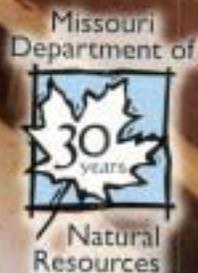
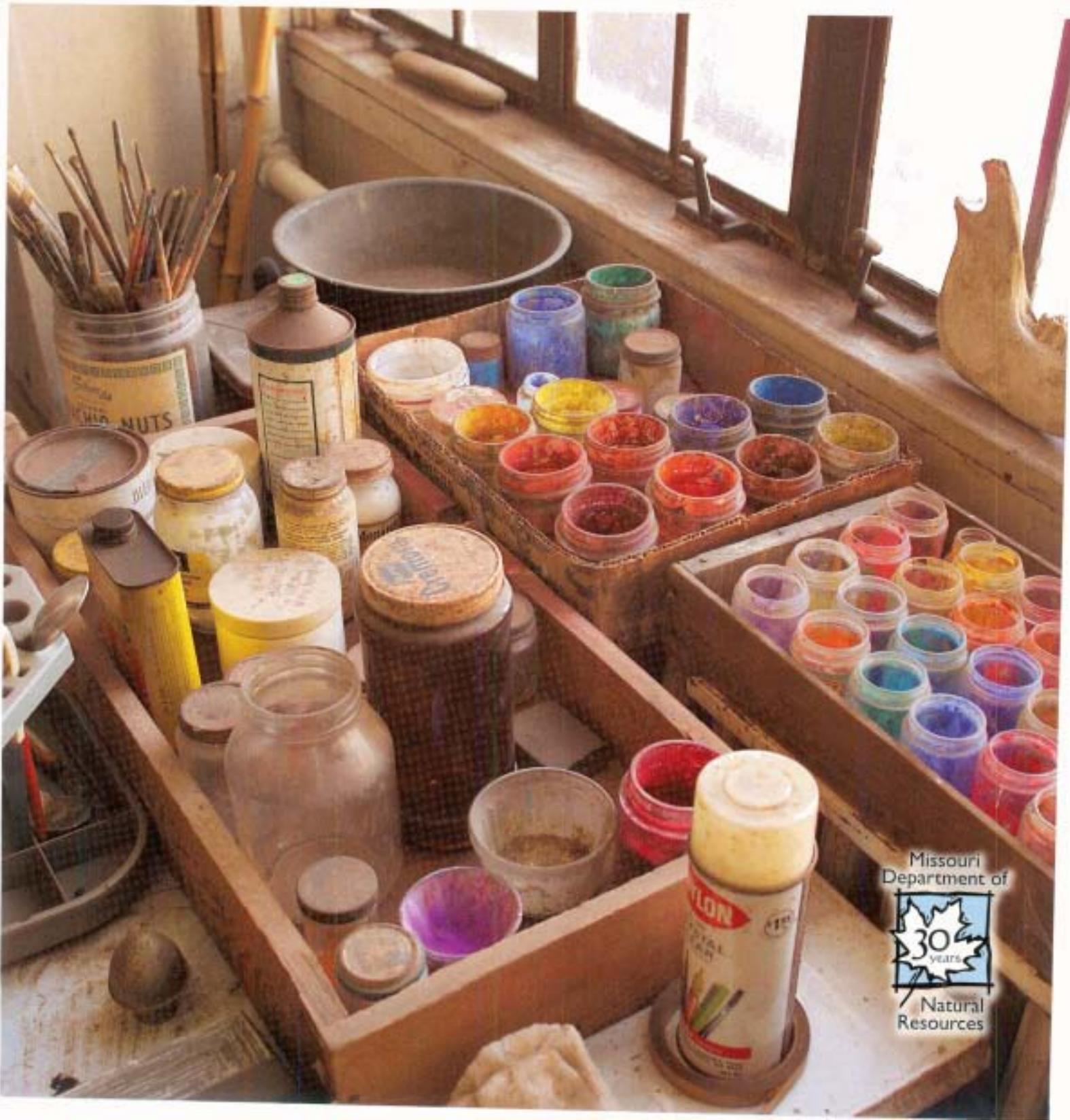


MISSOURI

resources

Spring / Summer 2004 • Volume 21 • Number 2



Director's Comment

I'd like you to take a moment and imagine your co-workers. Now imagine climbing onto a small keelboat with them and spending the next three years of your life traveling through a wild, uncharted territory together.

Many of us know the basics of the Lewis and Clark Expedition; it's been a staple component of museum displays and classroom curriculum for decades. And yet, how many of us really know this expedition?

Now, with the bicentennial of the Corps of Discovery, we have a once-in-a-lifetime opportunity to experience what made this expedition so historic and learn firsthand the impact that it had on our state and our nation. During the next several months, the focus of the nation will be on Missouri, showcasing not only our land and people, but also the Missouri River that served as the expedition's highway to history.

For the Missouri Department of Natural Resources, the commitment to this event has been twofold. First, we serve as staff support for the Missouri Lewis and Clark Bicentennial Commission, which is coordinating the statewide bicentennial efforts. We have also made commitments through our state park system to provide new facilities and programs associated with the Lewis and Clark Expedition.

We are opening two new facilities in conjunction with the bicentennial. The Edward "Ted" and Pat Jones - Confluence Point State Park opened in May and is located at the confluence of the Missouri and Mississippi rivers. The other new facility scheduled to open in May is Clark's Hill/Norton State Historic Site in Cole County. This hill, located high above the confluence of the Missouri and Osage rivers, was noted in William Clark's journal in 1804. We invite everyone to explore both these new sites.

There are many other ways to experience the Lewis and Clark bicentennial. Although two of the National Signature Events (at St. Louis and St. Charles) have already occurred, a third one is scheduled for July 4 in the

Kansas City area. This summer, there will be numerous festivals, re-enactments and programs that will bring history to life.

During June and July, watch replicas of the keelboat and pirogues with re-enactors in appropriate apparel on the river, or try your hand at making a dugout canoe. See artifacts from the original expedition at the exhibit at the Missouri History Museum in St. Louis.

Tour the National Park Service's mobile exhibit called Corps of Discovery II as it makes its way up the river. Accompanying this exhibit is the Tent of Many Voices, where you can hear the stories of the expedition and the impact it had on everyone, including the Native Americans they encountered. Interpreters from our state parks and historic sites are assisting with programs for this venue. This reflects the department's and the bicentennial's commitment to tell all the stories of the expedition.

In the coming weeks, I hope you and your family will take time to participate in the events being offered across Missouri. It will not only be fun and educational, but it will also give you an opportunity to relive history. I have mentioned just a sampling of the ways you can experience the bicentennial. For a complete list, visit the Missouri Lewis and Clark Bicentennial Commission's Web site at [\[www.lewisandclarkmo.com\]](http://www.lewisandclarkmo.com).



Steve Mahfood
Missouri Department of Natural Resources

MISSOURI resources

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Mission Statement

The mission of the Department of Natural Resources is to preserve, protect, restore and enhance Missouri's natural, cultural and energy resources and to ensure their enjoyment and responsible use for present and future generations.

"Integrity and excellence in all we do"

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page 2

For the Record

by Kim Dillon and Mike Currier

Imagine how little we would know about the Corps of Discovery if Lewis and Clark hadn't painstakingly kept their detailed daily journals. Thanks to modern technology, historical archives, artifacts and data are now more accessible than ever.

page 6

Partnering For Productive Reuse

by Heidi Rice

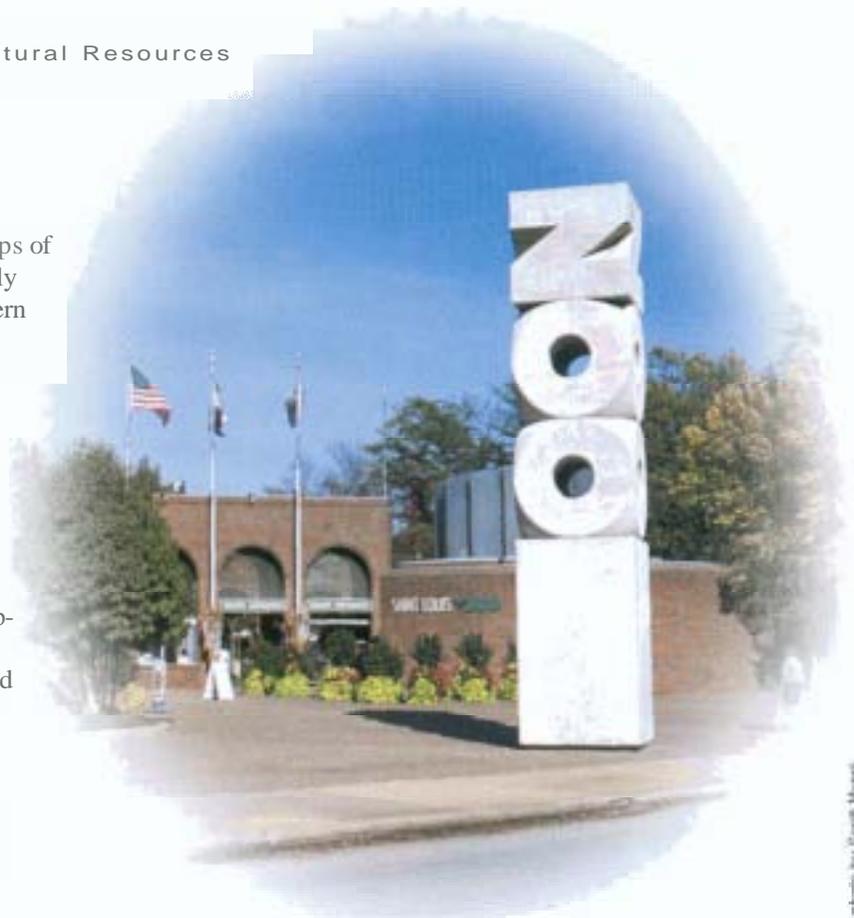
Thanks to citizens who care, companies that cooperate, and state and federal agencies that coordinate, an end to the toxic nightmares of the 70s and 80s is no longer just a dream.

page 10

Resource Preservation Gone Wild

by Vicky Kugler

The Saint Louis Zoo's reputation for preserving and protecting endangered animal species is known around the world. But its latest preservation efforts offer a blueprint for success that all of us can copy.



Left photo by Scott Myers

14 • News Briefs
Resource Honor Roll, Letters, E-Notes

23 • Teacher's Notebook
From the Ground Down

20 • Resources to Explore
Footsteps on the Frontier

25 • One Last Word
On-the-spot Savings

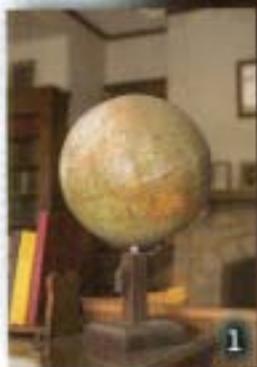


Right photo

Above right: The Saint Louis Zoo conserves water and energy resources with the help of an energy audit funded by the department.
Above: The cleanup of the BP Amoco refinery in Sugar Creek is a success story in cooperation and rehabilitation.
FRONT COVER: At the Thomas Hart Benton Home and Studio State Historic Site, the artist's studio remains unchanged since his death.
SACK COVER: The Penguin and Puffin Coast exhibit at the Saint Louis Zoo offers visitors an up-close look at these strange Antarctic birds.
Cover photos by Scott Myers

For the Record

Cataloging the Natural and Cultural
in Missouri's State Parks and
story by Kim Dillon and Mike Currier



Photos on pages 2-3
by Scott Myers:
Background: Thomas Hart
Benton's painting chair at the
Thomas Hart Benton Home
and Studio State Historic Site;
1) globe from the library in-
side Bothwell Lodge State His-
toric Site; 2) large, handmade
mittens from Watkins Mill
State Historic Site; 3) Thomas
Hart Benton paintbrushes at
the Benton Studio; 4) field
surgery kit in the museum at
the Battle of Lexington
State Historic Site; 5) Ben-
ton's painting studio; 6)
presentation sword in
the Battle of Lexington
museum; 7 and 8)
glass artifacts and
historic tins from
Watkins Mill State
Historic Site.



Resources

Historic Sites



The record of the Lewis and Clark Expedition was written with quills on parchment. When you read and study the journals and field notes, you can imagine the difficulty of maintaining a scientific and historic record under the extreme conditions encountered by the Corps of Discovery in 1804-1806. But also think of what would have been lost if the record had not been transcribed. The value of maintaining records is as important today as it was 200 years ago.

The Missouri Department of Natural Resources, through the Division of State Parks, is charged with preserving both natural and cultural resources in Missouri. At the core of this responsibility is the need to manage information. This is accomplished using specially designed database applications that make it easier to manage data and provide information to the public. To the visitor who uses the trails in state parks or visits an historic site, it is evident that the resources in Missouri's State Parks and historic sites are worthy of protection. But many visitors may be unaware of the tools that have been developed to help preserve these resources.

Cultural Resources and Artifacts

by Kim Dillon

Missouri state parks and historic sites are rich in cultural resources like buildings, landscapes, and archaeological features. **Artifacts**, which are objects created or modified by humans that have some degree of age associated with them, make up the bulk of the cultural resources cared for by the department. There are at least 200,000 artifacts housed in the parks and historic sites (including the Missouri State Museum). **Among** these objects are the extraordinary, like a bejeweled presentation sword, and the commonplace, such as pair of children's red wool mittens.

The information about an object is just as valuable as the physical artifact itself.

For instance, when a visitor to Watkins Woolen Mill State Park and State Historic Site learns that a pair of red mittens once belonged to the children of the mill's founder, the objects are transformed from "old stuff" found in someone's attic to artifacts with powerful links to the place one is visiting.

Connecting artifacts with their histories happens during the cataloging process, when objects are assigned a

unique number, described, and photographed. According to the American Association of Museums, institutions that care for artifacts are ethically obligated to document and account for their artifact collections. For the past 40 years, the state park system has done its part by maintaining data about each object in a catalog card system. While the card system functioned well, computer technology presented an opportunity to make the universe of artifact knowledge more manageable.

In 2000, the department began using collections management database software called PastPerfect to improve accessibility to artifact information. As catalog cards and photographs are converted into electronic format, database users will only be a few mouse clicks away from images and facts about key objects. So far, there are nearly 70,000 object records from 37 facilities in the database.

The advantages of the artifact database are numerous. Primarily, it is a preservation tool, ensuring that artifacts and their stories are never separated. In addition, as a centralized system with entries from many



2



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Department file photos:

1) longear sunfish; 2) pickerel frog; 3) alligator snapping turtle; 4) saddle-backed caterpillar; 5) shaggy mane mushroom (center); 6) great horned owl; 7) yellow lady's slipper orchid; 8) Io moth; 9) immature broad-winged hawk.

different facilities, the database will help staff make connections between widely dispersed artifacts, thus enhancing interpretive efforts. The database also improves accountability and tracking capabilities for the artifacts entrusted to the department. According to Lesley McDaniel, assistant historic site administrator at Felix Valle House State Historic Site, the database "allows us to manage our collec-

tions more effectively. We now have the ability to easily retain and access artifact data regarding inventory, condition and status."

The public will benefit directly from the growing database as well. It enables quicker access to catalog records, helping staff to respond to public and research inquiries more efficiently. In the future, the department plans to make artifact records avail-

able online so that "virtual" visitors can study the treasures of the artifact collection from their computers.

Whether an artifact is an original painting by one of Missouri's best-known artists, a piece of a family's everyday dinnerware, a one-of-a-kind presentation sword, or a little pair of wool mittens, the artifact database will help protect the state's cultural resources for future generations.

Natural Landscapes, Plants and Animals

by Mike Currier

While state historic sites preserve many cultural artifacts, Missouri state parks are a treasure house of natural resources. Whether you are searching for a plant that can cure cancer or are committed to preserving natural landscapes like tallgrass prairie, it is important to carefully record observations. The continuity of this record is the lifeline that connects the biological past to the future. What we have gleaned from scientific collections, historic land survey records and journals is of immeasurable value. These records provide key pieces to the puzzle that enable us to interpret and understand historic landscapes. They also become the current record as remnants of these historic landscapes like the wetlands of the Missouri River Alluvial Plains and the woodlands of the Ozark Highlands are restored and documented,

That portion of the state park mission that reads "to preserve and interpret natural landscapes ..." is focused on the preservation of biological resources, which involves an ongoing journey of discovery. Each state park and historic site has its own assemblage of native plants and animals (including mosses, lichens, fungi, aquatic invertebrates and insects, birds and mammals) to be inventoried and cataloged. In the contemporary practice of conservation

biology, informational databases are an indispensable tool. Two such databases are used to catalog the plants and animals of state parks.

The Department of Natural Resources Herbarium includes 10,500 plant specimens collected from state parks. The original herbarium database was developed to catalogue the flora in the late 1970's. Each specimen is assigned a number, and becomes a permanent archived record associated with a particular site and habitat. The herbarium is recognized nationally and provides scientific information in the form of specimens to researchers upon request. It also serves as a research reference collection for park managers.

In 1998, the department began to develop the Natural Resource Inventory Database System (NRIDS) to catalog the plants and animals of Missouri state parks including collections and verified observations. NRIDS is an Access 97-based software application that provides an easy and efficient means to enter and store data. In the past, this information was stored on paper in multiple files. Now, at the touch of a button, data is readily available to resource managers or for public use as preformatted wildflower or bird checklists.

After two years of development and three years of data entry, more

than 36,000 records have been entered into NRIDS from 55 of the 83 Missouri state parks and historic sites. While the record is far from complete, staff can begin to describe in detail the biologic value of Missouri's system of parks.

Sixty-two percent of the plant species native to Missouri, 90 percent of the reptiles, 93 percent of the amphibians, 94 percent of the mammals and 68 percent of the birds in the state have been documented in the Missouri State Park System.

Given these statistics, it is clear that Missouri state parks play a large role in providing habitat for native species and thus have great conservation value.

As the work continues to identify and catalog plants and animals through research and inventory projects, these values can be better described and communicated.

Cindy Hall, naturalist at Lake of the Ozarks State Park, puts it this way, "Tomorrow's biological record is being written today, not with parchment and quills, but with databases and keystrokes."

Kim Dillon is a cultural resource preservationist and Mike Currier is a natural resource steward for the Department of Natural Resources' Division of State Parks.

Partnering for Productive Reuse

by Heidi Rice

ENR photo by Scott Myers

Twenty-five years ago, America was waking up to the consequences of the Industrial Age. Every state, including Missouri, was learning a hard lesson about the careless handling of hazardous waste. Toxic landfills were poorly maintained – if at all. Hazardous waste spills were not cleaned up. Rusty drums of hazardous waste were buried and scattered all across the state. Many oozed hazardous liquids onto the ground. Those situations threatened our safety and health, polluted our water and soil and damaged our natural environment. Few knew that Sugar Creek, Missouri was just such a place.

Fortunately, the situation in Sugar Creek is well on its way to turning the consequences of the past into opportunities for the future.

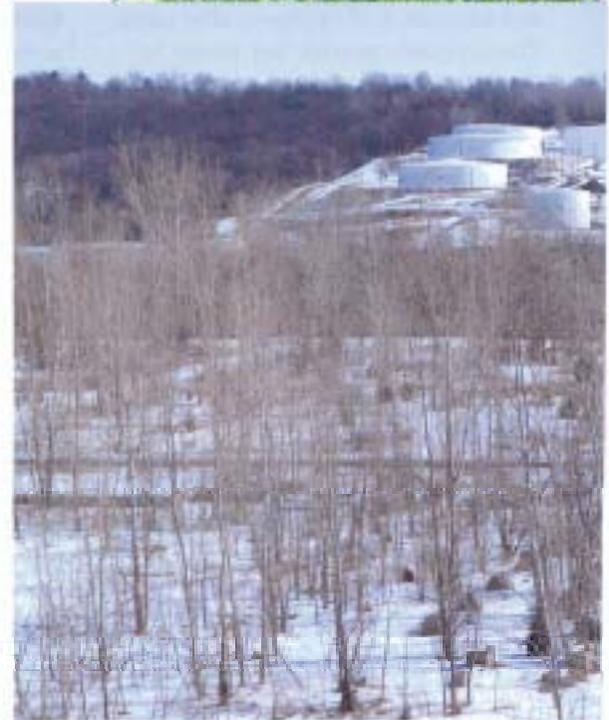
During the early 1800s, pioneers heading west along the Oregon, California, and Santa Fe trails would stop for supplies at Wayne City Landing, located along the Missouri River. Over the decades, this quiet, supply receiving port began to grow.



Wayne City Landing became the city we know today as Sugar Creek. Located eight miles east of Kansas City, Sugar Creek is nestled between the city of Independence and the south bank of the Missouri River. The streets are lined with charming houses and quaint storefronts. With a population of nearly 4,000, Sugar Creek remained a quiet retreat from the hustle and bustle of big-city life.

The Refinery

The city of Sugar Creek owes its growth to the opening of an oil refinery in 1904. Standard Oil of Indiana built the refinery on 450 acres of land along the Missouri River.



Workers were hired from both nearby Kansas City, Independence and even overseas. Nearly everyone in Sugar Creek worked at the refinery.

Petroleum products and eventually fuels, such as gasoline and jet fuel, were processed from crude oil at the refinery. A complex system of underground pipes carried crude oil to the refinery from as far away as Montana.

Over the years, Standard Oil of Indiana merged and split with many companies. Amoco owned the refinery in 1982, when it decided to shut down the processing activities. The product distribution terminal, offices and asphalt oil terminal remain in operation today.

The Smell of Success

Most Sugar Creek residents had accepted the petroleum odors as part of having a refinery as a neighbor. However, the residents were soon concerned when they found petroleum products outside the refinery gates. They noticed what appeared to be oil leaking through a retaining

wall that separated the city creek, also named Sugar Creek, from the refinery. Petroleum products and odors were found in natural springs west of the refinery. Not until the late 1980s would Sugar Creek residents have their suspicions confirmed.

Refinery documents dated as early as 1950 described tank and pipe leaks and petroleum product spills. Over several decades, millions of gallons of petroleum products had settled into the soil. Unfortunately, it did not stop there. The contamination moved down through the soil into the groundwater. Soon, it leached off the refinery property and underneath a nearby residential area.

Each of the refinery operators tried different ways to collect the lost petroleum products. Standard Oil built a recovery trench in 1967, to catch and stop more petroleum products from reaching the residential area. Amoco lengthened the trench several times along the southern border of the refinery. In 1982, Amoco set up a well system to recover oil that floated on top of the groundwater.

Until the 1980s, the federal and state governments had little authority to make Amoco clean up their refinery. However, in 1984, this changed when the Hazardous and Solid Waste Amendment was added to the federal Resource Conservation and Recovery Act. It listed cleanup requirements for all hazardous waste released to the environment at hazardous waste facilities – including petroleum products. Soon, the U.S. Environmental Protection Agency (EPA) scheduled the Amoco site for an inspection.

In June 1989, Amoco and EPA signed an agreement that required Amoco to carry out a detailed investigation of the refinery and surrounding areas, including all past petroleum releases. Any direct threats to the health of the residents or the environment were to be cleaned up as soon as possible. Amoco also was required to develop a long-term cleanup plan.

Amoco and the Missouri Department of Natural Resources signed an agreement in February 1990. This agreement outlined steps to close three ponds located on the refinery.

These ponds contained hazardous waste produced during processing activities.

“The most challenging thing about this project has been working with so many stakeholders. The key to this is to keep in constant communication. I hope we’re doing this well enough to reach a consensus on the best way to clean up the site and get it back into use.”

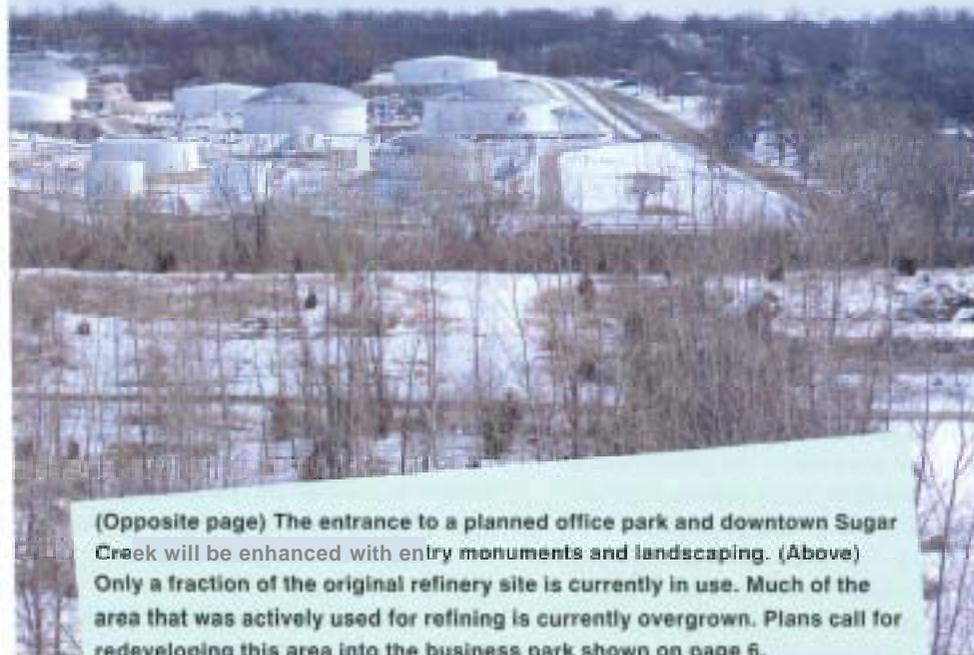
— Brian McCurren, Department of Natural Resources project engineer at Sugar Creek

The Community Voices Its Concerns

In January 1995, the City of Independence filed a lawsuit against Amoco. The next month, several Sugar Creek residents filed a class-action lawsuit. They claimed that the petroleum products underneath their neighborhood were lowering the property values. The lawsuits were combined and settled in August 2000.

Several Sugar Creek residents formed a citizens group called C.L.E.A.N.U.P. (Citizens Learning Everything about Amoco Negligence and Underground Pollution). C.L.E.A.N.U.P.’s goal was to share its concerns about the groundwater pollution and its possible effects on Sugar Creek residents’ health and property values. They also encouraged Amoco to speed up the cleanup.

BP Amoco illustration



DWIT photo by Scott Myers

(Opposite page) The entrance to a planned office park and downtown Sugar Creek will be enhanced with entry monuments and landscaping. (Above) Only a fraction of the original refinery site is currently in use. Much of the area that was actively used for refining is currently overgrown. Plans call for redeveloping this area into the business park shown on page 6.

In June 1998, C.L.E.A.N.U.P. asked the Agency for Toxic Substances and Disease Registry (ATSDR) to find out how the chemicals used at the refinery could affect public health. Although chemicals were found in the groundwater, all Sugar Creek residents used the public drinking water system, which was not polluted.

In their final report, ATSDR said that the nominal amount of petroleum fumes found in the air were not dangerous. It was unlikely that residents would become exposed to the high levels of chemicals found in the soil, 10 to 12 feet below ground.

The citizen group also was concerned about what it perceived to be a high number of multiple sclerosis cases in the area. C.L.E.A.N.U.P. requested this be investigated. The ATSDR found only normal inci-

Missouri Department of Health and Senior Services (DHSS) to begin a cancer study. The agency studied both Sugar Creek and the combined area of Jackson and Clay counties. DHSS found only normal incidences of the disease in Sugar Creek.

The Road to Recovery

In December 1998, Amoco joined with British Petroleum (BP) and became BP Amoco Corp. With input from the community, the Department of Natural Resources and EPA worked with BP Amoco to complete other short-term cleanup measures. A few of the measures include the building of a trench along the banks of Sugar Creek to catch petroleum products before they could reach the creek. Forty-one wells were installed all over the refinery to pump petroleum products out of the groundwater.

munication for all parties, as well as increased understanding of the cleanup's impact on the community.

Brian McCurren, the department's project engineer at Sugar Creek, emphasized the importance of balancing so many points of view.

"The most challenging thing about this project has been working with so many stakeholders. The key to this is to keep in constant communication," McCurren said. "I hope we're doing this well enough to reach a consensus on the best way to clean up the site and get it back into use."

Concerned that contaminated groundwater could have negative effects on property values, BP Amoco gave grants to the cities of Sugar Creek and Independence to help fund public improvement projects. It also began a Property Value Protection program, during which the firm offered to pur-



BP Amoco photo



BP Amoco photo

(Left to right) The original closure plan for the BP Amoco Site called for the conversion of the Sludge Pond into the liquids/solids reactor. There, the sludges underwent biotreatment as air was pumped through the sludge. Following treatment, the solids were moved to a 5000 cubic foot biodegradation pile. This method proved difficult to control and solids were eventually composted in piles that could be turned with earthmovers. Following biotreatment, the sludge pond was cleaned out and converted into a landfill for treated soil from the site. The landfill was capped and sodded over after it was completed.

dences of multiple sclerosis in Sugar Creek, though health studies have been initiated to determine if there is a relationship between these pollutants and multiple sclerosis.

C.L.E.A.N.U.P. also was concerned with the number of residents suffering from brain cancer. In July 1998, the citizen group asked the

More than 500 monitoring wells were drilled to monitor the amount of petroleum products in the groundwater.

Because so many parties were involved in the investigation and cleanup, it became more complicated to communicate effectively. The city of Sugar Creek organized a focus group. Its goals were improved com-

chase certain homes surrounding the refinery. During this program, BP Amoco offered homeowners a 10-year window to consider its fair-market-value offers for their property. In addition to property damage money awarded in the 2000 settlement, resident owners of these homes also were given money for moving expenses.

To allow the cleanup process to move faster, BP Amoco, the department and EPA agreed to perform future investigation and cleanup in a phased approach. Instead of investigating one large site, the site was divided into smaller areas. Each area is being investigated and cleaned up in the order in which the community has placed greater priority. The level of cleanup will depend on the future use of that area.

"The variety of future productive uses of the site requires long-term planning for continued protection of human health and the environment," said Rob Morrison, permits section chief with the department's Hazardous Waste Program.

fully protects public health and the environment and still promotes economic development.

This business park will support a variety of commercial and light industrial businesses, including light manufacturing, warehouse centers and offices. The park also will replace revenues lost to the City of Sugar Creek when the refinery closed. Potentially, hundreds of new jobs will be created. Land that otherwise would have remained abandoned will be returned to productive use and spur economic growth.

BP Amoco Site Manager Lloyd E. Dunlap feels that the spirit of cooperation on the project has been good for all concerned. "Working with

Amoco's active facility area includes improved fencing, replacing pavement with vegetation and planting a "living screen" of trees and shrubs to hide massive petroleum tanks. A new intersection forming the entrance to downtown Sugar Creek and the business park will be visually enhanced with entry monuments and landscaping.

"The things we have learned here have already been instrumental in steering long-term care and productive uses of other Missouri sites," Morrison said. "The Amoco refinery represents basic values to live by such as teamwork and recognizing the impact of our work on future generations."

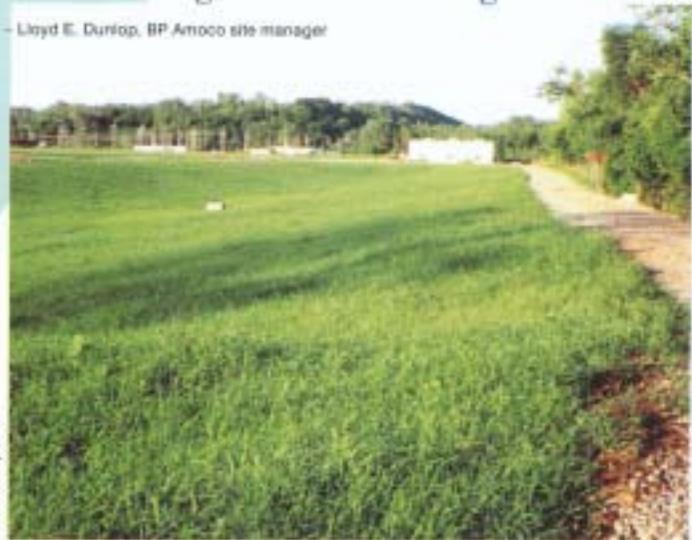
From its early days as a small-town landing, to a major petroleum

“Working with DNR, the City of Sugar Creek, and others has helped BP in its goal to make this former refinery property available for productive reuse. We have all learned from one another along the way, and we are all looking forward to a bright future and a new business park for Sugar Creek.”

— Lloyd E. Dunlap, BP Amoco site manager



BP Amoco photo



BP Amoco photo

Partners with a Plan

In the 2000 lawsuit settlement, Amoco gave the community the responsibility to identify reasonable reuse options for closed areas of the refinery property. A steering committee of eight Sugar Creek residents, along with the assistance of a development team and additional residents of Sugar Creek, drafted a reuse plan for the refinery property.

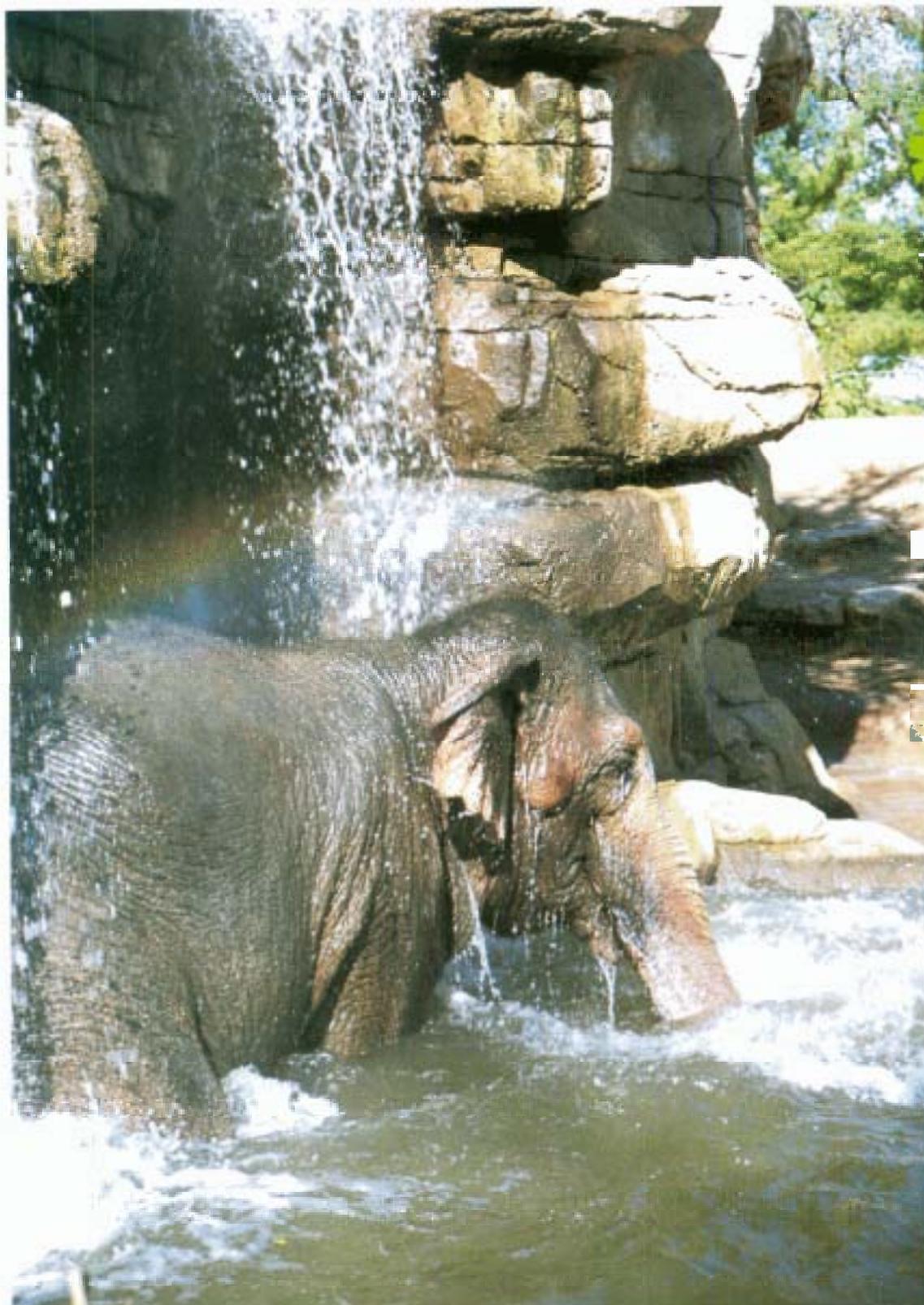
The major focus of the final reuse plan is the building of a business park. The goal is a reuse of the site that

DNR, the City of Sugar Creek, and others has helped BP in its goal to make this former refinery property available for productive reuse. We have all learned from one another along the way, and we are all looking forward to a bright future and a new business park for Sugar Creek," Dunlap said.

The business park also will be a "green" development unique to the Kansas City metro area. Businesses located in the park will use business practices that minimize their impact on the environment. Beautification of BP

refinery, to a "green" business park, the "Bluffs at Sugar Creek" is a revitalization success story in the making. The continued success of this cleanup depends on cooperation and support between many entities, including ATSDR, BP Amoco, DHSS, the Department of Natural Resources, EPA and the local government and citizens of Sugar Creek.

Heidi Rice is community involvement coordinator for the Hazardous Waste Program within the department's Air and Land Protection Division.



For nearly 90 years, the Saint Louis Zoo has been known for its innovative approach to preserving and protecting endangered animal species from around the world. Now, the zoo's innovation is aimed at preserving its own natural resources.

In 2002 the zoo, which hosts 3 million visitors annually, joined with the Missouri Department of Natural Resources to review its use of water and energy in an effort to improve the facility's use of each resource. Zoo staff formed the resource conservation and recycling committee to work with the department's Outreach and Assistance Center on resource use.

While most people visit zoos to see tigers, snakes and similar exotic creatures, making resource preservation a feature of the zoo is a natural fit. "It's not enough to save species of animals in zoos and aquariums any more," said Dr. Jeffrey P. Bonner, president of the zoo. "Many endangered species will not make it into future decades unless world resources and ecosystems are protected."

Improved resource management will help the zoo set an important new example for the public. Just as important will be the money saved that can be redirected to benefit both animals and

Resource Conservation

Saint Louis Zoo adds water, energy to protected list



visitors, according to Steve Barth, the zoo's chief financial officer. "We expect the change in our culture to enhance our bottom line now and for the future," Barth said. "It will allow us to become an even better place to visit."

Energy Grant Helps

Zoo Evaluate Needs

One key to the zoo's reflection on resource use has been an extensive energy audit, funded by a grant from the Missouri Department of Natural Resources' Rebuild America Program. In an audit of this type, virtually every energy-using piece of equipment is evaluated and compared against newer technology. In cases where newer technology is more energy efficient, the cost savings make it worthwhile to replace the older equipment. In other cases, new equipment is not needed, but very simple changes in operations can have significant impact. These are called **low-cost/no-cost** energy conservation measures.

Most buildings can easily see a 20 to 30 percent improvement in energy efficiency. With annual energy bills of nearly \$1 million, this could be a huge saving for the zoo. "The zoo has shown a rare level of commitment to this process of **self-evaluation**, and I have no doubts that not only will their effort pay off for the environment, but it will also improve their bottom line," said Pat Justis, energy engineer for the department's Energy Center. "Almost anywhere you look in our communities you can find unnecessary energy waste that could be turned into money in the bank and result in less pollution."

While about one-third of the zoo's revenue is generated by taxes, the remainder of its operating and improvement expenses depend on earned revenues from parking lots, food service, railroad and souvenirs, as well as private donations.

"As we study each component of our **operation**, whether it be solar panel-powered energy or fuel-efficient vehicles, we will expect to solve some current energy issues and save the zoo money at the same time," says Dr. Bonner.

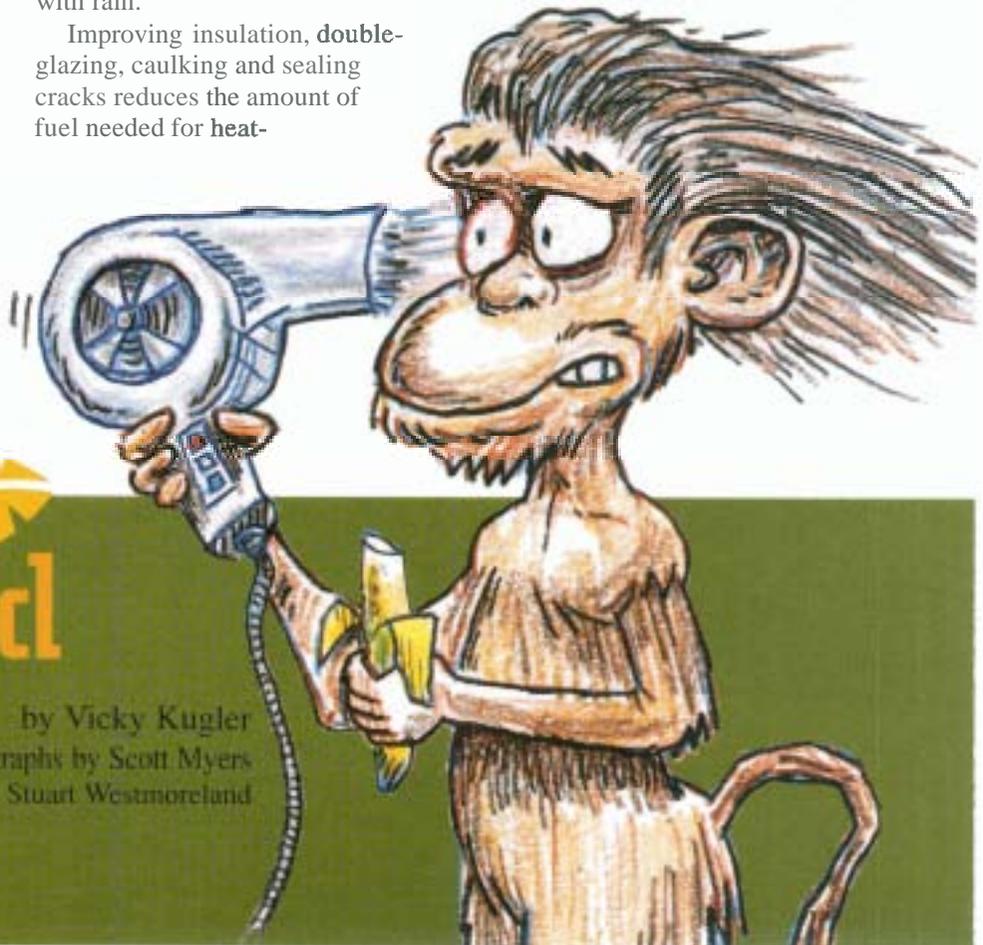
The total value of the Rebuild America grant is about \$32,000, which is being matched by about \$37,000 in cash and in-kind services from the zoo. The zoo will receive the grant funds only after it has implemented some of the energy audit recommendations. This helps the Department of Natural Resources ensure that the study actually has an energy-reduction impact.

To accomplish the audit, the zoo divided its 90-acre campus into 16 zones and assigned staff "landlords," who are responsible for monitoring their "properties" for use of energy and possible improvements. Tim Michels, owner of Energy Solutions Inc., trained the landlords to read meters, enter information into a database, establish baselines and analyze their findings.

Soon the zoo will know just where its energy dollars are spent. Cutting energy use not only saves money but also decreases the burning of fossil fuels and the pollutants related to such forms of energy. Even the cleanest burning power plants emit air pollutants that fall to the ground with rain.

Improving insulation, **double-glazing**, caulking and sealing cracks reduces the amount of fuel needed for **heat-**

(Opposite page) Many miles of pipe and plumbing are required to handle the Saint Louis Zoo's immense water needs. Besides clean drinking water for visitors, similar requirements for all the animals are immense. Zoos also need an abundance of water simply for cleanup and sanitation. Inefficient water use is costly - environmentally and financially.



Gone Wild

by Vicky Kugler
photographs by Scott Myers
illustrations by Stuart Westmoreland



ing. Saving heating fuels at the zoo protects the environment by decreasing local emissions of combustion gases that are one source of city smog and greenhouse gases.

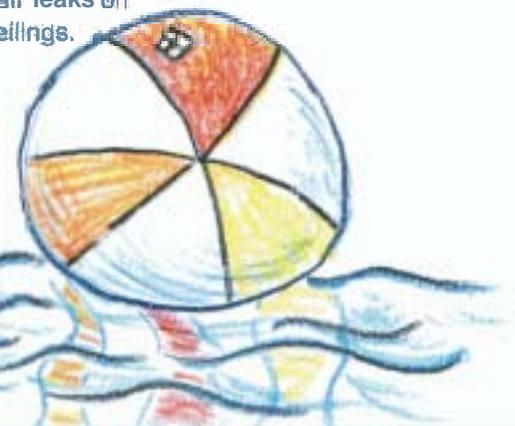
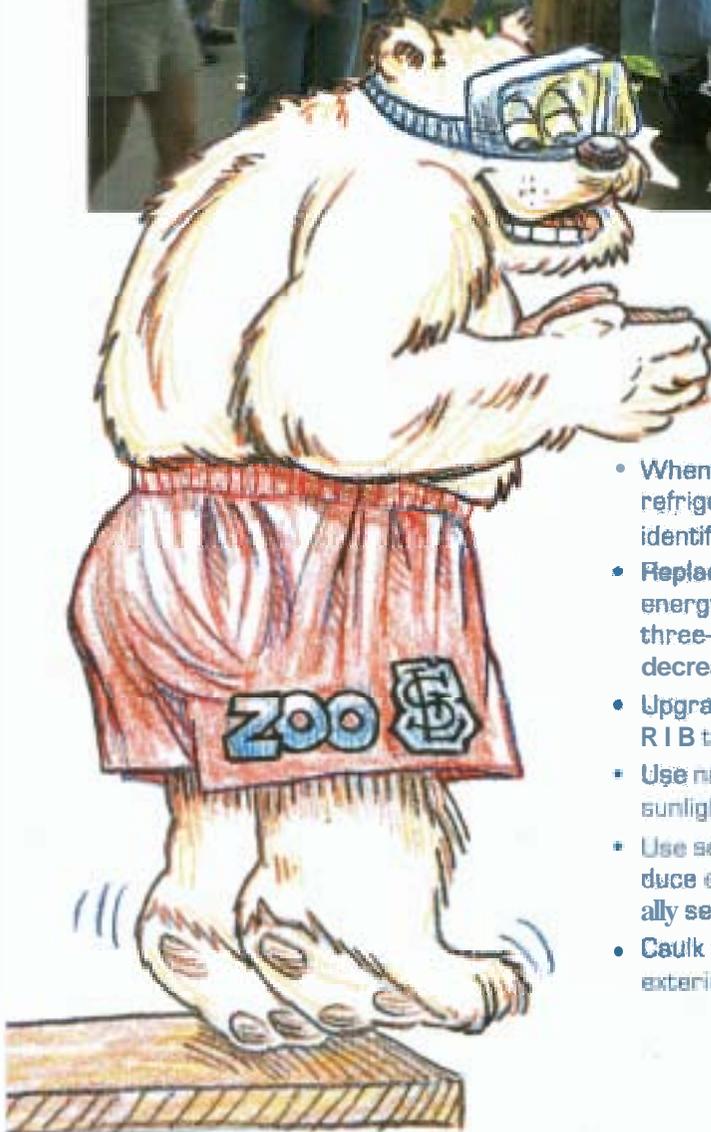
Water Conservation Needs Critical

The Saint Louis Zoo was one of the world's first innovators in the use of water to improve the zoo experience for both the animals and visitors. Water-filled moats replaced bars as the preferred method

Energy Conservation at Home or Business

Save energy at home and work like they do at the zoo.

- When purchasing new appliances such as air conditioners, televisions, refrigerators, washers and dryers, look for the ENERGY STAR® label, which identifies energy-efficient models.
- Replace incandescent bulbs in the lamps and fixtures you use most with energy-saving compact fluorescent lamps (CFLs). They even come in three-way bulbs now and the light color is natural. The cost of CFLs has decreased, and they last up to 10 times longer than incandescent bulbs.
- Upgrade ceiling insulation to R-38 and outer perimeter wall insulation to R19 thickness.
- Use natural sunlight to bring in heat on cool winter days, but exclude sunlight during summer with drapes, shades or awnings.
- Use setback thermostats (but not for heat pumps) and set them to reduce energy usage while asleep or away from home. Alternatively, manually set the thermostat back while asleep or away at work or school.
- Caulk and seal cracks and air leaks on exterior walls, floors and ceilings.

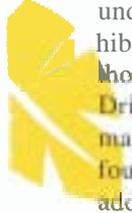


to separate animals and people. Later the zoo began creating immersion exhibits, lushly planted naturalistic environments with buildings and barriers hidden, that give visitors the sense they are actually in the animals' habitats.

Bears playfully swim, penguins dive into icy water, swans and ducks glide over beautiful lakes and hippos gracefully dance underwater in the zoo's River's Edge exhibit. Some of the large water features use thousands of gallons of water per day.

Drinking water is always available to animals in their cages and to humans from fountains. Cleaning and sanitation require additional water. Meeting these needs requires miles of pipe and plumbing.

The zoo asked the department's Outreach and Assistance Center for help with water-saving ideas, and has an enthusiastic subcommittee on water conservation. Saving water is a double benefit for the zoo because it is also billed a percentage of its water use for sewer charges. Working with the center's Environmental Assistance Office, the zoo identified and implemented a number of water-saving strategies:



- Turning off fountains when no visitors are on the grounds;
- Fine-tuning irrigation of the zoo's lush decorative plantings;
- Identifying and fixing leaks in underground pipes. This has already identified a huge leak of water that was also being heated or chilled depending on the season to provide an even temperature for a display, and;
- Moving alligators to inside displays in winter instead of heating water for an outdoor display.

Future projects being considered include infrared testing of water mains and evaluating water-saving restroom fixtures.

Recycling, Source Reduction and Sustainability

The Saint Louis Zoo has been recycling solid wastes, fluorescent bulbs, plastic, aluminum, cardboard, paper and batteries for the past 12 years. Recycling its old electronic equipment and collecting cell phones for reuse began in 2003. The zoo increases recycling by purposely selling some food and drinks in recyclable containers rather than disposable. An internal

award program to recognize the recycling efforts of the employees was initiated by zoo management. You can view online recycling information on the zoo's Web site at [stlzoo.org].

In addition to adopting more resource-friendly processes for current activities, the zoo also is giving thought to future development. Future building projects, beginning with the renovation of the zoo's 1904 Flight Cage, will reflect "green building" philosophies. A new animal nutrition center is in the design phase and officials plan to use LEED (Leadership in Energy and Environmental Design) principles to create a building that will save energy and other resources while producing an excellent quality environment for the zoo's workers.

While no one goes to a zoo to see energy saved, water usage reduced or trash recycled, the Saint Louis Zoo's message of resource conservation – both at home and worldwide – benefits exotic and domestic wildlife and, ultimately, people as well.

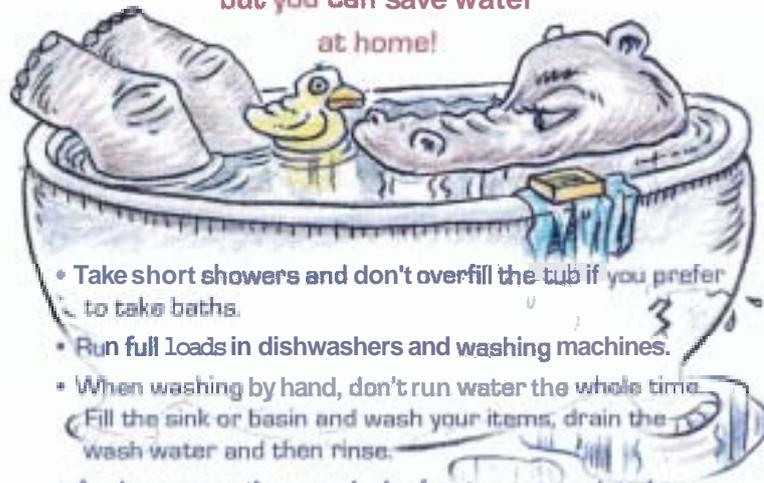
For more information and assistance on implementing a resource management program similar to the Saint Louis Zoo's, call the department's Outreach and Assistance Center at 1-800-361-4827. 🏠

Vicky Kugler is an environmental specialist with the Department of Natural Resources' Outreach and Assistance Center.

(Opposite page) Some aquatic immersion displays, like the new River's Edge, require thousands of gallons of clean water per day. Water conservation efforts on the bigger exhibits actually help pay their way through reduced water and sewer bills.

At Home with Water Conservation

You may not have a hippo in your bathtub but you can save water at home!



- Take short showers and don't overfill the tub if you prefer to take baths.
- Run full loads in dishwashers and washing machines.
- When washing by hand, don't run water the whole time. Fill the sink or basin and wash your items, drain the wash water and then rinse.
- Apply no more than one inch of water per week to lawns and never let sprinklers cause runoff to ditches, gutters and storm drains.
- Turn off water while brushing teeth and shaving. Put a few inches of water in the sink to rinse your razor.

Grant Helps Dairy Producers

The Missouri Department of Natural Resources has granted an initial award of \$289,045 to the Laclede County Soil and Water Conservation District. This portion of the grant covers the first two years of a four-year project with funds totaling \$632,641.

The district will use the grant for technical and cost-share assistance for dairy producers in the Osage Fork of the Gasconade watershed. The watershed covers approximately 325,000 acres in portions of Laclede, Webster and Wright counties. All landowners in those counties are eligible to apply.

The Osage Fork has six miles of losing stream segments that lose all or part of their flow by suddenly disappearing underground. This makes the river vulnerable to nonpoint sources of pollution where livestock numbers are high. Runoff from livestock manure can be a potential threat to surface and groundwater. The funding will help producers construct lagoon facilities to contain the manure until it can be properly applied to the land as fertilizer. These facilities make animal waste management easier for producers and provide a healthier more productive environment for the dairy cows.

"These types of projects allow important environmental improvements to be made that help both the landowner as well as those downstream," said Steve Mahfood, Natural Resources director.

Five planned grazing and watering systems will help keep cattle out of

streams and prevent stream bank erosion caused by trampling. The best management practices in this project are aimed at preventing manure from being directly deposited into a stream or running off into it from surrounding land. They also help reduce soil runoff.

Other goals of the grant include development of comprehensive nutrient management plans for producers, demonstration of manure transfer using underground pipe, educational field days, a Web site and newsletters. The Natural Resources Conservation Service and the Laclede County Soil and Water Conservation District in Lebanon will provide technical assistance for the project.

For more information, contact Mary Jo Tannehill with the Laclede County Soil and Water Conservation District at (417) 532-6305, or Colleen Meredith with the Department of Natural Resources' Water Protection Program at (573) 526-7687.

Improved Campgrounds Ready For Summer

Visitors to Missouri state park campgrounds will find numerous improvements this season. Through an initiative called Missourians Improving Their State Parks, the Department of Natural Resources has begun an aggressive effort to add electrical hookups to many of its basic sites to meet an increased demand by campers.

More than 200 campsites in six state parks have been upgraded with 50-amp electrical service. These facilities include Lake Wappapello State Park near Williamsville, Mark Twain State Park near Stoutsville, Meramec State Park near Sullivan, Montauk State Park near Salem, Stockton State Park near

Stockton and Watkins Woolen Mill State Park and Historic Site near Lawson. St. Joe State Park near Park Hills is adding 25 new 50-amp sites.

Campers also will find a completely renovated campground at Onondaga Cave State Park near Leesburg. The renovated campground includes 66 new campsites; 48 of which feature 50-amp electric service and water.

Other improvements awaiting campers this season include new or renovated shower houses at Lake Wappapello, Mark Twain and Stockton.

The Missourians Improving Their State Parks initiative earmarked a portion of the campsite fee for campground improvements. Additional revenue for the projects is from capital improvement funds provided by the parks-and-soils sales tax.

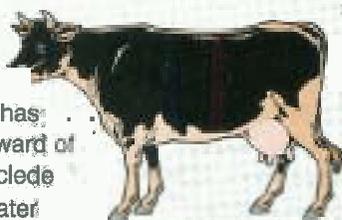
MoDOT Earns \$180,500 in Biodiesel Funds

The Missouri Department of Transportation has received \$180,500 from the sale of federal credits the department earned by using biodiesel fuel in its fleet.

The funds came from the Biodiesel Fuel Revolving Fund, and will be used to purchase cleaner-burning biodiesel fuel for MoDOT's equipment and vehicles. The Department of Natural Resources manages the fund, created by Missouri lawmakers as a depository for EPAct (Energy Policy Act

of 1992) credit trading proceeds, to assist state agencies with the incremental cost of using biodiesel with a minimum biodiesel concentration of 8-20 (20 percent biodiesel mixed with 80 percent diesel). Missouri agencies using biodiesel and generating EPAct credits also include the Department of Natural Resources and Department of Corrections.

The department's use of biodiesel drew the attention and praise from Missouri-born actor and environmental activist Dennis Weaver, who attended the press conference to announce the sale of the credits. "I'm delighted to see Missouri taking actions to reduce our



New Parks Opening!

Edward "Ted" and Pat Jones-Confluence Point State Park
Open May 9

Clark's Hill/Norton State Historic Site
Open May 29

See related story on page 20

dependence on foreign oil," he said. "Innovative state funding tools like Missouri's Biodiesel Fuel Revolving Fund help build markets for renewable fuels, help clean the air and ultimately will help us create a sustainable future for our kids."

MoDOT earned 200 federal alternative fuel vehicle (AFV) credits by purchasing more AFVs for their vehicle fleet than required under EPA's Act. The agency also earned AFV credits by using biodiesel in its existing diesel vehicles, which EPA's Act rules allow.

Biodiesel is a diesel alternative made from renewable fats and vegetable oils such as soybean oil. It works in any diesel engine with few or no modifications necessary. About 400 major fleets use biodiesel commercially nationwide, including all branches of the U.S. military, the National Park Service, public utility companies, school districts and municipalities.

Air Program Permits Undergo Streamlining

The Missouri Department of Natural Resources' Air Pollution Control Program is streamlining efforts to revise the Basic Operating Permit Program. Revisions to the program will result in a drastic reduction in **paperwork** for small sources. The changes benefit industry and permitting **authorities** without affecting air quality.

Program revisions will require the department to amend the operating permits regulations. The proposed revisions to the regulation for basic sources include: the treatment of **fugitive** emissions with regard to **applicability**; an installation equipment log for the record-keeping requirement; a **clarification** of permit amendments and modifications; the removal of the **annual** compliance certification, and; a revised operating permit notification.

The department is hosting **workshops** to help facilities' staff better understand the program changes. Workshops will be held in Jefferson City, Kansas City, Springfield and St. Louis. The revised operating permit notification forms are being used and

distributed in the workshops, which will be presented by the department's Environmental Assistance Office. For information on the workshops and availability, visit the Web page at [www.dnr.state.mo.us/alpd/apcp/MOEL/SwsSched.htm] or contact the department's Environmental Assistance Office at 1-800-361-4827.

The revised Basic Operating Permit Notification consists of a four-page report, available on the Web at [www.dnr.state.mo.us/oac/forms/]. Revisions to the Basic Operating Permit Program are the result of a joint effort by the Air Program Advisory Forum and the department's Air Pollution Control Program. The Air Program Advisory Forum comprises stakeholders from industry groups, individual companies and environmental groups.

Because the changes to the program require rule amendments, the department asked the Missouri Air Conservation Commission to grant a **variance** from two sections of the rule. On Dec. 4, 2003, the commission granted a variance from the Basic Operating Permit requirements of 10 CSR 10-6.065(4)(G), Notification Contents, and (4)(I), Compliance Reporting. The basic installations will be able to use the revised notification forms and are not required to submit an annual compliance certification requirement for 2003.

Boonville Water System Falls

When the City of Boonville's two drinking water intake pumps failed on February 19, state officials were quick to respond. After being notified, Department of Natural Resources technical staff were dispatched to help city officials obtain emergency drinking water supplies and to develop a **temporary** pumping system until the situation could be resolved, Ensuring a **continuous** supply of safe drinking water for Boonville residents was critical, as the cause for the pump failure was not



immediately determined. The pumps bring raw water from the Missouri River into the city's treatment plant for processing before it is sent to residents.

One department employee offered technical assistance in solving the actual pumping system problem, while the other worked to obtain bottled water and arrange for tankers to temporarily haul water to the city. Seventeen tanker trucks were required to provide residents with an adequate supply of water until the pumping system was back online.

The city instituted mandatory conservation orders, called local businesses and went door-to-door to alert residents about the issue. Once the system was up and running, it took about eight hours for it to refill and begin to deliver clean water to Boonville residents.

State Park System Seeks Public Input

You can win a two-night stay at a Missouri state park by offering input on what should be included in the Missouri state park system.

The Missouri Department of Natural Resources is seeking public input on **identifying** missing state parks and historic sites in the state park system, which are referred to as Missouri's **masterpieces**. In 1992, the department's Division of State Parks developed an expansion plan for the state park and historic site system. Specifically, this plan identified notable gaps in the **system** where particular natural, cultural and recreational resources were either not represented or were **under-represented**. The plan is being reviewed to determine how successful the division has been in filling these gaps and **finding** where other gaps may still exist.

As a part of this process, the department has developed a survey to allow the public an opportunity to identify potential gaps in the system and **suggest** potential "missing masterpieces" to fill these gaps. The survey also provides opportunities to voice any opinions about the standards used to



establish and maintain the state park system. In addition to being posted on the Web at [www.mostateparks.com/survey/], the "Missing Masterpieces" survey is available at Missouri state parks and historic sites as well as at sport shows and other public venues.

If you are interested in participating in the survey, access the online Web version or call the department toll free at 1-800-334-6946 (voice) or 1-800-379-2419 (Telecommunications Device for the Deaf) to request a mailed copy of the survey. You also may request a copy of the survey by filling out the card located in this issue of *Missouri Resources* or by sending an e-mail to [moparks@dnr.mo.gov].

Participants can enter a drawing to win a two-night stay for two at a motel or cabin in one of several parks.

The Missouri state park system currently includes 83 state parks and historic sites and its mission is to preserve and interpret the state's most outstand-

ing natural landscapes and cultural landmarks while providing recreational opportunities. Any potential new state park or historic site must meet these standards and adequate resources must be available to manage it. Simply identifying a potential gap does not mean that it will automatically become part of the Missouri state park system.

Cleaner Water On Tap For East Prairie

A groundwater treatment system has been completed in East Prairie. The dual-phase system will begin continual operation as soon as the testing of the system is completed," said Alan Reinkenmeyer, chief of the department's Environmental Emergency Response section. "The cleanup was necessary to protect ... East Prairie's public water supply and the water supplies of several private well owners in the area."

The department estimates that approximate-

ly 17,000 gallons of gasoline were released into the sandy subsurface soils around a local convenience store over a several-week period during the spring of 2003.

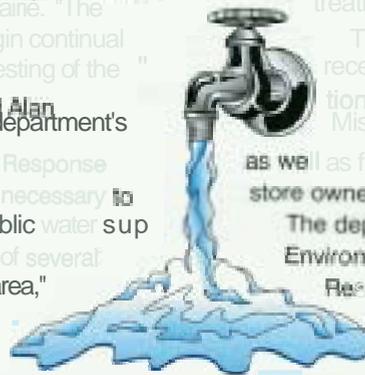
Since early June 2003, slightly more than 6,000 gallons of gasoline have been recovered from the groundwater. The system will recover gasoline still floating on the groundwater as well as vapors in the soil. The vapors and contaminated water will be processed on

site with a specially designed carbon-treatment system.

The department has received excellent cooperation from East Prairie and Mississippi County officials,

as well as from the convenience store owner.

The department's Environmental Emergency Response section has on-scene coordinators located throughout



Odell Davis, front row center, Parkville, Mo., circa 1907.

My name is Odell Davis, native-born in Parkville, Mo. on Aug. 8, 1904. I am the boy in the short pants in the picture on page 2 of the Summer 1997, Vol. 14 No. 2 issue of *Missouri Resources*. The photo shows members of Parkville's Washington Chapel C.M.E. church. My mother, sister and other relatives are pictured also. I believe I am the oldest, or one of the oldest, natives of Parkville alive today. If you hear of anyone else in that photo that is near my age, I will be very happy to hear from

them. I will be 100 this August, and am still able to drive to church and the store.

Please send me the cost of a subscription since I live outside of the state.

Thomas O. Davis
Omaha, NE

Editor's Note:

We contacted Mr. Davis and were able to send him back issues of *Missouri Resources*, as well as a complimentary subscription and some extra copies of that issue. The story in which his picture appeared was "Foundations on the Fringe," which featured efforts to restore and preserve buildings and sites important to the cultural history of African-Americans in Missouri. Some back issues of this edition are still available through our office. Letters can be sent to Mr. Davis at 2222 Pratt St., Omaha, NE 68110-1861.

We just saw a copy of your publication at Bennett Spring State Park near Lebanon and would enjoy a subscription to it. Although we didn't catch our quota of trout, we nevertheless had a very enjoyable and peaceful time. We especially enjoyed the family atmosphere - the park is well kept, etc. I never saw so many hummingbirds in my life. They were feeding over at the restaurant adjoining Sand Springs Lodge. They were attracted to flowers and five or more leaders. They were like flies! Up here in Pike County, we are lucky to have six or seven feed in a day.

Munel Oberman
Bowling Green

LETTERS



Letters intended for publication should be addressed to "Letters," *Missouri Resources*, P.O. Box 176, Jefferson City, MO 65102-0176 or faxed to (573) 751-8084, 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 more@dnr.mo.gov 

environmental
n o t e s

Mercury-content Products Present Disposal Challenge

Human activities are responsible for mercury pollution of the air, water and soil. Mercury concentrations in the air are usually too low to be of direct concern. But when mercury enters water, biological processes transform it to a highly toxic form that builds up in many species of fish and animals that eat fish, including us.

Toxic when eaten, inhaled or placed on the skin, mercury may seem to have no effect. Then symptoms develop later or become noticeable with continued exposure. Mercury becomes a gas at room temperature so it is very dangerous if spilled indoors.

At present, there is no economical or convenient way to get rid of products containing mercury. These items should not be put in the trash!

- **Fluorescent bulbs:** Avoid breaking bulbs and contact a recycling service that will accept them or remove them safely.
- **Thermometers:** Mercury thermometers can be identified by the silver colored liquid in the bulb. Replace them with digital thermometers or alcohol (red bulb) thermometers.
- **Thermostats:** Instead, use electronic thermostats.
- Certain button cell batteries
- Dental fillings (contain mercury)
- Mercury switches – usually silent light and tilt switches
- Old pesticides, fungicides and paint (see label)

The Missouri Department of Natural Resources' Environmental Emergency Response team should be contacted at (573) 634-2436 if a mercury spill occurs.

Some Missouri communities and Solid Waste Management Districts provide household hazardous waste collection facilities or events when recycling is not an option. Call (573) 526-6627, (573) 751-5401 or 1-800-361-4827 for further information.



resources, including energy efficiency and renewable energy, into classrooms.

"Schools are an excellent place to demonstrate renewable energy options to communities," said Anita Randolph, director of the Missouri Energy Center, the state's energy office. "Students will have the opportunity to learn about how energy efficiency and renewable energy, such as solar power, benefit our economy and environment."

Schools throughout AmerenUE's service area are eligible to apply. "(This) will give AmerenUE the opportunity to learn more about interconnection of small solar arrays into its existing electric grid," said AmerenUE Senior Vice President David Whiteley.

Another partner in the project is the Gateway Center for Resource Efficiency, a division of the Missouri Botanical Garden. Gateway Center for Resource Efficiency, a regional leader in energy and environmental education, will provide the energy education program to the schools.

The solar equipment is estimated to cost \$10,000 per school, or \$10 per watt. Funding for the solar equipment program will come from Missouri Schools Going Solar as well as the required \$2,500 cash match that each school must provide. More details and applications are available online at [www.dnr.mo.gov/energy/renewables/solar-schools.htm] or by contacting the department's St. Louis Urban Outreach Office at (314) 340-5900.

the state and available 24 hours a day, seven days a week to respond to hazardous substance spills. In 2003, the section responded to 680 environmental incidents.

These efforts are funded by the hazardous waste generator fee, which will expire Jan. 1, 2005, unless it is extended. Reinkemeyer added that the department is committed to the cleanup as long as funding remains available.

To search additional environmental emergencies reported to the department since 1993, visit [www.dnr.mo.gov/meerts/index.do]. For more information contact the department at 1-800-361-4827 or (573) 751-4465, or via the Web at [www.dnr.mo.gov].

Go Solar Program Energizes Schools

Schools throughout Missouri will begin generating small amounts of energy and large amounts of interest in solar energy as a part of Missouri Schools Going Solar, a program administered by the Missouri Department of Natural Resources and funded by AmerenUE.

The program will select 20 schools to receive a 1-kilowatt photovoltaic solar array to be installed on school grounds.

Schools also will receive curricular materials and training to help teachers incorporate lessons about energy



Cameras in Alleys "Looking" Good

Mayor Francis G. Slay announced that the City of St. Louis will be partnering with the State of Missouri to bring the successful Missouri Department of Natural Resources' surveillance camera program to the city. This is the third in Mayor Slay's Neighborhood Life Initiatives, a series of programs designed to deal with the problems that plague urban neighborhoods.

Joining Slay were State Rep. Amber Boykins, Craig Abbott and Terry Ball of

the department and Circuit Attorney Jennifer Joyce.

Under the Neighborhood Life Initiatives, the City of St. Louis has been fighting absentee and slum landlords with the Problem Properties Initiative, which has seen an 85 percent compliance rate. The city also is fighting trash and illegal dumping with its Clean Up St. Louis Initiative. The surveillance cameras in alleys will be useful tools and will expand the city's existing programs. St. Louis is the first metropolitan area to be targeted for the "Cameras in Alleys" program. Starting immediately, cameras will be set up in alleys

to catch and prosecute illegal dumpers.

"The Cameras in Alleys program has proven successful around the state, and I am hopeful that the program will help curb illegal dumping here," Slay said.

In addition to the St. Louis efforts, the department will continue to work on other areas of the state.

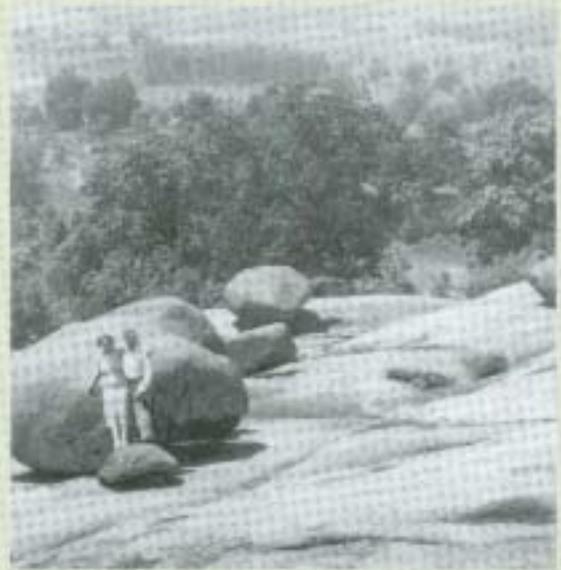
Detailed Geology Atlas Released on CD

The Department of Natural Resources' Geological Survey and Resource Assessment Division (GSRAD) has released the first edition Missouri Environmental Geology Atlas (MEGA) on CD-ROM. The atlas contains 15 statewide geographic information system (GIS) layers that can be selectively stacked to create customized maps and presentations.

The CD-ROM includes software that can be used to display the data, make overlays on digital topographic maps,

TIME EXPOSURES

At 1.5 billion years old, the massive pink granite boulders at Elephant Rocks State Park are some of the oldest exposed rock on Earth. The area in Iron County was a popular destination long before it became a state park in 1967. In addition to being scenic, Elephant Rocks also has provided building material for some of the Midwest's most notable historic structures, including the Eads Bridge in St. Louis, the state capitals of Illinois and Iowa and the Missouri governor's mansion. The area was first suggested as a state park in 1924. In 1967, an intact section was bought and donated by the retired chief geologist for the St. Joseph Lead Company, John Stafford Brown. Elephant Rocks then became an official state park. This photograph, sent in by Scott Van Matre of Ballwin, shows friends of his grandfather's at Elephant Rocks in 1935.



Send your photo to "Time Exposures," c/o Missouri Resources, P.O. 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.

complete simple analysis and queries and export records as tables. MEGA also includes a manual and tutorial.

The data include geologic maps, well logs, field reports and newer databases. Additional layers include: bedrock and surficial material geology; information for more than 145,000 wells; sinkhole, stream-classification, spring, cave-area and dye-trace location data; and the Public Land Survey System grid network. Data such as streams, lakes, major roads and other basic entries also are included.

The data layers were collected from the late 1800s through 2002, and comprise much of the basic geologic and hydrologic data used by GSRAD. It is expected that MEGA will be used as one tool for making informed environmental decisions related to the protection, cleanup or use of groundwater. Geoscience educators and students, planners and the

general public also will find the data useful as a source of information for basic Missouri geology.

Updates of the MEGA Geology Atlas are planned, and may include well and boring logs, geohydrologic site investigation summaries, known waste disposal sites, lake sites, mine locations and other economic geology information and stratigraphic sections. Information from the database should not be used without field confirmation in cases that may impact public health, safety or welfare.

The MEGA CD-ROM and manual can be purchased for \$25 plus tax by contacting GSRAD at (573) 368-2125 or via the Web at [www.dnr.mo.gov/geology].

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



Grain Valley High School Programs, Involvement Taking Root in Community

Students at Grain Valley High School have started many projects that improve and enhance the environment at their school as well as their community. Through the leadership of Paul Gustafson, who teaches environmental science there, students began a community tree-planting program for citizens of Grain Valley. Rather than just plant whatever they could afford to buy the most of, Gustafson and his group made sure their investment was destined for success. By planting trees that matched the climate profile for their area, the 450 trees destined for the school campus and community had a better chance to survive. They didn't stop there, however. The students also successfully raised their own crop of walnut, red bud, pin oak and hibiscus trees over the last several months. This spring, the teacher was proud to report they had reserved another 500 trees from the Licking nursery, and immediately went to work finding suitable environs for them.



Composting at Grain Valley's Outdoor Classroom

Much of Gustafson's spring 2004 has been devoted to developing grant proposals to further the students' opportunities for outdoor classroom activities. They have established a wildflower garden for the budding team of green thumbs, and the site has begun to support itself, thanks to their new community composting program that accepts lawn waste and turns it into food and bedding for their growing list of projects, or, list of growing projects. He's looking forward to the next year or two when the project will have enough excess compost to give away to the public. Like everything else the teacher and students touch, they'd like to see the composting program grow.

Funding is an issue – and Gustafson must watch his operation's nickels and dimes. "It's not just a matter of being frugal or environmentally conscientious, it's just the way it is," Gustafson said. They make plant tags out of used venetian blinds and aluminum cans, recycle numerous plastic soda bottles from school trash for plant pots, and he procures his entire wood needs for building plant light racks, raised beds, and signage through scrap lumber tossed out of construction sites. Gustafson adds that donations of T-posts and fencing would be greatly appreciated. Further expansion

of their compost pens is on hold until he can secure these items. "This little monster I've created is starting to outstep the manual capabilities of my volunteer "indentured" students and my own volunteer time during summer," he added. He is careful to plan any growth, as too much of a good thing could dampen his student's enthusiasm for their real love – the outdoor classroom. It is that enthusiasm that helped Gustafson and his students win a 2002 Kansas City area Choose Environmental Excellence award in the schools category.

The outdoor classroom encompasses approximately 10 acres adjacent to the school. The area includes two one-acre prairies of Indian and little blue stem, 25 raised-bed gardens for ornamentals and propagation beds, a small pond, educational stations, tracking pit, wildlife food and shelter plantings, the community compost program pens, botany class experimental plots, and wildflower and butterfly gardens. The classroom is used by environmental science, botany, zoology, art and photography classes, as well as the elementary school next door.

Deer are frequently viewed but, like the students, have become very active participants in the program. Rather than see them as a nuisance, Gustafson has embraced their value by including a "tracking pit" and deer education program for the elementary school. "We have no problem showing tracks, scat and browings," Gustafson said in an obvious understatement. He notes that the deer have given the older students the opportunity to vary the types of plants they use and experiment with different deer repellents and enclosures for their botany projects.

Gustafson doesn't just hand out packs of seeds to his classes and send them on their way, however. The scope of the myriad projects has grown and the workload and responsibilities require organization and teamwork. He readily delegates this to his students, and they embrace it with appreciation. Given the chance to work outside the boundaries of a school building with ownership in their school community, they have quarterly elections so the opportunities to lead are shared.

When Grain Valley High School students pull their spades out of the soil, it's off to the streams for restoration and cleanup projects, conducting radon tests at homes and participating in the Envirothon high school regional competition at Burr Oak Woods Nature Center. Grain Valley hopes to do well enough in the regionals to advance to the state competition. Gustafson stresses that the students train for the Envirothon outside of school hours. He plans to incorporate more of this training in the environmental science class to allow greater in-school skills development for the competition.

Richard Green, a senior, sees the principles stressed in Gustafson's classes as valuable tools for success in the Envirothon, an academic bowl competition devoted to environmental knowledge and resource management. "The information learned from the Envirothon program is very useful to students with outdoor interests. I think it trains you for real world situations faced by conservation biologists, and gives us an opportunity to further understand the unique features found in Missouri," Green said. "The outdoor classroom has been a great tool to apply things I've learned in Boy Scouts and Envirothon," he added.

Gustafson concurs, and is inspired as he watches his love for the natural world inspire his students – and vice-versa. "For students, working in the outdoor environment builds character, stewardship and pride in their accomplishments. For the teacher, it instills faith in our future."

Footsteps on the Frontier

Following Lewis and Clark Through Missouri State Parks

by Jennifer Sieg

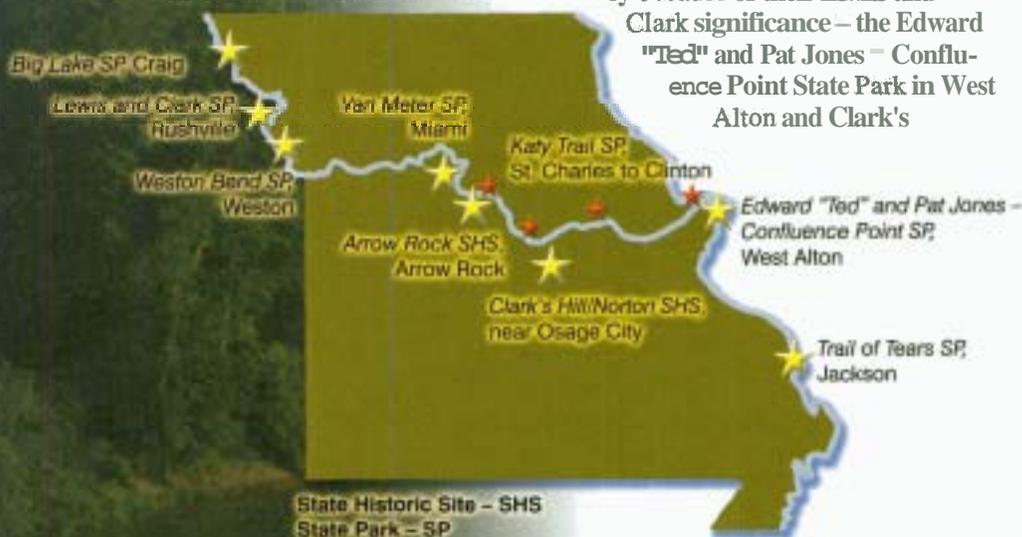
Two hundred years ago, at the request of U.S. President Thomas Jefferson, Meriwether Lewis and William Clark assembled a crew and launched an expedition to explore unfamiliar land acquired by the United States. Today, we can only imagine the sense of adventure and the daily challenges and uncertainties that this famous duo and crew faced.

In November 1803, Lewis and Clark arrived in Missouri and began their trip up the Mississippi River to Wood River, opposite the mouth of the Missouri River. From here, they would begin their two year, four month-long journey to the Pacific Ocean and back. Since their journey, many people have retraced Lewis and Clark's footsteps, carefully studying and researching their journals, looking for landmarks and landscapes mentioned.

In an effort to commemorate this epic journey, the Missouri Department of Natural Resources has developed exhibits and programs for state parks and historic sites that tell the story of Lewis and Clark in Missouri. As a part of this effort, interpretive markers have been placed in nine state parks and historic sites along the expedition route on both the Mississippi and Missouri rivers. Visitors to these places can follow the footsteps of Lewis and Clark across Missouri, taking in history and experiencing outdoor adventures of their own along the way.

New Sites Have Lewis and Clark Connection

Two of these locations were recently acquired by the Department of Natural Resources, primarily because of their Lewis and Clark significance – the Edward "Ted" and Pat Jones – Confluence Point State Park in West Alton and Clark's



Trail of Tears State Park
DNR file photo

Hill/Norton State Historic Site near Osage City in Cole County. Both sites will be open for the Lewis and Clark bicentennial and will continue to serve as places of interest.

Edward "Ted" and Pat Jones - Confluence Point State Park

West Alton - The Mississippi and Missouri rivers each played a major role as Lewis and Clark's highways. The point at which these two great rivers meet is now the focal point of Edward "Ted" and Pat Jones - Confluence Point State Park. A path leads to where the Mighty Mississippi and the Big Muddy merge. An open-air interpretive facility features seating and information on the rivers as transportation routes as well as their significance to the expedition. Plans include linking the park to trail systems in the area and a courtesy dock.

Descriptions from expedition journals of the land surrounding the confluence and land surveys of the early 1800s play a significant role in the department's efforts to restore the original natural landscape in the park. Efforts will be focused on recreating the native vegetation and natural wetland communities, including native bottomland forests, marshes and prairies.

Clark's Hill / Norton State Historic Site

Osage City - Clark's Hill/Norton State Historic Site preserves the hill that Clark noted climbing when the Corps of Discovery camped at the confluence of the Missouri and Osage rivers in June 1804.

Features of the historic site include interpretive signage and a trail that leads to an overlook, which provides a view of the rock where Clark stood, as well as the expedition's campsite below along the bank of the Missouri River. Changes in the Osage and Missouri rivers have moved the confluence several miles downstream near the town of Bonnots Mill.

Following the footprints of Lewis and Clark along the Missouri River also will lead visitors to these state parks and historic sites with interpretive markers:



Trail of Tears State Park

Jackson - Lewis and Clark camped near today's park grounds on Nov. 24, 1803. Lewis noted the high bluffs with sheer, perpendicular walls rising out of the river and the thick forests in the area, both features of the park. A new overlook in the park allows a spectacular, high-vantage view of the Mississippi River.

Katy Trail State Park

St. Charles to Clinton - Approximately 185 miles (St. Charles to Boonville) of this 225-mile walking and bicycling trail is the longest non-motorized section of the Lewis and Clark National Historic Trail. Lewis and Clark interpretive signs and panels can be found at several locations along the trail.

Arrow Rock State Historic Site

Arrow Rock - The Lewis and Clark Expedition noted passing the "Prairie of Arrows," where the town of Arrow Rock would be founded a few years later. The historic site preserves and interprets several historic buildings in this small town, which is listed as a National Historic Landmark.

(Opposite page) A new overlook at Trail of Tears State Park provides a majestic view of the Mississippi River and the bluffs that border it.

(Above) This aerial view clearly shows the different colors of the Mississippi and Missouri rivers as they merge at Edward "Ted" and Pat Jones - Confluence Point State Park.



Photo by Tim Negret

Weston Bend State Park

Weston – Lewis and Clark's keelboat ran aground on a sandbar as they worked their way around what is today **Weston Bend**. Weston Bend State Park's overlook offers a majestic view of this Missouri River bend.

Lewis and Clark State Park

Rushville – On July 4, 1804, Lewis and Clark discovered an oxbow lake that was a wildlife paradise with fish and many young geese. Clark named the lake "Gosling Lake," which today borders the park and is known as Lewis and Clark Lake. Along with interpretive information, the park will feature a half-scale replica of a keelboat.

Big Lake State Park

Craig – The Lewis and Clark Expedition rounded a bend on the Missouri River July 13, 1804, and noted an elegant prairie. On their return trip, they camped at an island opposite this prairie on Sept. 10, 1806. Big Lake, which borders the park, is an oxbow lake formed from a remnant of this bend.

Other places of interest to continue the journey include Jefferson Landing State Historic Site, Jefferson City, one of a few remaining 19th century riverfront landings on the Missouri River. A statue depicting the signing of the Louisiana Purchase, which led to the Lewis and Clark Expedition, stands behind the state capitol.

Just west of Jefferson City is Sugar Loaf Rock. Although not a state park or historic site, the landowner has given the Department of Natural Resources limited temporary access to this prominent Lewis and Clark landmark to provide guided tours for the bicentennial.

For more information about these state parks and historic sites, contact the Department of Natural Resources toll free at 1-800-334-6946(voice) or 1-800-379-2419 (Telecommunications Device for the Deaf) or visit the Web at [www.mostateparks.com]. For more information on the Lewis and Clark bicentennial commemoration in Missouri, visit [www.lewisandclarkmo.com].

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

Van Meter State Park

Miami – On June 15, 1804, the Lewis and Clark Expedition camped opposite the sites of the former **Little Osage and Missouri Indian** villages, near present-day Van Meter State Park. A mural inside the park's visitor center depicts a **Missouri Indian** village and other exhibits interpret the life of American Indians in the state,

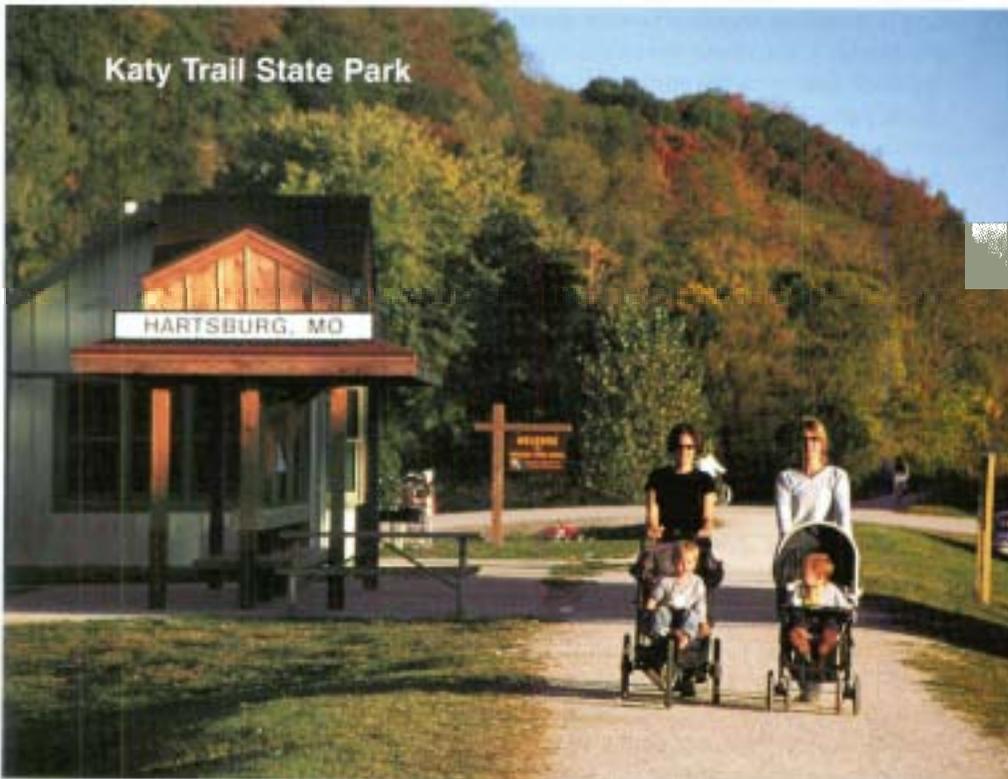


Photo by Scott McNeil



Credit photo by Scott Myers

Career Connection

From the Ground

by Dean Martin
photographs by Craig Chatfield

Down

"Some of my relatives often tease me, saying that I got started playing in the mud and I'm still there," says Timothy Knoernschild when asked how he got started in the soil science profession. "I just tell them, 'I started at ground level and then worked my way down,'" he adds.

Suffice to say, Knoernschild enjoys being a soil scientist with the Missouri Department of Natural Resources. As he sees it, one of the main attractions of being a field soil scientist is getting to work outside. Another draw, as well as a challenge to the job, is learning and applying a demanding science.

It is not for everyone, but for those who do not mind getting dirty, prefer working outside and enjoy working with and solving real-world problems, soil science may be something worth looking into. "I like to go outside and work with the different soils and map and document them," Knoernschild adds.

The Soil and Water Conservation Program soil scientists work closely with the Natural Resources Conservation Service (NRCS) by collecting and preparing soils data for publication. They also work with



the University of Missouri on training, public information, delivery of data (see www.soils.missouri.edu on the Web), as well as other activities.

Recently, the department assigned Knoernschild to the Kansas City Regional Office with responsibilities for the northwestern part of Missouri. He works with other department soil scientists, NRCS soil sci-

Soil scientists use the hydraulic probe to pull soil cores for examination. (Inset) As part of the flood plain forest research project at Yellow Creek Conservation Area, Tim Knoernschild used a hand probe to pull samples.

entists, local soil and water conservation districts, landowners and others to collect data and to provide interpretations of what **soil data mean to people for their particular** land uses. It has been quite some time since soil scientists have been available in the northwest part of the state, so one goal of Knoernschild **and other** soil scientists is to let residents know that they are always ready to help with their needs.

There have been many **changes** in the soil science program during the past **couple** of years, and there will continue to be more. This is a result of moving from a mapping-oriented focus to a more customer-driven approach of providing soils information and assistance.

In the Soil and Water Conservation **Program**, up-to-date education and training is critical. Last **summer**, **Knoernschild** attended **the** national meeting and associated workshops of the Soil Science Society of America. In addition to seeing different **landforms** and soils, he was able to **learn** from fellow scientists from around the world, as well as discuss future efforts in the soil sciences field. Knoernschild also has taken advantage of soil **science** courses contracted through the University of Missouri, the annual Central States Forest Soils Conferences and other opportunities.

Another aspect of **Knoernschild's** job that is a little out of the ordinary is that he is not a full-time employee. The flexibility in his **schedule** allows for an average work **week** of about 30 hours, but sometimes it exceeds 40 when needed. "This part-time status readily suits my **situation** for a **number** of other things in my life," says Knoernschild.

Knoernschild has been with the Department of Natural Resources for 15 years and is classified as a Soil Scientist III. He has a Bachelor of Science degree in general agriculture. He started out as a soil scientist with a local soil and water conservation district, but was hired by the department after **responding** to a newspaper ad.

The **State** of **Missouri** soil science series includes four promotional levels. To become a soil scientist, a prospect must have a **Bachelor's** degree in soil science, agriculture, agronomy, conservation, forestry, environmental science, geography, **geology** or **another** closely related discipline. A minimum of six semester hours of soil science **are** required. Technical or professional experience in soil survey work may be substituted **on** a year-for-year basis.

There are 20 soil scientist positions within the department's Soil and Water Conservation Program, located in **six** offices around Missouri including Kansas City, Poplar Bluff, Jefferson City, St. Louis, Macon and Springfield.

Soils science is a career field for those who, like Tim Knoernschild, enjoy being outside while learning and applying a demanding science to the soil. Oh, and it doesn't hurt to like getting dirty once in a while, especially while you're getting paid to do it.

Dean Martin is section chief for the soil science section of the department's Water Protection and Soil Conservation Division.



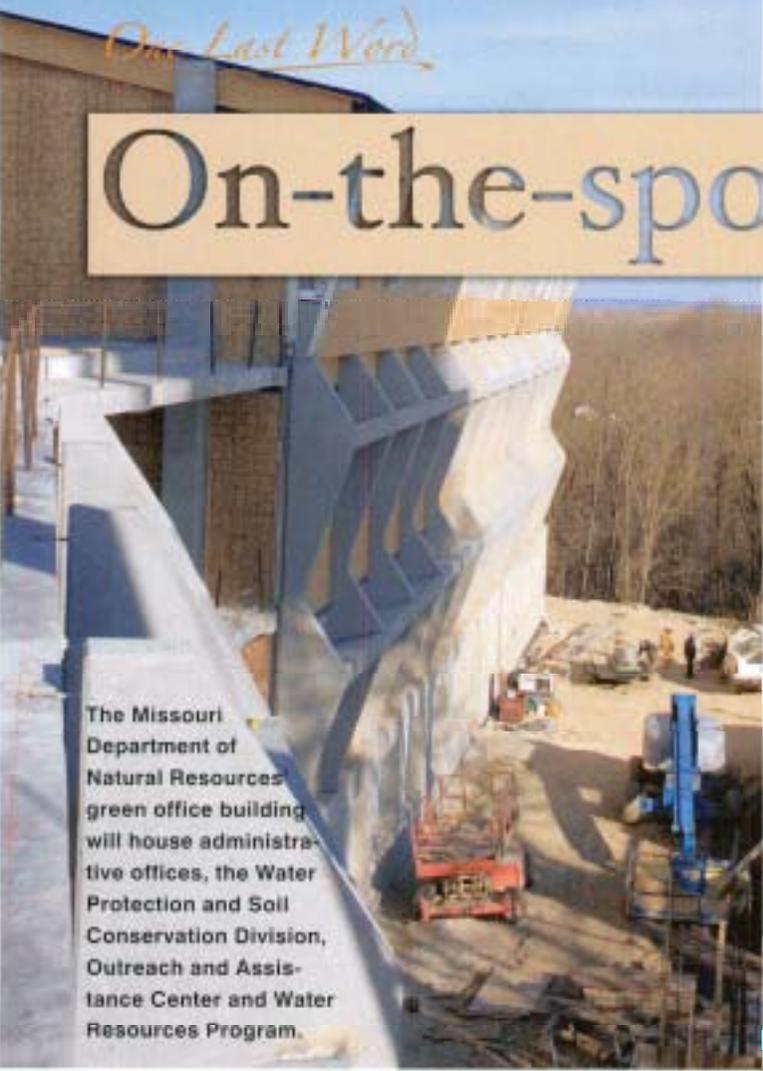
Tim Knoernschild and Greg Caldwell measure and describe a core sample taken during a research project at Yellow Creek Conservation Area in Chariton County.

"The emphasis of the future will be on helping people with interpretations for uses of the soil and providing more identification from lab data of what is in the soil line," said Knoernschild. In addition to more soil-data interpretations, soil scientists are continuing to work more with other scientific disciplines to understand and solve soil-related problems.

Besides field work, Knoernschild is sometimes called upon to provide training for newly hired soil scientists. Soil science is a group project and training is very important for soil scientists to do their jobs effectively. The newest staff receive training from more experienced soil scientists with the Department of Natural Resources and NRCS. Additional college courses, workshops and other training are also available.

On-the-spot Savings

by Stuart Westmoreland
photograph by Scott Myers



The Missouri Department of Natural Resources' green office building will house administrative offices, the Water Protection and Soil Conservation Division, Outreach and Assistance Center and Water Resources Program.

materials were either reused by DOC or sold to offset demolition costs. A small portion was legally landfilled.

"We transported about 4,000 bricks down the hillside to the state prison, where we had inmates knock the mortar off and stack them for reuse on the green building," said Dan Walker, General Services Program director and coordinator for the project.

"It was an extremely beneficial partnership between the department and Corrections; we received inexpensive labor and the clean brick we needed to reuse on the project."

C&D debris includes concrete, asphalt, wood, roofing, drywall, metals and many miscellaneous and composite materials. This type of waste is generated by demolition, new construction or the remodeling of buildings and roadways. With all this constructing and demolishing going on, it's no wonder that estimates put C&D at 18 percent of Missouri landfill tonnage.

Waste generated at construction sites is more likely to be recycled than from demolition sites, due to the ease in separating the materials. Most construction occurs in phases, which streamlines the separating and organizing of similar materials that can be

reused rather than discarded. Recycling goals still can be achieved if the material is mixed, but the cost of this process offsets some of the benefits.

The green office building prime contractor and subcontractors have done their source separation on-site to reduce disposal costs and generate income through the sale of salvaged material. Labor costs from separation can be minimized by planning your source separation and finding local processors for salvage and recycling.

Reuse centers for construction and demolition materials, such as Habitat for Humanity ReStores, can be found at [www.habitat.org/env/restore.aspx]. These stores may accept flooring, plumbing fixtures, dimensional lumber, doors, windows, cabinets and appliances that are removed from old buildings or that remain from new construction. They also have these recovered items for sale at a fraction of retail prices.

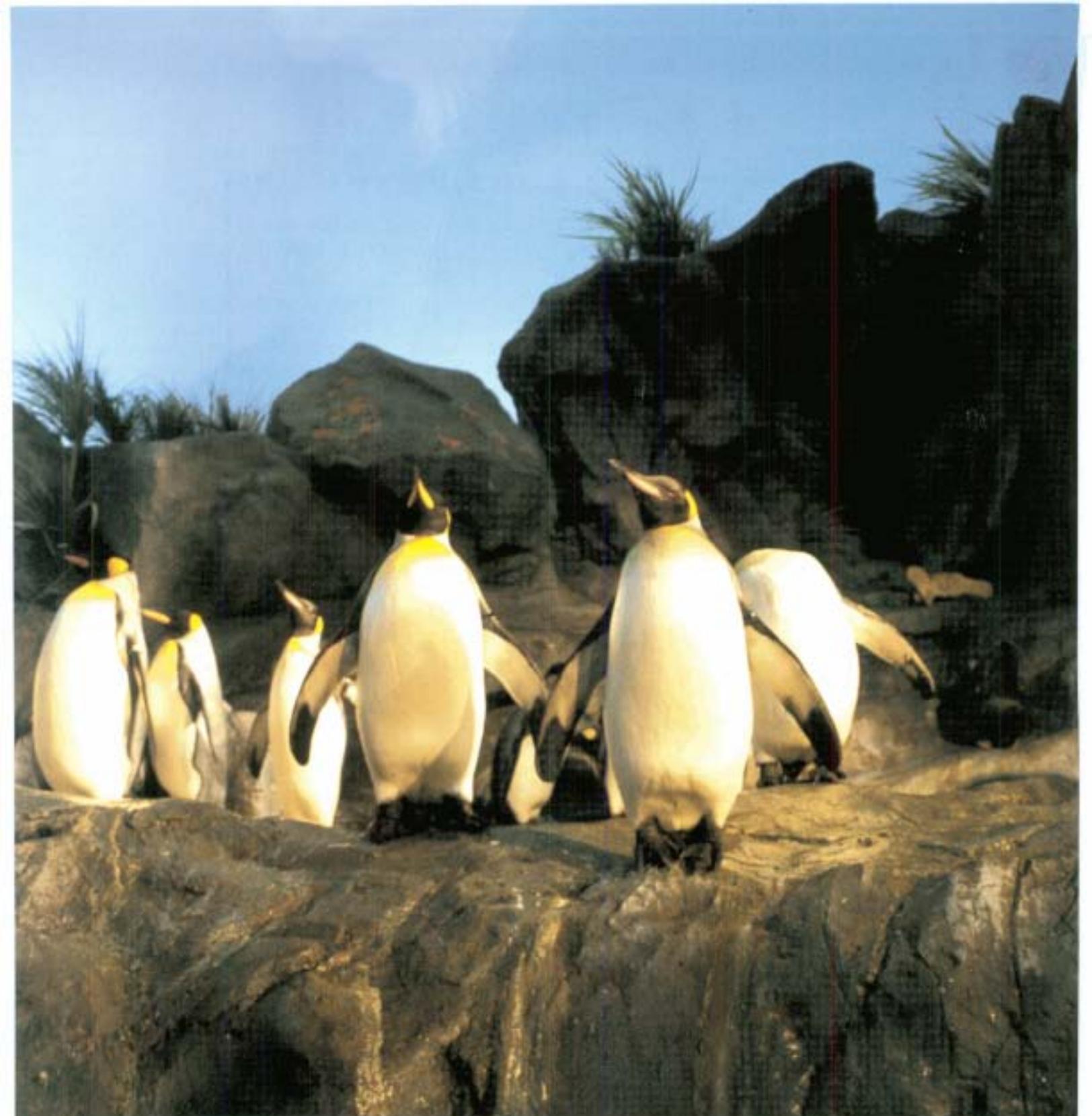
According to the Solid Waste Association of North America, three general categories of construction and demolition waste comprise more than 61 percent of Missouri's total C&D waste stream: asphalt and concrete, wood waste, and ferrous metals. The metals markets are well established so it is beneficial to concentrate on the wood and aggregate portions of the waste stream.

See the department's C&D waste fact sheet (PUB #001306) at [www.dnr.mo.gov/pac/pub1306.pdf]. For more information, call 1-800-361-4827 or see our Web page at [www.dnr.mo.gov], select "current issues" from the menu.

Stuart Westmoreland is a public information administrator and editor of Missouri Resources.

What comes down, must go up – at least that is what's going on at the Missouri Department of Natural Resources' green office building. Slated for completion in late fall 2004, the structure not only will be a state-of-the-art energy-efficient facility, but is designed to be a prototype for future state buildings.

It may look new, but there sure is a lot of old stuff going into it. The contractors call it C&D – construction and demolition debris. But rather than become part of the ever-growing C&D waste stream that will end up in some Missouri landfill this year – much of the "D" waste is going right back to work. Brick from the old Missouri Department of Corrections (DOC) training academy that was deconstructed to make room for the green building is being cleaned and reused for the new facility. All other



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