

MISSOURI

resources

Spring / Summer 2010 • Volume 27 • Number 2

SUSTAINABILITY  GREEN LIVING

Director's Comment

This nation recently celebrated the 40th anniversary of Earth Day. Gaylord A. Nelson, a former governor and U.S. Senator from Wisconsin, created the first Earth Day back on April 22, 1970 as a method to increase environmental awareness. Senator Nelson believed we needed a comprehensive and nationwide program that would save the natural resources of America. His dedication to the cause proved successful as he became an environmental leader who helped build the foundation for environmental law such as the Environmental Protection Act, the Clean Air Act and the Clean Water Act.

The remarkable success of Earth Day grew from the seed Senator Nelson planted back in 1970 and has continued to grow and flourish to this day. Senator Nelson once asked, "Do we really have to destroy tomorrow in order to live today?" Of course not. Our nation continues to learn how to improve environmental protection using new technologies and through better understanding.

In an effort to improve Missouri's environment and Energize Missouri, the department is funding projects that will reduce energy use, reduce fossil fuel emissions and create and retain jobs. The department selected 58 communities across the state to receive federal American Recovery and Reinvestment Act funding. These communities' projects will reduce their waste and help improve Missouri's environment and improve energy efficiencies that will reduce their costs and help lead the way to a more sustainable future. The department's Energize Missouri Web site at: www.dnr.mo.gov/transform/energizemissouri.htm has more information on this successful effort and how it's helping Missourians.

Early estimates show that 105 jobs will be created as a result of Energize Missouri Communities funding. Completion of the funded projects are anticipated to save Missouri communities and counties more than 47.7 million kilowatt-hours of energy per year and reduce CO₂ emissions by



11,657 tons, which is the equivalent of removing 2,022 cars from our roads.

Another project that helps promote the environmental benefits of renewable energy is the American Solar Challenge. The challenge is a competition to design, build and race solar-powered cars in a cross-country event. The Road Race will begin a weeklong 1,100 mile journey from Tulsa to Chicago. The department is hosting an event at the State Capitol on June 22 from 1 to 6 p.m. to showcase the efforts of the race. The free event is open to the public and will provide displays and exhibits for viewing while awaiting the arrival of the cars and teams that will be checked in by race officials in front of the Capitol. Missouri S&T's car, Solar Miner VII, is participating.

Events like Earth Day and the American Solar Challenge serve as an opportunity to rekindle our flame for environmental protection. It is up to us all to raise awareness of local environmental issues and keep the flame going throughout the year.

A handwritten signature in black ink, appearing to read "Mark N. Templeton".

Mark N. Templeton
Missouri Department of Natural Resources

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printed on recycled paper



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Green Gatherings

by Andrea Morrow and Kathy Deters

Whenever people get together, there is waste. From weddings and meetings to tailgate parties, the piles of trash left from consumables is considerable – and growing.

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The Greening of Johnson’s Shut-Ins State Park

by Sue Holst

It took only minutes to virtually destroy a major part of one of Missouri’s most popular state parks. In the four-plus years since, accepting the irreparable damage of some natural features at Johnson’s Shut-Ins has been painful. But refocused on the future and sustainability, a new park has emerged.

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A Run for the Sun Solar Decathlon Showcases Race for Energy Efficiency

by Philip J. Tremblay

What’s conceived and built on-campus by Missouri college students, torn down and taken to Washington, D.C., rebuilt, torn down again and brought back to Missouri – where it’s reassembled once again?



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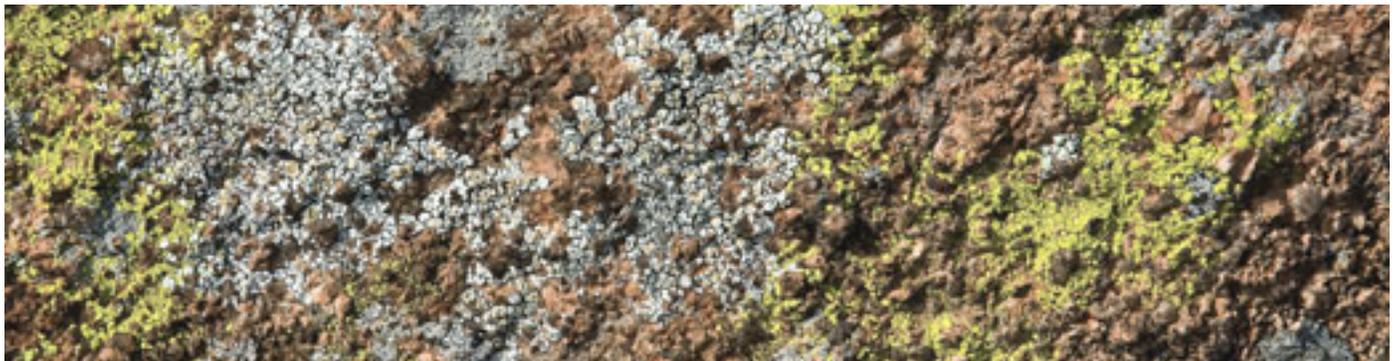
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The Hidden Resource ... Rare Earth Elements



DNR photos by Scott Myers

Above right: Steel beam connectors are a sustainable design element in many of the new buildings at Johnson’s Shut-Ins State Park.

Above: In what could pass as a shot from the Space Shuttle, a close-up reveals lichens on a granite boulder at Elephant Rocks State Park.

COVER: Wild bergamot, also known as horsemint or beebalm, is a native perennial in 99 of Missouri’s 114 counties.

Cover photo by Scott Myers.

Green Gatherings

by Andrea Morrow and Kathy Deters



DNR photo by Scott Myers

(Above) Jacob Luecke, left, Sandy Stover, lower center and Karen Buschman work on a Missouri Chamber of Commerce and Industry Webinar production to help reduce members' travel costs.

(Opposite page, bottom) Julia Haslanger of Sustain Mizzou, provides recycling bags to tailgaters in the parking lot of Faurot Field. The volunteer Tiger Tailgate Recycling program also places recycling bins in tailgating areas.

Anyone who has had to clean up after a wedding, baby shower, family reunion, graduation party or professional meeting is familiar with the mountains of waste that are left behind. Paper plates, disposable cups, food scraps, decorations – the volume of discarded materials can be astonishing.

But there is an increasing interest in planning special events to reduce this waste and its impact on the environment. According to Cheryl Haney with the Aries Company, an event rental and production company in St. Louis. Aries Co. provided green centerpieces for the Muscular Dystrophy Association's "Evening Under the Stars," and consulted on green aspects of the Tug McGraw Foundation Gala, a private fund raiser hosted by Tim McGraw and Faith Hill at Grant's Farm in St. Louis.

Though the task may appear daunting at first, Haney says planning a green event is much easier than most people realize.

"We just remind people to think of the four R's – Reduce, Reuse, Recycle and Rent!," Haney explained. "What can be reused? Centerpieces, for one. What can be recycled? Programs, invitations. And renting can reduce the need to purchase unnecessary items."

She also recommends other measures such as using soy candles in votives. When working with a vendor to add lighting effects, request energy-efficient LED lights.

"Look for vendors that already have a green plan," Haney said. "Challenge them to be as green as they can be."

The Missouri Department of Natural Resources offers green event planning tips on its Web site at: dnr.mo.gov/env/swmp/GreenTips.htm.

Consider issuing environmental invitations – e-vites – and using online registration, rather than stationary. If stationary is a must, choose invitations and thank-you cards printed on recycled-content paper

Tips for Your Green Gathering

Compiled from our green tips Web site at: dnr.mo.gov/env/swmp/GreenTips.htm

Meetings:

- Provide recycling bins in public areas and private rooms.
- Use cloth napkins and tablecloths.
- Use glass or ceramic coffee mugs instead of plastic foam or paper.
- Use water coolers instead of bottled water.
- Donate extra food and refreshments to local shelters or food banks.
- Use online invitations or registration.
- Collect and reuse plastic nametag holders.
- Use reusable or recyclable signage.
- Minimize travel requirements.
- Schedule activities within walking distance of each other.
- Encourage the use of public transportation via incentives.

Weddings:

- Consider heirloom rings from family or antique stores.
- Brides can wear their mother's wedding gown.
- Groom; groomsmen rent tux or purchase suits they can wear again.
- Bridal attendants can select dresses that can be worn again.
- Invites should be printed on recycled content with soy ink or consider sending e-vites.
- Encourage guests to carpool to the wedding and reception.
- Use local florists or greenhouses and buy reusable silk flowers or replantable items when possible.

- Consider close-to-home weddings and receptions in local parks.
- Arrange for reusable plates, glasses, cups and utensils and cloth napkins and tablecloths.
- Have your caterer look for locally grown produce and meats.
- Ask the venue or caterer to put out bins for recycling bottles and cans.
- Encourage guests to buy earth-friendly gifts via a green gift registry.
- Avoid throw-away wrapping materials and unnecessary bows and tissue.

Tailgating:

- Use a farmer's market for fresh produce, buns.
- Buy locally produced meat to minimize shipping energy costs.
- Purchase condiments in bulk rather than single serving sizes.
- Carpool to the game.
- If the game is close to one of the tailgater's homes, have your party in their yard and walk to the game.
- Use propane or a chimney starter if using charcoal.
- Consider a solar-powered grill.
- Durable plastic plates, cups and silverware are reusable and last a long time.
- If your group listens to other games, while tailgating, consider a crank-powered radio.
- When it's game time, find recycling bins for your various recyclables.

with soy-based ink and mailing labels using water-based adhesives. RSVPs can be sent via e-mail or a phone call, rather than another piece of paper.

As the saying goes, consider location, location, location. Choose a site that is close to attendees, or near mass transportation and an airport for out-of-state guests. Reducing travel requirements automatically decreases energy use.

When serving a meal at meetings and special events, opt for reusable dishes. Also serve condiments in reusable containers instead of plastic packets. Choose cloth, rather than paper, for napkins and tablecloths; request water coolers instead of individual water bottles. According to the Earth Policy Institute, 1.5 million barrels of oil are consumed each year in the production of plastic bottles. Be sure to request onsite recycling bins in communities where recycling is available.

In addition to these general guidelines, here are a few specific tips for making your special occasion greener:

TYING A GREENER KNOT

As brides and grooms prepare to begin their future together, many also want to ensure that their planet is as clean and

healthy on their 50th anniversary as it was on their wedding day.

"Green is a choice, not just a theme. So many think 'green weddings' must be a 'natural, hippie or granola' event," Haney said. "This is just not the case. Green weddings can and will be just as elegant as the couple wants."

Couples looking for green options in their wedding planning may begin with



Photo by Nick King / Columbia Daily Tribune



Photo by Brian Tucker

(Above) A rehearsal or wedding dinner set with reusable plates, silverware and glassware provides elegance seldom duplicated by paper plates, plastic spoons and plastic foam cups.

their ring selection. An antique or heirloom engagement ring, for example, not only has special meaning for the bride, but also saves resources. Brides with a love of nostalgia may also want to consider borrowing their mothers' wedding dresses or purchasing a dress from a vintage shop. Grooms can rent tuxedos as a green alternative, or purchase a suit that can be worn for other occasions.

Though many couples choose exotic locales for their weddings, Missouri offers lovely reception sites, including state parks and historic sites, that may reduce both travel and cost. Some fees may apply; visit: mostateparks.com for a complete listing and be sure to contact the state park in advance. Choosing flowers and greenery that are locally grown is another way to reduce energy consumption and introduce a sense of the local community to the ceremony.

After the wedding, consider composting floral arrangements, having them dried and preserved or donating them to a local hospital or nursing home. Brides and grooms with a green thumb may also enjoy growing flowers that can be replanted after the party, which will provide a lasting memory of that special day at their first home. Using locally grown produce and meats provides local flavor and saves on energy costs.

Green wedding gift registries enable couples to request earth-friendly products. Couples can show their appreciation by

treating their guests to green party favors, such as a tree planted in their name or a gift basket of green products.

CORPORATE GREEN

As conference coordinator for the Missouri Chamber of Commerce, Sandy Stover plans conferences across the state. Stover has made Chamber events greener by taking a few simple steps, such as offering online registration; posting conference presentations on the Chamber's Web site, rather than printing and distributing hard copies; using electronic marketing instead of mass mailings; and opting for conference calls during conference committee planning instead of face-to-face meetings, which require more travel. Stover also hosts numerous educational seminars throughout the state but with more businesses on tighter budgets, she noticed a decline in attendance.

"I have seen a drop-off in seminar attendance, which led me to implement the Webinars last fall," Stover said. "Webinars reduce travel costs and save time."

Choosing reusable or recyclable signage for corporate meetings and events and reusing nametag holders is another way to reduce waste and save money in future event planning. Minimize conference attendees' travel by choosing meeting sites that are near one another and close to airports and public transportation.



A five-day conference for 2,500 can consume 62,500 plates, 87,500 napkins, 75,000 cups/glasses and 90,000 cans and bottles, according to the Fifth Edition of Professional Meeting Management. A few green measures can mean significant savings.

GREEN TEAM SPIRIT

Thousands of fans will converge at their favorite stadium before a big football game. No matter what their team colors are, green is always appropriate when it comes to tailgating. Start with transportation: carpooling to the game with friends cuts energy use and provides extra time together. Dress for the weather to avoid using the car heater, and consider a solar- or crank-powered radio to keep up on other games.

When it's time to grill, choose propane. If cooking with charcoal, use a chimney starter rather than lighter fluid. Solar-powered grills are another option. They may take a little longer than traditional grills, but are perfect for brats and hot dogs. Purchase reusable plates, cups and napkins in your team colors to reduce waste and save money at next year's tailgate parties. If disposables are being used, choose ones made of recycled materials or that can be composted. Take advantage of the recycling bins provided at most stadiums. If no bins are available, take trash home for recycling.

University of Missouri tailgaters will find plenty of recycling opportunities for glass, aluminum and plastics types 1 and 2, thanks to Tiger Tailgate, a partnership among MU Campus Facilities-Landscape Services, Anheuser-Busch Recycling, MU Intercollegiate Athletics, Sustain Mizzou, City of Columbia and N.H. Scheppers Distributing. Students distribute bags that can be used to collect several types of beverage containers, as well as cardboard, and personally thank tailgaters for participating.

Check if your favorite tailgating venue has a similar program. If not, consider contacting



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the school or college and encourage them to place recycling bins on their grounds.

"While it is extremely important to cheer and root for the Missouri Tigers, it is also vital that we all stand up for the core values that Mizzou represents: Respect, Discovery, Responsibility, and Excellence. Recycling definitely falls under those categories," said Mike Madden, Tiger Tailgate recycling manager. "It benefits not only the university, but the community as well."

With proper planning, any event can be greener and more earth-friendly. For those wanting professional guidance, Haney suggests consulting with an event planner. To find one near you, check with the International Special Event Society at: www.ises.com.

"Greening doesn't have to add to your budget. Greening is just making good decisions based on environmental impact," Haney said. "Your event can and will be as green as you make it." ☀️

Andrea Morrow and Kathy Deters are former public information staff for the Department of Natural Resources.

(Top left) Locally grown floral arrangements can be offered as party favors to guests. Later the decorations can be composted. (Above) Planning a green wedding can still preserve cherished traditions.

The Greening of Johnson's Shut-Ins State Park

by Sue Holst
photographs by Scott Myers



Dec. 14, 2005. A concrete wall at the front of Taum Sauk Reservoir gives way. More than 1.3 billion gallons of water are unleashed down Proffit Mountain. The water rages into Johnson's Shut-Ins State Park, ripping up trees, scouring out mountainsides – annihilating in seconds what nature took millions of years creating.

Besides destroying or extensively damaging many of the facilities, it also altered the landscape of the valley, including a designated Missouri natural area. The shut-ins themselves were filled with boulders, gravel and debris.

More than four years later, the park is fully open again – and a showcase for how green a park can be.

“We have used Johnson's Shut-Ins State Park to showcase the mission of this department. By making an effort to include sustain-



“We first focused on the restoration of the quality resources because that is what makes this park special.”

- Greg Combs, eastern parks district supervisor

able and “green” features wherever possible in rebuilding this park, we have led by example,” said Bill Bryan, the department’s state parks director.

Soon after the breach, the Missouri Department of Natural Resources began the lengthy process of environmental recovery, restoration and eventually redevelopment of the park. The department was able to officially open the completed day-use area of the park in the valley in June of 2009. This summer will also feature a new campground in the Goggins Mountain area of the park and the Black River Center, which is a new orientation center in the valley.

After the breach, the first priority was environmental recovery and resource restoration, especially the East Fork of the Black River and the fen, according to Greg Combs, the district supervisor for state

parks in the eastern part of the state and the onsite project manager for rebuilding the historic park.

“We first focused on the restoration of the quality resources because that is what makes this park special. From there, we designed our development to be in concert with those resources,” Combs said.

And that redevelopment incorporated environmentally friendly design concepts wherever feasible and possible.

“We always try to incorporate environmentally friendly features on any remodel or construction of a new facility in state parks,” said Jane Lale, planning and development director for the department’s Division of State Parks. “This situation was somewhat unique because we basically had to build almost an entire park.”

Many of the features are ones that individuals and businesses can incorporate into

(Opposite page) The Black River Center serves as the park’s new cornerstone building. Its green features include geothermal heating and cooling and energy-efficient lighting.

(Inset) The pervious paving has decorative openings that allow storm water to soak in rather than run off.

(Below) Smaller rocks that were washed down the side of Proffit Mountain in December 2005 have become part of the park’s new structures. The designs are reminiscent of construction work done by the Civilian Conservation Corps in many state parks during the 1930s.





(Above) The stone used on the exterior of the Black River Center mimic the order of rock layers found in the nearby St. Francois Mountains. (Inset) Cedar trees that once grew where the new campground is now provide sturdy, decorative seating for visitors to Johnson's Shut-Ins State Park.

their own homes and buildings. For example, a geothermal heating and air conditioning system is being used at the Black River Center and all facilities have energy-efficient appliances as well as interior and exterior lighting to reduce energy use.

To make use of natural light, skylights and tube lighting have been installed in all structures, including the shower house and seasonal quarters. Windows are low solar heat gain coefficient and an ecoscreen fabric solar shade has been installed on the large window that faces east in the Black River Center conference area. Both reduce cooling costs in warm-weather months. The offices have occupancy sensors to make efficient use of lights and low-flow faucets and on-demand water heaters were added.

To ensure the long-term use of the orientation building, steel roofing and steel and

concrete siding were used along with masonry walls and Douglas fir beams. At the park's maintenance building, an outdoor wood furnace was installed for heat and a cistern was built to collect rainwater for washing equipment and other uses.

Pervious pavers, which allow water to filter through them into the ground, have been used on most of the parking areas and for the campground parking pads. In the day-use area of the park, an underground wastewater system with biobeds was incorporated into the redevelopment. This innovative treatment system, which was selected because of the limited space available, allows the wastewater to be pretreated then evenly distributed among the biobeds before being absorbed into the ground.

Storm water in the day-use area valley is collected in bioswales. The drainage system around the Black River Center and the braided road system collects the storm water runoff and allows the water to be more naturally absorbed into the ground. This technique was used to minimize runoff into the river and any impact to the water table near the fen.

While many of the designs were ones that can be commonly used, other features are unique to the park. The water from the breach washed many rocks and boulders down the mountain into the park. These same rocks, mainly rhyolite, granite and dolomite, have been incorporated into the design of many buildings and features, such as the bridges, culverts, boardwalk pillars, shelters, pavilions, and the seat wall near the park store.

The various types of stone used on the outside of the Black River Center mark the progression of geologic time from oldest rock on the bottom to younger rocks near the top.

Boulders were also employed at strategic locations in the reconstruction of the East Fork of the Black River to help stabilize

banks and return the stream to its natural Ozarks appearance.

When clearing was required for the new campground in the Goggins Mountain area of the park, tree removal was kept to a minimum to help retain the natural feel of the area. Cedars that were cleared from the area were used to make benches for the park. Other trees such as dogwood, redbud and red oak that were cleared from the new campground area were transplanted into the valley to help replace the trees that were lost during the breach. Only native plants and grasses were planted in the campground and the valley. Native trees and shrubs such as cottonwood, sycamore and green ash and shrubs such as sumac and rough-leaved dogwood were planted along the banks of the reconstructed river to help stabilize it. Other native trees and shrubs have been planted in the scour channel and have been effective in helping to stop erosion and storm runoff.

“This park has always been special because of its natural features. What visitors will see today is not the same as it was before 2005,” Bryan said. “But we have tried to rebuild a park that reflects those natural qualities while incorporating the sustainable and environmentally friendly features that will showcase it into the future.” 🌅

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



Large rocks that were washed into the park's fragile fen are now part of the landscape and a permanent reminder of recent events and recovery. The fen is a natural wetland community and a designated Missouri natural area. (Bottom) New energy-efficient camper cabins provide a rustic place to stay for visitors to the park.



A RUN FOR THE SUN

Solar Decathlon Showcases

by Philip J. Tremblay



Stefano Paltera/U.S. Department of Energy Solar Decathlon

American pioneers moved into the wilderness of their time with log cabins. These structures were brought to the continent in the 1700s by Swedish settlers. The cabins used readily available timber, needed no nails and went up quickly.

Today's pioneers face a "wilderness" defined by rising energy demand, vanishing natural resources and many economic challenges. Housing today needs to be innovative – adapting to the latest energy-saving technologies, using recycled materials and

Race for Energy Efficiency

they must be attractive to both homeowners and mortgage lenders. Comfort and sustainability are features that reach well beyond those offered by the traditional log cabins of the past.

For several years, Missouri University of Science and Technology, Rolla, students, faculty and a support network of contractors, manufacturers, designers and inventors have competed in the Solar Decathlon, sponsored by the U.S. Department of Energy. While faculty offer advice and guidance and the professional network offers financial support and practical experience, this effort is primarily student-driven. The Missouri Department of Natural Resources' Division of Energy is one of the team's financial sponsors.

Missouri S&T participation in the Solar Decathlon in 2002, 2005, 2007 and 2009 has resulted in state-of-the-art demonstration homes that return from competition and serve as on-campus teaching tools. Located in the Solar Village on the campus at Rolla, the homes also provide student housing across from the Gale-Bullman Multi-purpose Building on West 10th

Street. You can watch progress of the on-campus reconstruction at: solarhouse.mst.edu/webcams.html.

Stuart Baur, PhD., assistant professor in the Civil, Architectural, and Environmental Engineering Department at Missouri S&T, served as the faculty advisor for the 2005 and 2007 solar homes. The 2009 advisor was Katie Grantham Lough.

Baur sums up the general purpose of the student competition: "It is to learn from previous designs and improve upon future

designs, resulting in energy efficiency in all future and existing homes. With global warming becoming an increasing concern, it is important that we do our part in minimizing our impact on our environment for future generations."

Luke Sudkamp, a senior in architectural engineering and the project manager for the 2009 team said, "The team's philosophy is simple – educate everyone who is interested in solar living."

At the National Mall, students offer tours to the public with the intent of increasing knowledge regarding opportunities and latest developments in solar technology. The myriad questions that arise during tours are reflective of the incredible diversity employed to create the solar homes. Regardless of the seemingly strange or innovative technology, materials or systems used, the projects still must work, and work well.

In the 2007 and 2009 Solar Decathlons, the Missouri S&T team placed 11th out of 20 entries. In each of these years, Team Germany, Technische Universität Darmstadt, finished first. The German students focused on producing surplus energy by using the maximum overall building dimensions allowed, applying solar photovoltaics to every available surface and other new

(Opposite page) Crowds tour 20 solar-powered homes on the National Mall in Washington, D.C. during the 2009 U.S. Department of Energy Solar Decathlon. Missouri's entry is second from the right, on the upper tier of homes on display. (Inset) Juror Jonathon Knowles looks over the recycled sorghum interior of Missouri's Show-Me House. (Below) Anna Osborne, Team Missouri, paints the ceiling of the Missouri entry.

Stefano Paltera/U.S. Department of Energy Solar Decathlon

Stefano Paltera/U.S. Department of Energy Solar Decathlon





- 100 SUBJECTIVE POINTS:**
 - Architecture
 - Market Viability
 - Engineering
- 75 SUBJECTIVE POINTS:**
 - Lighting Design
 - Communications
- 100 OBJECTIVE POINTS:**
 - Comfort Zone
 - Hot Water
 - Appliances
 - Home Entertainment
- 150 OBJECTIVE POINTS:**
 - Net Metering



DNR photo by Scott Myers

(Top) Early October sunshine powers up the solar homes for attendees of the 2009 Solar Decathlon in Washington, D.C. (Above) Nearly ready for its trip east, the house sits on the Missouri University of Science and Technology campus at Rolla.

technologies. The team won the net metering (least electric power required) contest and performed well in architecture, lighting design, comfort zone and hot water contests.

Second place in 2009 went to the University of Illinois at Urbana-Champaign. Their entry, Gable House, was a blend of traditional homebuilding and advances in energy-efficiency technology. Third place went to Team California, from Santa Clara University, California College of the Arts.

Scoring the Competition

Scoring the decathlon contestants is not as simple as glancing up at the scoreboard during a sporting event. Once the house reaches Washington D.C. it is judged in several contests by many experts on how well it meets the criteria established for that year. In 2009 there were 450 possible subjective and 550 objective points to be earned (see inset in top photo).

“The Solar Decathlon is forever changing,” Baur said. “It is difficult to compare 2009 results to previous competitions due to rule changes, changing teams, and different jurors scoring the houses.”

Baur explained that each year, the DOE receives more and more proposals for entry and increases the standards required of the teams. The teams admitted into the competition must demonstrate greater potential each year and the finished products of the teams that return must achieve new levels.

The Show-Me Team, consisting of students from Missouri S&T and Missouri University-Columbia, has begun the process of applying for entry into the 2011 Solar Decathlon. As in 2009, the house will be built on campus and be designed to be taken apart and moved to Washington D.C. where it will spend a month being judged. Improvements on the 2009 designs will be the key as to how the house does in the various contests.

The Show-Me House

The team’s 2009 Show-Me House is a single 15 ft. by 50 ft. module capped by a hinged roof, 14.5 ft. at its highest point. Structural insulated panels in both the roof and walls provide an R-40 insulation value. The roof supports an 8-kwh array of photovoltaic panels for electricity. The roof also includes an evacuated-tube solar water heating system for a variety of home uses, including radiant floor heating. The round tubes absorb heat over a larger angle than flat plate collectors.

The Chameleon Home Automation System, designed by the Show-Me Team, controls the interior environment. Residents can program the system with touch screens

found throughout the house. Sensors within the structure activate heating or air conditioning for indoor comfort. Chameleon also controls humidity, automatically runs appliances at the most efficient time of day – solar noon in a solar-powered house – or turn lights on and off and even open and close windows.

Windows admit natural light and LED fixtures provide most of the lighting needs. Americans with Disabilities Act requirements are addressed in most of the Show-Me House, including the height of cabinets and countertops.

Cost and Effort; Benefit and Experience

Just getting to the building construction phase is a challenge. The effort cost around \$600,000 in 2009, most from grants and various sponsorships.

“The structure of Team Missouri is unique from many teams in the decathlon,” Baur said. “The team includes faculty advisors and students from various disciplines and backgrounds. Students are elected to officer positions by team members. These officers are project manager, director of design and construction, director of public relations, director of finance and secretary.”

Students join the team voluntarily, and carry the bulk of the work – design decisions, fundraising, and building. A main faculty advisor oversees the work of the students and helps ensure they reach benchmarks on schedule. Other faculty serve on the advisory board to assist team members in their area of expertise.

Ten to 15 students from MU participated on the 2009 team, compared to about 35 students from Missouri S&T. In the 2011 contest, MU will add business and journalism students, as well as those from the Architectural Studies and Interior Design programs.

“Former students are also welcome to add their input and the current team will consult with some of the more involved for-

Richard King/U.S. Department of Energy Solar Decathlon



mer team members,” said Baur. “The two universities have worked together again to submit a proposal for the 2011 Solar Decathlon ... final acceptance to be announced in mid April.”

Younger members from the 2009 team are now leading the team’s efforts for the 2011 decathlon. “Provided entry, many of these members will see the project all the way to completion, but others will graduate before the [2011] decathlon,” Baur said.

“In addition to Department of Energy providing each team a \$100,000 grant over two years, a lot of the funding for the project comes from monetary donations, in-kind donations, university support and other research grants,” said Baur.

“Missouri S&T also will continue to participate in the Solar Decathlon because of the experience the students receive,” he said. “Students are able to learn about teamwork, leadership, and communication between engineers and architects. This experience prepares the students for some of the problems they will face when they graduate and start their careers.”

For more information on the team, visit: solarhouse.mst.edu/team.html; the Show-Me House at: solarhouse.mst.edu/; or the competition at: solardecathlon.org. ☀

Philip J. Tremblay is a public information coordinator and also serves as assistant editor of Missouri Resources.

The solar houses are reconstructed on the National Mall before judging and public tours. At right is the University of Wisconsin–Milwaukee entry. Beyond it is the Team Missouri solar home.

News Briefs



Katy Trail State Park Celebrates 20 Years

Katy Trail State Park, the longest completed rail-trail in the nation, will celebrate its 20th year this spring.

More than 20 years ago, the department and innovative individuals had a vision to turn a railroad corridor into a hiking and bicycling trail. The trail is built on the former railroad corridor of the Missouri-Kansas-Texas (MKT or Katy) Railroad. After the railroad ceased operation in 1986, the department made use of the National Trail System Act, which allowed railroad corridors no longer in use to be rail banked on an interim basis for recreational trails. Using a donation from Ted and Pat Jones, the department was able to acquire and develop the initial trail from St. Charles to Sedalia. Currently, the trail stretches 225 miles from St. Charles to Clinton and serves approximately 300,000 hikers and bicyclists every year.

The department will mark the 20th anniversary with special events, programs and exhibits throughout the year. A kickoff event was held on May 8 at the Katy Trail trailhead in Rocheport, which was the site of the ceremony for the official opening of the first segment of the trail on April 28, 1990. The event included remarks by Gov. Jay Nixon, recognition of groups and individuals who made the trail possible.

Other events and programs throughout the year include the 10th annual Katy Trail Ride, which will be held this year June 21-25 from St. Charles to Clinton. A special ticket book program will encourage people to visit every community along the trail for special prizes and incentives. Special exhibits at key trailheads will give a brief history of the trail. Other events are being planned in cooperation with many of the communities along the trail. Edward Jones, the financial services firm established by Ted and Pat Jones, is the title sponsor of the 20th anniversary events.

For more information about Katy Trail State Park, the Katy Trail Ride or upcoming 20th anniversary events, visit: www.mostateparks.com or call toll-free at 800-334-6946.

Bi-State Report on Water Issues



The Department of Natural Resources, the Arkansas Department of Environmental Quality and Arkansas Natural Resources Commission have released the first report on bi-state water issues to governors Jay Nixon of Missouri and Mike Beebe of Arkansas.

The report focuses on the quality and quantity of water resources shared by the two states.

An agreement signed by the states' governors in 2008 asks the agencies to identify shared water resources and implement plans to protect them in a region both environmentally and economically important to both states.

Officials with the three agencies met in Arkansas in August 2009 to identify opportunities to collaborate on future projects important to the health and beauty of the states' shared resources. The agencies committed to continue working on such issues as minimum stream flows, nutrient criteria, water quality reporting and water use.

Detailed information about the meeting is included in the report, which can be found on DNR's Web pages at: dnr.mo.gov/env/wrc/.

The agencies will continue this work in 2010 with a meeting in Missouri.

Recycled Products Directory on CD

The Recycled Products Directory is available on CD through the Missouri Market Development Program and will be mailed, at no cost, to individuals. Buying products made from recycled ma-



terials supports recycling by strengthening the market demand for these materials. If more recycled products are purchased, more new products will be created – as well as new jobs and businesses.

There are 91 Missouri companies listed in the directory and a total of 378 businesses, nationwide. The products, which are made from recycled materials, are listed in 21 categories and include playground equipment, recycled glass bird feeders and glass lollipop yard decorations. There is even a recycled-product deer stand in the directory.

The Missouri Market Development Program operates under the Environmental Improvement and Energy Resources Authority, a financial arm of the Department of Natural Resources. The Recycled Products Directory also is available online at: dnr.mo.gov/eiera. Click on the symbol for Recycled Products Directory. For assistance, call Market Development at 573-526-5555.

State Parks Youth Corps Launched

An innovative summer program is benefiting both youths and state parks and historic sites. The State Parks Youth Corps, an initiative by Gov. Jay Nixon and funded through federal American Recovery and Reinvestment Act money, is providing an opportunity for youth between 17 and 24 to experience state parks while learning valuable work skill training. The added benefit is that they will enhance Missouri's 85 state parks and historic sites.

Under the new program, Youth Corps members are earning \$7.25 an hour and may work up to 240 hours from May 1 through Sept. 30. Categories for participants vary and include such areas as trail and building maintenance, park/site aides, office assistance, habitat restoration; special event, communication and interpretive assistance; and artifact management and natural history aide.





environmental notes

The program is a partnership between DNR's Division of State Parks and the Department of Economic Development's Division of Workforce Development. Staff from the Division of State Parks developed the specific projects and DED's Workforce Investment Boards recruited and selected income-eligible applicants for the new youth positions.

For more information about the State Parks Youth Corps, call 800-592-6020 or go to: thinkoutside.mo.gov.



Geologic Maps Now Published

Five new geologic maps are available for portions of Callaway and Osage counties.

The department's Division of Geology and Land Survey creates the maps through the STATEMAP component of the National Cooperative Geologic Mapping Program, which is co-funded by the U.S. Geological Survey.

Areas of coverage include Mokane and Luystown at a scale of 1:24,000. Bedrock and surficial material maps are available for Mokane West and Luystown quadrangles. A surficial material map is also available for Mokane East. These bedrock and surficial material maps continue ongoing mapping projects by the department.

Bedrock geologic maps provide information about the layering of bedrock units and faulting, folding or deformation that may be present. The maps also provide information about the distribution and structure of limestone, sandstone, coal and granite. Surficial material maps focus on all of the deposits above bedrock. This includes soil, but it also includes up to several hundred feet of deeper unconsolidated rock and material.

Geologists with DGLS have been creating geologic maps of Missouri for more than 100 years.

For more information or to purchase these or other Missouri geologic or topographic maps, visit: missourigeologystore.com, call 800-361-4827, 573-368-2125 or visit the Di-

A Fair Amount of Recycling

War, a depressed economy and natural disasters may grab headlines, but the business of recycling is alive and well.

Missouri State Fair, with help from Social Ventures Midwest Assistance Program, a Minnesota-based, 9-state nonprofit and the Johnson County Sheltered Workshop in Warrensburg recycled more than 18 times the amount of recyclables from the 2009 fair than in 2008. More than 9 tons were recycled, compared to less than a one-half-ton in 2008. In tons, this was 6.98 cardboard, .64 plastic, .27 aluminum, 1.33 newspaper and .81 unrecyclable for a total of 10.03 tons collected and another 9.23 recycled.



Fair Director Mark Wolfe said major contributing factors to the success were better grounds coverage with increased number and placement of bins – from 50 in 2008 to a total of 390 in 2009. Anheuser Busch Recycling/County Distributing Co. provided 40 of the bins and 350 came from the Missouri Department of Natural Resources and WCA Waste Corporation. Two cardboard compactors also were donated by DNR's Solid Waste Management Program and WCA. One compactor was used on the bags from the beverage container bins and the other for compacting collected cardboard for transport.

Pioneer Trails West Central Missouri Solid Waste Management District, Region F, assisted in collections with the Johnson County Sheltered Workshop. The Missouri Office of Administration supplied bags and the Missouri Recycling Association helped with bin placement and cardboard collection during Missouri State Fair setup and teardown.

Recycling Growth in Lean Times

From Waste & Recycling News

According to an American Forest & Paper Association survey released in March 2009, the U.S. hit a record 57.4 percent paper recovery rate in 2008, up from 56 percent in 2007.

American consumers recycled polyethylene terephthalate containers at the highest rate in 10 years, according to the National Association for PET Container Resources, the Association of Postconsumer Plastic Recyclers, and the PET Resin Association. The groups reported a 2008 PET recycling rate of 27 percent, the highest recycling rate in more than ten years and nearly a 10 percent increase over 2007 figures.

The recycling rate for aluminum cans increased to 54.2 percent in 2008 as compared with 52.8 percent in 2007, according to industry trade groups that track recycling trends.

Overall steel recycling rates reached a record high, according to the Steel Recycling Institute. The steel recycling rate reached 83.3 percent for 2008 as 82 million tons of domestic steel scrap was used to make new steel products in the U.S. and foreign countries.

To find out how to increase recycling in Missouri communities, check the DNR Web pages at: <http://www.dnr.mo.gov/env/swmp/docs/RecycDoliststatewide.pdf> or <http://dnr.mo.gov/env/hwp/computerlist.htm>.

News Briefs

vision of Geology and Land Survey, 111 Fairgrounds Road in Rolla. For more information about STATEMAP, see: dnr.mo.gov/geology/statemap/missouri-maps.htm.

Support for Parks Via the Internet

A new Web page has been established to assist people who want to make a donation to help maintain Missouri's 85 state parks and historic sites – making it easier and more convenient to show your support for Missouri state parks.



People who access the new Web page: mostateparks.com/donations.htm receive instructions on how to donate online or by mail. Either way, they will receive a confirmation that can be used as record of their donation. The state park system does

not receive any general revenue and is funded primarily by half of the one-tenth of a cent parks, soils and water sales tax. Currently, it is estimated that the average Missourian pays \$6 a year through the sales tax to support the state park system. Supporters have been able to donate to the state park system at individual state parks and sites for many years.

Donations will help repair and maintain existing buildings such as visitor centers, lodges and historic structures. They will also provide new public facilities and services such as boardwalks, educational exhibits, upgraded park campgrounds and interpretive programming.

For more information about Missouri state parks and historic sites, call 800-334-6946, voice or 800-379-2419, Telecommunications Device for the Deaf. Information is also available at: mostateparks.com.

\$2.9 Million Grant and Loan for Monroe County

The Missouri departments of Natural Resources and Economic Development have presented the Monroe County Public Water Supply District No. 2 with \$2,940,553 in grants and loan for drinking water improvements.

Natural Resources provided a \$1,065,250 grant and a \$1,065,200 loan through the American Recovery and Reinvestment Act's State Revolving Fund program. In addition to the Recovery Act funding, the department awarded a \$310,103 rural water grant. The DED's Community Development Block Grant program provided the district with a \$500,000 grant.

Monroe County PWSD No. 2 serves customers across three counties, Monroe, Audrain and Montgomery. The district will replace approximately 2,700 self-read water meters with new radio-read meters. The new radio sys-

Your "functional art" picture of the hot water plumbing system (volume 27, #1) was interesting, but mainly what I saw was a lot of copper and metal fittings. Folks discuss the "output" benefits of "going green," but few discuss where the raw materials come from. For example, solar requires both exotic and non-exotic metals (many from other countries), and ALL of them require mining. About the only thing more difficult to permit in the U.S. than a new mine is a nuclear plant, and we all know how that issue is turning out.

Please discuss both sides of this issue.

Michael Williams
Columbia

The photograph of the waters at Ha Ha Tonka Springs (Winter 2010) is absolutely glorious. It reminds me of a Monet painting. This is a wonderful work of photographic art. Kudos to the photographer.

Thomas McBride
Annapolis, Mo.

I would like to get copies of your collection of stories on the New Madrid Fault. Also, could you tell me where the Richter Scale device (closest to Bowling Green) is located that



records the small quakes in the New Madrid Seismic Zone? Is it possible to visit this facility and see one of the small earthquakes being recorded? Does this have any pattern as to what time of the year, or time of day offers the best chance to observe small seismic activity? Any information on this subject would be appreciated.

Erwin Hilty
Bowling Green

Editor's Note

Seismographs that detect and record ground motion are available at St. Louis University's Earthquake Center at 3507 Laclede Avenue in room 303. Hours are 8 a.m.-4 p.m., Monday through Friday. Tours can be arranged by calling 314-977-2236. Small earthquakes occur in the New Madrid Seismic Zone every week. For more information visit: dnr.mo.gov/geology/.

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

tem will transmit water readings directly to the district.

In addition to the water meters, the district will use the grant and loan to install a new 100,000 gallon elevated storage tank, booster pump station and distribution system improvements. The district will contribute \$100,000. The projects are estimated to cost \$3,040,553 and expected to be completed in December 2010.

For more information, contact DNR's Water Protection Program at 800-361-4827 or visit the department's Web site at: dnr.mo.gov/env/wpp/srf.

Public Water Systems Fail to Test

Thirty-nine public drinking water systems in Missouri have chronically failed to complete drinking water testing required by the Department of Natural Resources. The systems have had at least three major monitoring violations in a twelve-month period. While failing to monitor does not necessarily mean the water is unsafe, routine testing by a facility is crucial to maintaining a safe water supply.



The department requires all public water systems to test for bacteria at least once a month to verify these systems are providing safe drinking water to the public. Most community and non-community public water systems in Missouri comply with all monitoring requirements and meet all drinking water standards. The list of 39 systems represents only 1.4 percent of the approximately 2,800 public drinking water systems in Missouri.

Bacteriological testing can be the first step in identifying and correcting a problem. The next step is to investigate the cause of any bad samples and perform corrective action, such as requiring a boil water order or disinfecting and flushing the system. A public water system that has a chronic history of both failing to monitor and exceeding contaminant levels cannot verify the quality of drinking water for its customers.



Stream Team Notebook

Pershing State Park Stream Team Partnership

Pershing State Park Stream Team 3625 has formed a partnership with students from Brookfield High School. The focus of this partnership is the protection and rehabilitation of Locust Creek, a stream that runs through Pershing State Park. Tom and Lisa Woodward, of Laclede, have attended the Volunteer Water Quality Monitoring workshops to learn how to identify water quality indicator species such as macroinvertebrates. Macroinvertebrates are animals without backbones that are tiny, but large enough to be seen without a microscope.



DNR photo by Priscilla Slotts

Lee Wilbeck moves a bucket containing a basketful of artificial habitat to study the aquatic insects in Locust Creek.

Surveying the aquatic species in the flood-damaged Locust Creek proved to be a real challenge. The stream banks are very steep and because it is a prairie stream, finding the proper habitat for the macroinvertebrates is difficult. In a true example of scientific exploration, the team jumped at a chance to be part of a pilot project investigating the use of artificial substrate baskets for macroinvertebrate capture.

Three metal mesh baskets were acquired for the team to use. The baskets were then stuffed with cobble-sized rocks, woody debris and sycamore leaves – all parts of the natural habitat that would have been found in the stream bottom of Locust Creek before the flood damage took place. To keep the baskets in place, Tom Woodward, who is the superintendent at Pershing State Park, and assistant Lee Wilbeck, Brookfield, ran a light cable from the baskets to well-anchored posts in the stream bank.

The rehabilitation project is proving to be a worthwhile and valuable endeavor. After the baskets were in place just a few weeks, aquatic insect species took up residence in the provided substrate. Brookfield High School students lend a hand by helping to sort and identify the insects that are captured. The Pershing State Park Stream Team found caddisfly, mayfly, dragonfly, and damselfly larvae, as well as several crayfish.

"The rehabilitation of Locust Creek is worth all of the effort it will take," Woodward said.



For more details visit the department's Web site at: dnr.mo.gov/env/wpp/chronic/index.html.

These system's owners have been sent multiple violation notices in addition to certified letters informing them

TIME EXPOSURES



A view of underground lead mining at Doe Run Lead Company, Shaft No. 6 at Rivermines, a community now incorporated, along with Elvins, Flat River and Esther, into Park Hills. The photo was taken in May 1915 and is provided by Charles E. McNew, Desloge. McNew's grandfather, Ervin Levi Barton, is standing on the rock at the far upper right.

Mining in Missouri's historic Lead Belt, one of the richest lead ore sources in the world, also involves the communities of Bonne Terre, Desloge and Leadwood in central southeast Missouri.

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

that chronic failure to monitor is unacceptable. The department also makes on-site inspections and attempts to reach an agreement with the responsible parties to ensure sampling requirements will be met. If noncompliance continues, the department pursues enforcement action.

For more information, contact the department's Water Protection Program at 800-361-4827 or 573-751-8309. The list can be found at: dnr.mo.gov/env/pmnr/pmnr09-01.htm.

New President for Botanical Garden

Peter Wyse Jackson, director of the National Botanic Gardens of



Dublin, Ireland, has been named successor to Peter Raven, the longtime president of the Missouri Botanical Garden, a popular St. Louis attraction. He will work with Raven during the transition period.

Trustees of the Botanical Garden said Wyse Jackson will begin Sept. 1, 2010 as garden president and director. Raven will continue full-time as president emeritus through July 2011 and will work after that on special projects as needed.

Raven is regarded as one of the world's leading botanists. In the 1970s, he transformed the Missouri Botanical Garden into a world-class center for botanical research, education and horticultural display.

Wyse Jackson has given the National Botanic Gardens of Ireland new priorities in environmental sustainability, biodiversity, and conservation.

Wyse Jackson said it is a crucial time for the environment, with a quarter of the world's 400,000 known plant species – medicinal and otherwise – in danger of extinction.

He said he would rally financial support for the Botanical Garden and offer leadership for its mission of identifying plants and protecting their habitat, even as plants are threatened by the spread of new diseases, pathogens and invasive species.

Landfill Expansion in Stoddard County

The Department of Natural Resources has issued a construction permit to Lemons Landfill LLC to construct the Lemons Horizontal Expansion in Stoddard County.



Lemons will use the expansion to dispose of non-hazardous waste in a sanitary landfill located about one mile north of U.S. Highway 60 in Dexter.

The department reviews all applications submitted by cities, counties and private owners to ensure solid waste disposal areas are properly designed and constructed. Other technical factors that protect Missouri's environment are also examined.

Questions and comments regarding the sanitary landfill or the department's role in regulating solid waste sanitary landfills may be sent to the Missouri Department of Natural Resources, Solid Waste Management Program, PO Box 176, Jefferson City, Mo. 65102-0176 or by phone at 800-361-4827 or 573-751-5401.

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

Sgt. Brett Barnes Willing to Take the Heat

Sgt. Brett Barnes, a Division of State Parks ranger sergeant at Mark Twain State Park, Stoutsville, has had to take the heat, but his dedicated efforts also have earned him some recognition. During the June 2009 Katy Trail Bike Ride, he helped dozens of riders who were sidelined by extreme heat.

In October 2009, Sgt. Barnes, who received strong support from fellow DSP staff, was named Employee of the Month for the Department of Natural Resources. In November he was named State Employee of the Month.

Sgt. Barnes coordinated safety and law enforcement logistics for the annual bike ride. He made several 170-mile round-trips in the evenings before the ride to participate in monthly planning meetings for the event. He arranged for rangers and other law enforcement to provide overnight coverage during the event. He also arranged, during rush hour traffic, an escorted crossing over the Missouri River Bridge at Jefferson City by 300 riders.

Later, Barnes also coordinated an organized crossing of busy Highway 19 at Hermann.

"Brett Barnes' contribution during the Katy Trail Ride was noticed by the majority of the participants," said Dan Paige, who was the Division of State Parks' acting director at that time. "It was the hottest week of the summer, and there were a number of medical emergencies," he said.

Several DSP employees nominated Barnes for recognition. Quinn Kellner, Natural Resources Manager at Edward and Pat Jones-Confluence Point State Park, said, "Dozens of riders were unable to complete the first 60 miles of the five-day, 225-mile ride and had to be picked up at remote locations along the trail. There

were also several medical emergencies that required transportation and treatment," Kellner added.

Sgt. Barnes located and transported many riders himself and worked with other rangers and department staff to ensure that all riders were accounted for daily.

Another nominator, Alex Kovac, a park ranger corporal, said, "Brett goes above and beyond to establish good relationships with fellow department staff and agencies that we work with. Throughout the week of the Katy Trail Ride, he made notes of different people and agencies that assisted us in the event so he could send them notes of gratitude afterwards.

"I can honestly say that I have never had a supervisor that I learned more about what to do and how to treat people than Brett Barnes. If given the opportunity, I will be a better supervisor for having had him as one," Kovac added.

Other DSP staff who nominated Sgt. Barnes for recognition are: Natural Resource Managers Keith Petersen, Debra Ray and Jim Gast; Dawn Fredrickson, Katy Trail Coordinator; and Mary De la Guerra, office support assistant.

The Palmyra resident began working with the department as a state parks seasonal aide in June 1994. He also has held the positions of park maintenance worker I and II and rose through the ranks as park ranger.



Sgt. Brett Barnes

DNR photo by Scott Myers

Hickory Hills School Going for the Gold

Earlier this year, 750 students and 70 faculty and staff of Hickory Hills K-8 School moved into a new building. The old building, having served the Springfield community since 1952, had been surrounded by a growing city. A safer, quieter site at 4650 E. State Highway YY is now graced by a \$19.5 million, 118,000 square-foot facility that is likely to become one of Missouri's first LEED® certified elementary-middle schools.

"We may not know what level of certification we will receive for over a year," said Principal Kelly B. Allison. "This is a lengthy process, but the best case scenario would be a Gold Level."

According to Jack Ball Architects PC, Springfield, the project, guided by firm president J. Christopher Ball and project coordinator Ryan M. Faust, was designed to achieve the 40 to 43 points needed to obtain silver certification under the LEED standards established for schools.

"Achieving LEED points was never the primary goal," according to the architects. "The real goal was making smart, sustainable decisions that would result in a great building for the school district and the community."

After three years of planning and construction, the 22-acre site accommodates the new building, fields for soccer, football and softball, a playground and parking. The building features a heating and cooling system that is 40 percent more efficient than what would be minimally required. It is expected to pay for itself in seven to 10 years.

Features such as water fountains in all elementary classrooms, a sky-lighted hallway, fresh air ventilation and energy-efficient lighting make the building very user-friendly. A wetland basin on a corner of the property collects storm water and makes it available for

other uses. The building features a rooftop terrace and greenhouse. Each classroom at Hickory Hills School has its own "smart board" – a modern, electronic black-board display.

"This is a touch screen, interactive marker board that is connected to a computer," said Allison. "We also have demonstration models for both solar panels and a wind turbine that will generate power to heat the greenhouse," he said.

Seventh-grade science teacher Jeff Birchler expects the green features of the new school to help provide environmental education as well as shelter. "Our green curriculum is spread throughout all disciplines and all grade levels. From kindergarten through eighth grade, our students experience lessons on all subjects that have ties to our green theme," Birchler said.

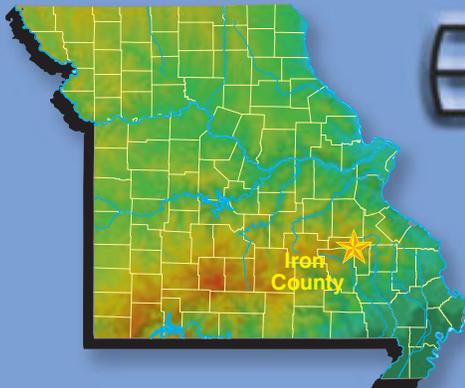
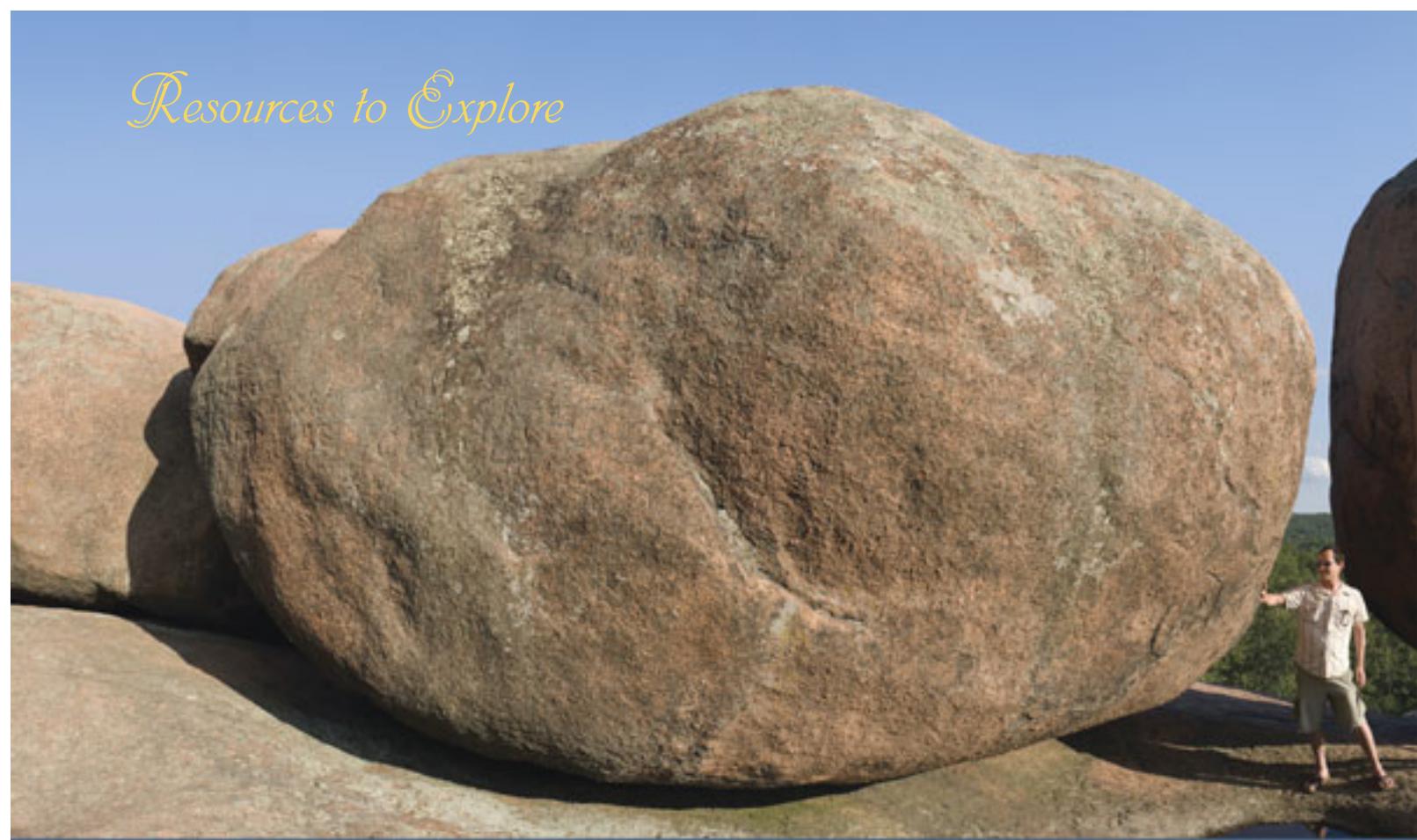
The 3Rs – reduce, reuse and recycle – are practiced by students and staff. As data is generated that reflects the building's energy consumption, students will be monitoring.

Birchler summed up the school's importance to young minds as they begin to view the school in a real world context. "This use of resources will teach students the economic value, as well as the environmental value of doing these things."



Hickory Hills School Library

Architectural Imageworks LLC



Elephant Rocks State Park

by Art Hebrank
photographs by Scott Myers

If friends invited you on a safari to southeast Missouri to observe a herd of native elephants, would you think they had lost their minds? Did they say pink elephants?

They did. Elephant Rocks State Park in Iron County is home to a sizeable herd of ancient pink elephants. Well, huge boulders that look like elephants if you use a little imagination. The herd stands frozen in time atop a massive stone monolith, the high point in the park.

The largest, usually called Dumbo, measures 27 feet tall, 35 feet long, and 17 feet wide. It tips the scales at a hefty 680 tons.

How were the elephant boulders formed and how did they get here? A study of St. Francois Mountains' geology reveals that they were not transported at all. They were formed in place, right where they stand.

The elephants are formed of coarsely crystalline red granite, called Graniteville Granite, after the nearby town. The granite is composed predominantly of two minerals – potassium feldspar and quartz.

Formation of the granite began about 1.5 billion years ago when molten magma a couple of miles beneath the earth's surface slowly cooled and solidified (see graphic on

page 22). Over the next billion-or-so years, most of the overlying rock was eroded away. The granite expanded upward and cracks and fractures formed. A network of arched sheeting fractures and vertical joint fractures broke the upper part of the granite into a mass of large, squarish blocks. These are the building blocks for making elephants.

Next, we need a geologic process that will round off the edges and corners of the blocks – a two-stage process. The elephants were first preformed beneath the earth's surface, and then exposed by erosion. In stage one, water moved down from the sur-



has been eroded from above the core stones, but is still in place around the bottoms. These are future elephants.

Once the granite elephants are formed, atmospheric weathering continues to modify their shapes and surfaces – even today. Rainwater soaks between grains and into small fractures at the surface of the granite. When the water freezes, it expands, flaking off mineral grains. This further rounds the boulders and contributes to their rough surface. The innocent looking gray-green lichens that grow on many granite surfaces also modify the elephants. Lichens produce a weak organic acid, powerful enough to dissolve the rock’s feldspar grains.

Physical, chemical and biological forces work together to form one of the most interesting features seen on the tor’s whale-back ridge. The shallow, rounded rock basins, often filled with water, are popularly called solution pans or bird baths. Water retained in the basins facilitates freeze-thaw action and is conducive to growth of lichens. Rotting plant debris in the pools increases acidity of the water and further deepens the basins.

face through the fractures in the granite. Along the fractures, subsurface weathering broke down feldspar grains into clay, disintegrating the granite. The result was a network of granite masses surrounded by disintegrated granite. The solid, rounded masses are called “core stones” and the disintegrated granite is “grus.” Much later, after the entire Ozark region was uplifted, streams eroded and washed away the grus, freeing the core stones. The elephants were born.

The landform is properly called a “tor” – a stack or pile of spheroidally weathered, residual granitic-rock boulders, sitting atop a bedrock mass of the same rock. While tors exist elsewhere in the United States and worldwide, they are nowhere abundant as they are here. Elephant Rocks is certainly Missouri’s finest tor and one of the best examples of this interesting igneous-rock landform in the entire Midwest.

At Elephant Rocks, tors at different stages of development can be seen. On the high point is the end product: disintegrated granite is all eroded away, leaving the elephants standing

free atop the massive granite monolith. At British tors, they call this monolith a “whale-back ridge.” Below the ridge, where the granite masses are still lined up side by side, the erosion is incomplete. The grus

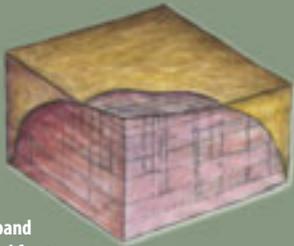


(Above) The McNew family enjoys a shaded picnic table tucked among the boulders at Elephant Rocks State Park.
 (Top) The Ricky Skiles family, Owensville, explores the giant boulders that rest atop a base of bedrock in the St. Francois Mountains of Iron County.

How the Elephants Formed



Formation began approximately 1.5 billion years ago with a hot molten magma a couple of miles below the surface. The magma cooled slowly and solidified into a large mass of crystalline igneous rock called granite.



Over time, much of the overlying rock eroded, allowing the granite to expand upward. Cracks and fractures then formed a network of arches. Vertical joint fractures broke the upper portion of the once solid granite into a mass of large, squarish blocks.



Rainwater penetrated these fractures and joints. Groundwater disintegrated the adjacent granite, widening the cracks and rounding off the corners of the blocks. The large, spheroidal rock masses formed beneath the surface are called core stones.

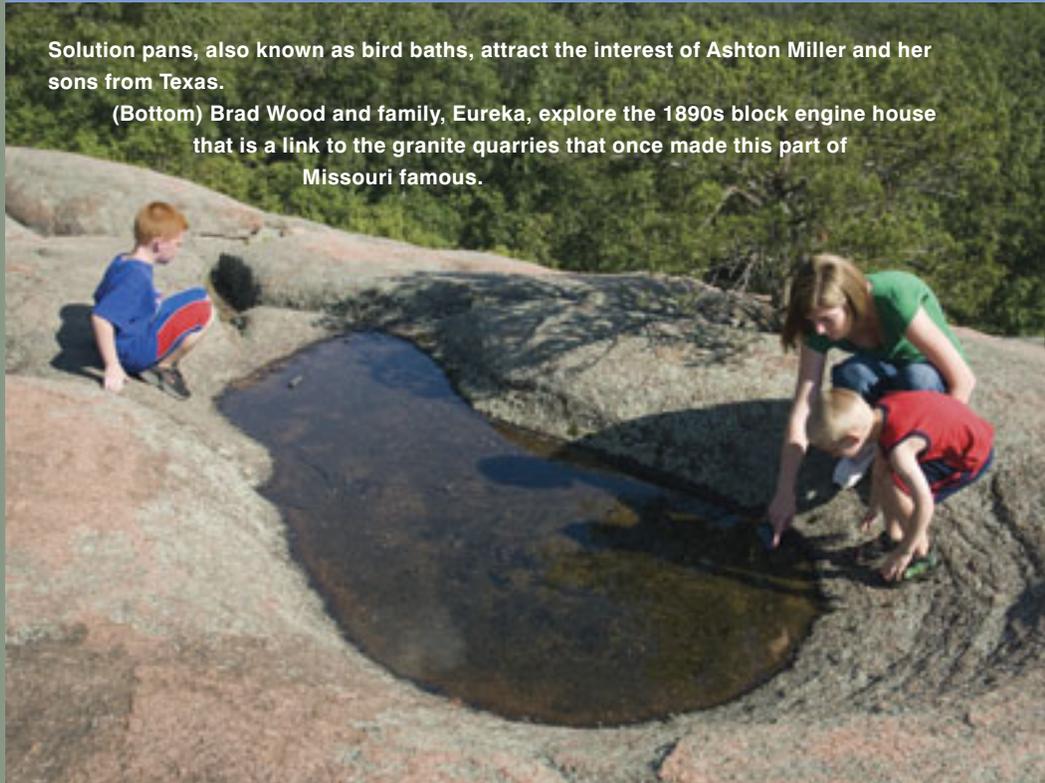


Later, after the Ozarks was uplifted about 250 million years ago, the disintegrated granite began to be eroded, exposing the preformed "elephant rocks." This erosion is still taking place today.

DNR illustration by Beth Byers

Solution pans, also known as bird baths, attract the interest of Ashton Miller and her sons from Texas.

(Bottom) Brad Wood and family, Eureka, explore the 1890s block engine house that is a link to the granite quarries that once made this part of Missouri famous.



More Than Just Rocks

Elephant Rocks State Park is more than just rocks. The park incorporates features of historic significance and offers a broad range of family-oriented recreational opportunities.

The Sheahan Brothers Quarry, one of three in the park, opened in 1889 and operated for 63 years, producing the fine red granite called "Missouri Red." Also open to exploration are the ruins of an old granite-block engine house built in the 1890s.

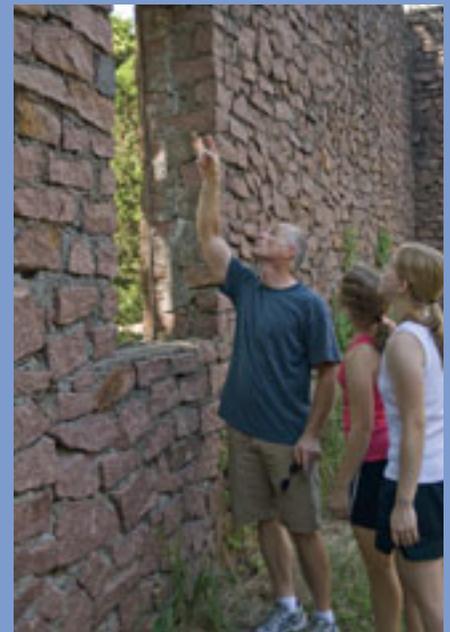
Also, don't overlook the diverse recreational opportunities. The big granite elephants provide chances for rock climbing and the newer sport of bouldering. Park features are easily accessed from the Braille Trail, a mile-long paved loop trail designed to accommodate visitors with visual or physical disabilities. The first of its kind in Missouri state parks and nationally recognized, it offers trailside interpretation printed in both English and Braille. The park also has a playground and a large picnic area with 30 sites situated among the boulders.

As long as the big pink elephants and man have coexisted in Missouri, there have been visitors to these rocks. Native Americans, pioneer settlers

and Victorian-era tourists all came to marvel at the giant boulders. After the area became a state park in 1969, visitation skyrocketed and now the park hosts about 250,000 visitors annually.

Elephant Rocks State Park is on Highway 21 in Graniteville. For more information, visit: mostateparks.com.

Art Hebrank is the site administrator at Missouri Mines State Historic Site.





Paul Simon

Preventing Troubled Waters

by Jennifer Sieg

photographs by Scott Myers

In 1969, the famous singer/songwriter Paul Simon wrote the 1970 hit song “Bridge Over Troubled Water.” Today, a man with the same name prevents water from causing trouble in Missouri. He is a civil engineer with an emphasis on dam safety working in the Missouri Department of Natural Resources’ Water Resources Center in Jefferson City.

While going to school at the University of Missouri-Rolla (now Missouri University of Science and Technology), Paul Simon worked on flood studies for the local U.S. Geological Survey office. This experience instilled in him an interest in water. As a result, he focused on water and construction management while pursuing his master’s degree in civil engineering. He knew he wanted to work in a field related to water and got his wish when he landed a job the summer after he graduated as a dam safety engineer for the department. About four years later, he was promoted to a civil engineer-dam safety.

The Department of Natural Resources regulates any dam that is 35 or more feet tall and is not regulated or owned by the federal government, which totals approximately 660 dams across the state. A typical day in the life of a dam safety engineer may include going out to inspect dams, writing inspection reports or reviewing construction permits for new or existing dams. Survey-

ing new dams to make sure that they were built according to the construction plans is also part of the job.

“There is a good mix of field and office work,” said Simon. Some time is also spent mapping dams in geographic information systems and creating emergency action plans for high hazard dams.

“I have the best job in the state,” said Simon. “I get to help protect public safety, work with owners and work outside. I get to see a lot of the state and meet a lot of interesting people. I enjoy helping the owners protect their investment and the people downstream. My job is very gratifying and I feel like I’ve accomplished something.”

Simon also likes the personal relationships that come with working with the dam owners. “I jokingly get called ‘that dam engineer’ a lot,” said Simon.

Although Simon holds a master’s degree in civil engineering, the requirements for the civil engineer position call for a bachelor’s degree in engineering and four years of professional experience in civil engineering. Graduate work in geotechnical, hydraulic or civil engineering can be substituted for the experience on a year-for-year

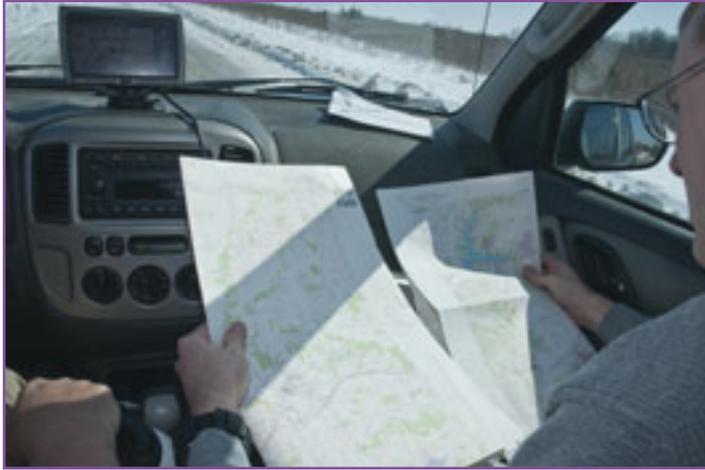
Paul Simon, a dam safety engineer with the Department of Natural Resources’ Water Resource Center, takes measurements at the top of a dam to verify that it is high enough to safely contain the water volume produced by a major storm.



(Bottom) Dam safety starts with an inspection of the toe of a dam to make sure it is not damaged or leaking.

(Inset) Survey data is immediately delivered to Water Resource Center computers by GPS technology.

(Below) Checking a dam's downstream hazard classification involves verification of homes and other structures in the area likely affected by a failure of the dam.



basis for a maximum of two years. Registration as a professional engineer by the Missouri Board of Architects, Professional Engineers and Land Surveyors is also required for the job.

In addition to the education and experience requirements, Simon feels that “people” skills are essential in performing this job. “I work closely with dam owners and the general public. Sometimes I have to be understanding, patient and strategic in helping them understand the situation and why they need to comply.”

Simon feels that he makes a difference to the residents of Missouri by helping protect the public from the economic and environmental impacts that would result from a dam failure.

For more information about this job or other career opportunities with the Department of Natural Resources or other state agencies, visit the Office of Administration’s Web site at: [//oa.mo.gov/pers/](http://oa.mo.gov/pers/).

Jennifer Sieg is a public information specialist with the department’s Soil and Water Conservation Program.

“I have the best job in the state. I get to help protect public safety, work with (dam) owners and work outside.”

- Paul Simon, civil engineer

The Hidden Resources

Rare Earth Elements in Missouri

by Hylan Beydler

Rare earth elements (REEs) with mysteriously unusual names such as gadolinium and lanthanum hold vast potential for business, energy and defense technologies.

Most are actually metals in relatively high concentrations in the earth's crust. The task is finding these important elements in sufficient concentrations that are economically recoverable. For this reason, some iron deposits in Missouri have been the recent focus of REE experts who have been evaluating rock core samples to determine their potential. Some of these elements are classified by the U.S. Geological Survey as strategic and critical to the United States.

Most of the 16 naturally occurring rare earth elements are found in Missouri. The largest concentrations occur in southeast Missouri. They include gadolinium, dysprosium, lanthanum, cerium and yttrium.

Often called "rare earths," these naturally occurring elements are key

ingredients of "green technology." There is increasing demand for such rare earths for various green products, from the magnets in wind turbines and automobiles to the manufacture of solar panels, energy-efficient fluorescent lamps and automotive components.

According to Jerry Prewett, Geological Survey Program director with the department's Division of Geology and Land Survey, rare earth elements have important and diverse properties.

"One very exciting development uses five rare earth elements in magnetic refrigeration. This new technology has the potential to replace conventional refrigeration, reducing energy consumption and carbon dioxide emissions," said Prewett. Two of the fine REEs required, gadolinium and dysprosium, are found in Missouri.

REEs also have been important in the development of cellular phones, computer monitors, televisions, fiber optic cables and energy-efficient lasers. Magnetic rare earths contribute

to industrial applications in aerospace, medical, instrumentation, electronics and motion control. The minerals present in Missouri's deposits could prove to be strategic to the U.S. Department of Defense.

One important and growing REE use is for rechargeable lanthanum nickel-hydride batteries. They offer longer battery life, fewer disposal issues and are used in hybrid vehicles. Lanthanum is found abundantly in Missouri ore deposits.

Since 1948, most of the world's REEs came from India. Since 1990, the world has depended on China for the critical minerals.

Rare earths have an annual global impact in the billions of dollars. According to the USGS, the U.S. continues to be a major consumer and importer of rare earth products. In 2008, the estimated value of refined rare earths imported by the U.S. was more than \$127 million. Based on preliminary investigations, Missouri's deposits may support some of the world's future critical rare earth element needs.

Hylan Beydler is division information officer for the department's Division of Geology and Land Survey.

Missouri REEs – Hybrid Electric Uses

DIESEL FUEL ADDITIVE
- Cerium
- Lanthanum

UV CUT GLASS AND POLISHING POWDER
- Cerium

LCD SCREEN
- Yttrium
- Cerium

OXYGEN AND ENGINE SENSORS
- Yttrium

ELECTRIC MOTOR/GENERATOR
- Dysprosium

NiMH BATTERY
- Lanthanum
- Cerium

CATALYTIC CONVERTER
- Cerium
- Lanthanum

photo illustration by Scott Myers

Average REE Use in Vehicle/Pounds	
standard car10
hybrid electric and all-electric 20-25

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