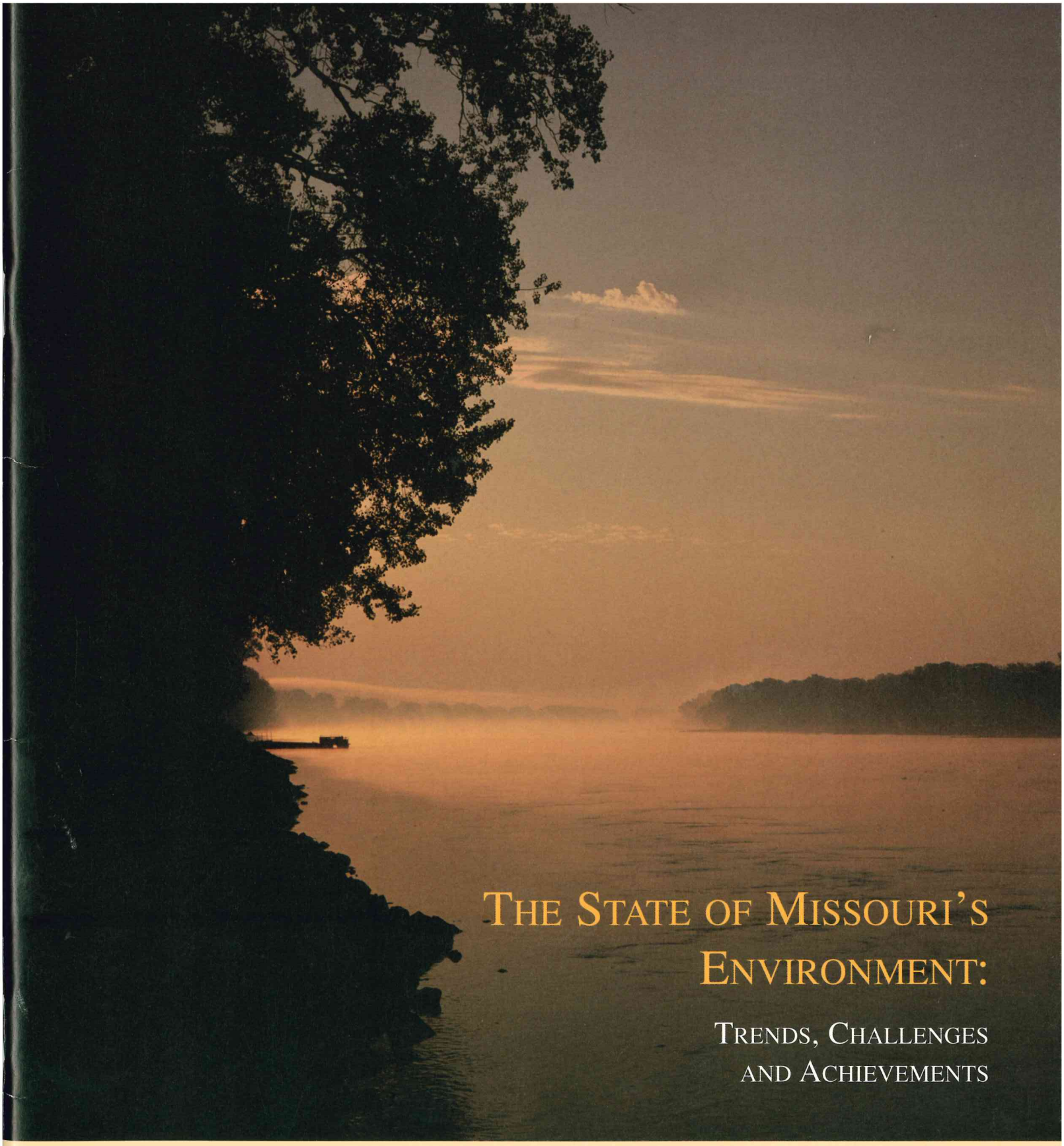
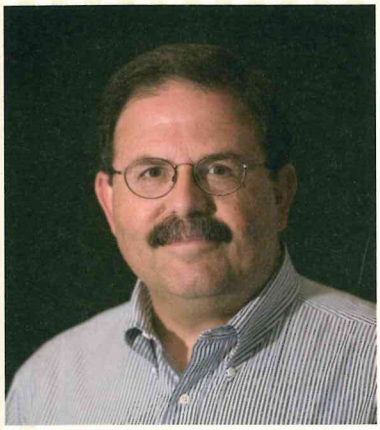


The State of Missouri's Environment:

Trends, Challenges and Achievements

Missouri
Department of
Natural Resources

December 2004



Director's Message

The Missouri Department of Natural Resources' vision statement says, "We envision a Missouri where people live and work in harmony with our natural and cultural resources while making decisions that result in a quality environment and a place where we can prosper today and in the future." In fact, our ability to live in such a manner is critical to the vitality of our economy and the health of our families. Our department is charged with responsibility for promoting this vision.

In this report, we examine the progress that has been made in protecting our air, land and water quality and our energy, natural and cultural resources. A great deal of work continues to be done. The St. Louis and possibly Kansas City regions will likely face new, stricter regulations in the future.

Our water quality continues to be threatened by our daily decisions. Protecting our water resources will require a more holistic approach than what we've taken in the past. Research and experience have taught us that watershed-based thinking and planning best protect Missouri's water resources. And recent droughts have taught us that we must consider both water quality and quantity in our decisions. Each year, Missouri homes send more trash to the landfills. And despite the rising cost of energy – both to our environment and our pocket books – our energy consumption rate continues to increase.

At the Missouri Department of Natural Resources, we are committed to protecting our state's energy, natural, cultural and historical resources. Missouri's citizens, our businesses, community leaders, elected officials, grassroots organizations, schools and families also must be leaders and our partners in these efforts. This report highlights a few of these most successful efforts.

Since the events of Sept. 11, 2001, new issues have come to the forefront of discussion – particularly our dependence on foreign fuels, the security of our drinking water treatment plants and other facilities, and Missouri's ability to quickly and effectively clean up hazardous materials. We look at these issues as well.

Finally, economic challenges faced by both our state and our nation recently have spurred many to look more closely at how the decisions we make affect the economy. Issues related to national security and continuing threats to our country have spurred many of us to look at our dependence on certain forms of energy.

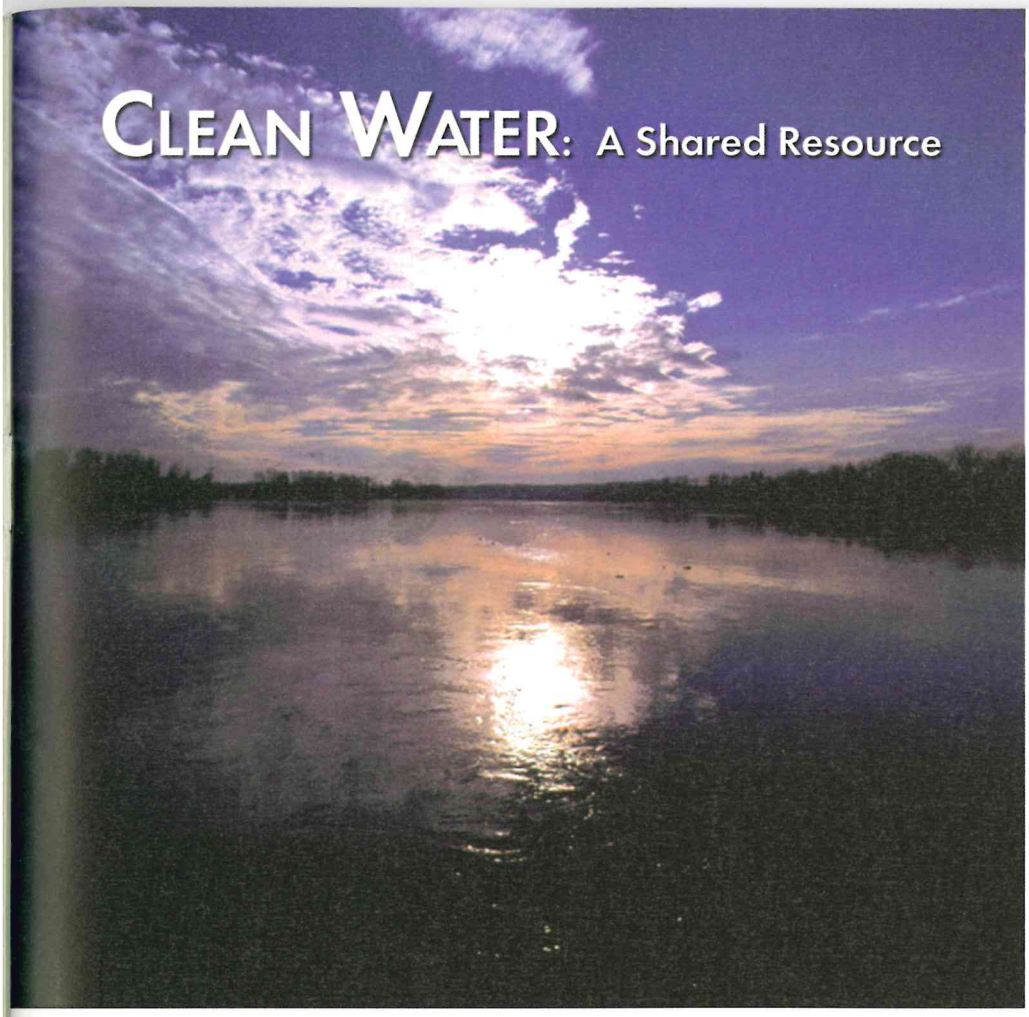
We believe that environmental protection supports economic growth and helps protect our quality of life. This report will look at the impact of a clean environment on Missouri's economy.

According to Governing *magazine's Source Book 2004, Missourians spend $1 a week, or about 14 cents a day, protecting their environment. Adequate funding is necessary to ensure that Missouri is able to continue to permit businesses in a timely and effective manner; it is critical to both our state's environmental efforts and our economic growth.*

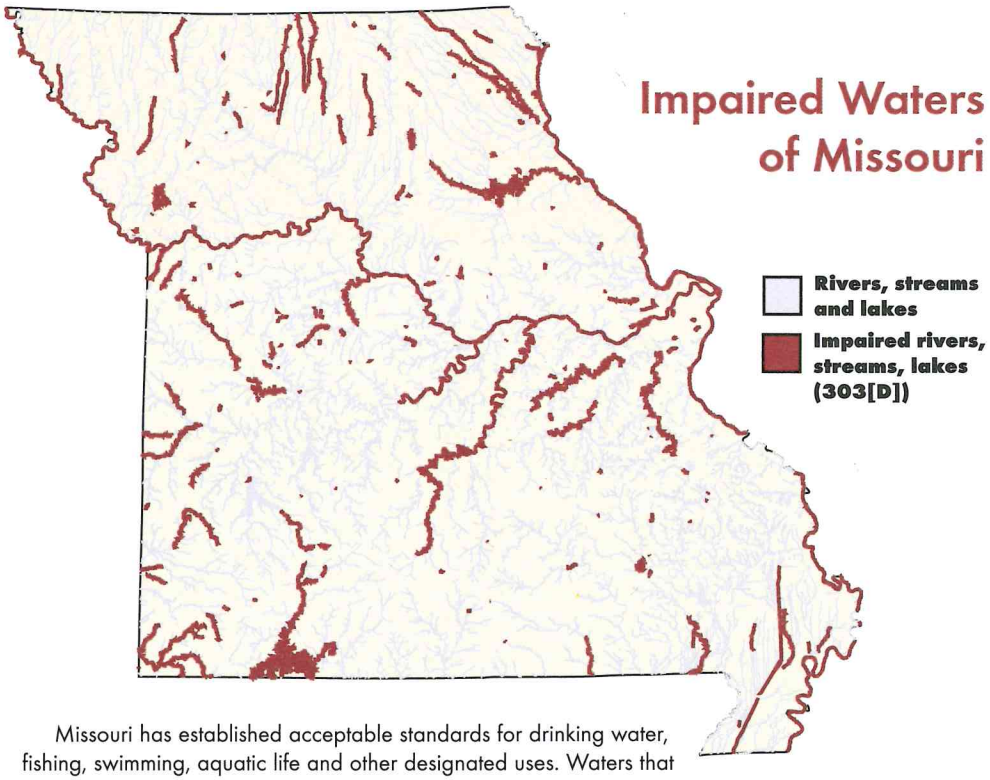
Sufficient funding also is crucial to protecting the health and well-being of our citizens and making this a state that people will want to visit. If your income is derived from tourism, if your family enjoys spending time in Missouri's parks, if your business is among those regulated by state standards, if you drink Missouri water or you breathe Missouri air, you have a stake in protecting our state's environment. I invite you to learn more about Missouri's resources by calling us at 1-800-361-4827 or by visiting our Web site at www.dnr.mo.gov.

Steve Mahfood
Director, Missouri Department of Natural Resources

Clean Water: A Shared Resource



Did you know that the water quality decisions we make in Missouri not only affect the quality of our drinking water, but can even make their way all the way down to the Gulf of Mexico? Earth is a water planet, and thousands of pollution sources can impair our water quality and dictate far-reaching consequences for all Missourians, as well as our neighbors. There is a great deal of overlap between the risks that pose a threat to our land and those that pose a threat to our water. The consequences of many of our choices are interconnected. Across Missouri, schools, universities, businesses, local governments, elected officials, community groups and private citizens work to protect water quality and availability on several fronts, which include preventing pollution from impairing our rivers, lakes and streams and our water supply; reducing soil erosion; developing a state water plan to ensure adequate water resources for all Missourians; and engaging other states and the federal government to maintain the future beneficial uses of interstate water for each and every Missourian.



Missouri has established acceptable standards for drinking water, fishing, swimming, aquatic life and other designated uses. Waters that don't meet these standards are placed on a special list called the 303(d) list. A stream is considered impaired when it fails to meet water quality standards established by the Clean Water Commission. Section 303(d) of the federal Clean Water Act requires states to identify and list all impaired waters. The list is revised and updated every four years. After studying the scientific data, waters are added or subtracted from the list depending on the status of their health.

Protecting Our Rivers, Lakes and Streams

A little more than half of Missouri's 22,194 permanent stream miles fully support aquatic life. Of the 10,900 stream miles that do not fully meet water quality standards, approximately 1,000 miles are impaired by heavy metals or toxic chemicals. Roughly 10,000 miles are impaired by habitat degradation.

Of Missouri's 293,319 lake acres, approximately 95,000 are threatened by eutrophication, a condition that occurs when nutrient enrichment of a water body leads to increased algae growth. About 131,000 lake acres are impaired by mercury, manganese or nutrients.

Protecting the people and infrastructure downstream of regulated dams in Missouri continues to pose challenges as well. Missouri contains approximately 640 regulated dams

that must be inspected on a regular basis. The challenge of ensuring that these dams are properly maintained is both an environmental health and safety issue.

Nonpoint Source Pollution

Nonpoint pollution, a type of pollution that does not come from specific discharges, poses a serious threat to Missouri water quality. Runoff from agriculture, urban areas and abandoned mine lands are all examples of this type of pollution.

This pollution affects almost half of Missouri's streams and rivers and about one third of the lakes. Problems include contamination of drinking water sources with pesticides and effects from channelization or the modification of stream channels, mining operations and atmospheric deposition of acid and mercury from coal combustion.

Cities, mining areas, construction sites and farms continue to look for effective ways to deal with storm water runoff. Regulations are in place to prevent leakage from underground storage tanks and for the secondary containment of bulk agricultural chemical storage.

Large sand and gravel mining operations require a general permit for storm water runoff and smaller operations have been provided with guidelines for best management practices, in addition to the permit required of all sand and gravel operations. Federal regulations recently adopted by Missouri reduce the size of disturbed ground requiring a storm water permit from five acres to one acre. Storm water runoff discharge permits are now issued for construction sites and other areas with more than one acre of disturbed ground.

Point Source Pollution

This term refers to pollution that comes from a single point, such as a pipe. The number of miles of streams that are impaired, or that fail to meet water quality standards, because of wastewater discharges has generally held steady since 1984, when statewide data on stream quality first became available. In 1984, 105 miles of classified streams were judged to be impaired by domestic or industrial waste waters. The lowest estimate of this type of pollution was 42 miles in 1996.

Since then, estimates have increased, in part due to expansion and improvements in Missouri's water quality monitoring activities that have allowed more accurate estimates of water quality statewide. Estimates also increased due to changing perception and attention to listing waters with problems. Both of these allow better focus on these waters, but neither actually indicates a change in the quality of the resource itself.

Protecting Our Water: Challenges

- Iowa, Michigan and Wisconsin have a private well construction compliance rate of more than 90 percent; Missouri's compliance rate is estimated to be about 67 percent of private wells.
- Soil erosion resulting in sedimentation in our water resources and loss of productivity for our land resources affects 35 percent of Missouri's streams.
- Mercury pollution from power plants, medical and hazardous waste incineration, cement kilns and dental waste, continues to pose a particularly significant threat, making its way into Missouri's rivers and streams.
- Establishing accurate Total Maximum Daily Loads, or TMDLs, for Missouri's water bodies is more important than ever. A TMDL is a calculation of the amount of a pollutant or nutrient, if any, a body of water can receive and still support a wide variety of uses.
- Establishing TMDLs for bodies of water helps those working to protect them to determine the most effective course of action.
- As the number of people using Missouri's highways grows, the need to construct new highways and maintain current ones in a manner that is environmentally sound grows too. The Missouri departments of Transportation and Natural Resources have established a partnership to help ensure that Missouri's transportation system continues to thrive, while minimizing its impact on our natural resources.
- With Missouri communities growing, it's critical that we have an effective storm water protection program. However, a lack of financial resources threatens this program.
- Missouri currently has a very high number of communities whose drinking water does not need treatment due to the high quality of their groundwater resources. Maintaining the quality of groundwater resources in these communities requires ongoing vigilance.

303d List

Not all of Missouri's waters are high quality, or even the minimum quality required by regulation. Some waters do not meet the state's water quality standards. Subsets of those waters are listed on the Missouri 303(d) List. This list identifies many sources of water pollution, including wastewater treatment plants, quarries, agricultural runoff, urban runoff and abandoned mine lands, among others. Missouri has many examples of activities that were done in a way that protected water quality. The remaining challenge is to ensure that all activities are done in a way that will protect water quality and that those waters not meeting water quality standards are restored.

Mercury pollution continues to pose a growing threat to Missouri's waterways. The Missouri Department of Natural Resources recently analyzed largemouth bass mercury tissue data from several rivers, lakes and streams. If the data showed an average tissue (fillet, not whole fish) concentration of 0.300 mg/kg or greater, that water was placed on the 303(d)list. The department continues to work with power plants and others seeking permits in Missouri to reduce mercury pollution.

Animal Waste

There are about 400 Concentrated Animal Feeding Operations (CAFOs) in Missouri. These facilities generate large amounts of animal manure and have the potential to cause serious water pollution problems. Concerns center on the cumulative effects of numerous small animal production facilities in an area as well as the potential for contamination from large facilities.

The department continues to require CAFOs to obtain a National Pollutant Discharge Elimination System permit. Water quality is protected through the department's permitting and enforcement program. The department also has established a partnership with the University of Missouri and the Natural Resources Conservation Service to educate and inform producers in proper manure handling. Finding ways to safely use animal waste, particularly poultry litter, will continue to be among the

state's top priorities, especially in southwest Missouri where improper handling or disposal of poultry litter can impair the region's rivers, lakes and streams.

Mining

Abandoned lead-zinc and coal mines continue to impair waters decades after mining has ceased. A tax on coal has funded efforts to clean up coal-mined lands nationwide. This tax, collected at the federal level, is scheduled to expire in 2004 if not renewed. Fourteen years of this and other programs in Missouri have reduced the number of stream miles impaired by acid mine drainage from about 100 to 15, but long-term effects most likely will remain. The department's Geological Survey and Resource Assessment Division is conducting an inventory of several thousand lead, zinc and barite mines to assist in prioritizing future sites for mined-land cleanups.

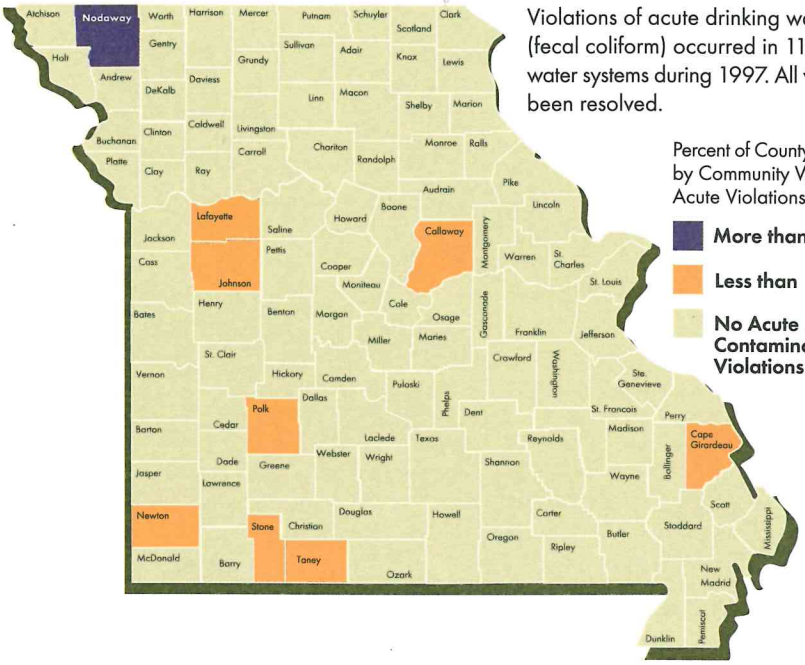
Due to budget reductions in fiscal year 2004, the U.S. Interior's Office of Surface Mining now enforces much of the Missouri Coal Regulatory Program. This office reviews and issues all new permits, revisions and renewals; determines performance bond amounts and makes decisions on requests for bond release; conducts inspections of all coal mining and reclamation operations; and cites violations when necessary. The Department of Natural Resources continues to inspect and reclaim mine sites if the operator's permit has been revoked, and reclamation must still be completed with bonds forfeited by the revoked company.

Missouri currently has more than 19,500 acres of coal mine land, both active and forfeited, that require monthly inspections.

Soil Erosion

The number one pollutant, by a very wide margin, entering Missouri's waters is soil. As soil is washed from the land, it takes other pollutants, such as pesticides and fertilizers, with it. Water washing over the land or through the soil can also carry dissolved chemi-

Community Water Systems with Acute Violations

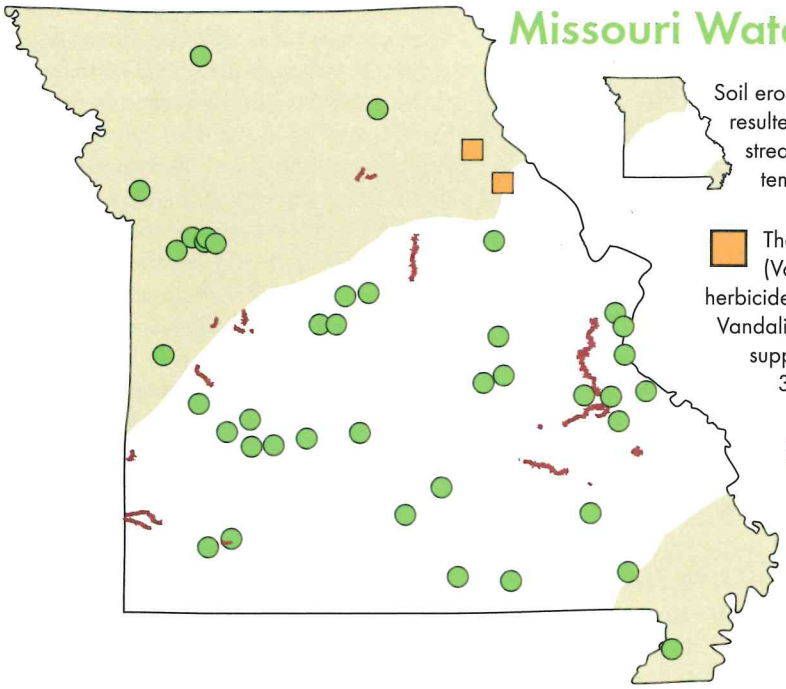


Violations of acute drinking water standards (fecal coliform) occurred in 11 community water systems during 1997. All violations have been resolved.

Percent of County Population Served by Community Water Systems With Acute Violations

- **More than 5%**
- **Less than 1%**
- **No Acute Maximum Contaminant Level Violations**

Missouri Water Quality Problems at a Glance

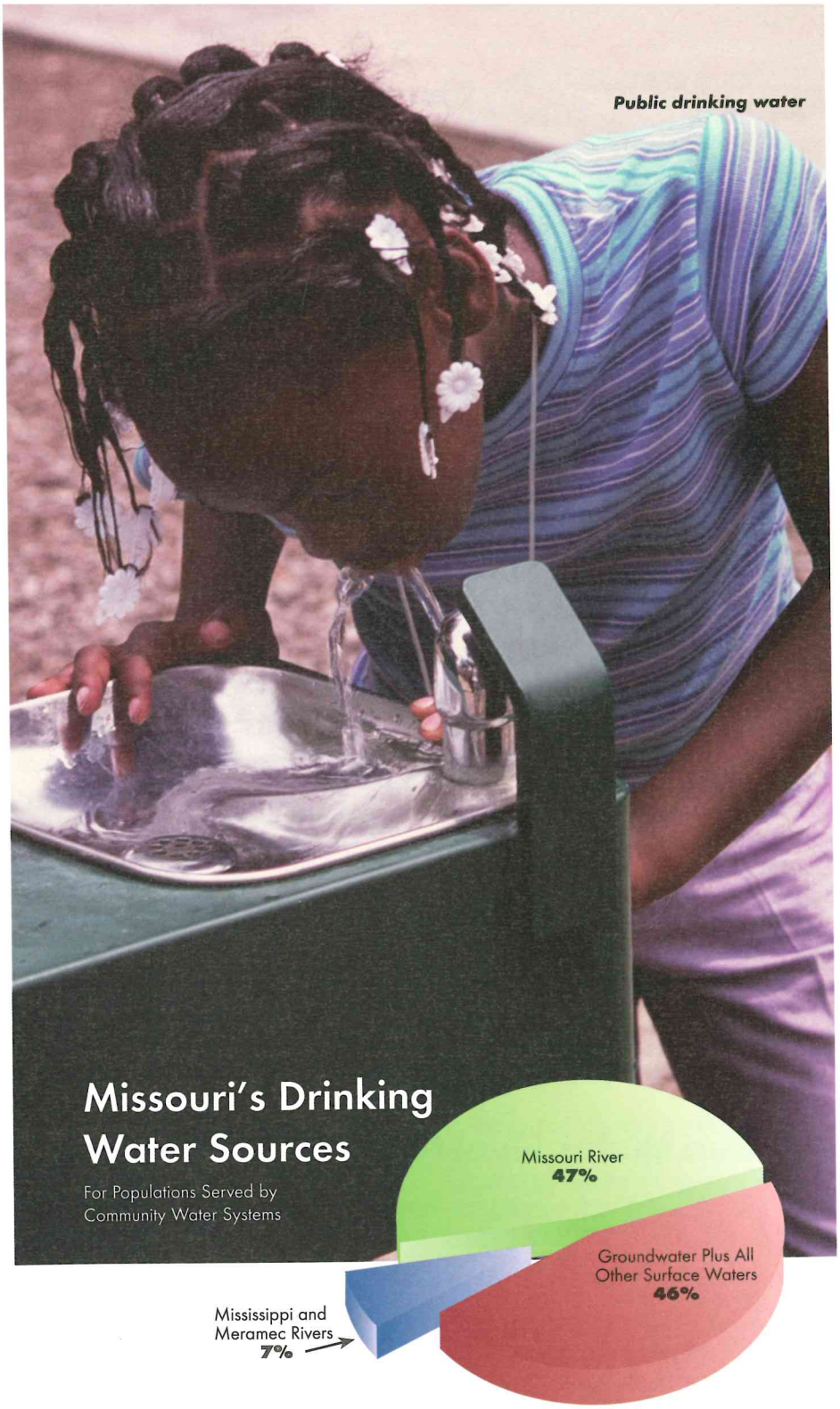


Soil erosion, stream channelization and removal of riparian tree cover have resulted in wider, shallower streams with fewer pools, more heavily eroding streambanks, fine, unstable bottom sediments (silt and sand), higher water temperatures and lower levels of dissolved oxygen.

There are four lakes that are classified for public drinking water supply (Vandalia, LaBelle No. 2, Monroe City Rte. J, Lewistown) with long-term herbicide levels in excess of state water quality standards. Of these, only Vandalia and Monroe City Rte. J are still using these lakes for drinking water supply. The estimated population served by these two reservoirs is about 3,900 people.

Forty municipal wastewater plant discharges cause such problems as sludge deposits, excessive algae growth, high levels of ammonia and low-dissolved oxygen levels in 2 miles of steams.

A total of 174 miles of stream are adversely affected by lead mining and by coal mining.



cals all the way to the Gulf of Mexico. By keeping soil and water that contain agricultural chemicals from entering Missouri's streams, rivers, lakes and water supply reservoirs, we can protect the quality of Missouri's water.

Currently the rate of soil erosion in Missouri is 5.6 tons per acre per year. Soil erosion is above acceptable levels on 5 million acres.

To reach our goal of 95 percent of Missouri's agricultural land eroding at tolerable levels or less, we need to reduce erosion on 3.7 million acres. We now must maintain our current savings while also reaching those acres that have been more difficult to address.

The Soil and Water Districts Commission, in its "Plan for the Future," has responded to the growing need to address the water quality issues within the soil and water conservation equation. Agriculture is totally dependent upon water and in turn affects the quality and quantity of water leaving agricultural land. Conservation practices lead to greater water infiltration and less runoff and erosion. Conservation practices hold water in the upland and release it more slowly into the watershed, increasing soil moisture, helping to grow crops and lessening downstream impacts such as flooding, sedimentation and agricultural chemicals in the water.

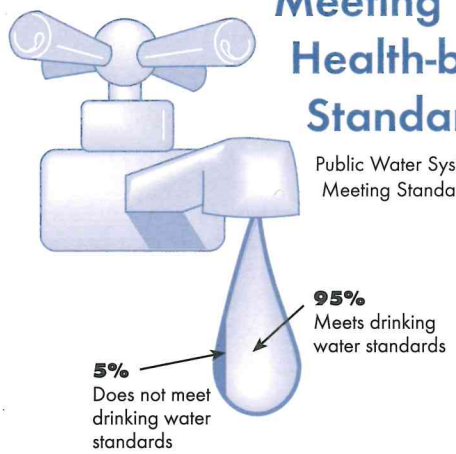
Channelization degrades aquatic life in 17 percent of Missouri's streams. Large channelization projects affecting many miles of streams are no longer occurring, but many short projects continue to reduce the number of miles of natural stream channels that occur across the state. Streams channelized many years ago provide poor aquatic habitat and add to flooding, high water velocities and streambank erosion.

Groundwater

About 44 percent of Missouri's population rely on groundwater as their source of drinking water. While most public drinking water supply wells and many private wells are deep, properly cased and properly grouted, some older, inferior quality private wells are shallow, not properly cased, nor properly grouted. More than 8,000 new wells are drilled each year in Missouri; however, the department estimates that less than 70 percent of these wells are properly certified, and more than 300,000 abandoned wells remain unplugged in our state. Septic tanks, feedlots or even chemical handling sites located near the wells can easily contaminate them. By properly constructing and maintaining wells and encouraging aquifer protection, we ensure safe drinking water for future generations and protect the groundwater resource.

Missouri's aquifers contain an estimated 500 trillion gallons of fresh water. Despite this tremendous resource, groundwater overuse in some areas has caused groundwater levels locally to decline tremendously. The levels in Noel, located in McDonald County, have dropped as much as 400 feet in the past 40 years. Parts of Springfield and the Joplin/Webb

Drinking Water Meeting Health-based Standards



City/Carthage areas experience seasonal problems as well. Fortunately, most areas of the state have experienced much less groundwater-level change.

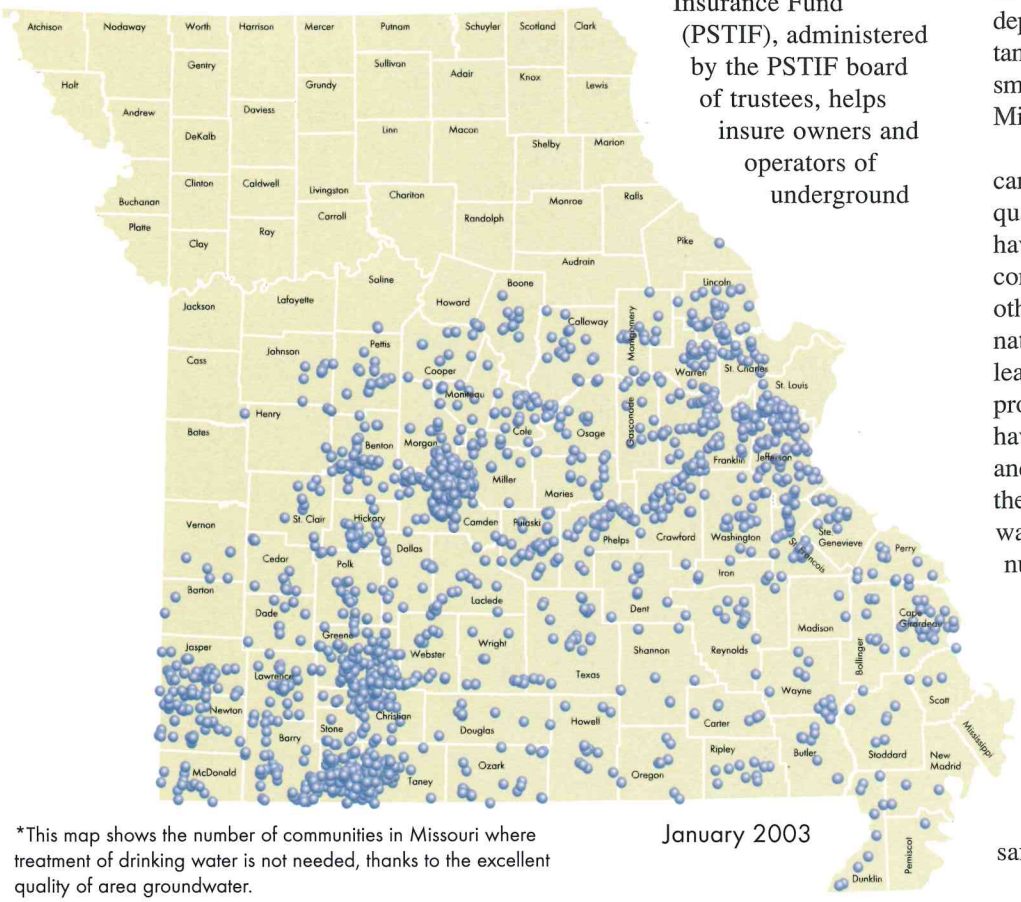
Underground tanks used to store petroleum also have posed a threat to Missouri water quality in the past. In 1984, the federal Resource Conservation and Recovery Act established a regulatory program for underground storage tanks. Missouri now has in place programs that register and inspect underground storage tanks and oversee the cleanup of leaking underground tank sites.

During fiscal year 2004 the department issued Missouri Risk-Based Corrective Action for Tank Sites, its first major revision to the petroleum cleanup guidance in more than 12 years. The new guidance provides greater flexibility and more tools for tank owners to clean up sites in accordance with the reasonably anticipated future use of the property. The new guidance is expected to streamline the cleanup process and save state cleanup dollars for use at more sites.

The Missouri Petroleum Storage Tank Insurance Fund (PSTIF), administered by the PSTIF board of trustees, helps insure owners and operators of underground storage tanks so that they will have the financial resources necessary to pay for leaks or spills from their tanks should they occur. Since 1992, the fund has insured more than 3,200 underground storage tank sites and 10,000 tanks.

There also is increasing evidence that groundwater quality is being threatened by our daily activities. Preliminary investigations by the Centers for Disease Control and the U.S. Environmental Protection Agency indicate that illnesses related to drinking water may be more prevalent than previously assumed. Some scientists indicate that as many as 25 percent of public wells in the United States – thought to be producing safe water – may be contaminated with viruses.

Public Drinking Water Wells Not Requiring Treatment*



*This map shows the number of communities in Missouri where treatment of drinking water is not needed, thanks to the excellent quality of area groundwater.

January 2003

Drinking Water

About 87 percent of Missourians are served by community water systems. The other 13 percent use domestic wells. In 2003, 95 percent of community water systems met health-based standards, though 120 systems did not. These public water systems typically are non-community systems and serve a small percentage of Missouri's population. The department will be focusing both assistance and compliance efforts on these smaller systems to ensure that all Missouri citizens drink water that is safe.

Our overall high compliance rate can largely be attributed to our good quality groundwater. Missouri does not have some of the naturally occurring contaminants like arsenic that challenge other states. Most of our water is not naturally corrosive so issues related to lead and copper pipe that have created problems in other parts of the country have not been a problem here. Nitrates and pesticides are not yet getting into the deep groundwater used by public water systems. Our large rivers and a number of reservoirs are the resources that serve our major population centers. While the pesticide atrazine was a problem at about a dozen surface water systems in the mid-1990s, effective treatment and good source water protection has eliminated the problem.

One of the biggest obstacles to safe drinking water in Missouri is a

(continued on page 8)

Universities Work Together to Protect Missouri's Water Quality

University researchers play an important role in the state's water protection efforts. Scientists with the University of Missouri-Columbia (MU) – home of the Tigers, and scientists with Southwest Missouri State University (SMSU) – home of the Bears, are studying Table Rock Lake. Armed with a better understanding of how the lake functions, the information learned from these studies may help reduce pollution on the lake.

The Department of Natural Resources funded an MU hydrologic study in 2002. Researchers examined how water mixes and moves through the lake. They discovered that during winter, when the lake water is cold, runoff into the lake tends to mix with the surface waters. During summer, the opposite is true; stream inflows tend to plunge below the warm surface waters.

The dynamics of how inflows mix into the lake are important because these inflows often carry pollution. This pollution includes phosphorus and nitrogen, which contribute to the growth of algae. Increased algae growth decreases water clarity and may cause taste and odor problems. Nutrients that enter the lake below the surface layer do not immediately affect the lake in terms of increased growth of algae but, over time, may cause problems as nutrient concentrations increase within the lake. Understanding inflows will improve our ability to monitor for changes in pollution.

Researchers at SMSU are examining the relationship between algae and zooplankton grazers in the James River arm of Table Rock Lake. These researchers are looking at the abundance and composition of algae and zooplankton, small animals that eat algae and serve as food for larvae fish, and how each changes with the seasons. Knowing what types of algae are in the lake is important; some groups are known to produce nuisance blooms and taste and odor problems.

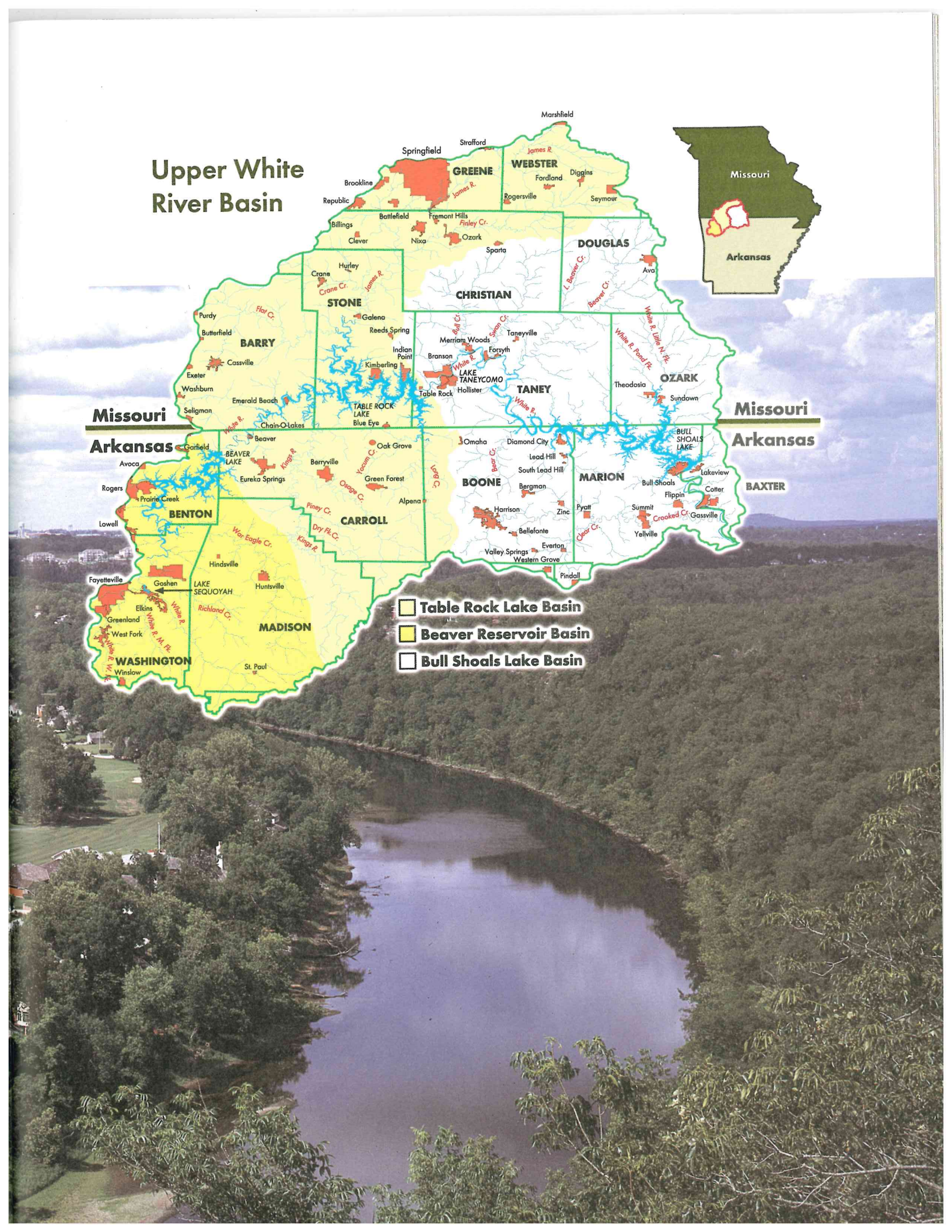
The hearty appetite of zooplankton for algae may actually help improve water clarity in the lake, especially during periods when these beneficial zooplankton are abundant. Continuing to study the complex relationship between algae, zooplankton and fish will help researchers to better understand the responses of lakes to nutrient pollution.

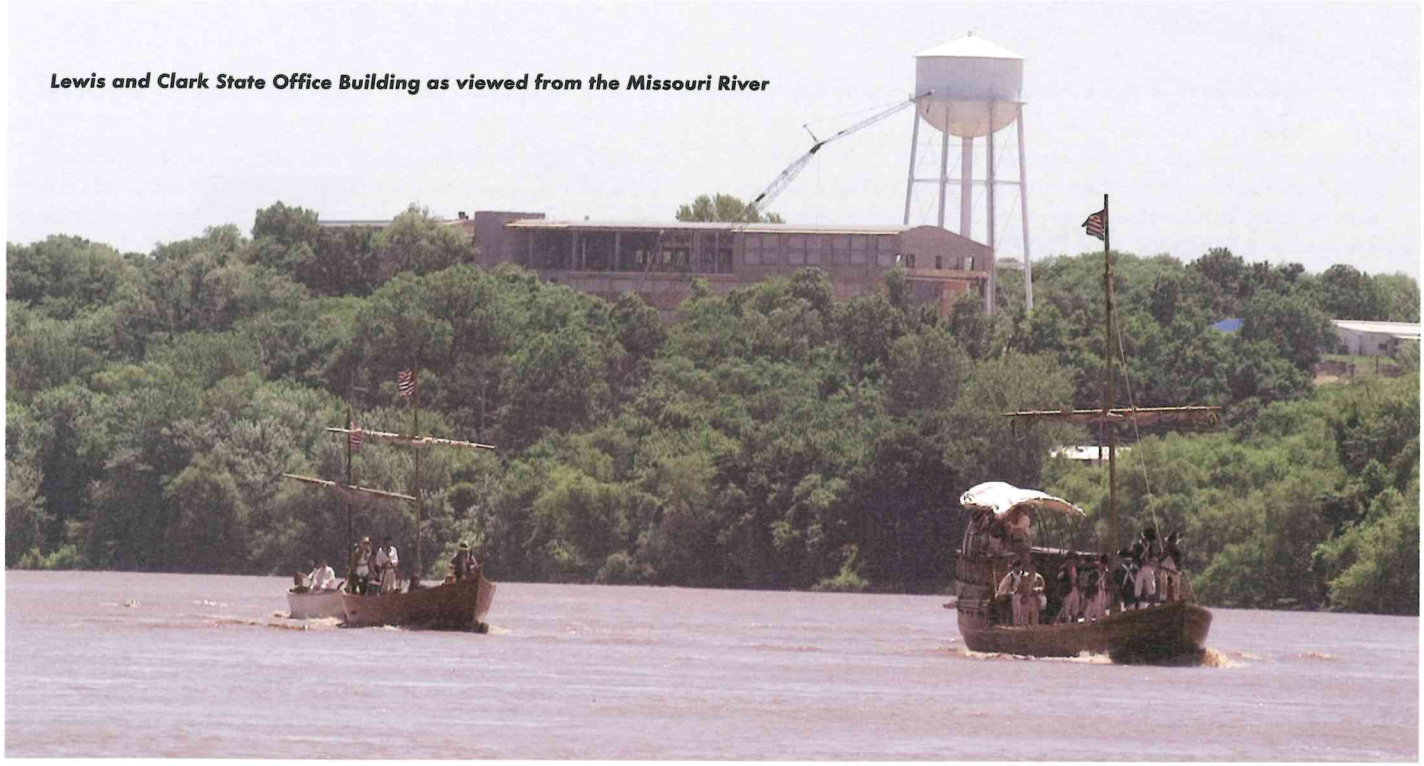
"I have long been interested in lakes and in the feeding interactions between species living in them," said John Havel, professor of biology at SMSU. "Lakes are dynamic systems and rapidly change over time, as do reservoirs like Table Rock Lake."

Tourists from around the world come to the Ozarks to enjoy the recreational, educational and entertainment opportunities in the area. That, in turn, generates millions of dollars for southwest Missouri's economy, so there is a clear financial interest in protecting these resources. The entire state benefits when Tigers and Bears study the environment.

Branson on Lake Taneycomo

Upper White River Basin





Lewis and Clark State Office Building as viewed from the Missouri River

simple lack of funding. Missouri communities are facing a lack of funding for maintaining and updating treatment facilities. The strain placed on many communities' public infrastructure has continued to grow, while financial resources have shrunk in recent years. Missouri communities have received more than $1 billion in financial assistance to construct and improve these drinking water and wastewater facilities through the State Revolving Fund. More than 262 leveraged loans have been awarded to communities in these efforts. Through the Clean Water and Drinking Water SRF financing, Missouri communities have saved more than $400 million in interest compared to conventional, higher-interest rates of financing.

Aging infrastructure continues to pose a significant challenge to maintaining safe drinking water in Missouri. The U.S. Environmental Protection Agency estimates the 20-year need nationwide for drinking water transmission and distribution is $83.2 billion. Failing pipes compromise drinking water quality by allowing contaminants to enter the system, posing a serious health threat.

This need can be addressed through funding for improvements; modeling to identify problem areas; inspections for leakage, corrosion, and cross-connections; and facility improvement and asset management plans.

The development of small subdivisions also poses a risk to drinking water quality. Developers of some subdivisions plan their developments so that each drinking water source serves less than 15 connections or 25 people, thus avoiding regulation as a public drinking water system. The construction and operation of the water system and the quality of drinking water provided to the people living in those developments are not regulated, which may compromise public health. Also, if or when the subdivision grows to the point of meeting the definition of a public water system, the homeowners association or other responsible party – not the developer – become subject to the drinking water law and regulations and may be liable for costly repair of the system or treatment of the water.

There has been an added emphasis on the safety of our drinking water supply, particularly in the wake of the tragic events of Sept. 11, 2001.

Managing the Missouri River; Shared Resources

Missouri, the belt buckle of the nation, occupies a watershed by America's greatest river system, the Mississippi. The Mississippi, the Missouri and the White rivers bring into the state tremendous amounts of water providing countless benefits. The water in these rivers must be shared with 19 other states. Missouri is both an upstream as well as a downstream state, which conveys great privilege and heavy responsibility.

As a downstream state we vigorously defend our right to use a fair share of water that flows into Missouri or along its borders. This resource provides nearly half of the state's drinking water, supplies cooling water for many of the state's utilities, serves as a mode of transportation for agricultural commodities and provides recreation and tourism opportunities for Missouri citizens. However, massive water diversions that are being developed in upstream states, such as the Garrison Diversion in North Dakota, could divert water out of the Missouri River basin, thus diminishing water available to us.

The Department of Natural Resources supports the protection of endangered species and the natural habitat along the Missouri River; however, we believe that there are common sense ways to protect the species without adversely affecting the river's many other uses. Ongoing debate about federal management of the Missouri River main stem reservoirs, the largest reservoir system in the nation, also could diminish Missouri's beneficial uses of the Missouri River. At the same time, we are obligated to use the water wisely and efficiently, and return as much water as possible, in as good a condition as possible, for the use of our downstream neighbors.

Stream Teams: Working Together to Keep Our Streams Clean

As a child, how many of us recall the joy of squishing mud between our toes as we picked smooth pebbles out of our favorite stream? Each stone we found and every frog we discovered was a treasure.

The streams that had once been filled with nature's treasures now often are filled with society's trash and pollutants. However, thanks to Missouri Stream Teams, many of these streams are being restored to their former conditions. Missouri Stream Team is sponsored by the Conservation Federation of Missouri, the Missouri Department of Conservation and the Missouri Department of Natural Resources, but it's the working partnership of volunteer citizens that has made this program a success.

This group works to educate Missourians and conducts "hands-on" stewardship projects, such as litter control, streamside tree planting to prevent soil erosion and water quality monitoring. Finally, this group serves as advocates, speaking on behalf of the streams they have adopted in their own communities.

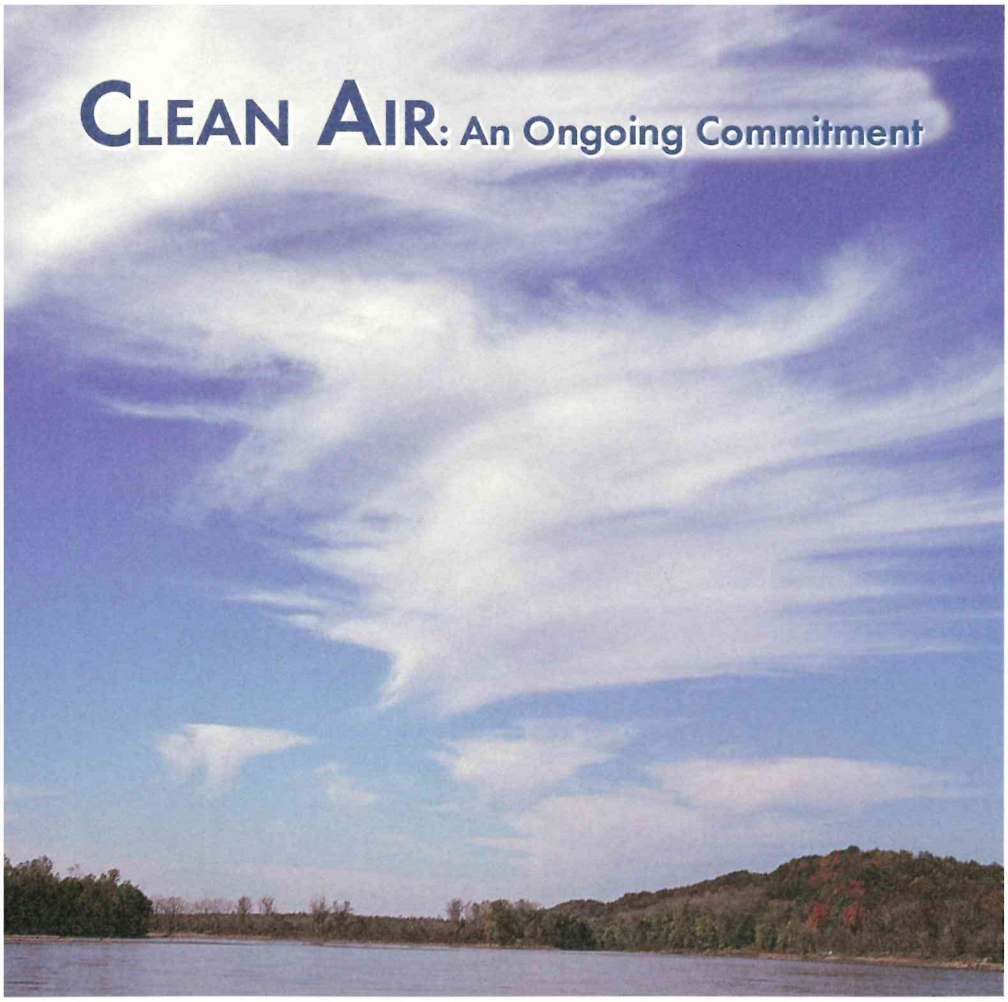
Cynthia Andre, an avid Stream Team volunteer, began monitoring water quality in Bull Creek in southwest Missouri as part of a small group of only three people. She became more active when she and her husband purchased land on the creek in 1995; the group of three has since grown to a team of between 20 and 30 volunteers.

"A Stream Team is a fun, hands-on way to learn about and protect a stream and a great way to interest others in the welfare of a stream," Andre said. "It can be a great activity for a group of friends or for a family and for teaching young children about the environment. The sponsoring agencies give you all the support, knowledge and tools you need to participate at whatever level you prefer, whether you just want to monitor the water quality or you want to become a serious voice for your stream in the state."

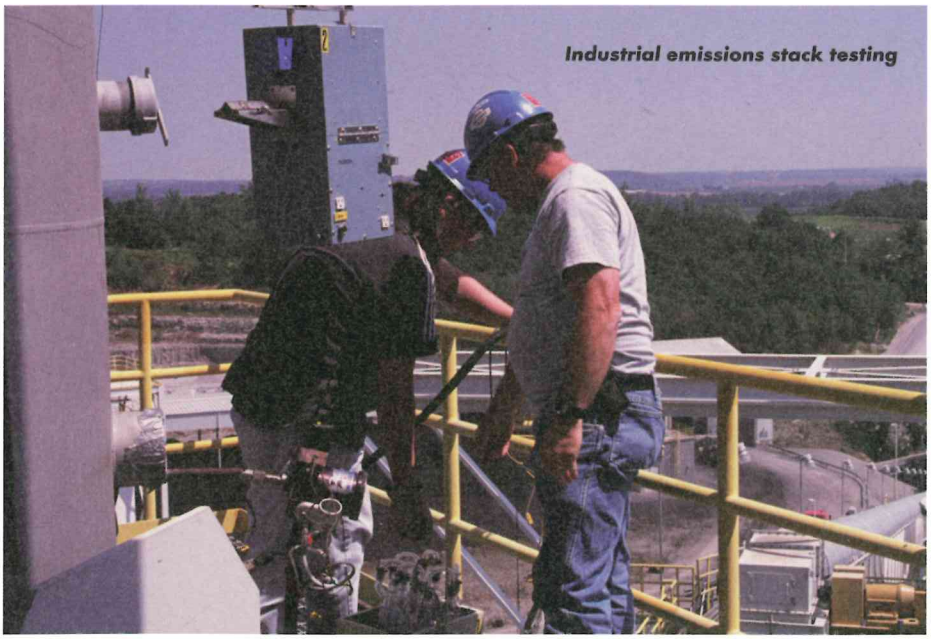
Missouri is home to 2,448 Stream Teams with about 45,000 members. A Stream Team can be found in nearly every county in the state. Stream Team organizers reported that in 2002, nearly 9,600 volunteers helped clean litter out of Missouri's streams, volunteering more than 40,000 hours of work and removing 590 tons of trash.

Anyone interested in supporting this effort can call 1-800-781-1989 to adopt a stream or participate in an already-established Stream Team. Thanks to the hard work and commitment of these teams of dedicated individuals, a visit to the local stream again turns up more treasures than trash.

CLEAN AIR: An Ongoing Commitment



While clean air sustains us and keeps us healthy, pollutants found in dirty air can trigger asthma attacks, worsen allergies, cause chest pain and irritate the upper respiratory system. The value of clean air is obvious. We judge air quality using the National Ambient (outdoor) Air Quality Standards established by the U.S. Environmental Protection Agency under the federal Clean Air Act. Ozone, fine particulate matter and lead have been the primary airborne pollutants of concern in Missouri.



Industrial emissions stack testing

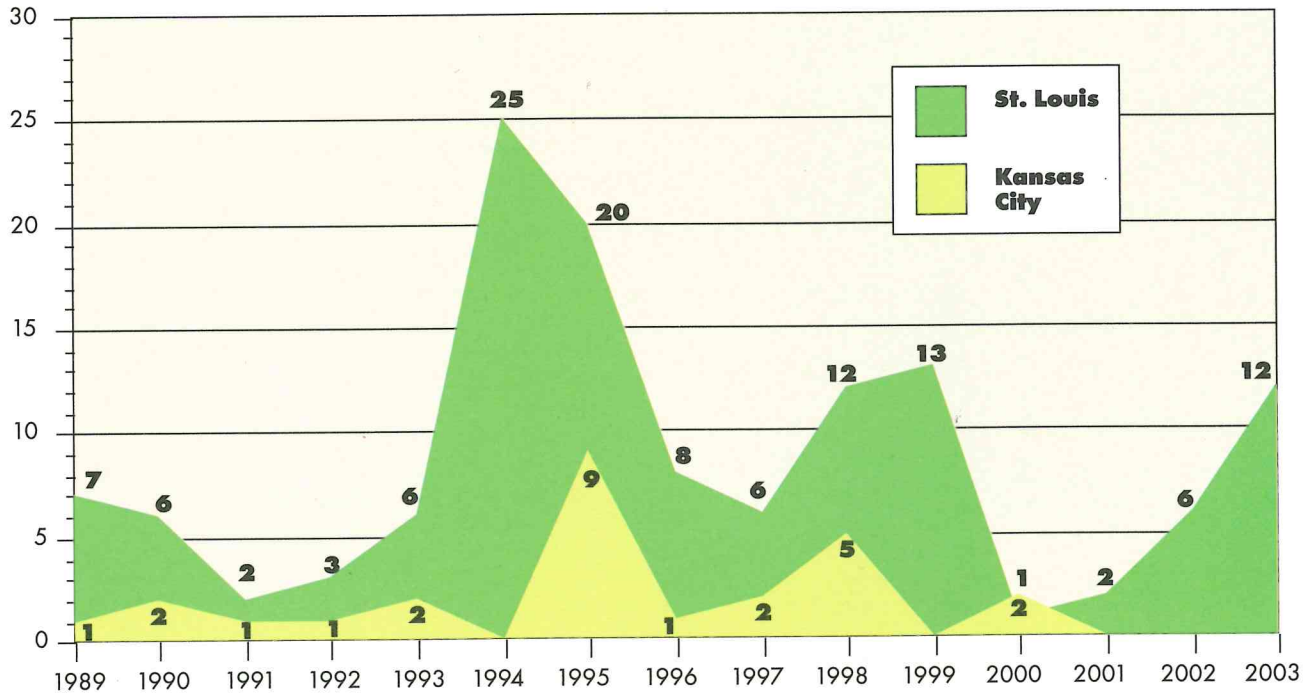
GROUND-LEVEL OZONE

Naturally occurring ozone in the upper atmosphere protects the earth from the sun's harmful rays. Ground-level ozone is an irritant that damages lung tissue and aggravates respiratory disease. This pollutant is the most harmful part of what we sometimes call "smog." Ozone is not directly emitted. It forms on hot, stagnant summer days as sunlight causes a reaction between nitrogen oxides and volatile organic compounds. Vehicles, power plants and industrial boilers are common sources of nitrogen oxides. Gasoline-powered vehicles and manufacturing operations are major sources of volatile organic compounds. Ozone causes throat irritation, congestion, chest pains, nausea and labored breathing as well as aggravation of existing lung or heart conditions, allergies and asthma. Ozone is harmful to plant life, forests and crops.

In Missouri, Kansas City and St. Louis face the greatest threat from ground-level ozone. Both communities have worked diligently to correct this problem. Kansas City remains in compliance with federal ozone standards thanks to the use of low vapor pressure gasoline; numerous controls on stationary industrial sources industrial controls for printers, surface coating operations and manufacturers; and voluntary efforts by residents, including commuting and taking the bus on days when ozone is likely to form.

The St. Louis region recently attained the one-hour ozone standard, so the U.S. EPA granted the department's request to redesignate the area to attainment. The number of days that the St. Louis area violated the standard has steadily declined. The trend in ozone precursors – volatile organic compounds and nitrogen oxides – has declined during the past decade as well. Cleaner burning reformulated gasoline, vapor recovery systems, industrial controls and education all have helped to show improvements in air quality. Voluntary efforts have been important in St. Louis as well. However, in April 2004, the U.S. EPA announced a new

Number of Days Ozone Exceeded Federal Standards in Kansas City and St. Louis



St. Louis vehicle emissions testing

stricter regulation for ozone, known as the eight-hour ozone standard. The St. Louis region is not in compliance with this new standard, and will likely face new, stricter regulations in the future. Due to favorable weather conditions in summer 2004, Kansas City will most likely be declared with the new attainment standard by the end of this year. However, Kansas City's attainment status may change in the future under typical summer conditions.

Gateway Clean Air Program

St. Louis's effort to meet the one-hour standard included an enhanced vehicle emissions testing

(continued on page 14)

Making Every Day A Green Day

For most Missourians, green simply means "go." To those living in St. Louis and Kansas City, the color green represents a coordinated community effort that has produced cleaner air.

In areas like St. Louis and Kansas City where ground-level ozone historically has been a problem, the U.S. EPA has created a color chart for determining the air quality each day during ozone season, similar to a weather forecast. The color green is used to designate days when air quality is clear and safe for area residents to breathe.

Efforts to make every day a green day in these communities are led largely by partnerships formed between local business leaders, government officials and non-profit organizations. In Kansas City, the Mid-America Regional Council leads these efforts. In St. Louis, the St. Louis Regional Clean Air Partnership provides air quality leadership.

These groups reflect diverse partners all working together to reach a common goal: cleaner air. SLRCAP'S Care About Clean Air program and MARC's Air Quality Public Education program alerts those living in the St. Louis and Kansas City regions when air quality may be poor. This information helps those with asthma, which can be triggered by ground-level ozone, better plan their days. It also reminds others that they can help keep air quality safe through voluntary efforts.

SLRCAP's Care About Clean Air program also rewards residents in St. Louis and surrounding communities for their efforts to keep the air clean. KMOV, a SLRCAP partner and a CBS affiliate, hosts a "Green Day Giveaway." On every green air quality forecast day during ozone season, KMOV randomly draws a name to win a "Green Day Giveaway" prize pack with prizes provided by several sponsors, including MetroLink/MetroBus, Citizens for Modern Transit, Schnucks, the St. Louis Science Center and Raging Rivers Water Park. In 2003, the grand prize was a Honda Hybrid automobile.

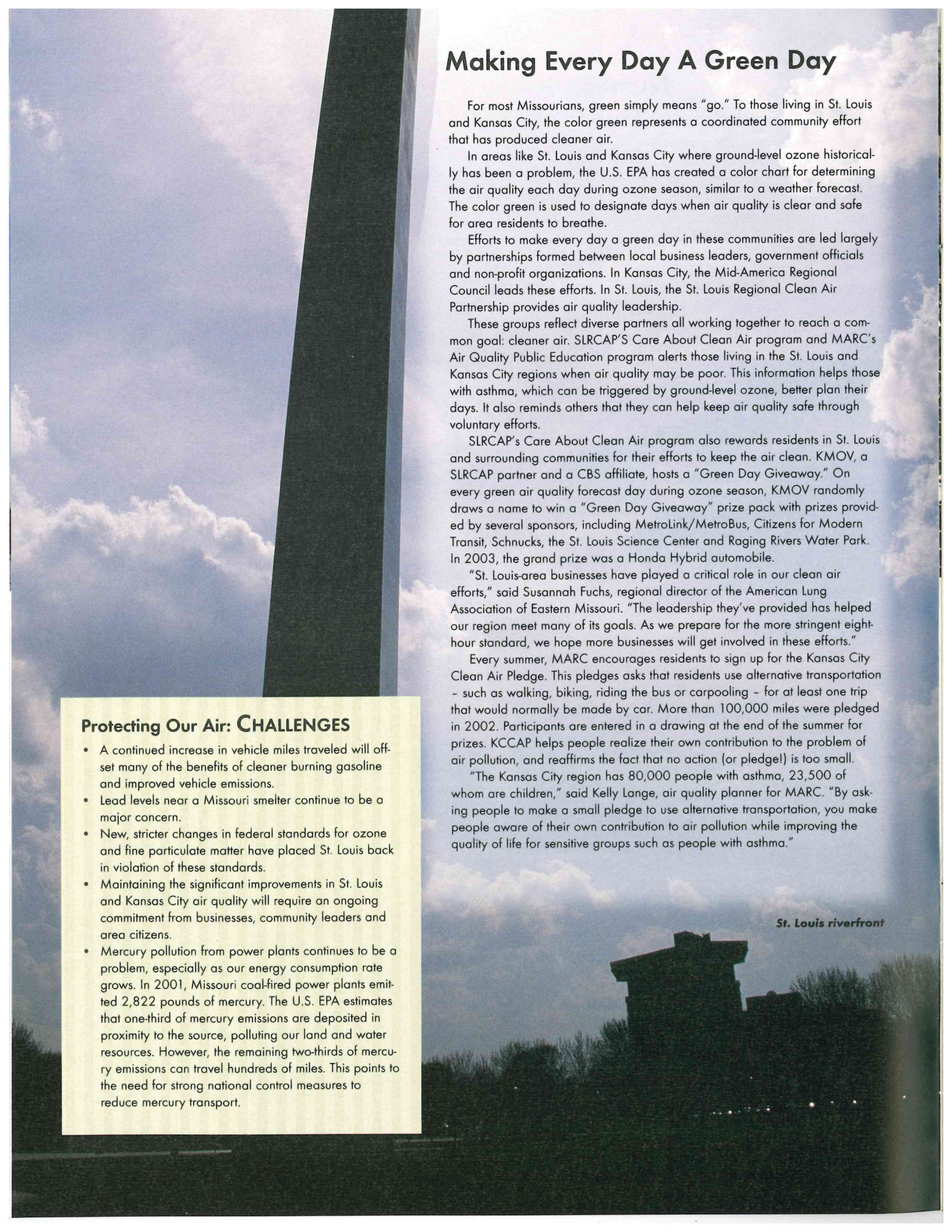
"St. Louis-area businesses have played a critical role in our clean air efforts," said Susannah Fuchs, regional director of the American Lung Association of Eastern Missouri. "The leadership they've provided has helped our region meet many of its goals. As we prepare for the more stringent eight-hour standard, we hope more businesses will get involved in these efforts."

Every summer, MARC encourages residents to sign up for the Kansas City Clean Air Pledge. This pledges asks that residents use alternative transportation - such as walking, biking, riding the bus or carpooling - for at least one trip that would normally be made by car. More than 100,000 miles were pledged in 2002. Participants are entered in a drawing at the end of the summer for prizes. KCCAP helps people realize their own contribution to the problem of air pollution, and reaffirms the fact that no action (or pledge!) is too small.

"The Kansas City region has 80,000 people with asthma, 23,500 of whom are children," said Kelly Lange, air quality planner for MARC. "By asking people to make a small pledge to use alternative transportation, you make people aware of their own contribution to air pollution while improving the quality of life for sensitive groups such as people with asthma."

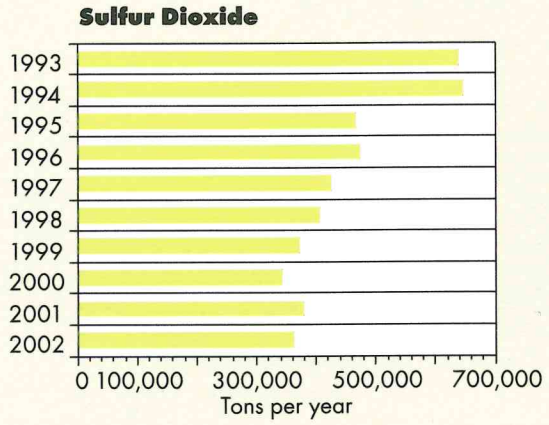
Protecting Our Air: CHALLENGES

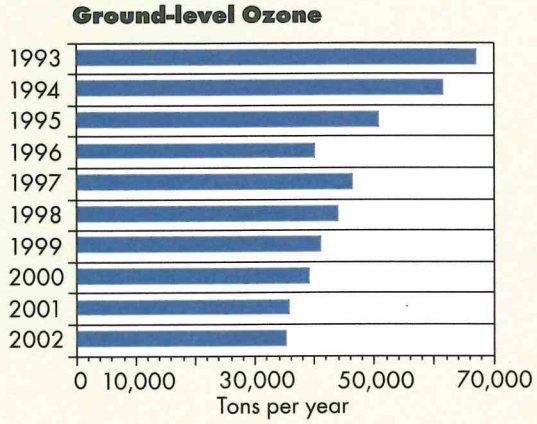
- A continued increase in vehicle miles traveled will offset many of the benefits of cleaner burning gasoline and improved vehicle emissions.
- Lead levels near a Missouri smelter continue to be a major concern.
- New, stricter changes in federal standards for ozone and fine particulate matter have placed St. Louis back in violation of these standards.
- Maintaining the significant improvements in St. Louis and Kansas City air quality will require an ongoing commitment from businesses, community leaders and area citizens.
- Mercury pollution from power plants continues to be a problem, especially as our energy consumption rate grows. In 2001, Missouri coal-fired power plants emitted 2,822 pounds of mercury. The U.S. EPA estimates that one-third of mercury emissions are deposited in proximity to the source, polluting our land and water resources. However, the remaining two-thirds of mercury emissions can travel hundreds of miles. This points to the need for strong national control measures to reduce mercury transport.

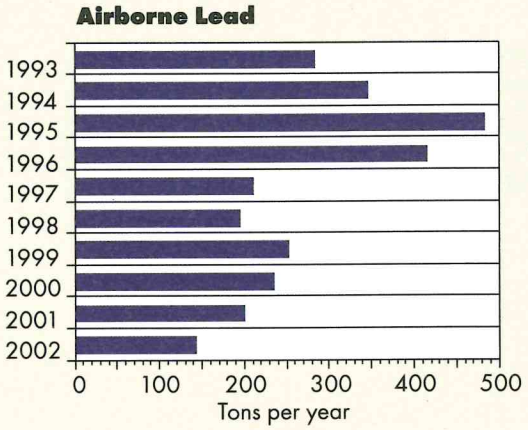


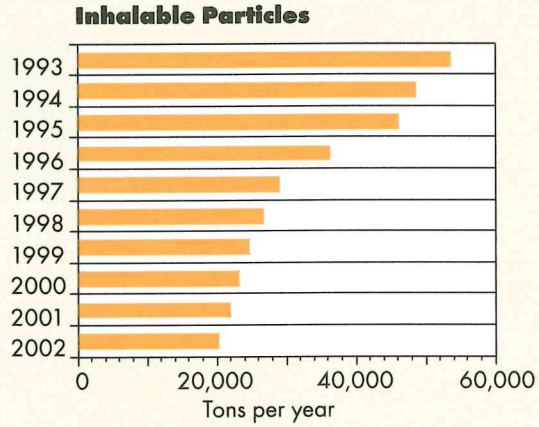
St. Louis riverfront

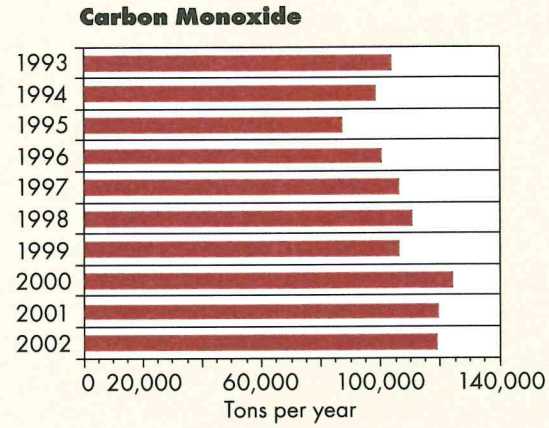
Air Emissions

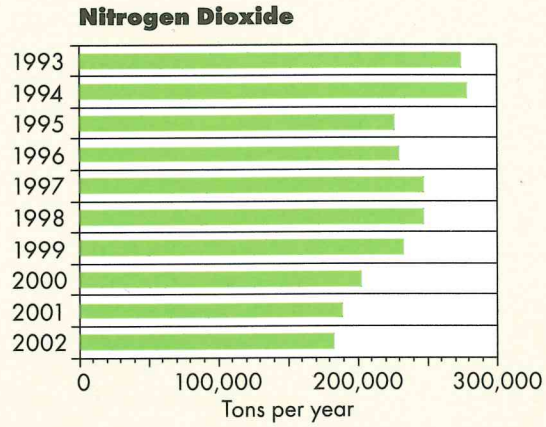












Sulfur Dioxide
Sulfur oxicles are produced by burning sulfur-containing fuels such as coal and oil, by smelting metals and by other industrial processes. Sulfur dioxide (SO_2) makes up about 95 percent of these gases.

Airborne Lead
In Missouri, airborne lead and its compounds are produced mainly by lead smelters.

Carbon Monoxide
Carbon Monoxide (CO) is a colorless, odorless, poisonous gas that forms when carbon in fuels is not burned completely. It is a byproduct of vehicle exhaust.

Ground-level Ozone
Ground-level ozone is a colorless gas that forms on hot summer days when sunlight causes a reaction between volatile organic compounds (VOCs) and nitrogen dioxide (NO_X). Vehicles, power plants and industrial boilers are common sources of nitrogen oxides. Gasoline-powered vehicles are a major source of VOCs.

Inhalable Particles
Inhalable particles include airborne dust, pollen, soot and aerosol sprays. Scientists sometimes refer to these as particulate matter.

Nitrogen Dioxide
Almost all nitrogen dioxide is man-made. If fuel is burned above 1,200 degrees Fahrenheit, airborne nitrogen forms highly reactive nitrogen oxides such as nitrogen dioxide. Principal sources are power plants, industrial boilers and vehicles.

program, the Gateway Clean Air Program, introduced in 2000. A portion of the St. Louis metropolitan area once had a history of exceeding the health-based standard for carbon monoxide. However, more recent air monitoring has shown continued reductions in carbon monoxide and hydrocarbons, in compliance with this standard. These reductions are primarily due to improved emission control systems in vehicles.

Airborne Lead

In Missouri, airborne lead and its compounds come primarily from lead smelters. Airborne lead poses the greatest danger to children age 6 and under. The federal air quality standard was established to protect public health. Low doses damage the central nervous system of children and unborn infants, causing seizures, mental retardation and behavioral disorders. In children and adults, increased blood-lead levels also cause fatigue, disturbed sleep, decreased fitness and damage to kidneys, liver and blood-forming organs.

Airborne lead falls to the ground and is deposited on buildings, roads and other surfaces. While the long-term trend in lead emissions in Missouri certainly is positive (see graphs on page 13), these emissions continue to be a health concern near Herculaneum.

The department collects daily samples from air monitors in Herculaneum. Although some of these monitors have recorded ambient lead concentrations more than 13 times the National Ambient Air Quality Standards in one day, federal standards require the data to be averaged over a calendar quarter. Through federal and state emission control plans, no quarterly violations had occurred between July 2002 through June 2004.

Today, high blood lead levels are due mostly to deteriorated lead paint in older homes and contaminated dust and soil. Nationally, average blood lead levels in children 6 years old and younger dropped from 16.5 micrograms per deciliter between 1976 and 1980 to 3.6 micrograms per deciliter between 1992 and 1994, a decline of 78 percent. The decline in average blood lead levels is due largely to federal efforts to phase lead out of gasoline between 1973 and 1995. Some decline also was due to legislation banning lead from paint and plumbing supplies.

Cleaning up Lead in Herculaneum

While the Glover and Bixby smelters have attained compliance with air standards, work at the Herculaneum smelter continues. In late August 2001, lead-bearing materials were discovered on the streets of Herculaneum, along the route that the Doe Run company uses to haul lead concentrate into the plant. The contamination decreased with distance from the plant. The lead likely fell off the tires and tailgates of trucks as they left and may have become airborne as vehicles drove over it.

The State of Missouri and the U.S. EPA ordered Doe Run to clean up the streets, and much of that work has been completed. The order also required Doe Run to inspect and clean the concentrate trucks before they left the plant. Additional state air monitors were installed to measure any potential impact that the street dust might be having on residents.

The Herculaneum smelter met the air standard for lead for the first time in the first quarter of 2002, although it is not currently at full production. Historical and ongoing releases of lead from these smelters will continue to be an area of concern.

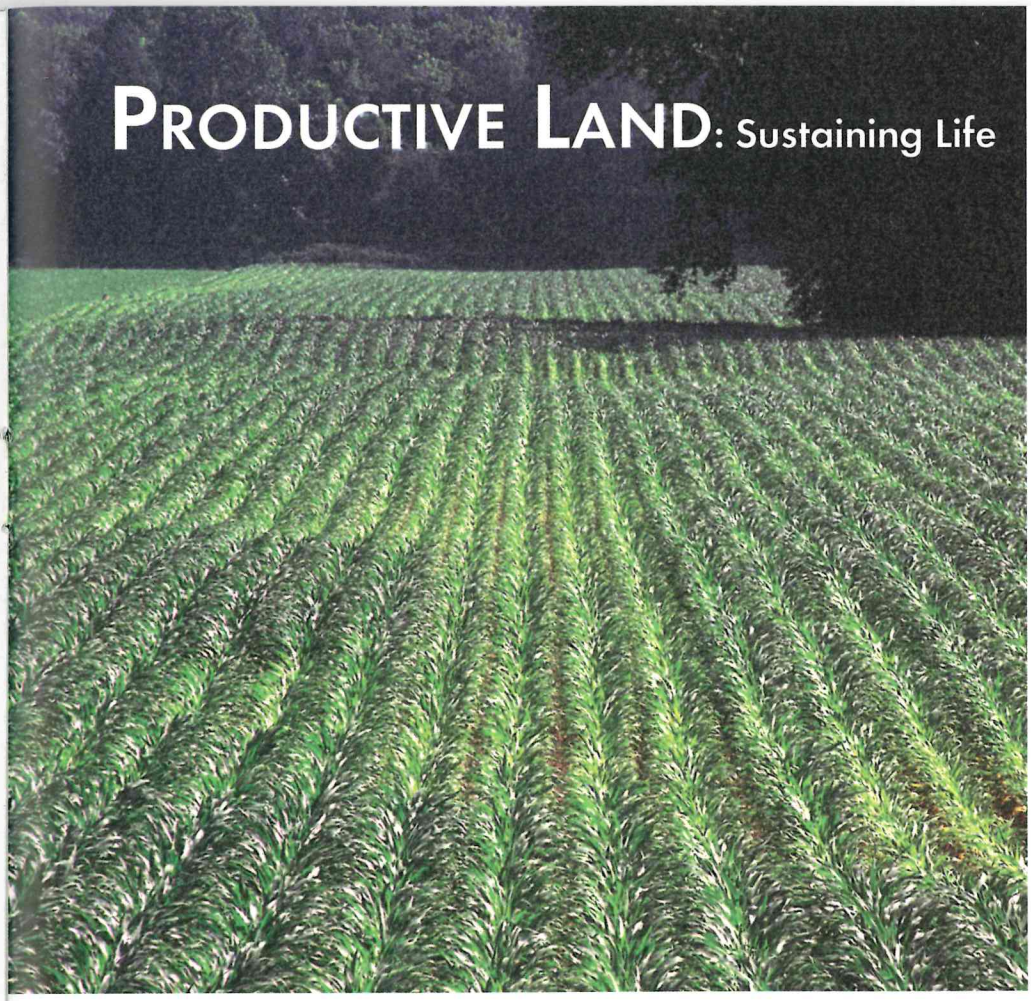
The State of Missouri also negotiated a buyout for homes nearest the smelter. This part of the agreement required Doe Run to offer to purchase homes within a defined area that contained approximately 160 homes. Offers were based on health risks and were made to homeowners with children less than 72 months of age in the home.

Carbon Monoxide

Carbon monoxide, formed by the incomplete combustion of fuel, is one of the most common pollutants. More than 75 percent of carbon monoxide emissions come from vehicle exhaust. Though deadly, carbon monoxide changes quickly into carbon dioxide, which is not dangerous but does contribute to the greenhouse effect.

A portion of the St. Louis metro area once had a history of exceeding the health-based standard for carbon monoxide. However, more recent air monitoring efforts have shown compliance with this standard. In 1999, the U.S. EPA formally recognized that the St. Louis area now meets standards for carbon monoxide. The rest of the state remains in compliance.

PRODUCTIVE LAND: Sustaining Life



Our land sustains us by producing the fruits, vegetables and grains necessary to nourish our bodies and the timber that provides us shelter. The crops our land produces also are an important source of income for many in Missouri's rural communities. Damaging our land by soil loss, polluting our soil or improperly disposing of solid and hazardous waste can have far-reaching consequences.

SOIL EROSION

About 59 million tons of soil erodes from Missouri's land each year. Much of that soil enters our waterways, clogging and filling streams, reservoirs and lakes. The severity of flooding is increased as these silt-laden waterways and reservoirs do not have the capacity to hold as much water. Thinner topsoil also decreases soil productivity. Less production means lost income to the landowner and higher prices for the consumer. Although soil erosion is a natural event, certain traditional farm tilling methods can accelerate erosion. This depletes the soil, requiring more use of fertilizers and pesticides and sometimes even rendering it useless. Our goal is to have 95 percent of Missouri's agricultural land protected so as to maintain its long-term productivity. With funding from the parks-and-soils sales tax, the department's Soil and Water Conservation Program has given approximately $372 million to 161,000 landowners for soil conservation efforts.

Because of its climate, topography and the types of soils common to the state, Missouri will continue to address significant erosion problems on acres dedicated to cultivated croplands. Since 1982, Missouri has reduced its rate of soil erosion more than any other state. Missouri once was second in the nation for its rate of soil erosion.

Much of this success can be attributed to the parks-and-soils tax. In 1984, 1988 and 1996, Missourians voted to support a one-tenth-of-one-percent sales tax that finances activities by the department's Soil and Water Conservation Program and the Missouri state park system. Funds are available to landowners to pay up to 75 percent of the cost of putting soil conservation practices on the land. This money will be lost unless the tax is renewed in 2008.

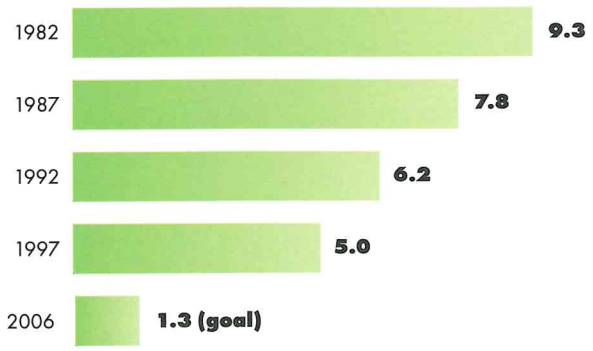
SOLID WASTE

Improper processing or disposal of solid waste can cause health and environmental problems such as groundwater and surface water pollution, air pollution and the transmission of disease. To prevent these problems, disposal facilities must meet stringent requirements for their design, operation and maintenance. Unfortunately, not everyone uses a permitted facility for disposal. Illegal dumping and other violations of the solid waste law make the enforcement arm of the Department of Natural Resources necessary. To enlist the help of local law enforcement agencies, the department has conducted Local Environmental Enforcement Program workshops across Missouri.

Ensuring proper disposal practices is just one challenge. By preventing, reusing, recycling or composting waste, we can save energy, raw materials and landfill space. The department has also saved businesses, individuals and nonprofit groups money by providing waste reduction and recycling grants. The

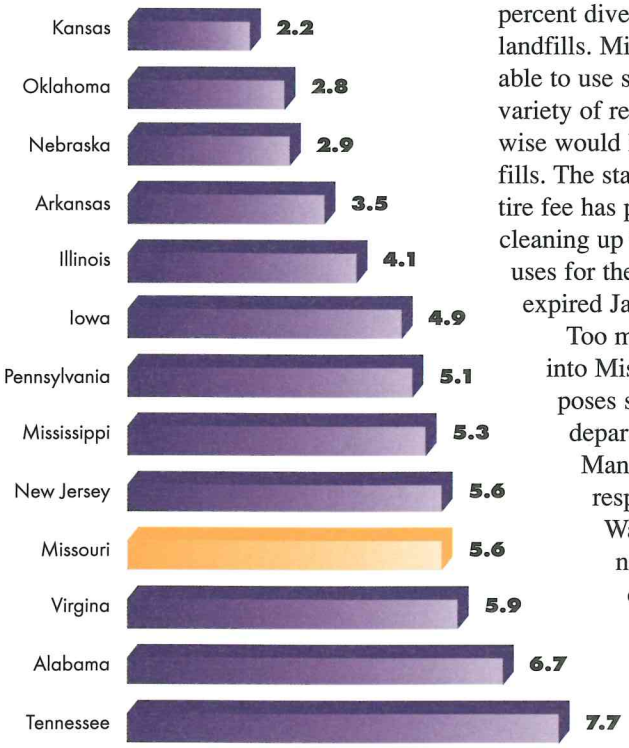
Agricultural Acres Eroding Above Acceptable Levels

(in millions of acres)



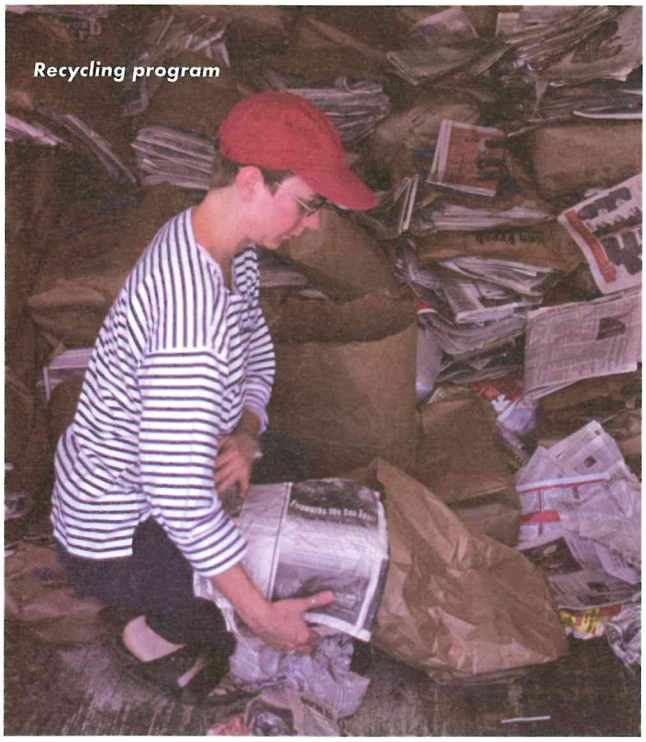
Total acreage in Missouri = 44.6 million
Agricultural acreage in Missouri = 26.2 million

Rates of Erosion



Rates of Erosion in tons/acre/year

department's Solid Waste Management Program and the Environmental Improvement and Energy Resources Authority have awarded more than 500 grants in the past 11 years totaling more than $33 million.



Recycling program

By focusing on alternatives to disposal, Missourians have achieved a 45 percent diversion of solid waste from landfills. Missouri companies have been able to use solid waste resources for a variety of recycled products that otherwise would have been buried in landfills. The state's 50-cent-per-tire waste tire fee has played a significant role in cleaning up waste tires and finding new uses for them. Unfortunately, this fee expired Jan. 1, 2004.

Too much is still making its way into Missouri's landfills, and this poses several challenges. The department's Solid Waste Management Program has the responsibility under the Solid Waste Law to provide engineering oversight and conduct inspections and enforcement for Missouri's 33 landfills and 53 transfer stations. Transfer stations are solid waste processing facilities, usually enclosed, where local, short-haul trash collection trucks bring their loads. The trash is consolidated and then taken to a regional landfill. The department's responsibility also extends to hundreds of old, abandoned landfills scattered across Missouri. These pose a real risk to human health and the environment due to uncontrolled gas migration and groundwater contamination. A cleanup fund is necessary to address this threat.

The siting of solid waste facilities such as landfills and transfer stations has become increasingly difficult and controversial. Everyone is able to generate a ton of trash per year but few want a landfill or transfer station nearby. As a consequence, many localities have zoned landfills and transfer stations beyond their borders.

Hazardous Waste

More than 70,000 chemicals are used regularly around the world. That's a pretty staggering number when you consider the potential health consequences associated with many of these chemicals. Hazardous waste most often is a byproduct (materials left after products are made). Some hazardous wastes also come from our homes, including items such as old batteries, bug spray cans and paint thinner.

Much of Missouri's hazardous waste is recycled, energy recovered or reused in some manner. The single largest hazardous waste generator in the state, an agricultural chemical manufacturer in Palmyra, incinerates its waste on-site.

Ideally, we should minimize hazardous waste and reuse, recycle and implement energy recovery for as much of what's created as possible. When these options aren't viable, hazardous waste should be safely contained until properly disposed.

Safe storage, reuse, recycling and energy recovery from hazardous waste continues to be a concern, as some operations may not be able to carry out these duties without creating risks to themselves, the environment and the general public.

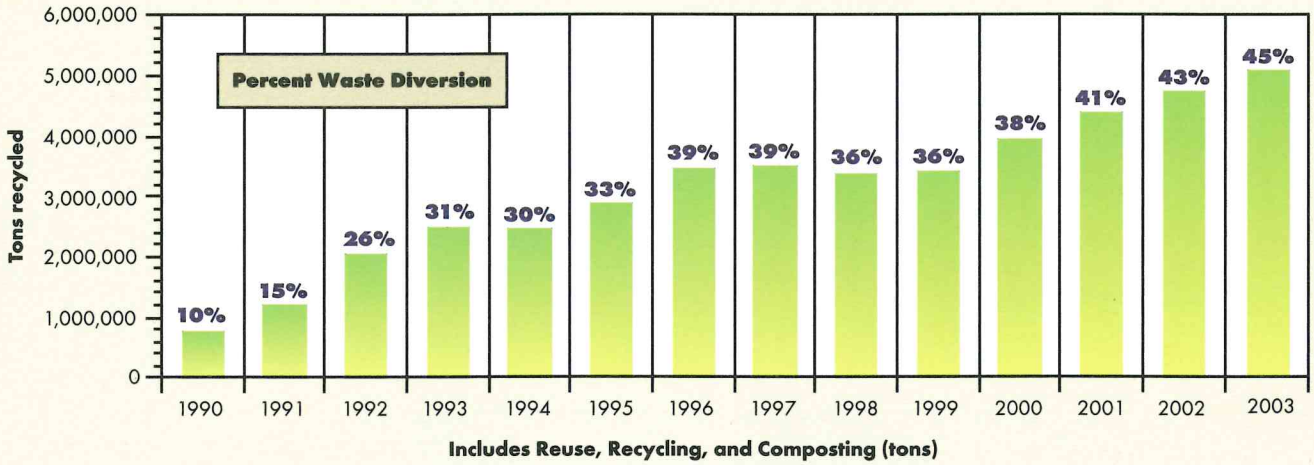
Of particular concern is preventing these substances from being used in potential terrorist attacks. The Department of Natural Resources continues to work with the organizations responsible for storing and transporting hazardous waste to ensure that it is done safely and responsibly.

Brownfields

Brownfields are sites where redevelopment and reuse is hampered by known or suspected contamination with hazardous substances. While many brownfield sites are minimally contaminated, potential environmental liability can be a problem for owners, operators, prospective buyers and financial institutions. Because of the large number of these sites, their economic impact, especially in heavily industrial areas, is substantial.

The department's Brownfields/Voluntary Cleanup Program can help resolve these issues so redevelopment and reuse can proceed. The B/VCP pro-

Waste Generated and Waste Diverted From Missouri Landfills

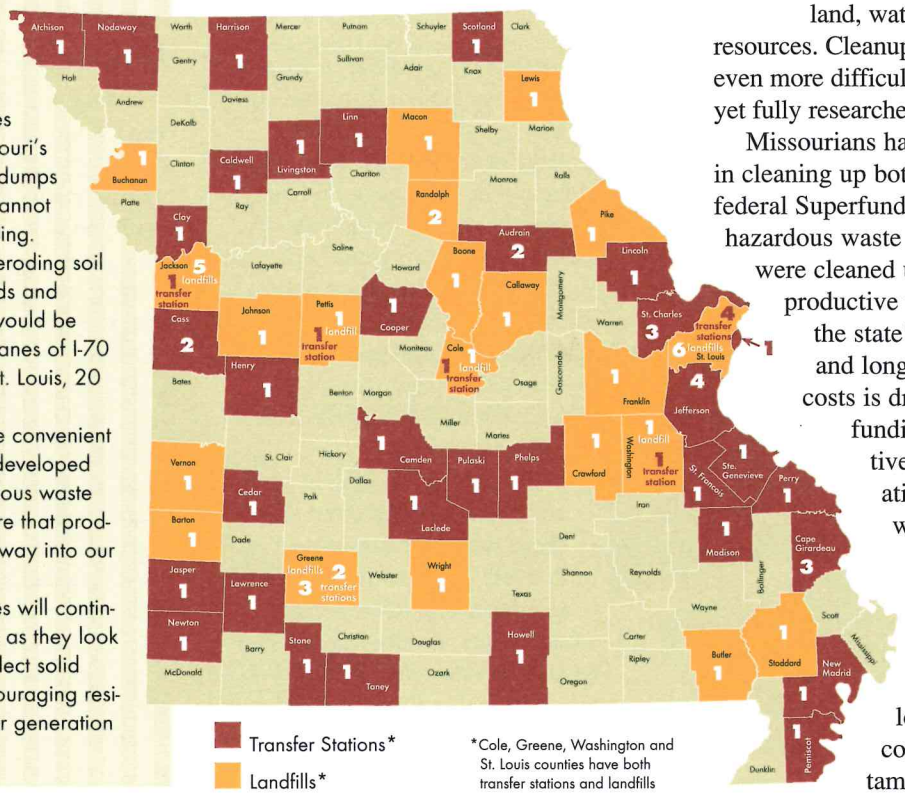


Protecting Our Land: Challenges

- To reach our goal of 95 percent of Missouri's agricultural land eroding at tolerable levels of soil erosion or less, we need to reduce erosion on 3.7 million acres.
- Thousands of new chemicals are created annually with little known about their impact on the environment.
- Reimbursement for community tire cleanups was funded from the state's 50-cent-per-tire waste tire fee. However, the waste tire fee expired Jan. 1, 2004. There will remain 3.4 million tires scattered across Missouri's landscapes in illegal dumps that the department cannot clean up without funding.
- One year's worth of eroding soil from the ditches, ponds and streams that catch it would be enough to bury four lanes of I-70 from Kansas City to St. Louis, 20 feet deep.
- Better, safer and more convenient methods need to be developed for household hazardous waste disposal to help ensure that products don't make their way into our water resources.
- Missouri's communities will continue to face challenges as they look for ways to safely collect solid waste while also encouraging residents to minimize their generation of solid waste.

vides consistency, including assurances that the property has been cleaned up to standards safe for its intended use. Successful cleanup and long-term stewardship of any residual contamination provides the certainty that redevelopment happens safely. Brownfield cleanup puts property back into productive use, encourages redevelopment and increases economic development in distressed areas. In Missouri, 124 brownfield sites currently are undergoing cleanup. Another 222 have been cleaned up and returned to use since the program's 1994 inception.

Missouri Landfills and Transfer Stations



Contaminated Land

A considerable amount of Missouri's natural resources have been contaminated with hazardous materials from mining, smelting, manufacturing, light and heavy industry, service-oriented businesses, military and other governmental activities. Even a tiny amount of hazardous materials can cause serious health concerns and harm a relatively large amount of air, land, water and groundwater resources. Cleanup efforts can be made even more difficult by contaminants not yet fully researched or regulated.

Missourians have been very active in cleaning up both federal and non-federal Superfund sites. In 2003, 55 hazardous waste sites in Missouri were cleaned up and returned to productive use. Unfortunately, the state's share for cleanups and long-term stewardship costs is draining the current funding system. A legislative committee is evaluating our hazardous waste funding issues. Maintaining this progress will require a commitment to funding the state's share of cleanups and long-term stewardship costs at sites where contamination is still present.

Cleaning Up Meth

Missouri has become a leader in meth production nationally. This insidious problem not only poses a serious health threat to the manufacturers and users, but also puts at risk those living or working in areas around methamphetamine production labs.

Based on these concerns, the state established a Clandestine Drug Lab Collection Station Program. Under this program, the Department of Public Safety purchases specially designed buildings that can be used to provide secure storage of confiscated methamphetamine chemicals.

The Department of Natural Resources provides all the supplies and equipment for the collection stations. Supplies range from personal protective clothing to test kits that screen for hazardous chemicals. The department also pays for proper disposal of all hazardous waste accumulated at the collection stations. With training from the department and the U.S. EPA, local agencies in communities across the state now are able to safely process the meth lab chemicals delivered to the collection stations by trained personnel.

Through cooperation among local law enforcement agencies, fire departments, the Department of Natural Resources and the Missouri Department of Public Safety, these chemicals are now properly disposed. Between October 1998 and November 2002, 4,178 methamphetamine labs were cleaned up, with the hazardous ingredients safely delivered at Missouri's clandestine drug lab collection stations.

Hazardous drug lab cleanups

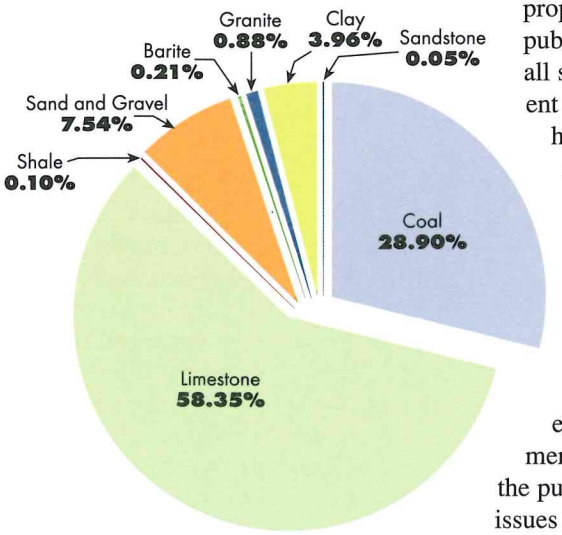
That adds up to more than 194,513 pounds of meth lab chemicals and debris processed and properly disposed of at collection stations. That's almost 195,000 pounds of harmful chemicals that otherwise could have been improperly disposed of, harming our air, land and water, which instead have been safely contained and no longer pose a threat to our environment.

Cleaning up existing meth labs and preventing new ones will require an ongoing effort. Missouri Gov. Bob Holden recently announced a new statewide initiative on methamphetamine education, prevention and treatment in Missouri. Holden created two new task forces to bring expertise and focus on prevention and treatment. In addition, he reorganized an existing task force to deal with the environmental challenges facing law enforcement officials and others who deal with hazardous materials related to methamphetamine control.

The Missouri Methamphetamine Enforcement and Environmental Protection Task Force will address the following:

- Providing law enforcement a safe, legal and effective place to temporarily store, manage and dispose of meth lab chemicals;
- Maintaining a certification program to train law enforcement officers dealing with meth labs, and;
- Providing personal protective equipment for law enforcement when dealing with hazardous chemicals.

Acreage of Land Reclamation Sites Permitted in 2002



The department is commited to developing readily available information systems so that prospective purchasers, lenders, developers, construction workers and the public can easily find out the safe uses as well as limitations of a property. This system would offer the public access to information about all sites where contamination is present and would protect communities, homes, schools and workplaces from risks posed by these contaminated sites.

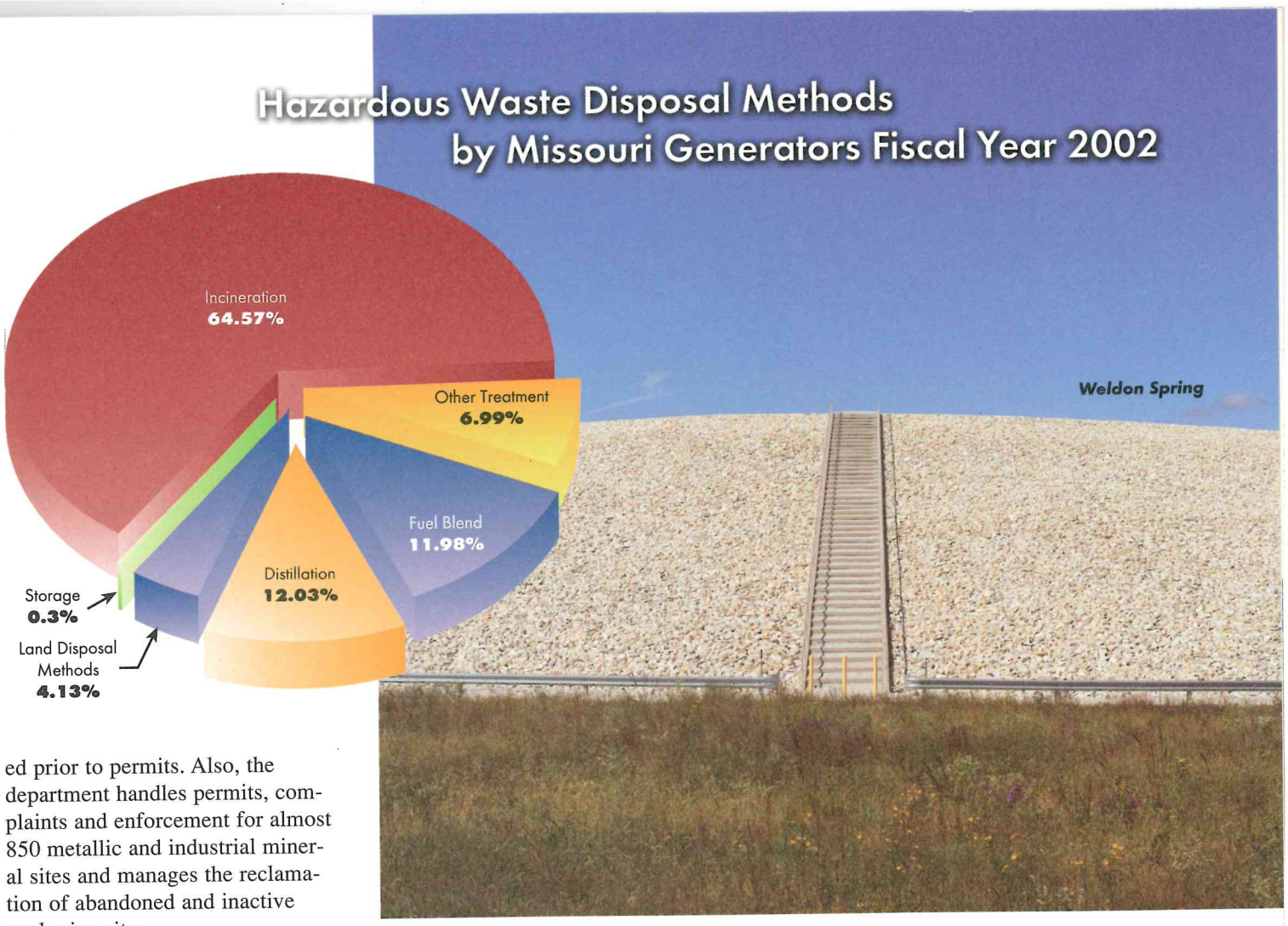
Public participation is a key component during clean up of these sites. The department is actively involved in providing assistance and information to community advisory groups that exist across the state. The department also is committed to ensuring the public is aware of environmental issues in their community.

Mining Activities

Imagine a land so barren and without vegetation that it has earned the nickname "moon land." Because of past mining practices, this has become a reality in many parts of Missouri. In the past, strip mining had allowed acid mine wastes to seep into local bodies of water, resulting in degradation of aquatic habitat and water quality.

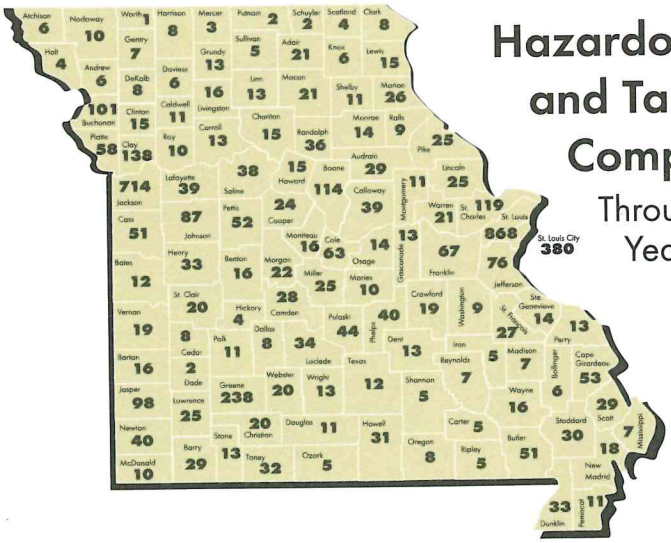
Although coal mining in Missouri has decreased in recent years, the need to reclaim any land previously disturbed by strip mining remains. Businesses and communities have worked diligently with the department to clean up these mines. In fact, 93,000 cumulative acres will have been returned to productive use by the year 2004.

Unfortunately, much work remains, but few resources are available to do it. There is no money available, for example, to reclaim old lead mine sites creat-



ed prior to permits. Also, the department handles permits, complaints and enforcement for almost 850 metallic and industrial mineral sites and manages the reclamation of abandoned and inactive coal mine sites.

As mentioned earlier in this report, due to state budget reductions in fiscal year 2004, the U.S. Interior's Office of Surface Mining now enforces much of the Missouri Coal Regulatory Program. This office reviews and issues all new permits, revisions and renewals; determines performance bond amounts and makes decisions on requests for bond release; conducts inspections of all coal mining and reclamation operations; and cites violations when necessary. The Department of Natural Resources continues to inspect and reclaim mine sites if the operator's permit has been revoked, and reclamation must still be completed with bonds forfeited by the company. Missouri currently has more than 19,500 acres of coal mine land, both active and forfeited, that require monthly inspections.



Hazardous Waste and Tank Cleanups Completed

Through Fiscal Year 2003

Understanding Our Land

The Department of Natural Resources produces and disseminates geologic and hydrologic information to be used for environmental and human health safety decisions. Earthquake risk, sinkhole collapse, potential sites where landslides may occur, areas where a limestone quarry could be developed, places where wells can be drilled to meet specific needs or where a landfill can be safely located all are types of information that can be predicted with sound geologic and hydrologic information. A national study determined that the value of this type of data exceeds the cost of developing the data by 25 times. From an economic perspective, Missouri must continue to produce and provide this information in a format usable by all types of decision makers.

Cleaning Up Waste Tires: A Community Effort

When waste tires are not disposed of or recycled properly they pose serious threats to human health and the environment. Tire fires release hazardous substances into the air and possibly into groundwater sources, and can burn for months or even years. The department estimates as many as 3.8 million illegal waste tires remain.

Since 1994, nearly 13 million tires have been cleaned up in Missouri. The department established several successful partnerships to clean up these tires. The department recently celebrated completion of a cleanup in Pettis County that involved removal of approximately 100,000 waste tires. This effort was made possible by a partnership with the Department of Corrections, which provided inmate labor.

Water sitting in waste tires breeds mosquitoes - known to carry diseases such as the West Nile virus, equine encephalitis, and the St. Louis and La Crosse strains of human encephalitis. In 2002 and 2003, there were 232 cases of the West Nile virus reported. City, county and community groups came together to tackle this issue. In the St. Louis area, Operation Brightside acted as the city community partner by picking up waste tires during its 22nd annual Project Blitz.

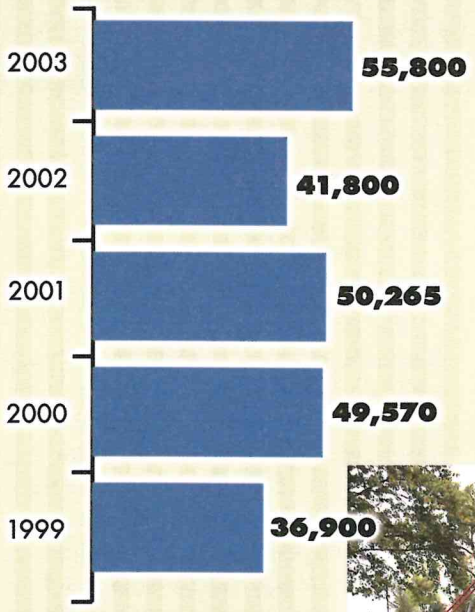
Several St. Louis County non-profit organizations, including Mid-County Partners for Progress and Neighbors Assisting Neighbors, conducted waste tire cleanups during the same timeframe. The St. Louis area collected more than 42,000 tires to recycle into fuel.

Volunteers undertook a similar effort in Kansas City and the St. Joseph area. Mid-American Regional Council provided leadership for this effort, with funding from Bridging the Gap. Both areas collected more than 19,000 tires to recycle into fuel. Elsewhere in the state, Madison County Caring Council collected nearly 19,000 tires; Urban Neighborhoods Alliance in Springfield collected 20,000 tires; and Stream Team #1848 in Popular Bluff collected more than 30,000 tires.

The department's Solid Waste Management Program reimbursed city and county nonprofit organizations for proper disposal of illegal waste tires collected during cleanups like these. The reimbursement was funded from the state's 50-cent-per-tire waste tire fee that consumers paid when new tires were purchased. However, the fee expired Jan. 1, 2004.

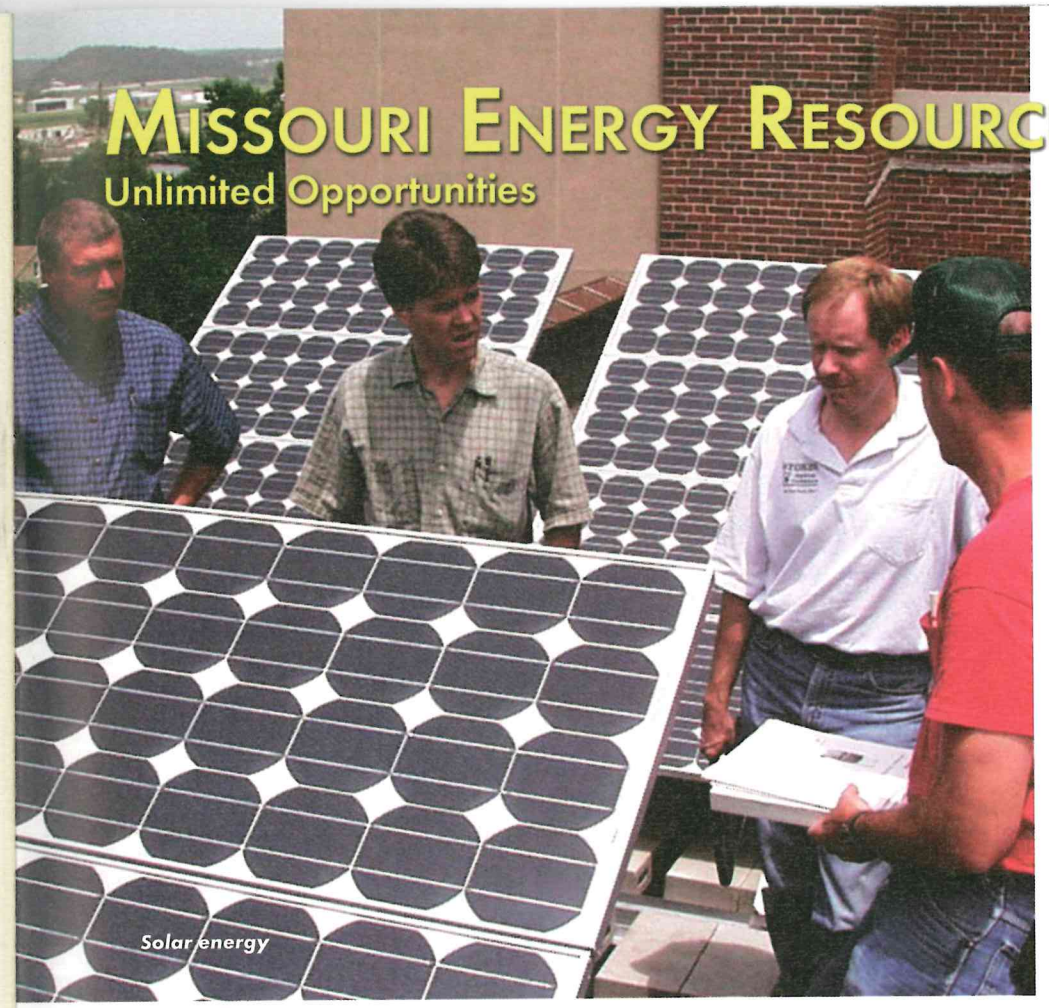
When waste tires are disposed of or recycled properly they can provide several beneficial uses including: fuel for power plants; playground cover, running tracks; and other recycled rubber products. In the last 10 years, the department awarded 281 grants totaling more than $2.9 million to schools, non-profit day cares, parks and other non-profit organizations to purchase these products. So, the tire that once was a home for mosquitoes and other pests may eventually protect a toddler from a nasty tumble.

Tons of Tires in Missouri Used for Fuel



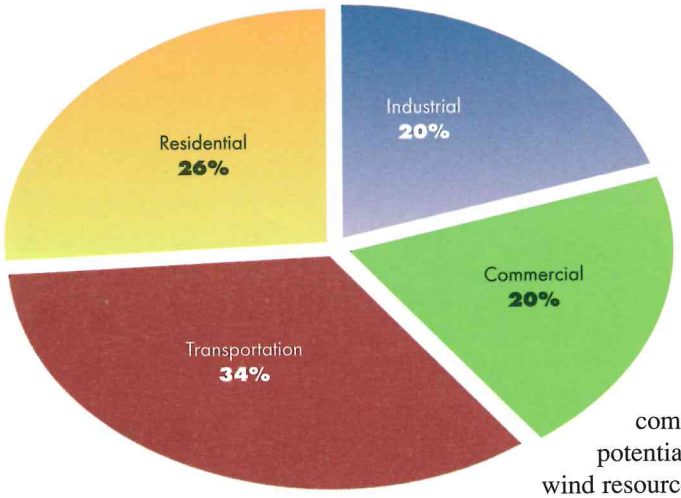
Recycled waste tires used for playground surface

Missouri Energy Resources:
Unlimited Opportunities


Solar energy

The State of Missouri works to ensure that our current power supplies are able to function uninterrupted and that energy supplies are transported safely. We also are looking more carefully at renewable energy, which would provide a safer, more reliable source of power, less susceptible to attacks and volatile market forces and would keep more of our energy money in Missouri.

Missouri Energy Use by Sector



Energy Use

Since more than 95 percent of Missouri's primary energy sources are imported from outside the state at a cost of more than $13 billion each year, energy efficiency benefits Missouri's economy by reducing the rate at which dollars leave the state for the purchase of fossil fuels. Energy efficiency also plays a vital role in environmental quality, reducing negative effects to Missouri's air and water by displacing fossil fuel generation. We all can make a commitment to save energy and, just as important, money.

Renewable Energy

Renewable energy comes in many forms. The potential for solar, biomass and wind resources exists in Missouri and in surrounding states. Biomass also holds great potential as an energy source in Missouri. Biomass is plant matter such as trees, grasses, agricultural crops or other biological material that can be converted to energy. In the summer, Missouri's solar resources are comparable to those of a Southwestern desert. One of the most important aspects of Missouri's solar resource is that it is most abundant when demand for electricity is highest – during the hot summer days when air conditioners place the greatest demand on the electric grid.

Renewable energy holds another allure: the opportunity to help Missouri's economy grow. Every day, Missouri's farms have access to bioenergy and solar and wind energy. New technologies offer the opportunity to harvest this energy for on-farm use, as well as for sustainable cash crops.

Finally, initiatives to develop renewable energy provide us with an opportunity to put to good use products that might otherwise have harmed our environment. Poultry litter, for example, has found its way into our rivers, lakes and streams, doing serious harm to these bodies of water. Several groups have worked together to create a Web site to help develop a market for poultry litter, putting together those who need it with those who have it. Poultry litter has great versatility and even is being explored as a potential energy source.

The Future of Energy Use in Missouri

Many states have adopted policies to encourage the use of renewable energy and investments in energy efficiency to achieve the resulting environmental, economic and security benefits to the public. In Missouri, the Department of Natural Resources' Missouri Energy Center, the state's energy office, is developing a model to help electric cooperatives and municipal electric companies assess biomass as an energy source. The department also is pursuing site-specific wind resources for development. The Missouri Energy Center is

using newly updated wind maps and anemometers, or wind-measuring devices, located throughout the state to assess wind's potential as an energy source.

The Missouri Energy Center also administers the department's Energy Loan Program. The program currently is helping Missouri school districts and local governments save an estimated $8.2 million in energy costs each year. The center has loaned $47 million statewide since 1988. In 2003, the improvements funded by these loans helped reduce carbon dioxide, or greenhouse gases, in Missouri by more than 25,000 tons.

Missouri benefits from hydropower generated at several locations throughout the state. This renewable source of energy provides a low-cost supply. Although water used to generate power is not consumed, the generation of power is tempered by demand for water by other uses.

In recent years Missouri has been active in the development and use of ethanol. In 2003, more than 50 million gallons of ethanol were produced by two farmer-owned plants in north Missouri (Craig and Macon). Two additional ethanol plants (Malta Bend and Audrain County) are expected to begin production in 2005, and other areas of the state are studying the feasibility of building ethanol plants.

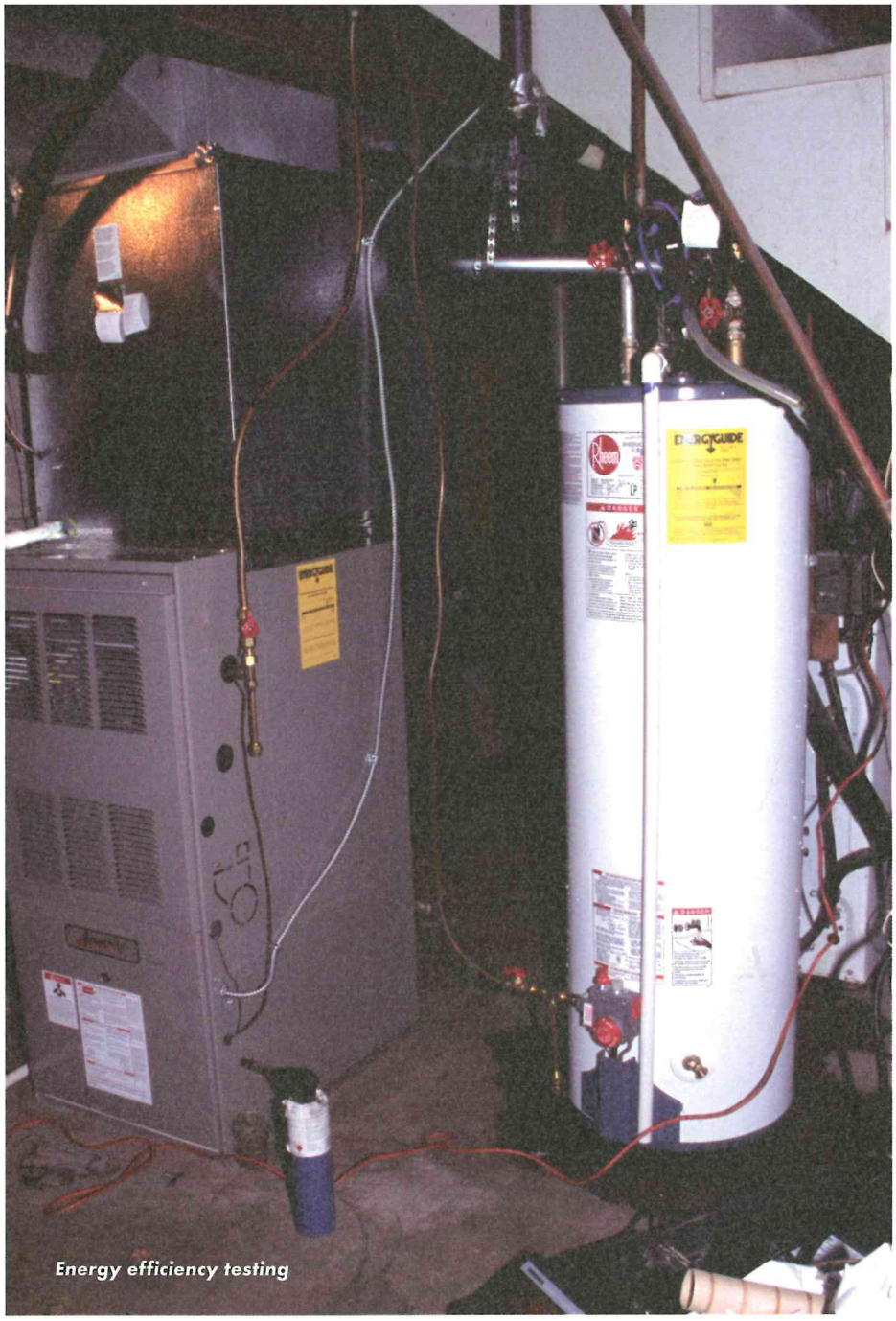
The Department of Natural Resources chairs a policy council that considers and makes recommendations on issues related to the state's energy use. In June 2003, this group submitted a comprehensive report on its findings to the governor. The council found that efforts dedicated to improving energy efficiency and the development and use of Missouri's renewable energy resources offer economic benefits to Missouri. The group went on to recommend that these opportunities should be fundamental components of the state's plan to meet its energy needs.

The council also recommended that Missouri aggressively develop, produce and use renewable energy and energy-efficiency resources to achieve the public benefits of economic growth, environmental quality and public health. A public benefits fund and other public policies including financial and other incentives should be established, according to the report.

The council looked at ways that state government could serve as a leader in energy efficiency efforts. According to the report, state agencies, including universities, spend about $78 million for energy use in state facilities.

If this energy bill were reduced just 10 percent, a conservative estimate, savings to the State of Missouri would be $7.8 million annually over the life of the efficiency measures.

Many of the state's energy plans have been guided by the Governor's Energy Futures Coalition report issued in February 1997, which made recommendations in four major areas:



Energy efficiency testing

Improving Energy Use: CHALLENGES

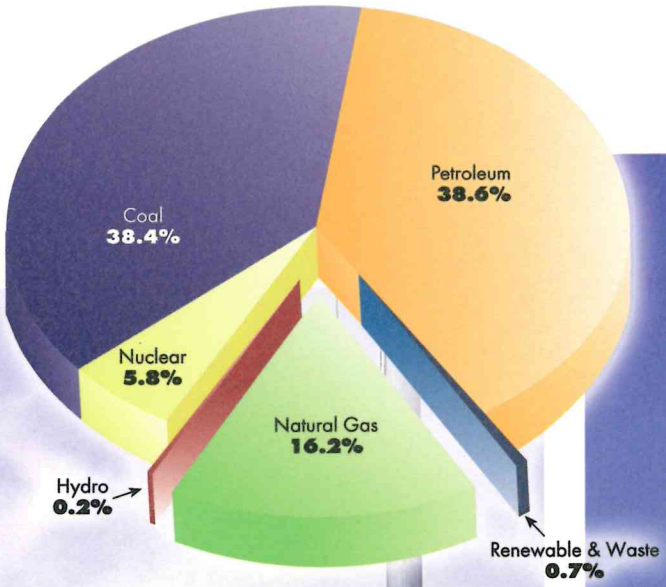
- Missouri's consumption of energy has increased 11 percent from 1990 through 2000.
- In 2000, Missouri ranked as the 22nd highest energy-consuming state in the nation.
- Missouri's energy expenditures increased 17 percent between 1999 and 2000, from $11.3 billion to $13.2 billion.

- Education, information, marketing and incentives;
- Transportation;
- Residential, institutional, commercial and industrial facilities; and
- Alternative and renewable energy supplies, such as ethanol and biomass production.

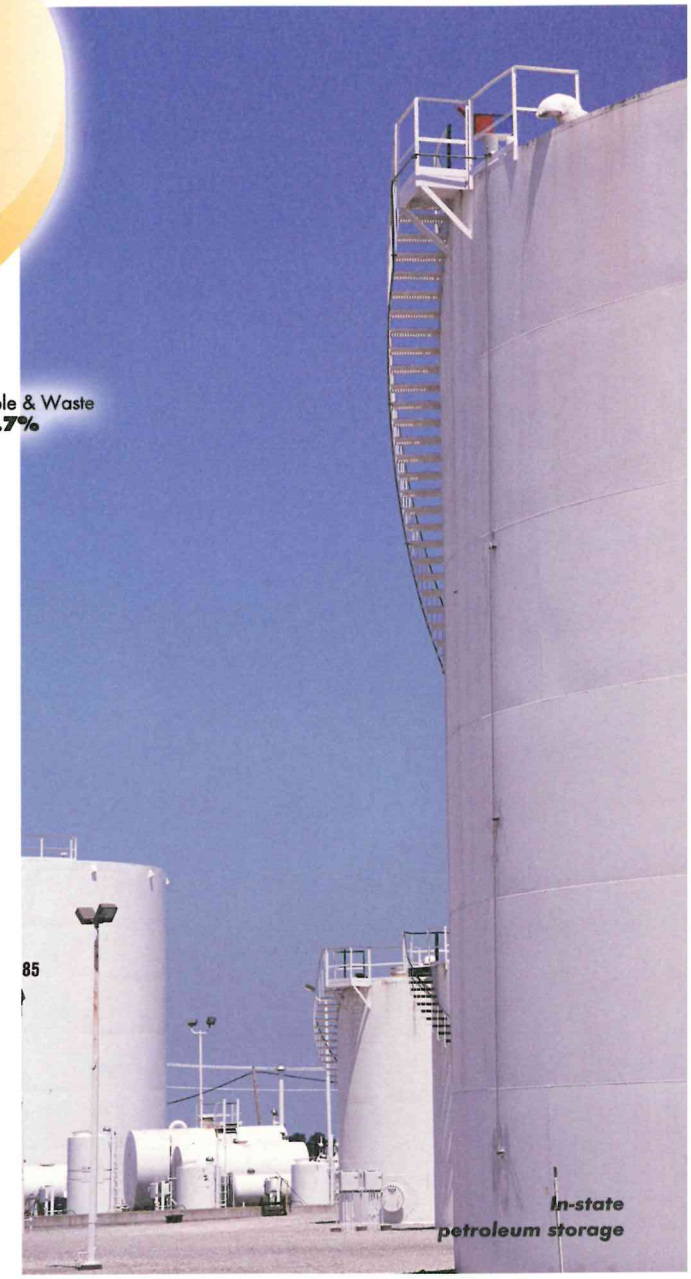
Many of the recommendations made by the Energy Futures Coalition, such as those related to energy efficiency within state buildings and state fleets, continue to be relevant and have been recommended by subsequent policy groups, such as the Governor's Energy Policy Task Force and Governor's Energy Policy Council.

The Energy Futures Coalition report also recommends improved coordination of state resources to assist low-income families in making their homes energy efficient. The Department of Natural Resources has convened two winter fuels summits to address this issue and continues to work with local agencies, the Missouri Department of Social Services and the Public Service Commission to integrate energy and weatherization assistance services for the public.

Sources of Missouri's Energy



Wind energy



In-state petroleum storage

Green Buildings: Building a Cleaner Tomorrow

You've got what growing on your roof?

Across the state, interest in and demand for sustainable design, architecture that incorporates "green" characteristics, is growing. Sustainable design constructions reflect a range of interesting and innovative elements, such as selecting a location that will allow designers to maximize the use of solar energy; using materials, such as carpet and concrete, with high recycled content; installing water-saving fixtures, such as waterless urinals; and even using grasses, groundcover and wildflowers on roofs to keep buildings cooler.

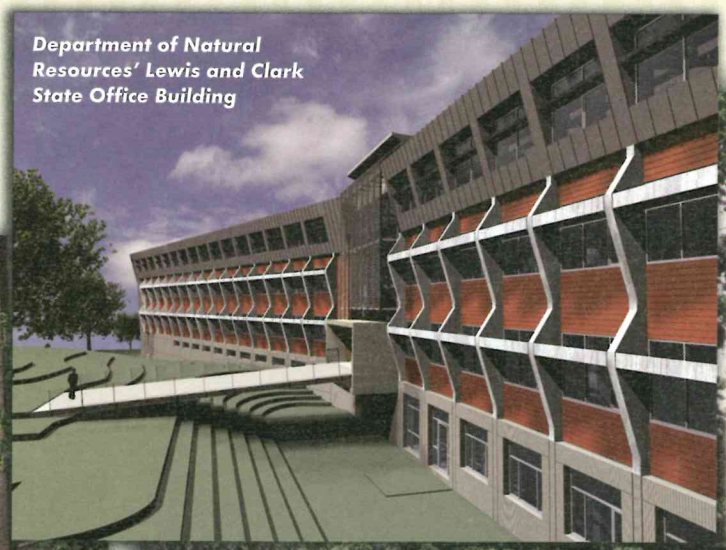
In Jefferson City, the Department of Natural Resources is working to make sure its facilities live up to the highest environmental standards. Staff in the department's Missouri Energy Center recently coordinated improvements to the office building in which it's located. At the suggestion of the Missouri Energy Center, the building, leased to the department by P&G Development Company, Jefferson City, received a number of upgrades prior to the department's occupancy. These improvements cut the building's energy costs in half and earned it the state government's first Energy Star® label in recognition of energy efficiency.

The state is also building a new green office building which is scheduled to be complete in fall 2004. The design makes the most of natural lighting, efficient heating and cooling systems and water conservation to lower operational costs and environmental impact. To ensure that the building would embrace its green identity, the department sought Leadership in Energy & Environmental Design (LEED™) certification. LEED™ certification, administered by the U.S. Green Building Council, rates projects based on five criteria: site sustainability, energy and atmosphere, indoor environmental quality, material and resources, and water efficiency.

Energy software modeling of the designed electrical and mechanical systems estimates the new building will save between $85,000 and $92,000 per year in energy costs. The department hopes this building will facilitate green development by educating the political/governmental community to build support; the building community to develop capability; and the general public to promote awareness and stewardship.

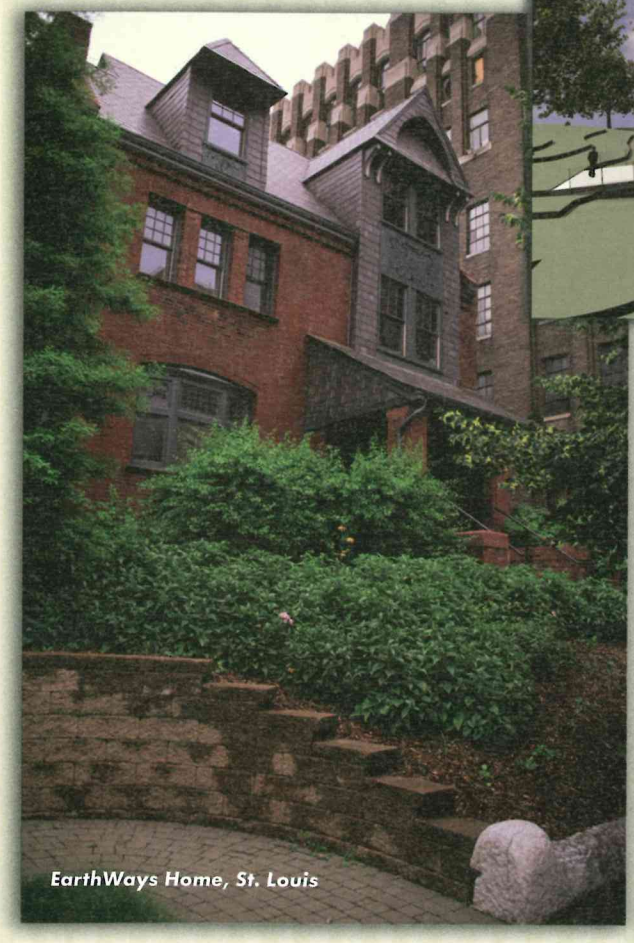
The sustainable design movement has found a leader in Kansas City as well. The soaring constructions designed by Kansas City architect Bob Berkebile fill many with awe, not only because of the beauty he incorporates into his designs, but also because of the harmonic relationship he creates between these buildings and the environment.

Berkebile, a principal in the Kansas City architectural firm BNIM Architects, has been referred to as the "godfather of sustainable design." He is the founding chairman of the American Institute of Architects' Committee on the Environment. He was instrumental in developing the LEED ratings criteria. He is a member of the Nature Conservancy Board of Trustees, chairman of the Environmental Management Commission for Kansas City and co-chairman of the Scientific Advisory Group on the Environment. Berkebile's firm is designed the Department of Natural Resources' green building.

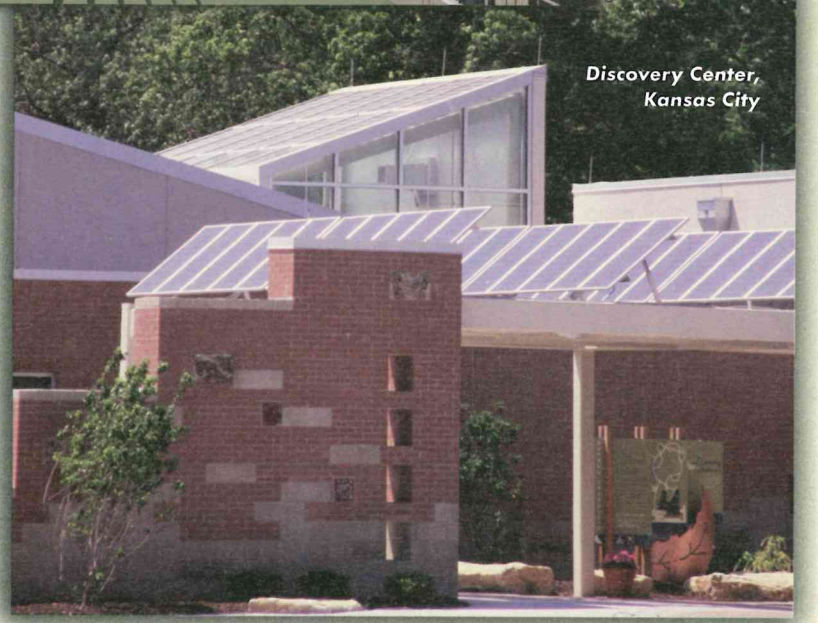


Department of Natural Resources' Lewis and Clark State Office Building

Copyright © 2002 BNIM Architects

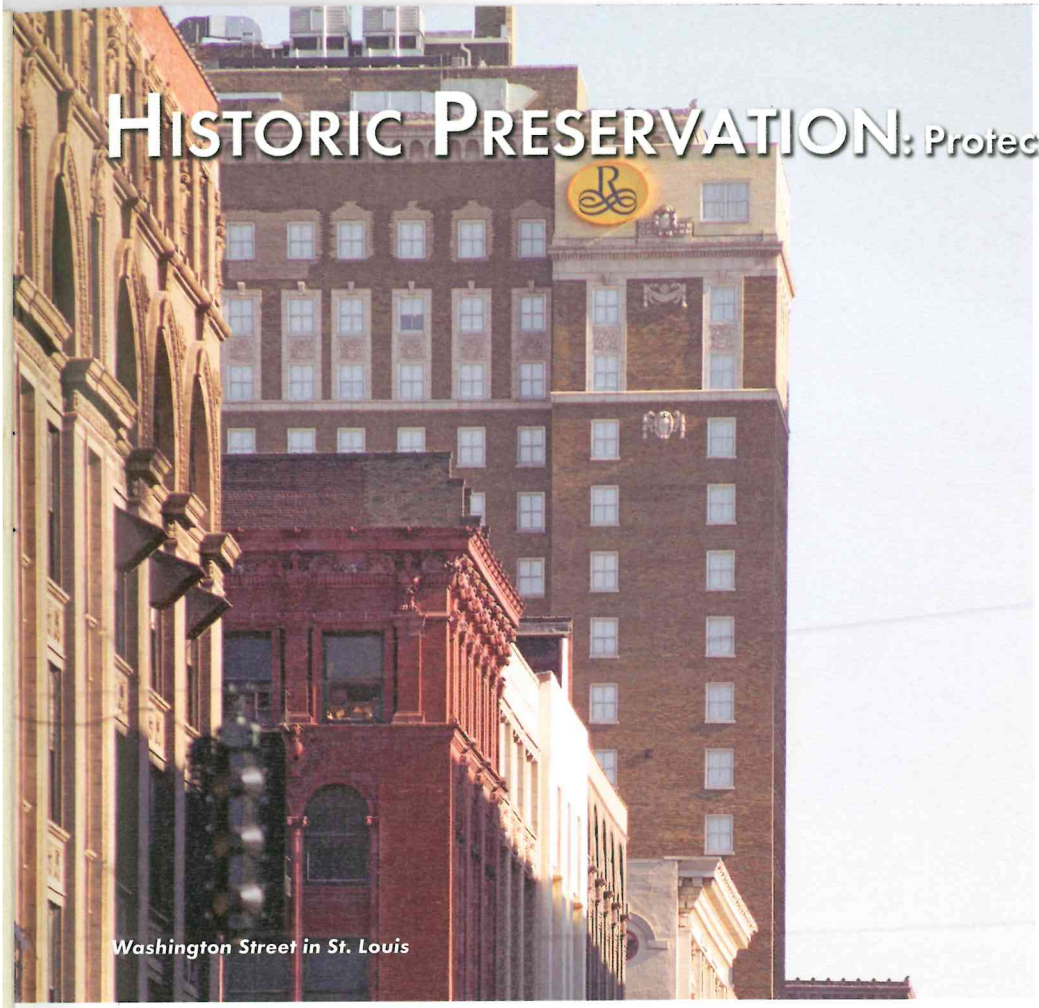


EarthWays Home, St. Louis



Discovery Center, Kansas City

Historic Preservation: Protecting Missouri's Rich History



Washington Street in St. Louis

When we think of protecting our resources, air, land and water probably come to mind first. But preserving Missouri's historic and cultural heritage is critical to our state's mission.

It was the Missouri River that inspired Mark Twain and the city of Marceline that served as the basis for Walt Disney's vision of Main Street Disneyland. Missouri's heritage has influenced our entire nation's culture. Therefore, it's important that it be protected for the continued enjoyment and education of future generations.

Protecting Our State's Cultural Heritage

It's hard to flip through cable channels these days without coming across a program about rehabbing an old Victorian home or a documentary about a hotel steeped in history. There is a growing appreciation of the importance of historic preservation in our society.

The National Register of Historic Places is the nation's honor roll of historic properties recognized by the federal government as significant at the national, state or local level. It provides a significant degree of recognition as to a property's importance. This can be a vital step leading to the property's preservation. Listing also can be a key prerequisite for other assistance such as federal grant funding, use of federal or state tax incentives or assistance from the provisions of the national Historic Preservation Act of 1966. Missouri's rehabilitation tax credit is recognized as one of the most effective tools for encouraging investment in historic resources and has served as the model for numerous other states. Five-hundred seven rehabilitation projects have been assisted and more than $300 million has been awarded by the Missouri State Historic Tax Credit.

Historic preservation tax credits helped save the Kansas City Terminal roundhouse, part of the Westside Business Park project. The site won a 2003 Phoenix Award, a national recognition for brownfields redevelopment. In 2004, another Missouri project won the Phoenix Award for the U.S. EPA's Region 7, a four-state area.

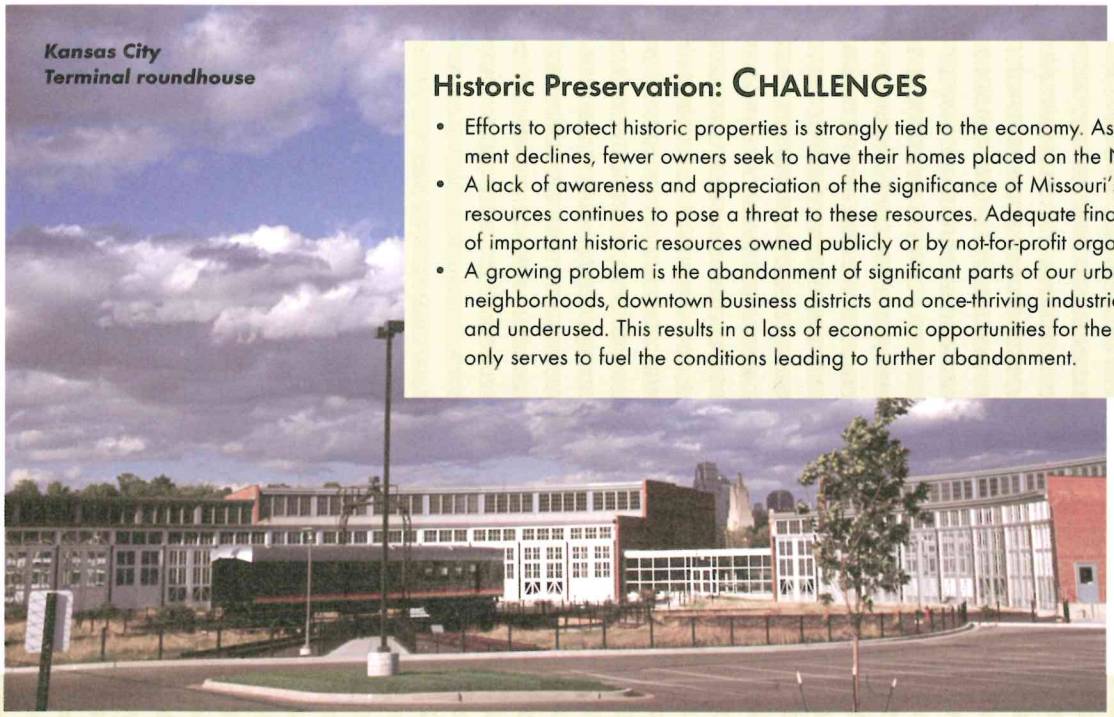
The Renaissance Grand Hotel and Suites, a project involving the redevelopment of two historic hotel buildings on St. Louis's historic Washington Avenue downtown, was the first Missouri project by HRI, a New Orleans company which now has an office in St. Louis. Kimberly-Clark Inc. was an equity partner in the project, which also cleaned up two brownfield sites and created more than 500 jobs in the area.

An estimated $346 million is spent annually on the rehabilitation of historic buildings and structures – defined as older buildings that might be eligible for the National Register of Historic Places. This work creates an estimated 8,060 in-state jobs annually.

Historic preservation in Missouri contributes slightly more than $1 billion annually to the gross state product, according to a study completed by the Center for Urban Policy Research, Rutgers University. The study, titled "Economic Impacts of Historic Preservation in Missouri," estimates Missouri's annual historic rehabilitation activity generates $70 million in total tax revenues, including $30 million in state and local tax revenues.

Summary of Missouri State Historic Tax Credits Issued

	1998	1999	2000	2001	2002	2003	2004	TOTAL
Number of Projects	1	20	32	63	93	119	179	**507**
Allowable Rehab Costs	$98,604	$51,308,114	$82,804,186	$166,184,147	$240,045,528	$356,929,140	$302,769,292	**$1,200,139,011**
Total Investment Costs	180,019	55,703,270	103,871,045	200,104,297	310,955,859	434,377,644	344,597,744	**1,459,789,878**
Tax Credits Issued	24,651	12,827,028	20,701,046	41,546,037	60,011,382	89,214,177	75,692,323	**300,016,644**



Kansas City Terminal roundhouse

Historic Preservation: CHALLENGES

- Efforts to protect historic properties is strongly tied to the economy. As the rate of real estate investment declines, fewer owners seek to have their homes placed on the National Register.
- A lack of awareness and appreciation of the significance of Missouri's historic and cultural resources continues to pose a threat to these resources. Adequate financial resources, particularly of important historic resources owned publicly or by not-for-profit organizations, is vitally important.
- A growing problem is the abandonment of significant parts of our urban core areas. Traditional neighborhoods, downtown business districts and once-thriving industrial areas become stagnant and underused. This results in a loss of economic opportunities for the residents of these areas. This only serves to fuel the conditions leading to further abandonment.

Revitalization: Benefiting Communities, Benefiting the Environment

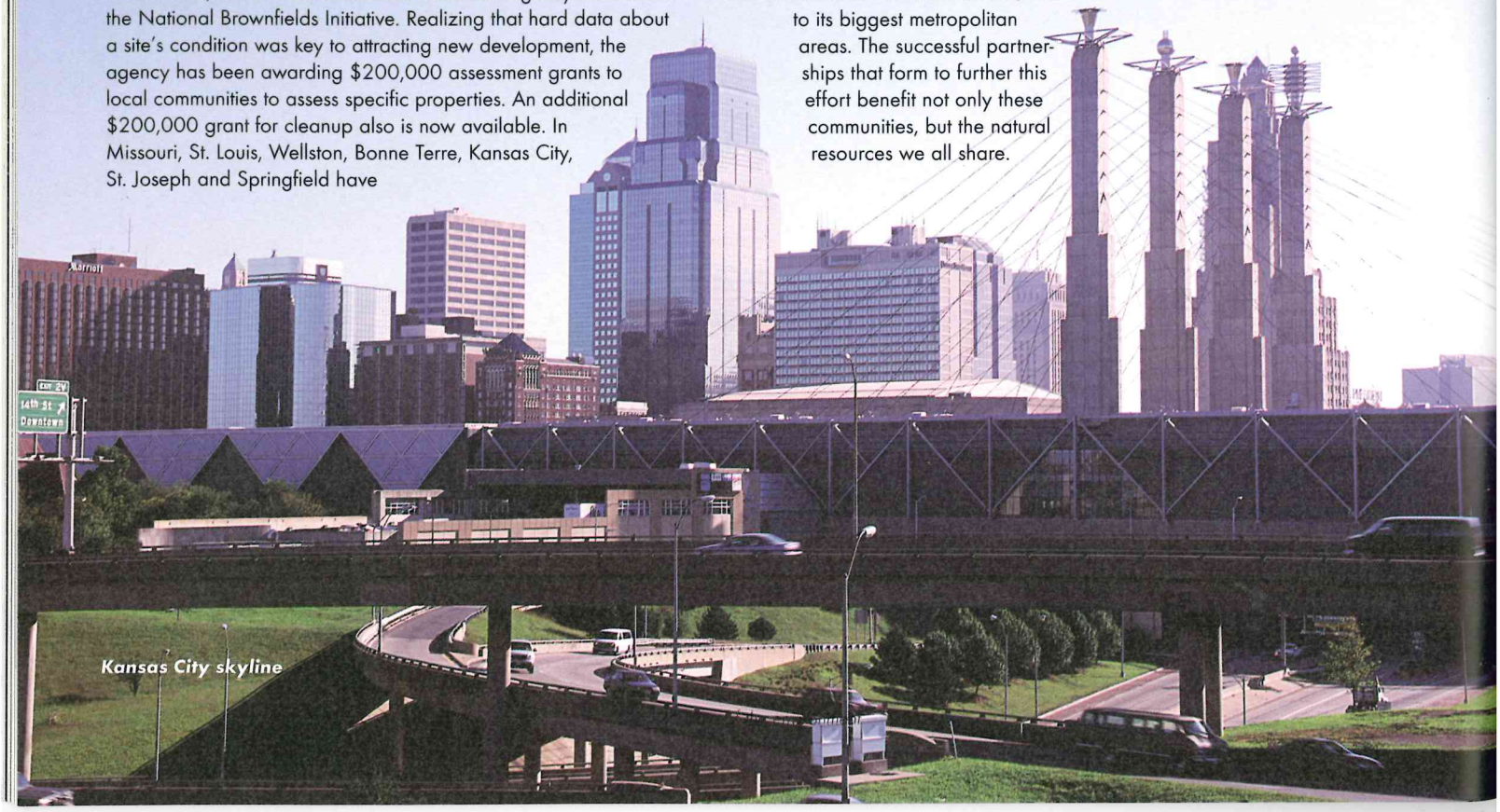
As large metropolitan areas like Kansas City, St. Louis and Springfield look to revitalize their urban cores, attracting more families to live in these downtown areas near where they work saves energy and protects air quality by reducing commuter miles and boosts the economy.

Brownfield redevelopment is an important component of efforts to revitalize urban cores. The U.S. Environmental Protection Agency defines brownfields as "abandoned, idled, or underused industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contamination." The name comes from their appearance – weed-covered and run-down.

In 1995, the U.S. Environmental Protection Agency announced the National Brownfields Initiative. Realizing that hard data about a site's condition was key to attracting new development, the agency has been awarding $200,000 assessment grants to local communities to assess specific properties. An additional $200,000 grant for cleanup also is now available. In Missouri, St. Louis, Wellston, Bonne Terre, Kansas City, St. Joseph and Springfield have received grants. Missouri also has a strong cleanup incentive program involving the Department of Natural Resources and the Department of Economic Development. The state program offers tax credits that can pay up to 100 percent of cleanup costs, up to the value of the predicted economic benefit.

Missouri's smaller rural communities often benefit from revitalization efforts as well. The department's Outreach and Assistance Center helps communities preserve and restore historic properties. This program has put money into once-struggling towns and stimulated tourism.

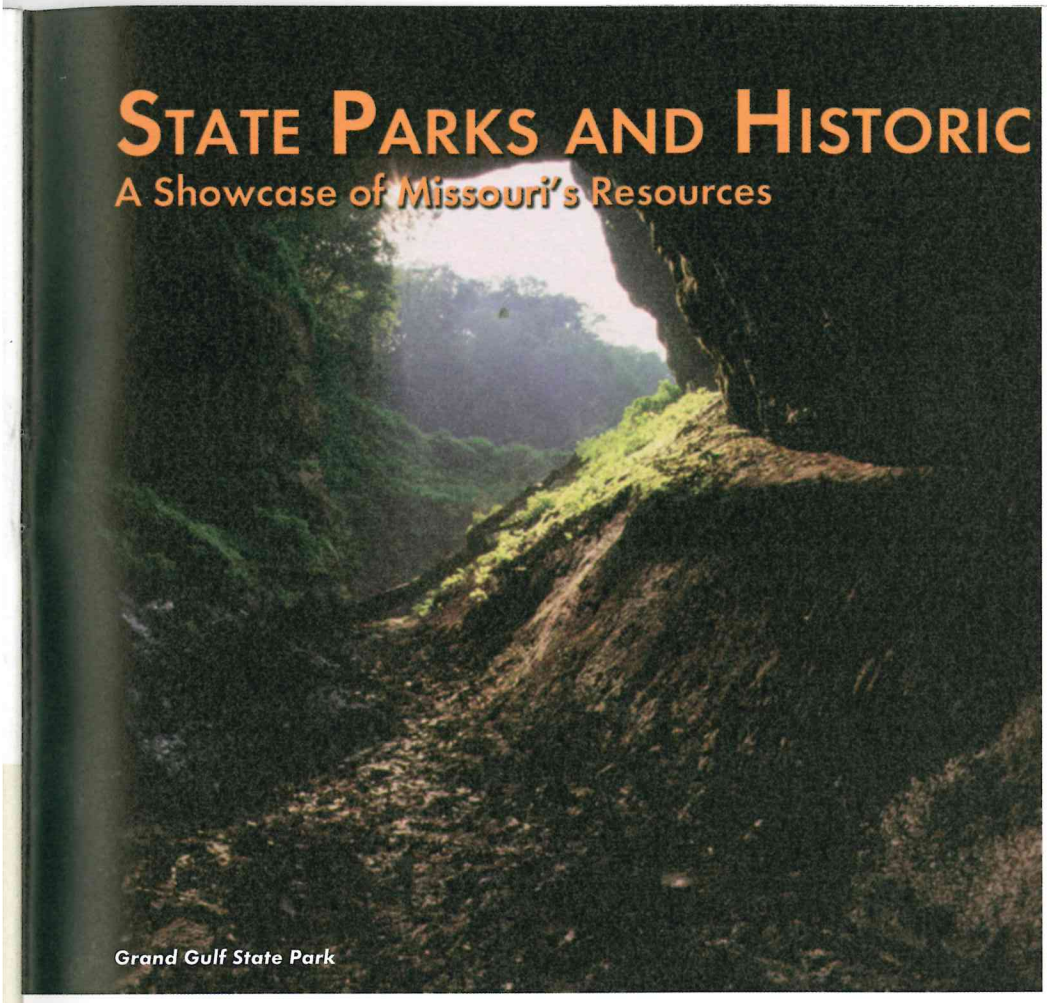
Efforts to revitalize are important to a range of communities, from Missouri's smallest rural towns to its biggest metropolitan areas. The successful partnerships that form to further this effort benefit not only these communities, but the natural resources we all share.



Kansas City skyline

State Parks and Historic Sites:

A Showcase of Missouri's Resources



Grand Gulf State Park

We've saved our discussion of state parks for the end of this report because the health and vitality of these parks are heavily dependent upon the other resources we've discussed. Healthy air, clean water, protected land and rich historical resources are all reasons that make state parks and historic sites worth visiting. Perhaps that's why we take such pride in our state parks and the tremendous number of visitors they attract each year: They are the culmination of our efforts to protect our state's environment and historic resources.

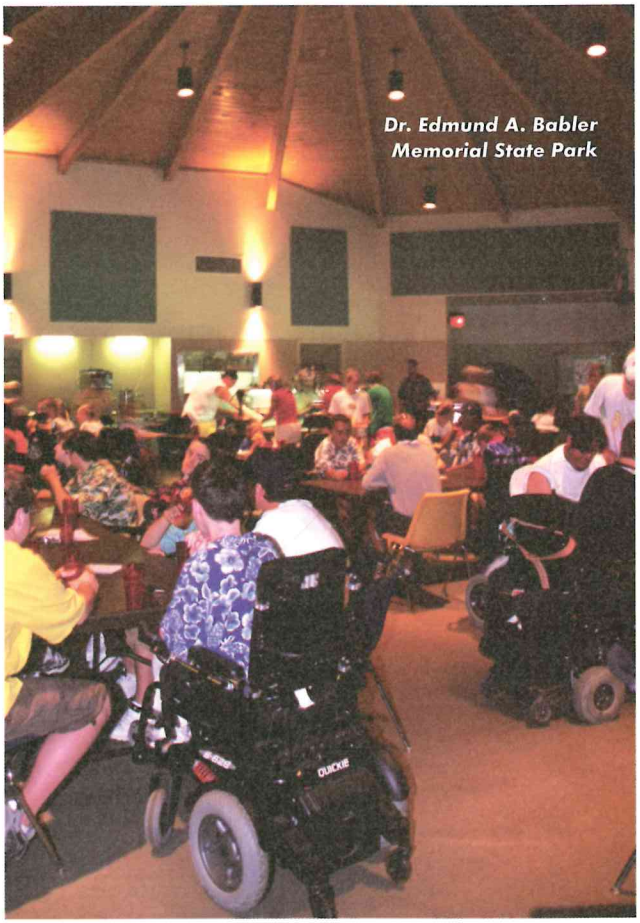
The Missouri state park system was created in 1924 and today has grown to include 83 state parks and historic sites encompassing more than 140,000 acres. Through trails managed by the Department of Natural Resources, access also is offered to the 61,000-acre Roger Pryor Pioneer Backcountry.

The mission of the state park system is to preserve and interpret the state's most outstanding natural landscapes and cultural landmarks and to provide recreational opportunities. To accomplish this, the system preserves the homes of famous Missourians, Civil War battlefields, and reminders of yesterday such as gristmills and covered bridges. Staff work to research and protect a range of items at our historic sites as well, including Civil War uniforms, antique furniture, Thomas Hart Benton prints and even portions of the Underground Railroad. In 1996, the Cultural Resources Fund was established to acquire objects of historical significance and conserve those objects already in historic sites. Through this fund, $100,000 is set aside annually to enable Missouri's state parks and historic sites to complete specific projects, such as restoring a painting or a piece of furniture. The money is part of the Missouri state park budget and is earmarked for this purpose.

Missouri's most outstanding landscapes and natural features are preserved here for everyone to enjoy – deep forests, glades, prairies, wetlands, streams and lakes. These settings provide many opportunities for recreation, including camping, hiking, fishing, picnicking, horseback riding, boating, ATV and dirt bike riding and just enjoying the outdoors.

The system includes many unique sites, such as Katy Trail State Park, which is the nation's longest developed rail-to-trail project, and Edward "Ted" and Pat Jones-Confluence State Park, which has been developed at the confluence of the two greatest rivers in the nation – the Missouri and the Mississippi.

Hikers also can experience the solitude and wildness of the Roger Pryor Pioneer Backcountry in southeast Missouri, thanks to an agreement



Dr. Edmund A. Babler Memorial State Park

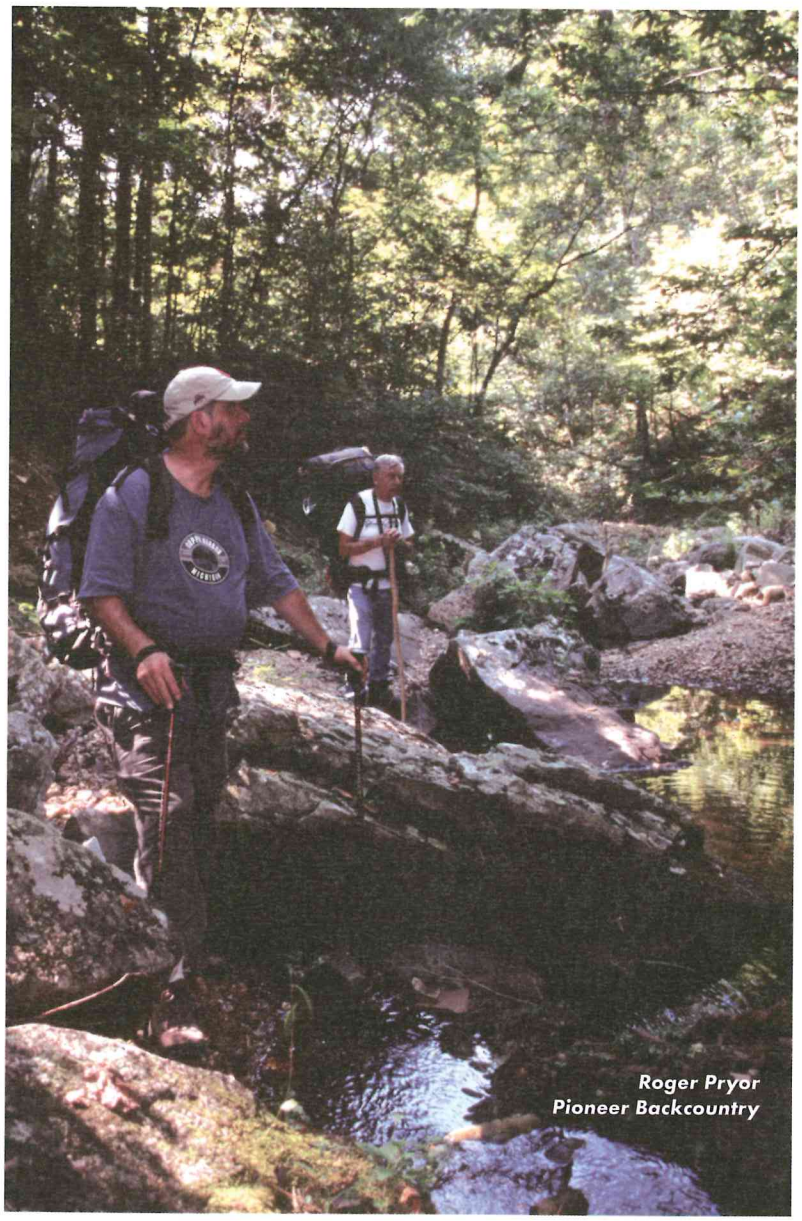
between Leo and Kay Drey of St. Louis and the Missouri Department of Natural Resources. Located mainly in Shannon County, the Roger Pryor Pioneer Backcountry is a 61,000-acre portion of the Pioneer Forest, owned by the Dreys.

The wilderness area is named for Roger Pryor, best known for his 14-year career with the Missouri Coalition for the Environment, where he served as the coalition's executive director and senior policy director. In addition, Pryor organized the state's first natural areas conference and spent six years compiling the definitive survey of Missouri's natural areas. He also was a longtime supporter of the state parks system and spent three years working as a planner for the Department of Natural Resources.

Through the agreement, the Dreys have donated easements for a 33-mile trail corridor through the backcountry to the Department of Natural Resources' state park system.

The Missouri state park system has consistently been ranked as one of the best state park systems in the nation, and has a very high satisfaction rating with visitors. It was recognized as one of only three nationwide finalists in the 2003 National Gold Medal and State Park Awards Program.

This support is reflected in the overwhelming approval by voters of the parks-and-soils sales tax, which is the primary funding source for the state park system. This tax has been overwhelmingly approved by Missouri voters three times consecutively and will need to be reauthorized again by 2008, when it is scheduled to expire.



Roger Pryor Pioneer Backcountry

Missouri's state parks and historic sites have become an important component of our state's economy as well. A study by the University of Missouri-Columbia recently found that in 2002, individuals and families visiting Missouri state parks spent more than $410 million in Missouri. Of that total, non-resident visitors generated $140 million in total sales in Missouri. This includes all sales associated with the trip, such as travel expenses, lodging and groceries. When the total $410 million is spent and respent in the economy, it brings the state park system's overall economic impact in Missouri to $538 million annually.

We must continue to work to make Missouri's state park system the very best in the nation. An important part of this effort is soliciting feedback from our state park and historic site visitors. Every state park and historic site conducts at least one annual public meeting to talk with visitors about their site. Such feedback has led to changes and improvements, including the new centralized campground reservation system.

In a recent survey, 99 percent of visitors reported being satisfied with their experiences while in the parks. This satisfaction may be one reason for the tremendous number of visitors the park receives, more than 17 million annually.

Citizen support is crucial to maintaining top-quality state parks. These parks could not function without those who have contributed to the Volunteers In Parks (V.I.P.) program.

Maintaining a record of our cultural and natural resources continues to be a priority for the State of Missouri as well. Missouri state parks and historic sites are home to a rich collection of these resources, so many efforts to gather information on these resources start here. In 2000, the department began using collections management database software called PastPerfect to gather and maintain information on Missouri's hundreds of thousands of artifacts. A similar database has been developed to record the thousands of diverse species found in Missouri's

(continued on page 31)

Leo Drey, Missouri Pioneer

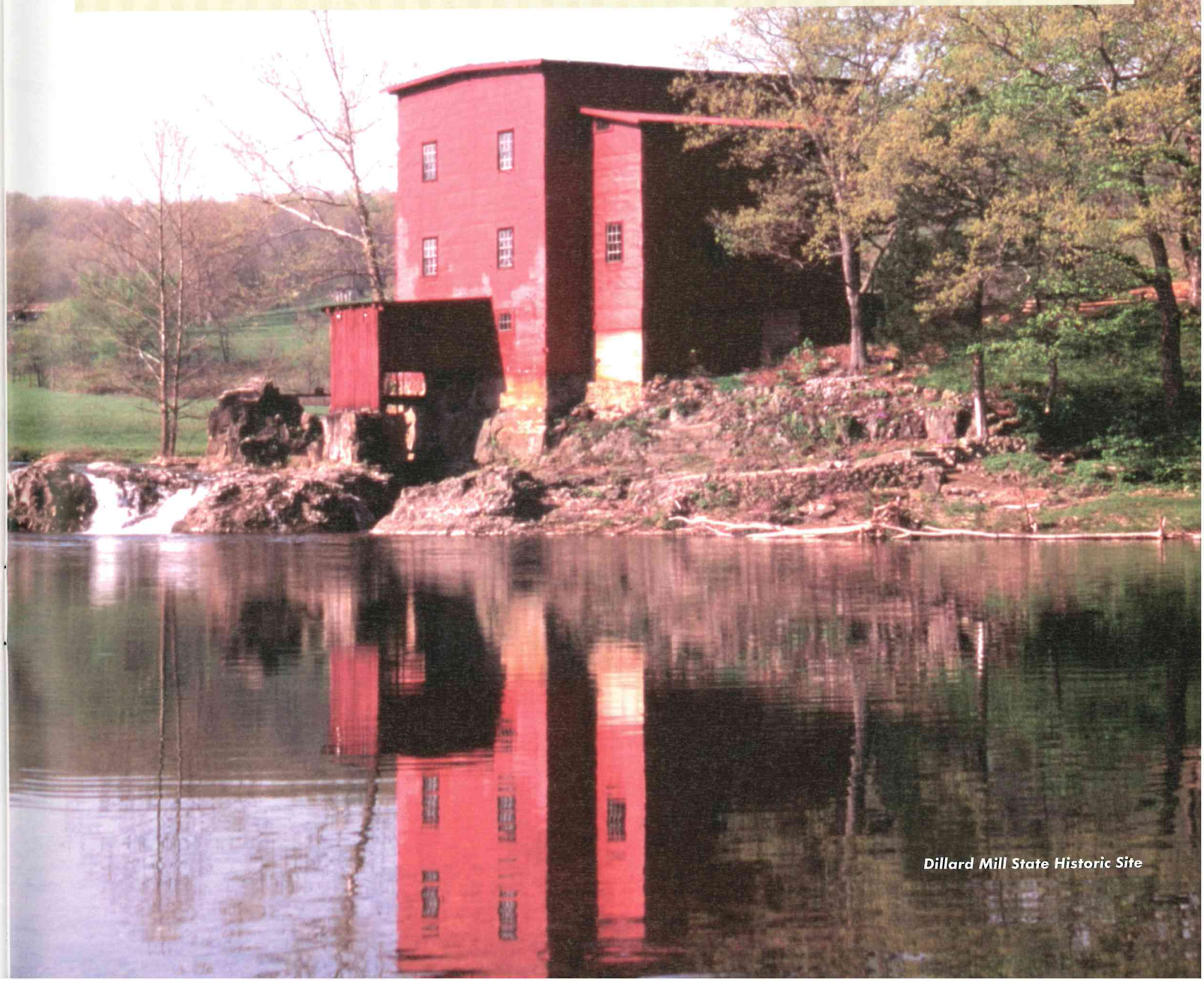
Leo A. Drey is one of Missouri's most environmentally conscious private landowners and has been a lumberman, conservationist and philanthropist. He has bought and sold land throughout the Ozarks and in the process contributed toward the establishment of state and national parks, forests, recreation areas, wilderness areas and natural areas.

Drey's legacy of environmental stewardship stretches back to 1951, when he created the 1,400-acre Pioneer Forest as a working forest to demonstrate sustainable forest management. In 1962, he began the L-A-D Foundation, a private land trust to which he has donated title to more than 149,500 acres, including such Missouri landmarks as Clifty Creek Natural Bridge in Maries County and the Virgin Pine in Shannon County. The foundation also leases property to the Department of Natural Resources to protect such landmarks as Dillard Mill State Historic Site in Crawford County and Grand Gulf State Park in Oregon County (see photo page 27). In 1999, he created the Ozark Natural Resources Foundation.

Drey has provided financial support to several important efforts. He helped fund the Missouri Natural Areas study during the 1970s and the Natural Streams Campaign. He also donated significant funds to the last two efforts to renew the parks-and-soils sales tax, which funds 80 percent of the state parks operation and development.

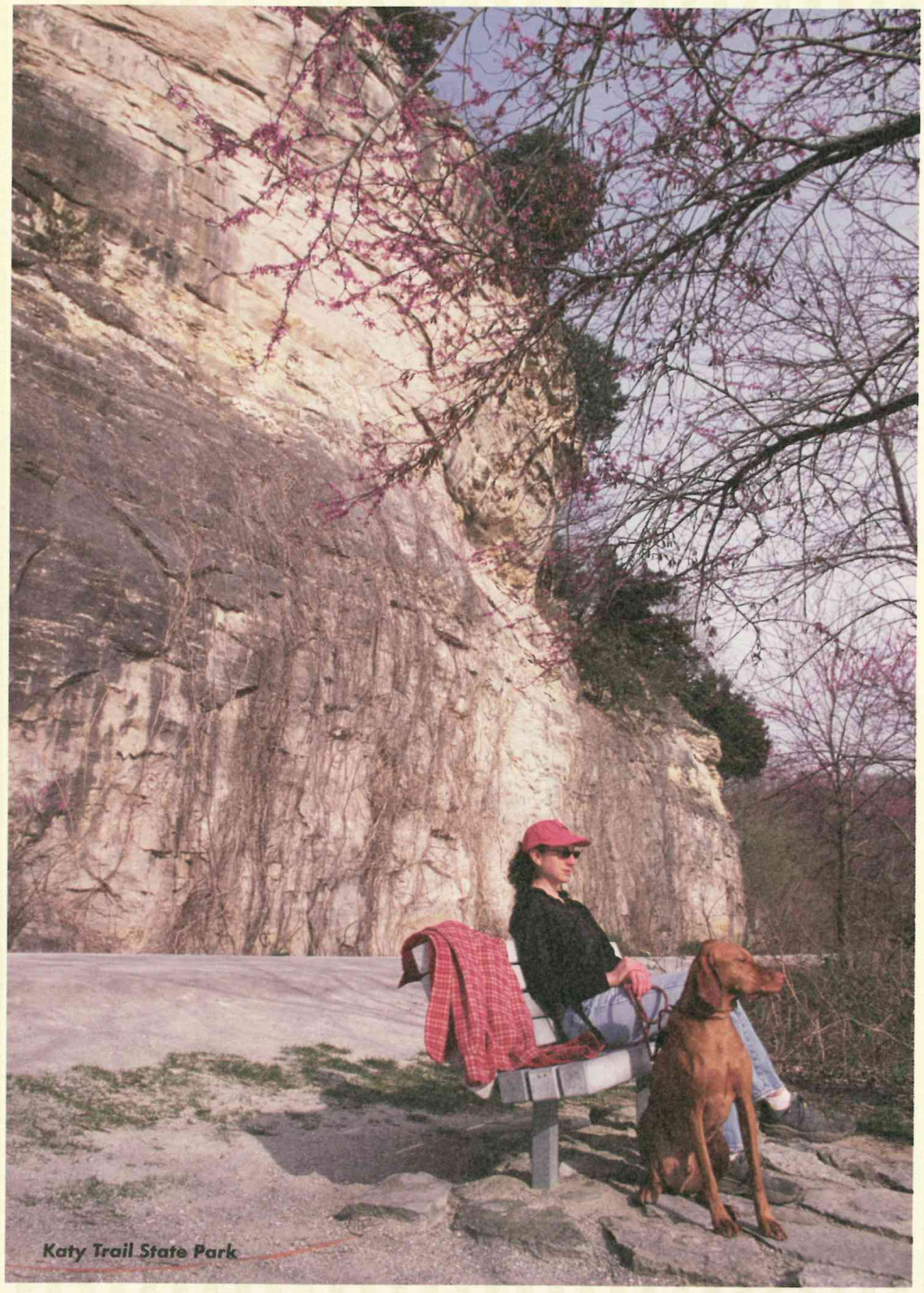
Drey has helped secure and preserve many natural areas throughout the state for the enjoyment of all Missourians. He helped to establish the Ozark Trail by donating a series of easements through 13 miles of Pioneer Forest. He protected Greer Spring, the largest undeveloped freshwater spring in Missouri, when it was threatened with development. He purchased 7,000 acres around the spring and then worked to have the area protected as part of the Eleven Point National Scenic River.

In 2001, Drey created the 61,000 acre Roger Pryor Pioneer Backcountry within the Pioneer Forest and leased more than 30 miles of trail in the area to the Department of Natural Resources to be operated as part of the state park system. Most recently, in July 2004, Drey and his wife Kay donated more than 146,000 additional acres to the L-A-D Foundation's 3,500 existing acres. The gift is the largest of its kind in Missouri history. As an environmental pioneer, Drey's trail of environmental successes spans more than five decades. Drey is yet another example of the tremendous respect Missouri citizens have for their natural resources.



Dillard Mill State Historic Site

Edward D. "Ted" and Pat Jones: Katy Trail State Park Benefactors



Katy Trail State Park

Katy Trail State Park has become one of Missouri's premier attractions, drawing visitors from across the nation and other countries. Each year, more than 400,000 visitors come to walk or ride their bicycles from St. Charles to Clinton. At 225 miles, the trail is the longest developed rails-to-trail project in the nation.

Katy Trail State Park would not have been possible without the support of Pat Jones of Williamsburg and her late husband, Edward D. "Ted" Jones. In 1986, the Missouri-Kansas-Texas Railroad (known as the Katy) decided to discontinue rail operations from Sedalia to Machens. The decision offered an opportunity for the Department of Natural Resources to convert the rail corridor into a trail, under provisions of the National Trails System Act. Ted and Pat Jones stepped forward and donated $2.2 million to acquire the line and develop the trail, making the dream a reality.

Following Ted's death, Pat Jones continued to support the Katy Trail as did the Edward Jones Co., which Ted founded. After the flood of 1993, they contributed money to help reconstruct the trail, which had been severely damaged. They also provided a toll-free number that people could call to receive updates on the trail's progress. Pat Jones continues to contribute on a regular basis to the Missouri Rails-to-Trail Foundation, which is used for a variety of things to support the trail, as well as other facets of the Missouri state park system.

Although Katy Trail State Park was the primary vehicle for support, Pat Jones has been an active supporter of many other efforts to enhance and ensure the public's ability to enjoy the outdoors. In 2001, she received a special award in recognition of her generous efforts at the TrailLink2001, Third International Trail and Greenway Conference in St. Louis.

Jones is a supporter of the Missouri Prairie Foundation and the Missouri Parks Association. During efforts to renew the parks-and-soils sales tax, which provides the major source of funding for the Missouri state park system, Jones was an active member of the Citizens Committee for Soil, Water and State Parks. This group organized the initiative petition campaign to get the issue placed on the ballot and have it approved by more than two-thirds of Missouri voters. Most recently, she has agreed to be a board member of the Missouri State Park Foundation and supported its establishment in 2001.

In 2002, the conservation leaders were recognized for their efforts by having one of Missouri's newest state parks named in their honor. The Edward "Ted" and Pat Jones-Confluence Point State Park is located at the confluence of the Missouri and Mississippi rivers in St. Charles County and showcases wetland restoration and interpretation related to Lewis and Clark's Corps of Discovery. The park preserves the area where the two greatest rivers in the nation – the Missouri and Mississippi – meet in St. Charles County. The Department of Natural Resources has developed a day-use park, which offers trails, river-related recreation and wildlife observation to enhance visitor enjoyment in this unique, natural setting.

This park also was made possible by the Danforth Foundation of St. Louis, which supported acquisition of the initial 202 acres of the state park and provided a grant to help the Department of Natural Resources develop it. Additional development has been possible through partnerships with The Great Rivers Greenway District and a grant from the U.S. Fish and Wildlife Service. The department opened the 1,118-acre state park in May 2004, in time for the 200th anniversary of the Lewis and Clark expedition. The new park also will serve as a link in a regional effort to provide trail access all the way from the eventual end of Katy Trail State Park in Machens to the Illinois border.

state parks. The continued support of the public will be necessary to ensure these species are protected as thousands of visitors pass through the parks and historic sites. We must rely on each visitor to leave the park or site as he or she found it. This also sets an example for future state park users.

Although the Missouri state park system is considered an award-winning system, it faces challenges like all public lands. An immediate challenge is to upgrade the infrastructure within many of these facilities.

Many of these state parks and historic sites were developed in the 1930s, and the infrastructure cannot support the millions of visitors to the system and the improved standards required for clean drinking water and safe wastewater treatment.

The department has been aggressively pursuing these upgrades, but more needs to be done. Adequate infrastructure is imperative if the state park system wants to protect the resources of the state and provide not only a quality experience for its visitors, but a safe and healthy one as well.

Land development around state parks and historic sites and the impact of urban sprawl also pose a challenge. In some instances, state parks and historic sites have become islands in a sea of development. They often are affected by air pollution, water pollution from sediment and sewage, and noise and light pollution from outside the park.

Protecting the natural and cultural resources within the state park system also continues to be a priority. Both natural and cultural resources must be properly maintained to be preserved. Loss of historic fabric over time is one issue that must be continually addressed. Landscape features must be properly maintained to preserve biodiversity and to prevent encroachment by invasive exotic species.

To address any or all of these challenges, a stable funding source is imperative. The parks-and-soils sales tax is the primary funding source for the state park system, which does not receive any general revenue. In 2008, renewal of the tax will allow these challenges to continue to be addressed.

Prairie State Park

Preserving State Parks: CHALLENGES

- The state's parks-and-soils sales tax, the main funding source for Missouri's state parks system, will need to be reauthorized by 2008. Continuing this tax is more important than ever so the state park system can meet new challenges.
- Maintaining a proper infrastructure for the state park system requires an ongoing effort.
- State parks often face threats from air, water, light and noise pollution from development outside parks borders. Many of these parks are in danger of being swallowed by a sea of development.
- Protecting and preserving biodiversity found within Missouri's state parks requires not only an ongoing effort by the many employees and volunteers who care for them but by the millions of visitors who enjoy these parks each year.
- The goal for Katy Trail State Park is to make it a truly cross-state trail, which means it would extend from Missouri's border with Illinois to our border with Kansas. To do this, the department must find a way to connect the trail with the network of trails in the Kansas City area.

Missouri's Resources: Putting It All Together

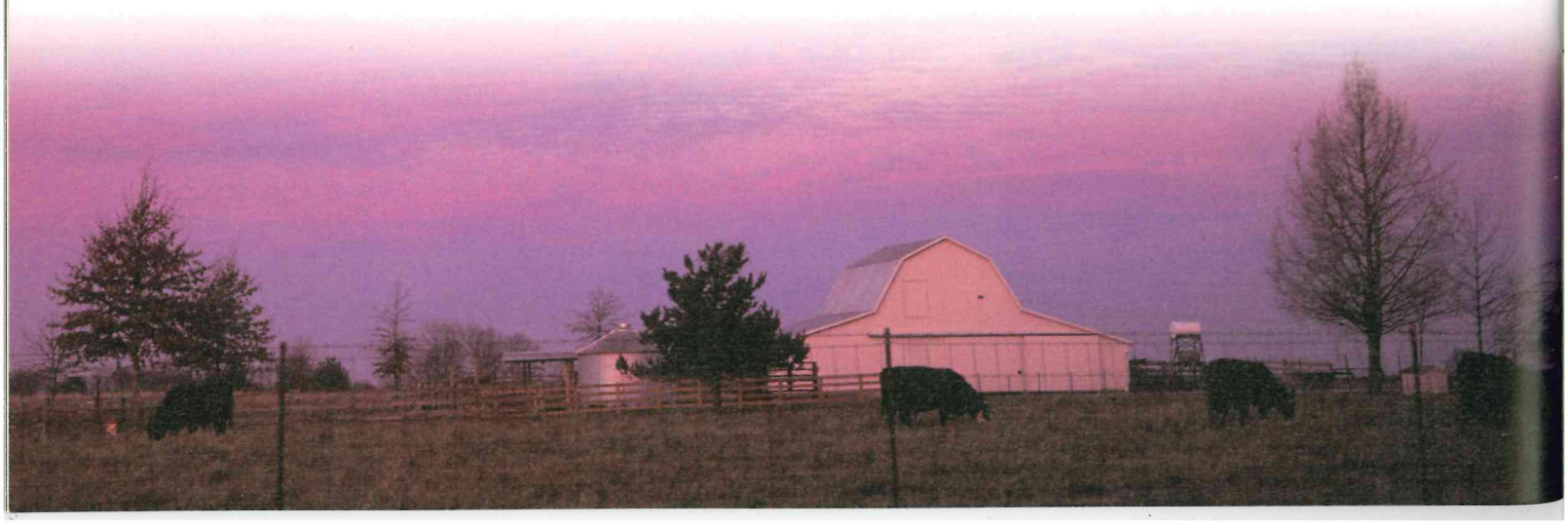
Our citizens, elected officials, community groups, city and county officials, businesses and private citizens can work together to protect and improve our environment and ensure that our natural and cultural resources can be enjoyed for generations to come. If you've taken time to read this report, you've already joined this effort by educating yourself on the current state of Missouri's environment. You may have come up with some things that you can do to help.

We are becoming increasingly aware of the importance of environmental protection. It seems every day that new studies link pollution to different forms of illness, making a clean environment one of our best defenses against asthma, heart disease, cancer and even the West Nile virus. We also now have a better understanding of the interconnectedness of environmental protection. Mercury in our air, for example, can tremendously impair our water quality, as can soil erosion, tire fires or leaking landfills.

The economic significance of environmental protection is growing as well. As tourism becomes a larger component of our economy, protecting our air, land and water quality is more important than ever. Our state parks generate $538 million in revenue annually for the state of Missouri. We also must look much more carefully at the amount we spend on energy. Energy efficiency and developing alternative energy resources isn't just an energy and environmental issue, it's an economic issue as well.

Technology is changing the business of protecting the environment. Geographic Information Systems technology, for example, has greatly expanded the type of information available in decision making. The department's Geological Survey and Resource Assessment Division recently released an electronic atlas stored on CD-ROM, containing more than 15 statewide digital GIS map coverages. The Missouri Environmental Geology Atlas, or MEGA, puts information into the hands of the public so people can make better informed environmental and development decisions. Hydrology and geology information is now much more readily available than ever before, allowing more accurate modeling for earthquakes, drinking water shortages and contamination migration.

As we've seen throughout this report, protecting each part of the environment – our air, land, water, energy and cultural and historic quality – requires a holistic approach. It also requires a holistic commitment from Missouri communities. It requires participation from every segment of Missouri – state agencies, elected officials, local governments, businesses and industry groups, agricultural operations, universities, schools, families and private citizens. When these individual components join together, there are no bounds or limits to the tremendous environmental progress the State of Missouri can accomplish.



What We All Can Do

The Department of Natural Resources seeks to work cooperatively and successfully with businesses, local officials and citizens to help promote a healthy economy and environment. Below is a list of actions we all can take to keep Missouri a great place to live and work.

Call the Outreach and Assistance Center at **1-800-361-4827** for more information on any of these actions.

BUSINESSES

Waste reduction and recycling

- Educate yourself on environmental regulations related to your business. Find out how you can participate in the voluntary Missouri Environmental Management Partnership (MEMP). Through MEMP, businesses can improve environmental and economic performance by developing environmental management systems.
- Conduct waste audits to determine whether you are paying more to dispose of trash or materials that could be eliminated, recycled or reused. Call the Solid Waste Management Program.
- Contact the department's Hazardous Waste Program for assistance in disposing of or cleaning up hazardous waste.
- Carefully follow procedures for safely disposing of solid and hazardous wastes associated with operation of your business.

Transportation

- Support flexible work schedules and telecommuting, which help to reduce traffic congestion and air pollution.
- Provide bicycle racks and on-site showers to encourage employees to take bicycles to work, and set aside special parking spaces closer to the entrance as an incentive for those who carpool.

Water protection

- When landscaping, incorporate native plants into the design and consider options that require little watering, fertilizers or pesticides.
- Make your office or company a leader in long-term stewardship efforts ... form a Stream Team.
- Follow proper procedures to prevent accidental spills and discharges.
- Reduce soil erosion at construction sites, farms and other businesses by using tips from our Soil and Water Conservation Program.

Energy Efficiency

- When undergoing building construction, talk with contractors about methods to improve the structure's energy efficiency. Purchase Energy Star® labeled equipment, which saves energy and money.
- Turn off lights in unused rooms and electronic equipment at the end of the day for measurable business savings.

COMMUNITIES

Resource protection

- Community leaders can make informed decisions about protecting the environment by contacting the department's Outreach and Assistance Center to obtain technical assistance and training opportunities, such as received through the Resource Management Institute.
- Choose locations for disposal and management facilities and water supply wells that take advantage of natural geologic conditions to protect and preserve groundwater. Call the department's Geological Survey and Resource Assessment Division.

Waste reduction and recycling

- Offer a convenient recycling program, accessible to all citizens.
- Offer an easily accessible, central and safe collection and disposal of household hazardous wastes and electronics.
- Be aware of abandoned sites in your community that may be eligible for cleanup programs. Contact the department's Hazardous Waste Program for information on returning these properties to beneficial use.

Energy Efficiency

- Apply for a loan through the state's low-interest energy loan program to make energy-efficiency improvements to your school or municipal building, which will not only save energy, but money as well. Contact the department's Energy Center for more information.

Water protection

- Learn about available financial assistance for water and wastewater systems improvements by contacting the department's Water Protection and Soil Conservation Division.
- Work closely with businesses and community planners to ensure managed growth that protects the area's air, land and water quality.
- Form a watershed group to protect and restore your local watershed.

CITIZENS

Waste reduction and recycling

- Be aware of and report illegal dumping of solid or hazardous wastes in your community. Contact the department at (573) 634-2436. To report dumping or other problems, contact your regional office, call the department toll-free at 1-800-361-4827 or visit www.dnr.mo.gov/concern.htm.
- Take advantage of community household hazardous waste or electronics collections to safely dispose of these special wastes.
- Support local recycling efforts and buy recycled products.

Transportation

- To protect air quality, carpool or take the bus to work. Also, try to choose a home that is close to your place of work, shopping and other destinations, and one that is close to mass transit. Visit the Department of Natural Resources' Energy Center Web site at www.dnr.mo.gov/energy for other energy efficiency tips.
- Choose a fuel-efficient vehicle and keep it in good running order. Check for proper tire inflation to ensure maximum fuel economy.

Energy Efficiency

- With new construction or remodeling, ask your builder for methods to incorporate energy efficiency. Visit the U.S. Department of Energy's Web site at www.energysavers.gov for easy, inexpensive ways to improve energy efficiency in your current home.
- Whenever possible, purchase Energy Star® labeled equipment, which saves energy and money.
- Replace incandescent bulbs with long-life compact fluorescents.
- Turn off lights in empty rooms and unused electronic equipment for measurable energy and cost savings.

Water protection

- Avoid pouring hazardous chemicals down drains or onto lawns. Never empty chemicals into rivers, lakes, streams or ponds.
- Have both private and public water supply wells constructed by permitted well drillers and ensure that these wells are certified by the Department of Natural Resources.
- Participate in community and Stream Team cleanups.
- Ensure septic systems are properly installed and maintained. Avoid using bleach and chemicals. Have tanks pumped every 2-3 years.
- Conserve water whenever possible. Consider landscaping with native plants which require less watering. Repair leaking faucets.

Resource protection

- Support funding for environmental protection, such as efforts to renew the waste tire fee and to extend the parks-and-soils sales tax, as well as fees and other methods of funding.
- Assist with the Volunteers in Parks (V.I.P.) program. Visit www.mostateparks.com/volunteer.htm for more information.
- Talk to your children about protecting the environment. Attend Earth Day events, participate in community cleanups and visit a state park.
- Learn more about Missouri's natural resources and how to protect them.

Visit www.dnr.mo.gov or call the Outreach and Assistance Center toll-free at 1-800-361-4827 for more information.

Environmental Facts and Figures

- In 2003, soil conservation efforts saved 3.58 million cumulative tons of soil from being lost in Missouri.
- Iowa, Michigan and Wisconsin have a private well construction compliance rate of more than 90 percent; Missouri's compliance rate is estimated to be about 67 percent.
- Kansas City and St. Louis both have shown dramatically lower occurrences of high ozone days. While both areas attained the one-hour ozone standard, they now face stricter regulations under the eight-hour standard.
- By 2004, approximately 93,000 cumulative acres of land previously used for mining will be returned to productive use.
- Since 1994, nearly 13 million tires have been cleaned up from nearly 500 illegal dumps in Missouri.
- Reimbursement for community tire cleanups was funded from the state's 50-cent-per-tire waste tire fee. However, the waste tire fee expired Jan. 1, 2004. There will remain 3.4 million tires scattered across Missouri's landscapes in illegal dumps that the department cannot clean up without funding.
- Missouri is ranked as the 22nd highest energy-consuming state in the nation; more than 95 percent of Missouri's primary energy sources are imported from outside the state at a cost of more than $13 billion each year.
- Missouri's award-winning state park system includes 83 state parks and historic sites encompassing more than 140,000 acres. Through trails managed by the Department of Natural Resources, access also is offered to the 61,000-acre Roger Pryor Pioneer Backcountry. The parks and soils sales tax, which supports the Missouri state park system, will expire in 2008 if not renewed by voters.
- More than 300 Missouri communities and agricultural producers have received more than $1 billion in financial assistance to construct and improve drinking water and wastewater facilities through the State Revolving Fund. Missouri ranks 11th in the nation for the amount of SRF assistance given.
- The department's Energy Loan Program helps Missouri school districts and local governments save an estimated $8.2 million in energy costs each year. In 2003, these improvements helped reduce carbon dioxide, or greenhouse gases, in Missouri by more than 25,000 tons.
- In 2003, the department cleaned up 306 hazardous material releases in situations where the responsible party could not be contacted or identified.
- The department also works with local law enforcement to safely clean up methamphetamine labs. In 2003, 2,314 clandestine drug labs were processed.
- As part of its regulatory role, the Department of Natural Resources conducted more than 13,000 inspections resulting in more than 2,100 findings of non-compliance. Nearly 80 percent of these situations were resolved voluntarily, often with compliance assistance, and without further enforcement action.

Missouri Department of Natural Resources
P.O. Box 176, Jefferson City, MO 65102-0176
1-800-361-4827 for department information
1-800-334-6946 for state parks information
www.dnr.mo.gov

PUB001332

PRINTED WITH SOYINK

printed on recycled paper

12/04