

MISSOURI

resources

Spring / Summer 2009 • Volume 26 • Number 2

Missouri Department of
Natural Resources



35 years

Director's Comment

In my new role as director of the Missouri Department of Natural Resources, I hope to put to good use the upbringing I received here in Missouri and the experiences that I have had across the country and around the world.

I have spent much of my career building partnerships and helping develop green markets, and I look forward to applying what I've learned to our growing green economy here in Missouri. I believe that we can help both our economy and our environment rebound by finding areas where the priorities of environmental groups overlap those held by the business community. Of particular interest to me is the great potential offered by the development of alternative forms of energy.

Missouri currently ranks 49th in the nation for use of alternative energy to generate electricity, according to the National Renewable Energy Laboratory. I know we can do better. To generate electricity, communities in northwest Missouri are already successfully using wind energy, and Missouri receives a similar amount of summer solar radiation as Florida. Because we are a leading agricultural producer, biomass also holds great promise.

Gov. Nixon has asked that when we leave office, we leave a cleaner Missouri. To create a sustainable Missouri – one in which we can both work and live productively – will require some innovative thinking. In the coming months I will be traveling throughout Missouri to build partnerships and to hear more about your ideas for accomplishing these goals. I look forward to meeting with many of you during the Katy Trail Ride 2009 in June.



Our department has already begun looking at many of our processes to determine where we can provide better customer service, including Missouri Resources. Please visit the Missouri Resources Home Page at [www.dnr.mo.gov/magazine/] and click on, "Take the Readers' Survey." Your feedback will help us ensure this publication addresses the issues that are of most interest to readers.

Having grown up in Olivette and graduated from Horton Watkins High School in Ladue, I am excited to return to my home state to help care for the resources that sustained me in my youth. It is an honor to have the opportunity to preserve and protect our state's resources, and to serve each of you.

A handwritten signature in black ink that reads "Mark N. Templeton". The signature is fluid and cursive.

Mark N. Templeton
Missouri Department of Natural Resources

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State of Missouri
Governor

Jeremiah W. (Jay) Nixon

Director, Missouri Department
of Natural Resources

Mark N. Templeton

Deputy Director and General Counsel

Joseph P. Bindbeutel

Deputy Director, Water Resources

Mike Wells

Director, Division of State Parks

Doug Eiken

Director, Division of Geology and Land Survey

Joe Gillman

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Alice Geller

Director, Division of Environmental Quality

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Director, Environmental Improvement
and Energy Resources Authority

Tom Welch

Editor

Stuart Westmoreland

Assistant Editor

Phillip J. Tremblay

Design Director

Belinda Hughes

Designer

Ruby Wells

Photographer

Scott Myers

Circulation

Luke Petree

Alisha Gibson

Editorial Board

Larry Archer

Hylan Beydler

Kerry Cordray

Kathy Deters

Sue Holst

Susanne Medley

Byron Murray

Kenneth Seeny

Stuart Westmoreland

Mission Statement

The mission of the Missouri Department of Natural Resources is to protect, preserve and enhance Missouri's natural, cultural and energy resources.

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page 2

Leave No Trace

by Jennifer Sieg

Missouri state parks have adopted a national education program that teaches us all how to protect the places we love.

page 5

The Little Green Monster

by Sue Holst

It's tiny, it's pretty ... and it's responsible for the death of more than 50 million ash trees in North America. Help us stop the emerald ash borer.

page 6

Responding to Disaster

by Larry Archer

In the 14 years prior to Hurricane Katrina, Missouri averaged one presidential disaster declaration per year. We've had 18 in the last four years.

page 11

Managing Mercury

by Larry Archer

One of only six elements that are liquid at room temperature, the perception of mercury has always been one of wonder and novelty. It's not quite that simple ... or safe.

14 • News Briefs

E-Notes, Letters, Stream Team Notebook, Time Exposures, Resource Honor Roll

20 • Resources to Explore

Washington State Park

23 • Career Connection

Cindy Starke: Coordinating Chaos

25 • One Last Word

Paving the Way



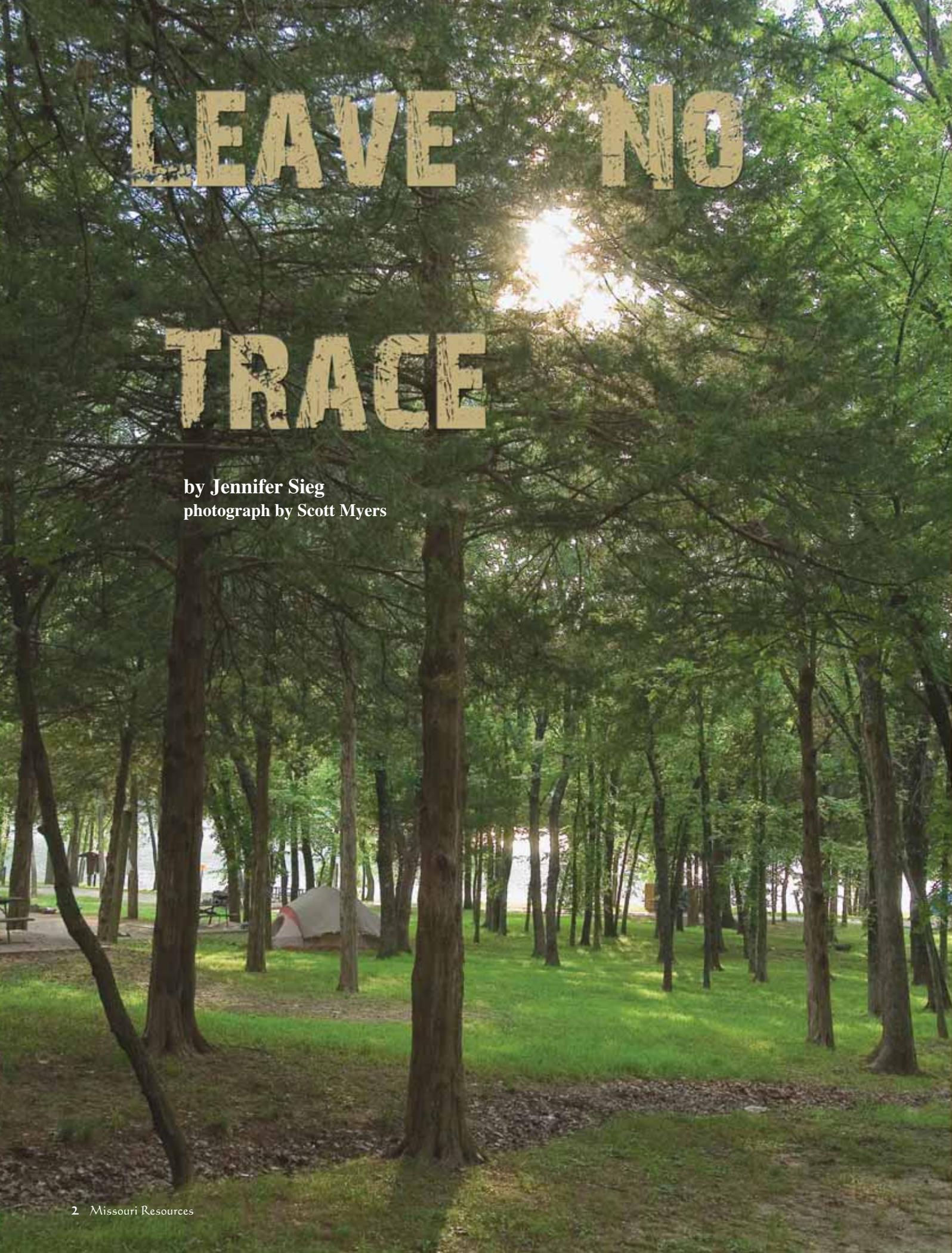
DNR photos by Scott Myers

Above right: DNR's Environmental Emergency Response Team joins the Missouri National Guard to assess and coordinate flood response operations in March, 2008.

Above: Spring brings fishermen back to Missouri state parks' trout streams. These two anglers are fly-fishing at Roaring River State Park.

COVER: Flowering dogwood from rural Osage County near Folk.

Cover photo by Scott Myers.



LEAVE NO

TRACE

by Jennifer Sieg
photograph by Scott Myers

Don't pick the flowers! This simple message has been voiced time and time again, but it was clearly illustrated to a young group of 4-Hers as they participated in a Leave No Trace program. The program began with about half of the kids receiving a flower. As they were asked to take their seats, you could almost see the questions on their faces. That evening, they learned an important lesson – when wildflowers and other natural objects are removed from public lands, it denies the opportunity for others to discover and enjoy them.

Leave No Trace is a national education program recently adopted by the Missouri Department of Natural Resources. The program teaches outdoor enthusiasts how to protect the places they love, such as Missouri's state parks and historic sites, from human-caused recreational impacts. Although existing rules in state parks and historic sites address some of the program's seven principles, the goal is to convince visitors that Leave No Trace is an attitude and a way of life, rather than a list of rules.

Following are the seven principles of Leave No Trace with several ways they can be practiced in Missouri state parks and historic sites.

PLAN AHEAD AND PREPARE:

This principle will not only help the environment, it will make your visit more enjoyable as well. Before leaving home, review park rules, repack food to minimize waste and check the weather forecast so you can bring along appropriate gear. Be prepared for hazards, bugs and emergencies. When planning a hike, know the physical limitations of your group and pick up a trail map, if available. This helps make the trip a safer and more positive experience and reduces the likelihood of a rescue operation, which can have significant impacts to the landscape.

TRAVEL AND CAMP ON DURABLE SURFACES:

When hiking, mountain biking or riding your horse, stay on designated trails; shortcuts can cause erosion and

confusion. When backpacking, use designated camping areas. To minimize impact in the campground, follow parking and campsite limitation rules. At historic areas, avoid walking on artifacts such as petroglyphs (see page 20 for more about petroglyphs).

DISPOSE OF WASTE PROPERLY (PACK IT IN; PACK IT OUT):

Whether camping, hiking or picnicking, put litter, even crumbs, peels and cores, in plastic bags and carry it home or to a trash or recycle bin. If bathrooms are unavailable, dispose of human waste properly. Also pick up after your pet; waste disposal bags are available at some state parks. When camping, strain your dishwater, then throw away the food particles in an appropriate container. Also, recreational vehicle owners should always use the dump stations to dispose of gray water.

LEAVE WHAT YOU FIND:

As in the opening example, leave flowers, plants, rocks and historical items and artifacts as you find them so others can enjoy them. Also, graffiti is vandalism – it damages rock art, ruins, cliff walls, trees and historic structures. In state park campgrounds, do not use trees to hang clothes lines or hammocks or tie up dogs or horses because repeated use can damage the trees. Also, gathering firewood is strictly prohibited in state parks.

MINIMIZE CAMPFIRE IMPACTS:

Build your campfire in the existing fire ring only and keep it small. Burning trash in the campfire is not only a bad idea but is also strictly prohibited in state parks. Not all trash burns completely and some can release toxins in the air. Allow your campfire to completely burn to ash before you leave. Use local wood to reduce the risk of importing invasive insects that like to hide in firewood. Campfires are prohibited along park trails. If you want to strictly follow Leave No Trace principles, use a camp stove instead of a campfire.

RESPECT WILDLIFE:

Observe wildlife from a distance

and keep your pets under control at all times. Never feed wildlife intentionally or unintentionally by leaving food out in the open and unattended.

BE CONSIDERATE OF OTHER VISITORS:

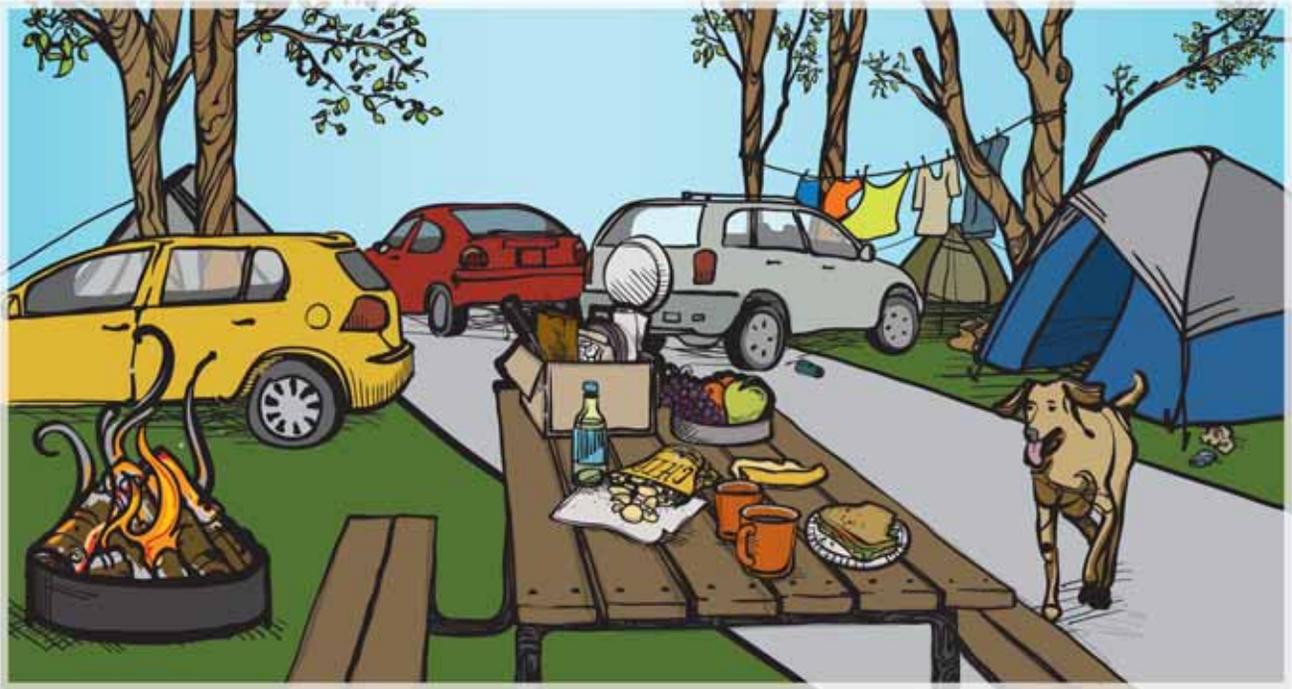
Other people may not love your dog as much as you do. Keep pets on a leash, under control at all times and never leave them unattended. On trails, know trail etiquette. Hikers and bicyclists should yield to horses. Above all, let nature's sounds prevail. Most people recreate outside to enjoy the peacefulness of nature, so keep voices and noises to a minimum no matter what you are doing.

As part of the department's commitment to the Leave No Trace program, many park and historic site staff have been certified as Leave No Trace trainers. To spread the word and generate enthusiasm for the program, some are doing programs on Leave No Trace in the campgrounds or places like 4-H meetings and schools. Others are promoting the principles during their routine "rounds" through the campgrounds and their regular nature programs and hikes.

On a recent muddy hike with Boy Scouts at Rock Bridge Memorial State Park, Kathryn DiFoxfire, a park naturalist, incorporated a couple of the principles. She asked the Scouts what they should do when they encountered a muddy spot on the trail – simply walk around it, move some sticks or stones to create a bridge right through it or walk through the middle of it. "When I told them that we would be walking straight through the mud, there were some looks of horror (especially on the adults' faces). Soon they were replaced with squeals of delight as the children realized that they were given permission to get dirty," said DiFoxfire.

Walking around muddy spots widens the trail and moving sticks and stones didn't adhere to the "leave what you find" principle. Since the group had planned ahead, they were wearing the right clothes and shoes for the muddy conditions.

Many of the programs currently offered by state parks focus on nature to



DNR graphic by Bridgic Stier

SEVEN PRINCIPLES OF LEAVE NO TRACE

- Plan Ahead and Prepare
- Travel and Camp on Durable Surfaces
- Dispose of Waste Properly
- Leave What You Find
- Minimize Campfire Impacts
- Respect Wildlife
- Be Considerate of Other Visitors

PICTURE ACTIVITY:

In the picture above, there are several things the campers should or shouldn't have done to "Leave No Trace." How many can you find?

ANSWERS AND EXPLANATIONS:

- There are three tents and three vehicles, which exceeds the campsite limit and can cause excessive wear and tear on the campsite.
- The vehicles should be parked on the camping pad, not on the grass.
- The trash on the ground should be placed in a trash bag or in an appropriate receptacle.
- The food has been left open and unattended, which is an attractant to wildlife.
- The clothesline tied between two trees is against park rules and can cause damage to the trees.
- There is nobody keeping an eye on the campfire.
- The dog should be on a leash.

help visitors learn more about it and appreciate it. With a successful outcome of these programs, visitors will capture the Leave No Trace attitude and will never see the program as a list of rules; instead it will be a life-long commitment empowered by enthusiasm for nature and the outdoors.

For more information about the Leave No Trace program, visit

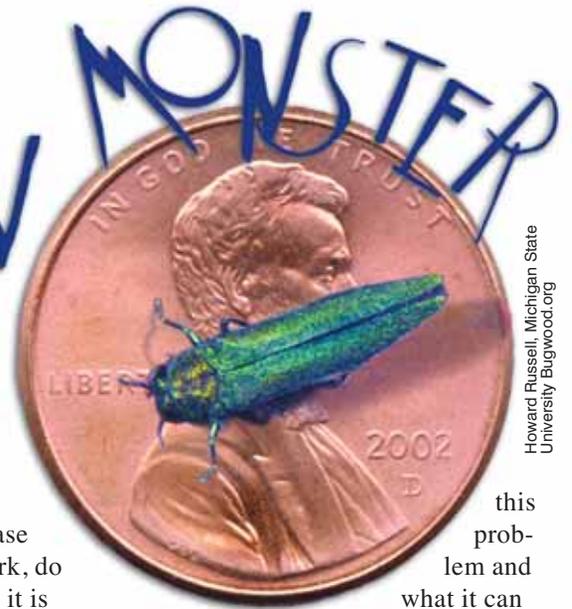
[www.LNT.org]. For more information about Missouri state parks and historic sites, visit [www.mostatoparks.com].

Missouri state park's Leave No Trace information will be posted online soon. 🌅

Jennifer Sieg is a public information specialist for the department's Division of State Parks.

Help Protect Missouri's Forests From THE LITTLE GREEN

by Sue Holst



Howard Russell, Michigan State University Bugwood.org

Sometimes problems come in small, pretty packages. In this case, it is the shiny, metallic-green exotic beetle called the emerald ash borer. The problem is that it has killed more than 50 million ash trees in the northern United States and now has been discovered in Missouri. This may affect your next trip to a Missouri state park.

The emerald ash borer was first discovered in northern Michigan in 2002 and has spread to nine other states (including Missouri and Illinois), plus Ontario, Canada. It has devastated entire forests. The larval stage feeds under the bark, cutting off the flow of water and nutrients and resulting in the death of the tree over a two- to four-year period. All of Missouri's native ash trees (green, white, blue and pumpkin ash), as well as many horticultural cultivars are susceptible.

The emerald ash borer was detected last summer in the Lake Wappapello's Greenville Recreation Area in Wayne County. National and state agencies had been proactively planning in case the beetle was discovered and the plan to contain and eradicate the insect was launched immediately. This was coupled with an educational and public awareness plan to limit its spread.

The most common way the emerald ash borer is spread is through movement of firewood. Federal and state quarantines have been issued for Wayne County to restrict the movement of any ash wood product, including all hardwood firewood. These quarantines include Lake Wappapello State Park and Sam A. Baker State Park, which are both in Wayne County. Violators are subject to federal and state penalties, including fines.

As a camper or visitor to Lake Wappapello or Sam A. Baker state parks, you can help protect all forests. If you purchase or bring firewood into either park, do not take it out of the park. Once it is brought into Wayne County, it is quarantined and must not leave the county. If you have any firewood in either park, you must burn all the firewood before you leave. Do not leave it for other campers.

If you camp in Missouri, be aware of where your firewood comes from and do not move it with you on your camping trip. Many state parks have firewood available to purchase, which makes it safe and convenient.

The best way to protect Missouri's forests is to educate yourself about

this problem and what it can mean for the state and your ash trees. For more on the emerald ash borer in Missouri state parks and what you can do, visit [www.mostateparks.com/firewood.htm]. For a nationwide perspective, visit [www.emeraldashborer.info/map.cfm]. For more on the signs and symptoms of emerald ash borers, go to [www.mdc.mo.gov/forest/health/ashborer/]. ☀

Sue Holst is the information officer for DNR's Division of State Parks.

Emerald Ash Borer



Originally from: Eastern Russia, northern China, Japan and Korea.

First confirmed in Missouri: July 23, 2008, at a U.S. Army Corps of Engineers campground in Wayne County.

Has it spread? So far, the insect has not been found elsewhere in Missouri.

What is being done at the ACOE campground? All infected ash trees in the immediate area are being removed.

How important are ash trees to Missouri? Reports show ash trees comprise about 14 percent of street trees in Missouri communities and over 21 percent of trees in urban parks.

How can I protect ash trees on my property? Keeping trees healthy by proper pruning, mulching and watering helps them resist insect attacks. If you suspect an infestation, contact a professional exterminator or arborist. Infestation patterns of other insects look similar.

Is ash still a viable choice for planting? Having a diversity of species is your best defense against all tree health problems. The wisest choice at this time is to not plant any ash trees.

Photo by Fengyou Jia, Division of Forest Pest Management, DCNR, PA

RESPONDING TO DI



DNR file photos

(Above, left to right) Roadways became waterways during March 2008 flooding. Orphan containers, including chemical barrels and propane tanks, are rounded up to prevent environmental damage. Department staff team with National Guard helicopters to locate existing and potential trouble spots from the air.

When a slow-moving cold front unleashed heavy rains across much of southern Missouri on March 17, 2008, the region's many rivers suddenly turned to dangerous torrents, posing a threat to nearby communities. Local and state officials closely monitored the rising waters, which quickly overtook low-water crossings, topped river banks and levees, and began pushing local residents from their homes.

Missouri Department of Natural Resources state on-scene coordinators Art Goodin and Josh Wilkerson arrived with a boat, prepared to chase displaced fuel tanks.

"We never really got to do that," Goodin said. "We shifted from hazmat response to rescuing people from flooded homes."

Goodin and Wilkerson, who are stationed at the department's Southeast Regional Office in Poplar Bluff, provided support for response command, and were quickly working on things well outside their typical work as environmental emergency responders.

"If there wasn't a Water Patrol guy around, someone would say, 'Hey, the DNR guys have a boat,'" Wilkerson said. In Butler County they helped the Water Patrol ferry about a dozen trapped people and "a little dog who didn't look very happy" to dry land.

While the first priority for emergency responders was to protect human life, they were also called out to work with the Poplar Bluff animal control office to help man's best friend, Goodin said.

"We rescued some dogs that were going to drown because they were tied up or in cages and the water was rising," he said. "The cats were very uncooperative. They went up a tree [and] I think were all right."

Before it was all over, Goodin and Wilkerson also were called on to dispatch U.S. Coast Guard helicopters from their response truck and transport utility linemen to sites inaccessible by land. When circumstances allowed, they also spent considerable time tracking down those runaway fuel tanks.

By noon, March 18, the state had activated the state emergency operations center, located in the basement of the Ike Skelton Training Center in Jefferson City – the joint home of the Missouri State Emergency Management Agency and the Missouri Army National Guard.

The activation of the state emergency operations center, which is ordered by the governor, triggers responses from most state agencies, including the Missouri Department of Natural Resources and many not-for-profit organizations. The department maintains a presence in the emergency operations center every time it is activated, which has been frequently the past three years.

Between Aug. 29, 2005, when the state activated the center in support of the national response to Hurricane Katrina, and Jan. 27, 2009, when it was once again activated for an ice storm that left much of southeast Missouri powerless, the state received 18 presidential disaster declarations. In the 14 years prior to Katrina, dating back to May 1990,

DNR photo by Scott Myers

S A S T E R

by Larry Archer



only 15 incidents – roughly one per year – resulted in presidential disaster declarations.

Disasters such as the March 2008 flooding bring into full view the wide range of the Department of Natural Resources' services and responsibilities. Of the 17 emergency support functions that are established in the state's disaster response plan, the department is the lead agency for one such function, hazardous materials and radiological support and plays a direct role in at least five others: public works and engineering, resource support, energy, public safety and security and external affairs.

The department's response ranges from direct citizen service in the field to managing resources and manpower as part of the state's overall disaster response. Whether on the scene or at the emergency operations center, the department supplies highly trained and motivated staff to the state's effort to protect human life and health, property and the environment.

All types of disasters have their unique challenges. The irony of floods is that the first thing people run out of when there's too much water is ... water. It is during these times that Deana Cash, an environmental engineer in the department's Public Drinking Water branch, can be found in the operations center determining which communities have adequate drinking water and which need assistance.

In addition to the many environmental specialists in the department's regional offices, whom Cash refers to as her "eyes and ears," she relies on a satellite mapping system and database of water systems to identify which systems are most likely to have problems during flooding. By knowing in advance which are most susceptible to flooding, she can contact their operators to make sure they have enough water in storage to ride out the event.

"We have a list of systems we know will likely be impacted," Cash said. "We try to let them know in advance what's happening."

On-scene coordinator Doug Thompson uses a global positioning device from a helicopter to pinpoint barrels, tanks and other containers, and assist ground crews in isolating and collecting them.



DNR photo by Scott Myers

Deana Cash, left, an environmental engineer with the department's Public Drinking Water Branch, and Daniela Heppard, a member of DNR's Environmental Emergency Response staff, use a map to locate municipal water systems that might be impacted by floodwaters.

Working with the department's Environmental Emergency Response section, she also keeps an eye on chemical releases that might impact public drinking water systems in downstream communities.

"There are concerns with contaminants, so we have to cross-coordinate," she said.

Much of how she responds to drinking water issues was developed from lessons learned after the historic floods of 1993.

Unlike most disasters, flooding, including the March 2008 floods, does not happen as quickly or unexpectedly as a tornado or ice storm. The department's Water Resources Center, operating out of the department's headquarters in the Lewis and Clark State Office Building in Jefferson City, tracks flood events and updates the department management on flooding projections.

By monitoring forecasted river levels as well as precipitation predictions and water releases from reservoirs in the affected areas, the center is able "to give the department a better view of what's anticipated and what that might mean on the ground," said Ryan Mueller, Director of the Water Resources Center. The addition of several stream gauges throughout the state further enables the National Weather Service in its stream forecasts.

According to Mueller, discerning river and lake levels during the March flooding was complex, considering the series of reservoirs on the White River in southwest Missouri and northern Arkansas that were all near flood storage capacity for most of the spring.

YOUR PERSONAL PLAN FOR DIS

When the governor orders the activation of the state emergency operations center during an emergency, it triggers a number of plans that agencies at all levels of the state have prepared, practiced and perfected.

If your family faced an emergency – regardless of whether it just affected your family or the entire state – would you know what to do? In large scale events – floods, ice storms or tornados – it could be days before vital services return. During that time, many people are on their own – without a plan or proper preparation.

To help Missourians better prepare for emergencies, the Missouri Department of Health and Senior Services has developed "Ready In 3." This campaign outlines how three simple steps – creating a plan, preparing a kit and listening for information – can help get anyone through the most common emergencies.

The unexpected nature of many emergencies means that families are likely to be separated when they occur: parents at work in different locations, children at school – again, possibly at different locations. Does everyone know how to contact one another? What if local phone service is disrupted? If you cannot



“During the March timeframe, we had several people watching the rivers and tributaries because the flooding was so widespread,” Mueller said.

Regardless of the type of disaster, access to energy is vital to the response and the recovery. That’s why John Buchanan, a planner in the department’s Energy Center, can be found tracking how a disaster has affected the delivery of energy.

“We would immediately begin to contact sources and identify what the relevant energy issues would be,” Buchanan said.

That might be identifying communities without electricity – and working with other agencies within the state to locate and provide generators for the shelters serving those communities – or following how a flood, ice storm or tornado is affecting the many fuel pipelines, bulk terminals or refineries that are located in or provide service to Missouri.

In some cases, those duties cross, and the goal is to get electrical service or generators to key fuel sites – a gas station or bulk terminal – so that emergency service

Daniela Heppard works at the state emergency operations center to coordinate requests for department resources during various disaster situations.

ASTER RESPONSE

go home, is there a safe place where each family member knows to go? These are the sort of things a good family plan includes.

The Ready In 3 Web site [www.dhss.mo.gov/Ready_in_3/] includes sample family plans in English, Spanish and Bosnian.

Following the January 2007 ice storm in southwest Missouri, many in Springfield were out of power for nearly two weeks. How long could your family fend for itself if it were trapped at home without water and electricity? A well-stocked emergency kit, including water, food, radio and more, can make the difference.

A complete list of items for an emergency kit is also available on the Ready in 3 Web site.

In any large-scale emergency, state public information professionals work with local and state news media to make sure the public has all of the most up-to-date and accurate information. Officials will pass any steps the public needs to take – such as an evacuation order or order to remain home – through local television or radio stations. Staying informed is vital.

We cannot control crises, but following the steps of the Ready In 3 program will help you keep an emergency from becoming a disaster.



DNR file photos

(Top) Displaced containers that may contain harmful materials are gathered at a staging area where they can be picked up by their owners or prepared for proper disposal. (Inset) On-scene coordinator Art Goodin inspects drifting drums and containers along a southeast Missouri road.

that might be under stress from flood waters; regional office environmental specialists provide technical assistance to affected drinking water and wastewater systems; geologists stand ready to respond in the event of a damaging earthquake; and more.

Just days before the March 2008 floods struck, Goodin and Wilkerson had been using that same boat to track down the source of a diesel fuel release that had left a sheen across the Mississippi River. Less than 48 hours and six inches of rain later, they were back on the water, but their jobs had changed significantly.

Though the demands of the job are varied, the goal is always the same: to protect the citizens of the State of Missouri. When disaster strikes, Missouri's most important natural resource is those who answer the call – whether that call is to track energy, watch river levels, make sure the thirsty have water to drink or rescue “a little dog who didn't look very happy.” 🌞

vehicles can get the fuel they need to continue to respond.

“Some of them rely heavily on fuel support,” Buchanan said.

Few programs within the Department of Natural Resources remain idle when the state responds to a natural disaster: park rangers answer calls for law enforcement assistance; engineers inspect dams

Larry Archer is a public information coordinator and the department's designated liaison to the state joint information center during disasters.

Managing Mercury

Spill Response and Collection

by Larry Archer

What started out for De Soto High School anatomy students as a hands-on lab in taking measurements and doing calculations became a hands-on, real-life experience in hazardous materials releases.

“One of our teachers was doing a lab and they were checking the temperature of water,” said Chris Woelich, science department chair. “A young lady had just laid the thermometer on the table and the end broke, releasing the mercury all over the table.”

Its nature as a metal that is liquid at room temperature once made mercury a novelty that was considered relatively harmless. It is now known that direct contact with mercury and mercury vapors, which occur when mercury is exposed to the air, can cause health problems. Because of this, Woelich, working with the classroom teacher, Terry Frank, took quick action.

“When it first happened, I Google-searched ‘mercury spill’ and found something from the Missouri Department of Natural Resources and followed that step-by-step,” Woelich said. “By the time he evacuated the classroom, I had Google-searched what to do.”

After evacuating the room, Woelich and Frank shut down the ventilation to the room to prevent mercury vapors from spreading to other parts of the school and began cleanup according to the literature they found online at the department’s Web site (see sidebar page 12). The students closest to the release were ordered to wash and change out of their clothes, which were bagged and held for responders to test.

Adam Vrabec, a state on-scene coordinator for the Department of Natural Resources, responded to the school with a representative of the U.S. Environmental Protection Agency. Vrabec praised the work of school staff in dealing with the release because they had taken all the appropriate measures.



DNR photo by Scott Myers

“The main thing is to isolate the area. Once you do that, you decrease the chance of contaminating additional areas,” Vrabec said.

Vrabec’s response to De Soto High School was one of 84 mercury incident reports received by the department’s Environmental Emergency Response section in calendar year 2008. Of those reports that required an on-scene response by the department, several were to schools where, like in De Soto, thermometers used in a science lab or project were broken.

The nature of mercury means that even a seemingly small amount – like what is found in a thermometer – can have negative health effects on those who have come in

Properly handling mercury requires caution and preparation to avoid health problems.

Dos and Don'ts for Home Mercury Spills

It seems like such an insignificant thing: small silver balls of liquid metal rolling across the floor from a broken thermometer.

However, even seemingly small amounts of mercury, while not an immediate threat to human health, can have negative health effects over time on those exposed directly to the liquid metal or to its vapors. This is particularly true of children less than 12 years old and pregnant women. Therefore, a proper cleanup of a mercury release is important. In homes, small spills can be cleaned up by the resident.

To aid homeowners in the proper cleanup of a small mercury release, the Department of Natural Resources has developed a fact sheet: Mercury Risks – Cleaning Up Small Spills at Home. It can be found online at the department's Web site: [www.dnr.mo.gov/env/mercury-cleanup.htm].

Before reviewing how to clean up a small mercury spill, it is important to know what not to do. Never use a vacuum cleaner or broom to clean up spilled mercury. A vacuum will vaporize mercury and disperse it into the air, making a bad situation worse. A broom or a paint brush will break mercury into smaller beads, making cleanup more difficult.

The first step in cleanup of a small mercury spill is to evacuate the area and isolate the spill. The evacuation should include leaving behind any contaminated clothes or shoes. Isolate the spill by closing interior doors and turning off the heating and air conditioning to prevent the spread of vapors. Mercury va-

pors can be dispersed by opening windows to the outdoors. The process can be improved by using exhaust fans to the outdoors. The affected area should be ventilated for at least 24 hours following the cleanup.

Any part of the body that directly touched the mercury should be washed thoroughly.

The fact sheet, Mercury Risks – Cleaning Up Small Spills at Home, includes a detailed list of cleanup supplies and how to conduct a cleanup. Anyone uncomfortable with attempting to clean up a small spill should contact the department's 24-hour emergency spill line at 573-634-2436, which is monitored by Environmental Emergency Response staff.

The same method can be used for cleaning up broken compact fluorescent light bulbs, which contain significantly less mercury than a thermometer. Care in cleaning up CFLs is still advised.

Once collected, do not dump mercury down a drain or in the trash. For more information on disposing of spilled mercury or mercury-contaminated items – like clothing, carpet or furniture – contact the spill line.

Large mercury spills – considered to be one pound of mercury or anything over two tablespoons – must be reported to the department through the spill line. Emergency responders will be dispatched to conduct on-scene cleanup and monitor the air for mercury vapor at the scene of a large spill. In the case of a large spill, the department recommends following the preliminary evacuation and isolation steps listed above before responders arrive.



DNR file photo

A mercury spill in this Springfield apartment required the removal of carpet and subflooring in the area of the spill.

contact with it. If air monitoring during the initial assessment of a scene reveals mercury vapors at high enough levels, responders will put on protective outerwear and respirators before completing the cleanup.

Short-term exposure to high levels of mercury vapors may cause serious health effects, including lung damage, nausea, vomiting and diarrhea, as well as increases in blood pressure or heart rate, skin rashes and eye irritation.

Symptoms from chronic or long-term exposure can develop in just a few weeks. Tremors, decreased eye-hand coordination, memory problems, insomnia and irritability can develop quickly. If these symptoms are not correctly identified and exposure is not prevented, permanent nervous system damage can occur.

The number and severity of mercury incidents has prompted the department to focus on removing mercury-containing instruments from schools and homes. In De Soto, Vrabec collected an additional 25 to 30 unbroken thermometers, which the school replaced with thermometers without mercury.



(Left) Ben Frissell, Department of Natural Resources Environmental Services Program, accepts mercury-containing devices from Denise Nichols at Boone County Health Department, one of several collection sites across the state.

(Above) Mercury is found on the floor of a storage trailer following a June 2008 fire at HTR Group, a recycling facility in Osage Beach. The fire melted mercury-containing devices that were in storage.

(Below) Terry Frank, left, and Chris Woelich, of the De Soto High School staff, took the proper steps to avoid harm to students from an accidental mercury spill.

“We’d much rather collect it before it breaks than clean it up after it breaks,” Vrabec said.

In February, the Department of Natural Resources sponsored a statewide mercury roundup, providing nearly 90 drop-off containers at fire stations and county health offices for mercury instruments like thermometers, blood pressure cuffs, thermostats and switches. Those who still have mercury instruments that they would like to dispose of can call the department’s 24-hour emergency spill line at 573-634-2436 for more information.

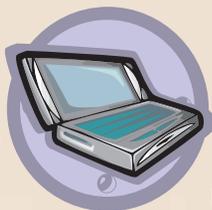
Because of the fast reaction of the faculty, no negative health effects were reported from the De Soto High School mercury release. For science faculty, it was motivation to develop a quick reference chart for dealing with chemical releases in the classroom, according to Woelich.

For the students of that anatomy class, it was a learning experience that was not in the lesson plan. ☀️

Larry Archer is a public information coordinator with the Missouri Department of Natural Resources.



Wireless Internet In Five State Parks



Wireless Internet (Wi-Fi) connections are now available at no charge in certain areas of Bennett Spring, Roaring River, Montauk, Big Lake and

Sam A. Baker state parks.

At Bennett Spring State Park near Lebanon, visitors can get Wi-Fi access at the dining lodge during regular operating hours. Sam A. Baker State Park near Patterson offers Wi-Fi in the dining lodge, store and cabins. At Montauk State Park near Salem, it is available in the Dorman L. Steelman Lodge, which houses the store and restaurant. At Roaring River State Park near Cassville, it is available at the Emory Melton Inn and Conference Center. Big Lake State Park near Craig offers access at the park store, including the store's café and recreation center. Guests are required to provide their own computers.

The department is adding Wi-Fi to enhance customer service and to meet the requests of state park users to stay Internet-connected. Wi-Fi availability will be added to additional state parks in the future. This free service is popular with regular visitors as well as those coming to the parks for meetings or conferences.

For more information, contact the Department of Natural Resources toll free at 800-334-6946 (voice) or 800-379-2419 (Telecommunication Device for the Deaf). For more information about Missouri state parks and historic sites, visit the Web at [www.mostateparks.com].



Take Our Online Missouri Resources Reader Survey

We want our readers' opinions! What do you like in *Missouri Resources*? What do you dislike? What do you want to see more of ... or less

of? If you would like to fill out the survey, go to the *Missouri Resources* Home Page at [www.dnr.mo.gov/magazine/] and click on "Take the Readers' Survey." If you don't have Internet access, or would prefer a printed copy, please send a self-addressed, stamped, business-sized envelope to "*Missouri Resources* Survey," P.O. Box 176, Jefferson City, MO 65102-0176.

We appreciate our readers, and will continue to do our best to keep you informed on the natural resource issues that affect all Missourians.

Roofing Disposal Requirements



The Department of Natural Resources is reminding homeowners and roofers to properly dispose of roofing material.

State law requires that roofing waste material, including asphalt shingles, wooden shakes and tar paper, be disposed of at a permitted solid waste facility, such as a sanitary landfill or transfer station. Illegal dumping of roofing debris can result in both civil and criminal penalties for an individual or construction company. The State of Missouri's air pollution regulations also prohibit the burning of asphalt shingles and most associated roofing wastes.

The department encourages homeowners contemplating the removal or repair of a roof to confirm with their contractor that the cost of proper or legal disposal of waste generated by the work is included in the price of the repairs. If disposal cost is not included, it becomes the homeowner's responsibility to arrange for proper disposal of the waste. If disposal costs are included in the contract price, it is recommended that the homeowner confirm proper disposal practices by requiring copies of disposal receipts from a landfill, and proof that the contractor has met all local ordinances and codes.

The department also encourages recycling or reuse of any roofing waste product before considering disposal. More information on the proper storage and disposal of wastes generated from construction work can be obtained from the department's Web site at [www.dnr.mo.gov].



Geologist Wins Poster Award

Edith Starbuck, a registered geologist with Missouri Department of Natural Resources' Division of Geology and Land Survey in Rolla, won the

"Best Poster Presentation" award at the 12th Annual Missouri GIS Conference held in February. Her poster titled, "Surficial Material and Bedrock Geologic Mapping at the Missouri Department of Natural Resources, Division of Geology and Land Survey," describes the process used by department staff to create geologic maps for Missouri.

With the explosion of technology, data collection and map development methods have changed significantly. Geologic maps are essential tools in planning Missouri's future because they help optimize the use of water, fuel and mineral resources and minimize environmental degradation and hazards. According to a study in the publication, *Meeting Challenges with Geologic Maps*, published by the American Geological Institute, the value of geologic maps is 25 to 39 times the cost of producing them.

Starbuck also authored the current issue of *The Geologic Column of Missouri*, a DGLS publication. The topic: geologic maps. It can be found at: [www.dnr.mo.gov/geology/docs/gcwinter9.pdf]

Industrial Mineral Search Available

There are about 800 active industrial mineral mine sites in Missouri and most counties have some kind of industrial mineral mining activity. The Department of Natural Resources has



environmental notes

created a Web page that allows individuals to search for permit information, maps and satellite photos about these mining companies.

Using a specially created online search engine, people can select a county and generate a list of mining sites in that county, then find the company name and get general information about that company. A click on the selection provides additional data.

The site is updated monthly using location and company information tables, as these are updated directly to the Web. Additional links allow users to view interactive maps of the counties containing Geographic Information System layers. These layers show various geographic information.

The department plans to add additional features to include a search by "commodity mined." The public is invited to suggest additions to the search criteria. Contact Bill Zeaman in the department's Land Reclamation Program at 573-751-1312.

For more information, visit the department's Land Reclamation Program Web site at [www.dnr.mo.gov/asp/lrp/impermits/search.asp].



Drinking Water Strategy in Print or on Web

The Department of Natural Resources has released the 2008

report on Missouri's Capacity Development Strategy for public drinking water systems. The report details the department's capacity development strategy for improving the technical, managerial and financial capacity of Missouri's public water systems.

Systems with sound technical, managerial and financial capacity are more likely to provide safe, reliable and affordable drinking water for their customers.

The department's report provides an overview of how Missouri's public drinking water supplies are performing in their technical, managerial and financial capacity and a strategy for them to improve. Some recommendations out-

Will Future Cruise on Pond Scum?

Missouri may soon receive national attention as a source of biofuels made from humble, but plentiful algae.

Nationally, several companies are reviving U.S. Defense Department research that was done between 1978 and 1996 to create jet fuel from the lipids contained in various strains of algae. Some may contain as much as 50 percent oil, providing a dense energy source that may also be used in biodiesel. Those efforts were abandoned when crude oil prices stayed low. Last year, with prices near \$150 per barrel, several Missouri businessmen and researchers began to look again at algae.



An acre of corn can produce about 20 gallons of fuel per year, compared with a possible 15,000 to 20,000 gallons of oil per acre of algae, according to researchers. However, with present technology, it costs about \$20 per gallon to get oil out of algae. David Ruan, University of Minnesota, and his colleagues are expecting to reduce this cost to \$5 or even \$3 per gallon by developing enclosed systems called "photobioreactors" to provide the proper balance of light and nutrients.

In July 2008, the Saline County Commission agreed to help the Marshall-Saline Development Corporation fund the construction of a commercial algae oil facility. Roy Hunter, executive director of the corporation said the EcoAlgae project, with Green Star Products, would bring national recognition to Saline County. In April 2009, Hunter told the MSDC there has been "considerable activity" on the project, but no start date.

In September 2008, Richard Sayre, formerly a professor at Ohio State University, became the first director of the Enterprise Rent-A-Car Institute for Renewable Fuels at the Donald Danforth Plant Science Center, Creve Coeur. Enterprise Rent-A-Car and two related brands – Alamo and National – together field a fleet of 1.1 million vehicles. All three are owned by the Taylor family. In 2007, Jack and Susan Taylor gave \$25 million to establish the Institute for Renewable Fuels.

"If the first generation was corn-based ethanol and the second involves using non-food parts of plants to make ethanol, the third generation will be oil from algae," Sayre said. He said extracting oil from algae to produce a more sustainable biofuel is one of the most promising areas of biofuels research today. It is quickly renewable, unlike corn or soybeans, which require growing seasons. It doesn't compete directly with the food supply and requires less land and water than other sources of biodiesel. And, the oil from algae has a much higher "energy density" than that of ethanol alcohol. "You can harvest the algae every day of the year," said Sayre.

Algae also have potential to reduce global warming by consuming carbon dioxide. Also in September 2008, an agreement was reached that would allow the Central Electric Power Cooperative's plants east of Jefferson City, along the Missouri River at Chamois, to produce algae with carbon emissions from the coal-fired facility. Jefferson City's Lincoln University researchers will use the carbon dioxide to grow algae, which is then sent to Missouri University of Science and Technology in Rolla to make biofuels.

The projects outlined here expect to see positive commercial results in three to five years.

News Briefs

lined include improving water system knowledge of rules and regulations and improving communication, education, resource sharing and planning.

The federal Safe Drinking Water Act requires the department to submit a Capacity Development Strategy Report to the governor every three years as a condition of receiving the full allotment of the Drinking Water State Revolving Loan Funds.

For more information or to obtain a copy of this report, please call the department's Public Drinking Water Branch at 800-361-4827.

A copy of the public drinking water strategy report is also available to the public on the department's Web site at [www.dnr.mo.gov/env/wpp/pub/CDstrategy.htm].

Helping Farmers Conserve Soil, Water

The Department of Natural Resources' Soil and Water Conservation Program has streamlined the process of providing funding from the parks, soils and water sales tax to implement soil and water conservation practices to control erosion and protect water resources in all 114 of Missouri's county soil and water conservation districts. The governor's recommended budget currently shows landowners will have access to \$30.6 million in fiscal year 2010.

Missouri loses about 71 million tons of soil each year, and thinner topsoil means lost productivity to agricultural landowners and higher prices for

consumers. Missouri citizens continue to provide overwhelming support for soil and water conservation efforts. In 2006, voters approved a 10-year extension of the one-tenth-of-one-percent sales tax with more than 70 percent voting in favor of the tax. The department has the statutory responsibility of administering the policies and general landowner programs developed by the Soil and Water Districts Commission.

With the department's help, Missouri landowners have saved more than 167 million tons of soil over the past 23 years. For more information, contact the Department of Natural Resources' Soil and Water Conservation Program at 573-751-4932 or the department toll free at 800-361-4827.

Great article on Boone Home in the Winter 09 edition. My daughter-in-law lives in an old South St. Louis home with loose plaster and has been wondering if there was some substance which might be used to reattach the plaster to the lath.

Could you forward this message to Mr. Roggensees or someone familiar with whatever was used to accomplish this at the Nathan Boone Homestead State Historic Site, as well as any other information on the subject?

David C. Herries
St Louis

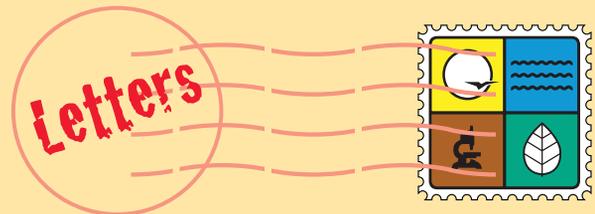
Editor's Note:

The story author and site administrator, David Roggensees, directed Mr. Herries to this Web site, [www.plastermagic.com]. He reports that the product and methods were used at Nathan Boone with great success, and the Web site's videos are very helpful.

I always enjoy reading *Missouri Resources*, it is a very nice and informative publication. I appreciate all the work that goes into making it a great publication.

I read about the new historic site southwest of Butler, Missouri, regarding the civil war. I am giving a program to the Daughters of the American Revolution in the near future and was wondering if you could send me any information about Fort Africa, and any information about this battle. I would appreciate any help you can give me.

Charlie Guthrie
Slater



Editor's Note:

The Division of State Parks is developing Island Mound State Historic Site on part of the site where black soldiers engaged in combat for the first time in the Civil War, during the Battle of Island Mound. The information sent to Mr. Guthrie for his presentation is available by calling State Parks Historian Alison Dubbert at 573-522-1499.

Thanks to your article in the Winter 2009 publication about the Nathan Boone Homestead, we spent a delightful, as well as most informative, visit to the homestead and look forward to a return trip when the weather is warmer. We truly appreciated our time with David Roggensees, resource manager, at the site. He was remarkably well informed and showed a great appreciation for Nathan Boone and the history of that era.

Thanks Missouri Department of Natural Resources, we had a great Sunday afternoon!

Mary Kay Kellogg
Springfield

Letters intended for publication should be addressed to "Letters," *Missouri Resources*, PO Box 176, Jefferson City, MO 65102-0176 or faxed to (573) 522-6262, attention: "Letters." Please include your name, address and daytime phone number. Space may require us to edit your letter. You also can e-mail *Missouri Resources* staff at moresdnr@dnr.mo.gov

Certified Operator Information Online



The Department of Natural Resources has posted a new on-

line resource with information about Missouri's drinking water and wastewater system operators. The new tool allows the public to view and search information about operators who are certified in Missouri for drinking water treatment, drinking water distribution, wastewater and concentrated animal feeding operations.

Users can check the status of an operator's certification and search for operators by county and certification type on the department's Web site at [www.dnr.mo.gov/operator]. Operators who are available for contract work will be highlighted, making it easy for systems that have lost an operator to quickly search for a replacement.

Systems that choose to hire contract operators may find it easier to locate one using the search feature. This particular search criterion will increase over the next few months as certified operators complete forms requesting to be placed on the list.

The resource also has been tailored to meet the needs of the operators. Following a log-in process, certified operators can view detailed information on their certificates, renewal training, contract operations, contact information and more.

This project is partially funded by a grant from the U.S. Environmental Protection Agency.

For more information about the new Web page and search features, contact the department's Public Drinking Water Branch at 800-361-4827.

State Revolving Fund Use Plans Issued

Department of Natural Resources plans describing how it intends to use state and federal funds to assist public entities with construction of water and wastewater infrastructural improvements are now available on the Web.



Stream Team Notebook

Doing a Good Turn

Daniel Blake of Stream Team 2748 and Boy Scout Troop 52 of Columbia have taken their slogan, "Do a good turn daily," to heart by adopting Gans Creek in Rock Bridge State Park as their monitoring site. Blake's mom Betsy, a long-time Stream Team volunteer, took her family on monitoring trips. By the time he was 14, Blake had decided to become a trained monitor himself. Blake saw this as a way to lead his troop to participate in a project he has enjoyed since he was four years old.



Photo by Betsy Blake

Daniel Blake, right, and fellow scouts test the nitrate levels in Gans Creek.

Blake attended monitoring training in April 2005. By June, he had the scouts out monitoring Gans Creek in Rock Bridge State Park – a natural choice for the boys. The troop had camped there and enjoyed the park in past visits. According to Blake, they saw this as a way to give something back to the park; also no one else was monitoring the creek.

Blake trained the scouts to do biological monitoring using the methods he learned at the workshop. Eventually he returned to acquire Level 1 training and taught them to do chemical monitoring, as well. Now, Troop 52 monitors their site twice a year, usually in June and October.

Being conservation-minded has paid off in other ways for Blake. He has won the prestigious William T. Hornaday Award from the Boy Scouts of America in recognition of truly outstanding efforts undertaken in the areas of natural resource conservation and environmental protection.

Now that Blake is almost 18, he will be leaving Scout Troop 52, but there is no fear that the monitoring trips will stop. He is already grooming his 14-year-old brother, Nathan, to take over Stream Team 2748.

For information about the Stream Team Program, visit [www.dnr.mo.gov/env/wpp/VWQM.htm] or [www.mostreamteam.org].



The Clean Water State Revolving Fund and the Drinking Water State Revolving Fund are the department's major infrastructure funding programs. Since 1989, the State Revolving Fund has provided more than \$2.1 billion to 240 Missouri communities to construct and improve wastewater

treatment and drinking water facilities. Towns and cities across Missouri have saved more than \$573 million dollars in interest charges compared to conventional, higher interest rates of financing. Most of the funds are used to make low-interest loans to municipalities, water and sewer districts and other

TIME EXPOSURES



Missouri State Archives, Charles Elliott Gill Collection

In 1909, Charles Elliott Gill took this photo of a blast furnace, built in 1857, at the Maramec Iron Works near St. James. The first successful iron works west of the Mississippi was launched in 1826 to provide a local supply of iron for wagon wheels, plows, axes and other items needed by settlers. Slaves mined the high-grade ore about a quarter-mile from the furnace. At the time, ore, charcoal and lime were layered into the furnace 100 times per day. Air was pumped in to raise the temperature enough to melt the ore. Charcoal production for the works required 10,000 acres of surrounding woodlands to be clear-cut by 1870.

Gill was a Dent County farmer, but also traveled coast-to-coast as an amateur photographer for more than 30 years. He died in 1962 at age 93, leaving 722 glass negatives and some original prints. His son, Edward Addison Gill, donated the collection, titled "Ozark Light," to the Missouri State Archives in 2002. They can be seen at [www.MissouriDigitalHeritage.com].

Send your photo to "Time Exposures," c/o Missouri Resources, PO Box 176, Jefferson City, MO 65102-0176. All pictures will be returned via insured mail. Pre-1970 environmental and natural resource photos from Missouri will be considered. Please try to include the date and location of the picture, a brief description and any related historic details that might be of interest to our readers.

entities for the construction of water and wastewater facilities. The loans help recipients comply with clean water and safe drinking water laws and protect public health. A small percentage of funds are used to cover administrative costs and provide compliance assistance.

In addition to the State Revolving Fund, DNR also provides funding for water and wastewater infrastructure

with funds made available through the sale of state water pollution control bonds. Programs funded through the sale of these bonds include the 40 Percent State Construction Grant, Rural Water and Sewer Grant and the Small Borrower programs.

Copies of the Clean Water State Revolving Fund Intended Use Plan, the Drinking Water State Revolving Fund Intended Use Plan and related

programs are on the department's Web site at [www.dnr.mo.gov/env/wpp/srf]. The Web site also includes application forms for the following year's Intended Use Plan.

EIERA

Environmental Improvement and Energy Resources Authority

EIERA Provides \$50,000 For Educational Center

The Environmental Improvement and Energy Resources Authority has provided \$50,000 in financial assistance for the Watershed Center at Valley Water Mill, Springfield. The educational facility is located on 100 acres, one mile north of I-44.

In 1984, officials with the city of Springfield, Greene County and City Utilities agreed to form the Watershed Management Coordinating Committee. This citizen-based group was charged with protecting current and future sources of public drinking water for the Springfield-Greene County community, through various water protection initiatives. The Springfield-Greene County Comprehensive Plan stressed the need for a watershed educational facility at Valley Water Mill.

The Watershed Center features the Becky Shannon Springside Learning Station and Lakeside Learning Station (pavilion). Additionally, the center provides conference and meeting rooms, and a recreational environment that includes hiking and biking trails, wetland areas, fishing piers, and boardwalks. The centerpiece of the facility, the main education building, has not yet been constructed.

EIERA is a financial arm of the Department of Natural Resources and provides assistance for environmental and energy projects statewide.

For news releases on the Web, visit [www.dnr.mo.gov/newsrel/index.html]. For a complete listing of the department's upcoming meetings, hearings and events, visit the department's online calendar at [www.dnr.mo.gov/calendar/search.do].

Springfield Plateau Grotto **Making a Bat-Friendlier Cave**

River Cave at Ha Ha Tonka State Park near Camdenton is one of the highest ranking caves for biodiversity in Missouri. When Eric Hertzler of the Springfield Plateau Grotto found out one of the gates to the cave had been damaged and the rock wall surrounding it had started collapsing, he was concerned for the cave and the species within it.

There are two sinkhole entrances to River Cave: the larger front entrance and a smaller back entrance. The front gate had been replaced in 2005 with a design that is "bat friendly." The rear sinkhole feeds from Dry Hollow, so during significant rain events, a large volume of water funnels into the cave through the back gate. This gate was held in place by an old man-made stone wall that started collapsing in the fall of 2008. As the wall came down, so did the old gate inside the wall. Endangered Indiana bats use the passage beyond this gate in the winter, so the concern was to get the gate up before they arrived for hibernation so they would not be disturbed.

Springfield Plateau Grotto (SPG) received a grant from the 3M company for the protection and preservation of the biodiversity of Missouri caves. Hertzler approached the SPG board chairman Jon Beard for help. The SPG board voted and decided to use more than \$3,000 of the 3M grant to improve and rebuild the back gate of River Cave. Materials to construct the new gate were purchased by SPG and donated to Ha Ha Tonka State Park, which is operated by the Missouri Department of Natural Resources. Ten members of Springfield Plateau Grotto and Lake Ozark Grotto donated nearly 90 hours of their time to help park staff with the project on site. Vol-

unteers from the two grottos included Eric Hertzler, Jon Beard, Ken Long, Bryan Cook, Bob Gitchell, Roy Gold, Christian Easter, Jeff Palmer, Charley Young and Darren Donley.

The first step was to remove what was left of the man-made rock wall and prepare the site for the new gate. This would give the new gate more than four times the surface area of the previous gate, enabling it to handle the large volume of water from Dry Hollow. Removal of this man-made structure also allowed the gate to be anchored deep into solid bedrock rather than the unstable wall. Construction of the new gate took about a week and grotto members were there nearly every day to help move material and assist park staff.

Thanks to the help and materials from these two cave conservation groups, the biodiversity of River Cave will be protected from the disturbance of unauthorized entry for many years to come.



DNR photo by Candy Long

Volunteers work on the entrance to River Cave.

Missouri S&T Energy Team **Tapping the Wind and Sun**

For many years, the students and staff at Missouri University of Science and Technology, Rolla, have placed themselves at the cutting edge of energy and environmental research. The university's solar vehicle team has competed with similar teams throughout the world. Now the focus is on a hydrogen-powered Eco-CAR, but this is only the beginning.

The university has launched an E³ campus: Energy, Environment and Education equals Civilization. The E³ complex, already incorporated in the city of Rolla's master plan, features a hydrogen fueling center, garage for the Eco-CAR development and base for a hydrogen-powered shuttle bus system. Eventually the campus will feature solar-powered dormitories constructed by students, waste-to-energy and wastewater recycling demonstrations, as well as a zero energy military base camp demonstration.

Currently up and running is a wind turbine and solar array at the Troop I State Highway Patrol Headquarters, adjacent to the E³ campus. Dr. Curt Elmore, P.E., associate professor of geological engineering at Missouri S&T and his team of students put the system together over three days in July 2008. In October, the system was granted an interconnection permit by Rolla Municipal Utilities.

"The two renewable energy systems were selected on the following basis – they are intentionally sized so that there is a high likelihood that all of the renewable energy will be used by the SHP, and there will be little or no energy returned to the grid," said Elmore. "This meant that less expensive, smaller systems could be used."

The wind turbine is a 10 kw Excel S Wind Turbine. It can produce 10 kw at 29.3 mph and begins generation at a cut-in wind speed of 8.05 mph. The turbine sits on a 120-ft. lattice tower. Equipment cost for the wind turbine was \$36,700. The photovoltaic system consists of 10 Sharp ND216U2 solar panels. Each can produce 216 w or 2.16 kw with all of the panels working together. Equipment

cost for the photovoltaic array was \$13,700.

While not a necessary part of a home-sized wind and solar energy system, the Troop I installation also includes a \$10,300 weather station.

The monthly totals of renewable energy generated by this project are available at [energy.mst.edu/]. The total renewable energy generated for November and December 2008, and January 2009 was 2,124 kwh – kilowatt hours.

"We are still analyzing the data, and it will take us one year to make a meaningful calculation in regard to how much energy is provided to the SHP headquarters, because the energy generation and consumption vary seasonally," said Dr. Elmore.

"It is okay to install a renewable energy system even if the economics appear unfavorable," he said. "You will realize some unexpected savings because you will be more conscious of your daily energy consumption. These systems cost less than an SUV, and you never hear someone say that they bought a car because it will pay for itself. Plus, the renewable energy systems potentially have a great environmental benefit!"



Ernie Gutierrez photo

Dr. Curt Elmore, left, and engineering students, Will Granich, Matt Vitello and Andrea Orlando, lower right.

Resources to Explore

WASHINGTON STATE PARK



Photo by Sarah Grantham



DNR photo by Scott Myers

by Jennifer Sieg

Hills, history and hard work define the creation of a great outdoor haven – Washington State Park near De Soto. On the hills above Big River, American Indians left behind remnants of their lives, carved in rock. Evidence of the sweat and labor of the Civilian Conservation Corps (CCC) also dots the park in the form of cabins, shelters, curbs and a rock step trail. Although hundreds of years apart, both groups left their distinctive mark on the area, providing unique stories and history to be interpreted at the park.

The rock carvings in the park, called petroglyphs, are the largest group yet discovered in Missouri. They are associated with prehistoric ceremonies linked to the American Indian culture that archaeologists call Mississippian. The petroglyphs are evidence of their beliefs and give clues to understanding the lives of these people, who are believed to have inhabited the area around A.D. 1,000. Because of the number and exceptional quality of the carvings, these sites were placed in the National Register of Historic Places. A large group of the carvings, protected by a shelter and boardwalk, are open to the public and interpreted on exhibit panels.

The petroglyphs are not the park's only claim to masterful craftsmanship in stone. After the donation of the land to the state in 1932, the CCC Company 1743 spent from 1934 to 1939 developing the park. Company 1743, the only African-American compa-

This shelter is one of 13 buildings built in the park by CCC Company 1743. (Above inset) This CCC overlook provides a breathtaking view of the area.

DNR photo by Scott Myers



ny to work in Missouri’s state parks, did extensive roadside work, laid stone for the 1,000 Steps Trail and built 14 buildings, including an octagonal lookout shelter and the Thunderbird Lodge, which has a creek flowing beneath it.

Inspired by the Indian carvings, they named their barracks “Camp Thunderbird” and continued that theme on the lodge. An Indian thunderbird symbol is carved in the east end of the building and is repeated in the handmade iron door hinges. In a letter written to the park in 2000, a former member of the company, William Grimmert, describes the extensive labor that went into the stone work.

“The stone was cut in chunks which was done by hand ... The chunks were then loaded on trucks and hauled to the area in the shade where the rock cutters shaped them into building stone. This was done with rock chisels and hammers.”

By day, more than 200 men worked hard. At night, they recreated, often boxing, or playing music, baseball or basketball. One member, James LaMarque, went on to pitch for the Kansas City Monarchs baseball team in the Negro American League.

In reference to his experience, Grimmert said that it was extremely rewarding. “Be-

fore that time, I had never witnessed so many young, inexperienced African-Americans being given the opportunity to function in a cooperative, professional manner. All of us learned that we had the ability to compete with top-notch results,” he wrote. Top-notch results are exactly what they achieved, as the exceptional quality of their craftsmanship in stone earned them high praise in the National Register of Historic Places’ citation for the park.

The rustic craftsmanship of the CCC blends well into the natural features of the park. Representing both characteristic and unique features of the eastern Ozarks, the 2,158-acre park contains a rich mixture of native forests. The Washington State Park Hardwoods Natural Area, bordering the Big River floodplain, is moist and robust with a wide assortment of trees. Under the canopy of tall Kentucky coffee, sugar maple and slippery elm trees, ferns and wildflowers mingle with understory paw-paw and bladdernut trees.

In early spring, one of the state park system’s most spectacular wildflower shows of blue-eyed Marys, celandine poppies, bluebells, trilliums and violets bursts into bloom.

Washington State Park is eight miles south of De Soto on Highway 21.

(Above) Bill Payne of De Soto learns about the petroglyphs protected within a shelter. (Opposite page, top right) This petroglyph thunderbird inspired the decorative theme at the park’s lodge and former CCC barracks.



Thunderbird Lodge, the park office and store, were built over a creek.

The hills above the natural area feature limestone glades and woodlands. These open forests and sparse grasslands are scattered throughout the park's uplands and along most of the trails. The trees are often quite small, even though they may be more than 200 years old. Three trails traverse through these wooded areas including a 10-mile hiking and backpacking trail. The 1,000 Steps Trail winds up a hill past a CCC picnic gazebo that provides a majestic view of the Big River, which borders the park, and the surrounding area.

The towering dolomite bluffs that overlook Big River make a scenic backdrop for a relaxing

float or a day of fishing. Canoe rentals and shuttle service are available at the park for a three- or six-mile float. Anglers can cast their lines for catfish, crappie and large and smallmouth bass. A boat ramp provides access to the river. On hot summer days, visitors can splash in the cool waters of the Big River or in the park's swimming pool, open from Memorial Day through Labor Day.

Wide open spaces for kids of all ages to run and just enjoy the outdoors are abundant. There are plenty of places to enjoy a lunch at a picnic table or one of three picnic shelters that can be reserved for a nominal fee. If not reserved, the shelters can be used for free on a first-come, first-served basis. There are also three playgrounds available to keep the kids occupied.

Those wishing to spend the night or a weekend can do so at the campground or in one of 11 cabins. The campground, which is the original location of Camp Thunderbird, features both basic and electric sites, showers, water, laundry and a dump station. There are both reservable and first-come, first-served campsites. A special-use area is available for organized youth groups.

The one-, two- and three-bedroom cabins can sleep a maximum of six to 12 people and feature kitchenettes with pots, pans and dishes. Meals or snacks can be prepared and enjoyed inside the heated and cooled cabins or outside on the fire ring with grill and picnic table. Located in the unique Thunderbird Lodge is the park store, which sells most necessities for your stay.

For evening entertainment on weekends, a seasonal naturalist presents programs in the park. The program schedule is available in the park office.

With its history and amenities, this park is the perfect vacation destination for outdoor recreation with a touch of education.

For more information about Washington State Park, contact the park directly at 636-586-2995 or the Department of Natural Resources toll free at 800-334-6946 (voice) or 800-379-2419 (Telecommunications Device for the Deaf) or visit the Web at [www.mostateparks.com]. Camping and lodging reservations can be made by calling 877-422-6766 or online at the Web address listed above.



Washington State Park offers 49 campsites. Here, the Pettibone family of Florissant prepares dinner over a campfire.

Jennifer Sieg is a public information specialist with the Department of Natural Resources' Division of State Parks.

DNR photos by Scott Myers



Cindy Starke

Coordinating Chaos

by Larry Archer

Many people are attracted to careers in emergency response: police officers, firefighters, paramedics and search-and-rescue personnel. The day-to-day unpredictability and ability to have an immediate impact on a bad situation appeal to those for whom traditional, nine-to-five office jobs do not.

Add to the mix a desire to protect the environment, and one quickly recognizes Cindy Starke's career path.

Starke is an environmental specialist with the Department of Natural Resources' Environmental Emergency Response/Field Services section and a certified state on-scene coordinator.

The department's state on-scene coordinators are a corps of environmental specialists whose jobs include being the department's first responders to the scene of any incident that might harm the environment. Typical responses include traffic accidents, where lost gasoline or diesel fuel might threaten a local waterway, but responders are also dispatched to much larger incidents as well: pipeline breaks, train derailments and chemical plant releases. A state on-scene coordinator was among the first dispatched to the December 2005 breach of the Taum Sauk Reservoir that did significant damage to Johnson's Shut-Ins State Park.

"It's something new every day, and it's field work, and that's what I wanted," said Starke, an Osage County native who began with the department in September 2007.

Prospects for environmental specialist positions are expected to have at least a bachelor's degree in a science-based field. Starke's major was agriculture.

"I grew up on a farm, and I knew when I went to college that this was the kind of work I wanted – to do something in the environmental field," she said.

Certification as a state on-scene coordinator requires additional on-the-job study. Staff must also become certified hazardous materials technicians and complete highly specialized homeland security-related training. Such certifications allow a responder to take control at the scene of an environmental emergency and oversee the response and cleanup.

While being a state on-scene coordinator might seem exciting, it is also demanding work that regularly tests the dedication of those who do it. Environmental emergencies happen at all hours of the day and night and frequently impose on personal and family time. Making sure the public has the means to report an incident 24 hours a day requires that someone is always on duty, even when they are at home. EER staff members take turns having the state's 24-hour spill line forwarded to their homes so no calls are ever missed – no matter what time they come in.

"The first night I took phones, I got two hours of sleep; then I had to come in and work a regular work day and then take phones again the next night," she said.



DNR file photo

(Top) Cindy Starke collects a soil sample.

(Above) On-scene coordinators participate in a HAZMAT decontamination wash in full Level A personal protective equipment.

DNR file photo



(Above) An on-scene coordinator in protective gear seals the rupture of a pipe carrying HAZMAT substances.

(Right) Starke calibrates the air monitoring and hazardous materials identification system.

(Below) Rick Gann, Northeast Regional Office on-scene coordinator, left, and Starke set up the remote air monitoring stations around a HAZMAT site.



DNR photo by Scott Myers



DNR file photo

“This isn’t just a job, it’s a lifestyle,” Starke added.

Responding to environmental emergencies is the most high-profile aspect of her job, but Starke’s days are filled with more than racing to the scenes of accidents, leaking tanks and burst pipelines. She also pulls her shifts in the program’s incident command center, which houses the department’s 24-hour spill line (573-634-2436), taking calls on environmental emergencies and dispatching staff, as well as providing technical guidance to the public.

When not responding to emergencies, on-scene coordinators are frequently preparing for them. They work with local emergency planning commissions on disaster training and planning. When disaster strikes, they also represent the department at the State Emergency Management Agency’s state emergency operations center.

On-scene coordinators conduct field work in support of other programs within the department, such as taking soil or water samples. They also take on special projects. In February, Starke coordinated a month-long statewide campaign encouraging Missouri residents to take their mercury thermometers and other mercury-containing items to drop-off sites throughout the state.

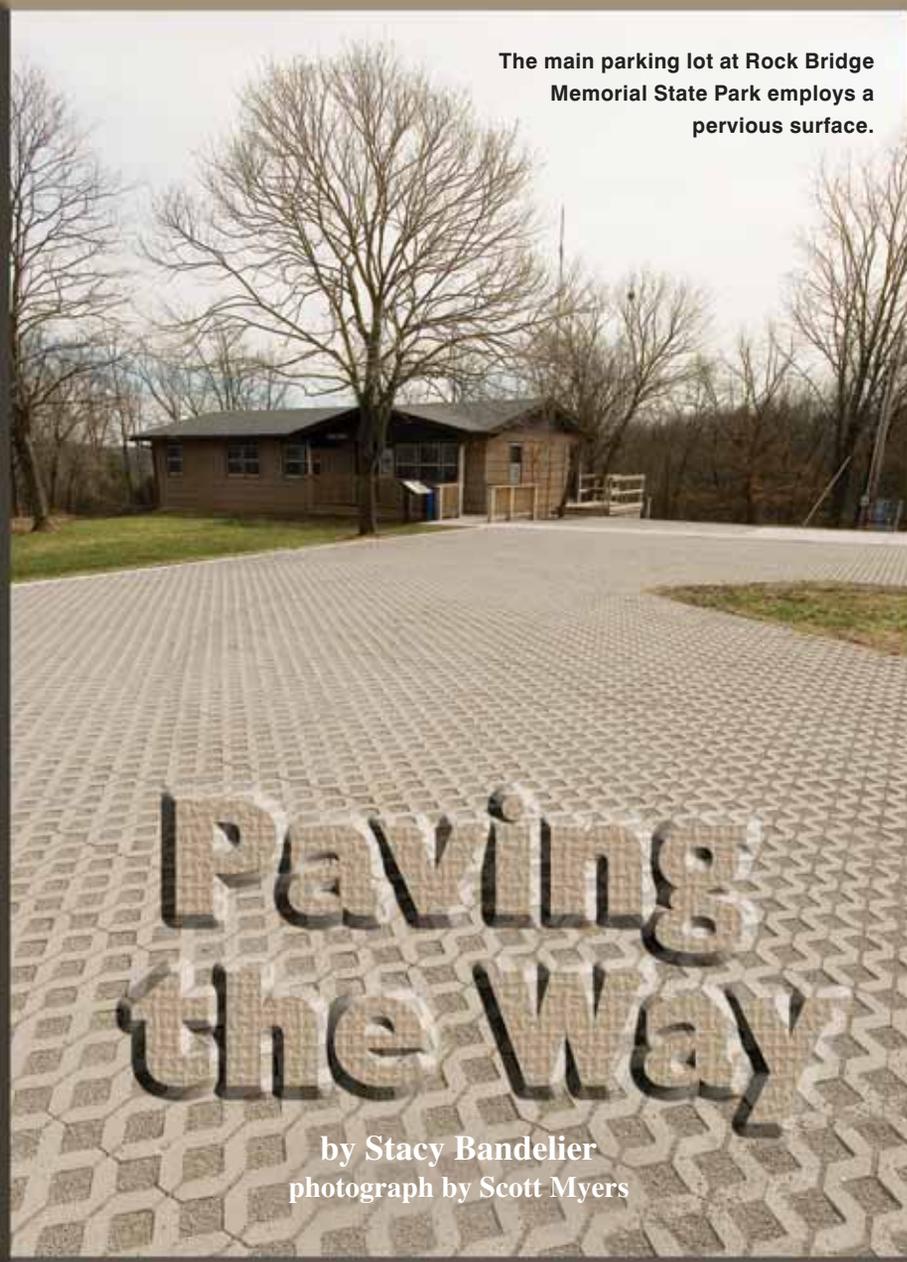
For Starke, being an on-scene coordinator brings together the best of all she had wanted in a career – even if that includes some occasional excitement and chaos.

“I feel lucky having this job,” she said. “I don’t mind getting up in the morning and going to work.”

For more information about diverse and exciting career opportunities at the Missouri Department of Natural Resources, call the department at 800-361-4827 and ask to speak with the Human Resources Program.

Larry Archer is a public information coordinator with the Department of Natural Resources.

The main parking lot at Rock Bridge Memorial State Park employs a pervious surface.



by Stacy Bandelier
photograph by Scott Myers

Water, like electricity and small children, follows the path of least resistance. At three Missouri state parks, the Missouri Department of Natural Resources is using pervious pavers in parking lots to divert water, making the path of least resistance result in less impact on the environment at these facilities.

Pervious pavers are essentially small concrete blocks. These blocks are laid on their sides onto a bed of crushed limestone and sand. The holes in the blocks and spaces between blocks then are filled with the same

rock mixture. This system allows rainwater to seep into the ground more effectively than on asphalt.

Runoff from asphalt parking lots carries various pollutants from cars into streams. It also can cause erosion, especially after a hard rain. Pervious pavers help eliminate both concerns. The crushed limestone mixture slows down the water, allowing it to be absorbed into the soil. This absorption filters out pollutants.

The main features of Johnson's Shut-Ins State Park near Lesterville, Rock Bridge Memorial State Park

near Columbia and Ozark Caverns in Lake of the Ozarks State Park near Linn Creek were created by water. At Johnson's Shut-Ins State Park, millions of years of erosion created the shut-ins that is the park's main feature. And both Rock Bridge Memorial State Park and Ozark Caverns are in areas with karst topography, an irregular limestone landscape characterized by sinkholes, underground streams and caverns. Karst areas are more susceptible to groundwater pollution than less porous topography. The pervious pavers provide park staff with an interpretive tool to explain the journey of water to visitors.

"Just today, we had a developer stop in the office and ask about the pavers. He was considering installing pervious pavers but wanted to see them for himself," said Roxie Campbell, an interpreter at Rock Bridge Memorial State Park.

"It is helpful to demonstrate that they do indeed work to convince developers to use the practice. One development at a time can eventually have a significant impact on protecting water quality," Campbell said.

The cost of construction materials for the pervious lot at Rock Bridge was paid for through a grant from a U.S. Environmental Protection Agency's Clean Water Act project. The financial cost of a pervious lot is approximately the same as an asphalt lot but friendlier to the environment.

"Traditional asphalt lots require use of tar and petroleum to seal cracks and maintain the parking surface, potentially adding to groundwater pollution," said Don Stier, a park planner with the Department of Natural Resources' Division of State Parks. "The biggest maintenance issue for a pervious lot is weeds growing through the spaces in the blocks."

Park planners will be monitoring the success of the pervious lots to determine future use in other facilities.

Stacy Bandelier is the graphics supervisor for the department's Division of State Parks.

**MISSOURI DEPARTMENT
OF NATURAL RESOURCES**
P.O. Box 176
Jefferson City, MO 65102-0176

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