School Center
- Second Place: Jordan Zax, Jefferson County, Sacred Heart Model School
- Third Place: Helena Kaelin, Campbell County, St. Catherine of Siena



Brayden Noah Mills, from Lone Jack School Center in Bell County, took first place in the Jim Claypool Art Contest. Photo by Division of Conservation

The state winners in the Conservation Writing Contest were:

- First Place: Jeremiah Ford, Leslie County, Leslie County High School
- Second Place: Annette Dangerfield, Green County, Green County High School
- Third Place: Ben Brooks, Woodford County, Woodford County Middle School

EPA revises multiple national standards

Continued from Page 12

DAQ already struggles with a limited budget that constrains both equipment purchases and staff hiring, which will be made even more difficult as the division works to meet additional requirements from the EPA.

County officials can prepare now for the potential impacts of these more stringent standards by working to reduce open burning and mobile transit. Counties that are able to stay below air pollution thresholds can avoid the economic restrictions placed on nonattainment counties—restrictions that never go away, even if an area is able to clean up its air and get back into attainment status. For more information on each of these pollutants visit:

www.epa.gov/ttnnaqs/standards/ozone/s_o3_index.html

www.epa.gov/air/sulfurdioxide

www.epa.gov/air/nitrogenoxides



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Seedling nurseries: growing trees for healthy and productive forests

By Lynn Brammer
Division of Forestry

We all benefit from trees and forests. Whether a dense stand of hardwoods in the east, a riparian forest along the rivers in the west, or a stately bur oak in the Bluegrass, every Kentuckian will breathe the clean air, drink the clean water, enjoy the wildlife habitat and use the products derived from our forests.



Forestry is big business in Kentucky, and many wood-using industries are located throughout the state. In fact, Kentucky's wood industry employs over 30,000 people and contributes \$4.5 billion annually to the state's economy. The source of most timber and the primary component to the wood industry is the private landowner, who owns 89 percent of Kentucky's forests. Unfortunately, most woodland owners are not prepared to grow and sustain a forest; therefore, they often rely on resource agencies like the Kentucky Division of Forestry (KDF) for assistance with forest management and tree care. KDF operates and maintains two seedling nurseries that offer more than 50 different species of conifers and hardwoods for use in establishing timber stands, im-

proving wildlife habitat, restoring streamside buffers, promoting urban forestry and reclaiming surface mining sites. A tree species will be highlighted in each upcoming issue of Land, Air & Water.

Seedlings are available each fall and spring on a first-come, first-served basis. For more information, visit the KDF Web site <http://www.forestry.ky.gov/seedling/> or call KDF at 1-800-866-0555.

Just the Facts: Shumard Oak (Quercus shumardii)

- **Growth:** Rapid under optimum conditions of adequate moisture and deep soils. It may reach 100 to 125 feet tall by 4 to 5 feet in diameter at maturity.
- **Sites:** Prefers constantly moist but well-drained, deep, rich soils that have variable pH. It thrives in full to partial sun and is shade tolerant in youth.
- **Range:** A southern species, encompassing territory from North Carolina to Texas, and northward to the lower Midwest.
- **Human Uses:** Typically marketed with other red oaks, and may be of higher quality than other associated species. It is used for flooring, furniture, interior trim and cabinetry.
- **Wildlife Uses:** Large acorns provide a valuable food source for wild turkey, quail, white-tailed deer, various songbirds and other wildlife.
- **Tree Trivia:** Shumard Oak is related to beeches, chestnuts and other oaks. A valuable landscape tree, it typically grows upright and will not crowd out nearby trees or buildings as it ages.