

### Section 3

#### Earth Science Week 2003 News Clippings

<u>Publication</u>	<u>Circulation</u>	<u>Page</u>
<i>Akron Beacon Journal</i> - October 9, 2003 - Akron, OH	94,081	3-2
<i>AAPG Explorer</i> - August, 2003 - Tulsa, OK	31,000	3-2
<i>AAPG Explorer</i> - August, 2003 - Tulsa, OK	31,000	3-3
<i>Geotimes</i> - Septmeber, 2003 - Alexandria, VA	10,000	3-5
<i>Herald-Dispatch</i> - October 14, 2003 - Huntington, WV	40,000	3-6
<i>Battle Creek Enquirer</i> - October 8, 2003 - Battle Creek, MI	26,000	3-6
<i>Metro West Daily News</i> - October 13, 2003 - Framingham, MA	51,961	3-6
<i>Missouri Conservationist</i> - March, 2003 - Jefferson City, MO	500,000	3-7
<i>Monroe Evening News</i> - October 17, 2003 - Monroe, MI	22,000	3-7
<i>Montgomery County Sentinel</i> - October 16, 2003 - Rockville, MD	8,000	3-8
<i>Prince George's Sentinel</i> - October 16, 2003 - Seabrook, MD	70,000	3-8
<i>News - Star</i> - October 6, 2003 - Monroe, LA	36,773	3-8
<i>Montgomery County Sentinel</i> - October 9, 2003 - Rockville, MD	8,000	3-9
<i>Prince George's Sentinel</i> - October 9, 2003 - Seabrook, MD	70,000	3-9
<i>Newport Plain Talk</i> - October 21, 2003 - Newport, TN	9,250	3-9
<i>Holbrook Tribune - News</i> - February 14, 2003 - Holbrook, AZ	37,000	3-10
<i>Greeneville Sun</i> - October 11, 2003 - Grenneville, TN	14,667	3-11
<i>NSTA Reports</i> - May, 2003 - Arlington, VA	53,000	3-11
<i>NSTA Reports</i> - August, 2003 - Arlington, VA	53,000	3-12
<i>Southeast Missourian</i> - October 13, 2003 - Cape Girardeau, MO	18,000	3-12
<i>Rocks &amp; Minerals</i> - September/October 2003,	6,000	3-12
<i>Science &amp; Children</i> - October, 2003 - Arlington, VA	20,000	3-13
<i>Science Scope</i> - October, 2003 - Arlington, VA	15,500	3-13
<i>Science Scope</i> - October, 2003 - Arlington, VA	15,500	3-14
<i>NASA Connect</i> - October 16, 2003	35,000,000	3-18
<b>TOTAL</b>	<b>36,240,732</b>	

# Park sponsors science fair

Budding rangers get chance to revel in dirt at Furnace Run park

The Earth will be in the spotlight on Sunday in northern Summit County.

Furnace Run Metro Park will hold an indoor-outdoor Earth Science Fair from 1 to 5 p.m. with park rangers, naturalists and scientists from around Ohio.



BOB DOWNING

There will be an array of exhibits, games, demonstrations and talks in a family-oriented program that will be based at the park's Brushwood Shelter. That's off Townsend Road in Richfield Township.

You can learn about the different types of Ohio soils and how they interact with plants, animals, land use, air, water and pollution.

Children can earn Junior Ranger badges as they learn about landscapes in the Cuyahoga Valley.

This year's theme is "Eyes on the Earth: Monitoring Our Changing World."

The fair is being held to mark national Earth Science Week.

The event is being presented by Metro Parks, Serving Summit County and the National Park Service, along with the U.S. Environmental Protection Agency, the Ohio EPA, the U.S. Department of Agriculture and its soil and water conservation districts, local health agencies, the Akron Regional Air Quality Management District, the Akron-based Northeast Ohio Four County Planning and Development Organization and the science departments at the University of Akron and Kent State University.

For more information, call 330-865-8065.



PHIL MASTURZO/Akron Beacon Journal

Local park legend and historian-archaeologist Joe Jesensky will speak on local metro parks at the Seiberling Naturealm.

Akron Beacon Journal  
October 9, 2003

[www.update](http://www.update)

## Resources Abound On AAPG Web Site

By JANET BRISTER  
AAPG Web Site Editor

Let's talk about our world for a minute. Actually, let's make that a week.

Earth Science Week is approaching (Oct. 12-18; see related story on page 12) and AAPG's Web site is a resource you need to direct your local science teachers to visit. Not only do we have the K-12 Resources area that the Youth

Education Activities committee is growing, but we also have links to tools and lesson plans.

So, what is your local society doing to promote Earth Science Week in your community?

If you need aids, look for the link on the K-12 Resources page. And, don't forget the "Cool Sites" part of the AAPG pages as well.

AAPG Explorer  
August 2003

# Geologists Proselyte the Science

By BETSY CAMPEN

Everyone talks about how difficult it is for geoscientists and all AAPG members should be concerned about the future of our profession and industry.

Everyone agrees that the key to tomorrow lies with the youth of today. But who is doing something about it? In some cases, a lot of people are, and these reports are intended to show how some members of the AAPG Youth Educational Activities Committee are heading in preparation for the future by providing educational outreach programs and activities.

It's also intended to inspire others to join the effort.

Yes, even you.

One of the major goals of the YEA, after all, is to aid members' efforts in volunteering in their own school systems and neighborhoods.

For example, we all have received that telephone call asking us to come "talk about geology" to the third grade. Mostly we can't remember it, and I have third graders think, where do rock collections go, and I think we can even identify which less discuss the rocks in that case!

Our goal is to provide a "lookbook" for the members to use on those occasions. We hope to have sample study plans such as the one provided here by Autumn Rhodes and Tom Reagin, so that you will be able to go to the YEA Web page, download materials for your third grade talk and plan with it.

AAPG is working closely with AGI on Earth Science Week (see box below), a great way to get started - urge each society to have an ESW committee.

In Colorado, we hope that each of you will go to at least one school during Earth Science Week and just talk about geology. Following are a few examples of how to get involved.

Due to funding cutbacks in most states, very little earth science is being taught. Each of us remembers what inspired us to become a geologist. Please take it upon yourself to go inspire some other young mind to go into geology. Your efforts can only help the oil and gas industry.

We welcome new members, and we would appreciate any ideas that you or your society would be willing to share with AAPG members. Just go to the AAPG home page, click on Education, and then at the bottom of the page K-12.

(Editor's note: Campen is chair of AAPG's Youth Education Activities Committee.)

## Getting Back to Nature

We have been active for many years in the Fairhill School in Dallas - a private school for students with learning difficulties.

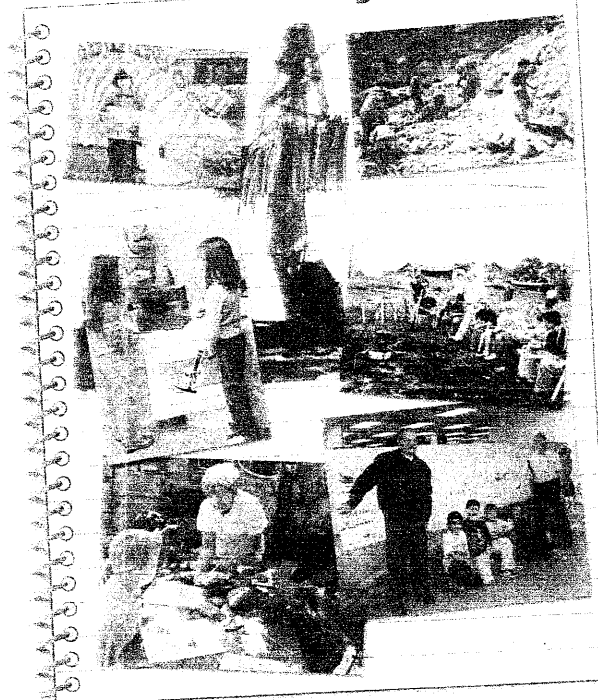
Maria reaches the Camera Club and has convinced students to photograph local and state honors.

Each year we host an "Earth Science" field trip at our ranch north of Dallas. Students follow a nature trail, identifying trees, shrubs and flowers.

And, of course, the students enjoy collecting the abundant fossils in the Cretaceous sands (overseen on the ranch by Marian and Maria Downey).

## And the Winners Are...

On the last day of our week-long contests, we had a contest and award ceremony. Books of \$25.00 for different grades.



Taking it to the streets - and everywhere else, for that matter: AAPG members demonstrate in these scenes that volunteer outreach efforts can make geology an integral, interesting and even inspiring part of people's lives. It can even be fun.

categories (first-second-third-fourth-fifth-sixth and seventh-eighth), with the winners getting a \$100 U.S. Savings Bond.

The Rocky Mountain Association of Geologists (RMAAG) provided the funds and a place to send or bring the entries. We advertised to teachers - including personal calls - but our results came from an early RMAAG suggestion: members get their kids, grandkids, etc., to enter.

We had a picture of a cute second-grade winner in the month's RMAAG "Question" (and) boy, did she get a kick out of being on the Web and in the paper.

We also had a meeting in May with our state geologist, our most popular TV weatherman and meteorologist, and other activities for the youth ESW.

Vera Origen  
Denver

## Reaching Out

Every year during Earth Science Week, the Northern California Geological Society hosts a fun and educational Teachers Day at Black Diamond Mines Regional Park in the San Francisco Bay area.

Teachers spent the day with Northern California Geological Society members and park rangers, starting with several hours underground in a refurbished and mine, learning the local geology from AAPG member Ray Sullivan and taking a geological mine tour.

We then looked at the same rock unit on the surface, followed by a history, barbecue. In the afternoon, the rangers conducted a tour of the local historical cemetery, giving the teachers sample exercises that can be done if they bring their classes back for a day at the mine.

Ivy Poolan  
If they wish, the teachers can earn an education credit for the day.  
Don Lewis  
Lafayette, Calif.

## Back to School

My goal each year is to speak to at least one K-12 class in the Denver area. The first step is to get invited and then figure out age-appropriate material based on the teacher's request.

Generally, the teacher is looking for a presentation to complement the topic being studied by the class - and frequently, with the younger kids, the invitation is to speak about dinosaurs.

Teachers are very willing to accept a more general discussion of geology time and material geology. It is amazing how all of my talks seem to have resources draped in along the way.

One of the tools that I have successfully used in younger classes, I copied from a ranger at the Tyrell Museum in Alberta, Canada.

Using a 50-foot tape measure, I tell the kids we are going to compare distance to time - assuming each inch equals one million years, the tape represents 500 million years - roughly the start of the Paleozoic. Students participate by holding various points on the tape as I walk around the room, and the classroom, the first dinosaur, early life, I illustrate many of the major events with fossils that are from rocks of that age.

One little girl asked me when Adam and Eve lived after some quick thinking, I had her hold the tape at the first appearance of the genus homo (without any editorial comment).

Another time I gave a presentation on geologic hazards to third graders. Several months later I received a call from the teacher, who said she had just talked to one of the kids' parents, who were in the process of buying a new house. The child asked the teacher if the house was on swelling soils. The adults were astounded, and when the parents followed up on the question, the neighborhood had had problems with swelling soils.

I keep thinking about the more informed citizens that can be produced because of geologists willing to talk about geology in the schools - or for Rotary clubs, churches and other adult groups.

Susan London  
Denver

## A Family Affair

In addition to being involved in Earth Science Week in my community, I involve my family. I purchase one Earth Science Week kit (\$4.95) for each of my grandchildren and ask them to take it to school for their teacher.

I tell them to ask about Earth Science Week, so that they can be the advocates in their classes.

All of our geoparents and geograndparents to send their children or grandchildren to go to school with an Earth Science Week kit.

Ed Roy  
San Antonio

## Going With the Flow

The recent news coverage on the geology of the 1997-1998 floods - I got the idea from Tom Reagin, who also works for the West Virginia Geological Survey.

For more information, visit the AAPG Web site.

See Activities, page 14

## Earth Science Week

Earth Science Week 2003, with the theme "Eyes on Planet Earth: Monitoring Our Changing World," will be celebrated Oct. 12-18, and will have four national contests that are associated with the theme.

In marking the sixth annual Earth Science Week, the "Eyes on Planet Earth" theme focuses on the important work performed every day by geoscientists throughout the world.

With the American Geological Institute acting as international coordinator, activities - such as essay and photography contests - are being planned by a number of AAPG societies as well as state geological surveys.

Australia, New Zealand and Indonesia are also Earth Science Week participants.

AGI is providing information kits and a packet for event planners designed for those interested in planning their own event or want to get involved with Earth Science Week on an organizational level.

For Earth Science Week information see <http://www.earthsciweek.org>



# Activities

from page 12

chart that helps kids see the process of identifying minerals. Before I pass out the chart, I give them some minerals (like quartz, barite, muscovite, and graphite) and ask them to describe them.

After a few minutes, I write down the characteristics on the board (color is usually the first thing that comes to mind). Then I give them some more minerals that look a little bit like the minerals they already have, like biotite, galena and magnetite, and tell them that it's not so easy to tell the minerals apart now based on color.

Then you try to get them to think of ways of classifying the minerals. They should be able to come up with a few good classification schemes and you can

write the results on the board.

I then pass out the identification flow chart and some more similarly colored minerals. It starts with metallic and non-metallic minerals and breaks it down. At the bottom it lists the minerals in the kits and some distinguishing characteristics of each to properly identify them.

The point of the demo is that geologists use a method to identify minerals - not just using color.

Autumn Rhodes  
Student Chapter President  
West Virginia University

## Passion + Geology = Normal

In this instance, I was volunteering as a mentor to four fifth grade students at Denver's Kaiser Elementary public school. Ed Post of Dinosaur Ridge and I teamed to instruct them on the geologic time scale.

The project took one day per week over a five-week period. During that time, we took field trips to the Denver Museum of Nature and Science, and to Dinosaur Ridge for research into how life changed through geologic history.

With this information, these young paleontologists (does this make them micro-paleontologists?) created a time line stretching from the late Precambrian to the present, with one inch equaling five million years. After completion of the project, they presented the final product to their classes.

I also have given multiple presentations in schools on what is involved in becoming a geologist, areas of geologic employment, and why in the world anyone would want to follow this course of action. The presentation is a combination of slides, rocks, and other visual aids, such as books (the Big Red Book is a BIG hit), maps, cross sections and seismic lines.

The goal of the presentation is to impart an impression that being passionate about rocks is not weird, and that studying, reading, writing, arithmetic, computer science and art are essential in being a complete scientist.

Elmo Brown  
Denver

## Teaching the Teachers

The West Texas Geology Foundation sponsored a workshop for elementary school science teachers on June 3-5 in San Angelo at Central High School. Thirteen elementary school teachers learned to teach the module "Energy: A Closer Look at Oil and Gas."

The Denver Earth Science Project, a branch of the Colorado School of Mines in Golden, Colo., developed the module with input from oil and gas professionals. The workshop leader was Jackie McMillan, a fourth grade teacher at Jones Elementary in Midland, Texas.

Each teacher was given a notebook with lesson plans and activities and a resource kit filled with materials for demonstration and experiment. The teachers visited a drilling rig, talked to independent geologists and looked at rock cuttings, among other things - all to enable teachers to explain the oil and gas business at the student's own grade level.

The workshop was funded by generous contributions from Burlington Resources and the Fasken Foundation, one of six sponsored by the WTG Foundation since 1996. Foundations, oil companies and individuals have contributed a total of \$40,390 to WTGF to present these workshops.

Will Green  
Midland, Texas

# Calling all Earth Scientists to the Fair

Don Byerly

Just when it seems science and science education are going you know where in the proverbial handbasket, a trip to the International Science and Engineering Fair (ISEF), sponsored by Intel and managed by Science Service, restores your faith in the future.

The ISEF, often referred to as the "Olympics of Science Fairs," brings together more than 1,100 finalists in grades 9 to 12 from all over the world in a different host city each year. The American Geological Institute (AGI), which publishes *Geotimes*, supports ISEF annually by recognizing young scientists who have demonstrated excellence in the earth and space sciences. Privileged to be an AGI Special Awards judge at the ISEF for a number of years, I have been heartened by the high caliber of projects in all facets of science, mathematics and engineering — it is not uncommon to see at least 10 percent of the finalists' projects have patents pending.

AGI presents its awards to finalists whose research best reflects the study of Earth and the AGI mission, emphasizing the vital role of the geosciences in society. Throughout the years, AGI winners have been outstanding. Although no records exist tracking their careers, it is safe to say, based upon conversations with past awardees, that they have all pursued higher education and most likely have successful careers. Typically, AGI awardees receive a monetary award and a publication. In 2003, the first-place project received \$1,000; the second-place project \$250; and both received certificates and the book, *Origins, Evolution of Continents, Oceans and Life* by Ron Redfern. Each of the student awardees and their teachers also receive one-year subscriptions to *Geotimes*. Additionally, the Association of Engineering Geologists and the Association for Women Geoscientists presented awards to outstanding student projects.

Despite the excellence of the earth and space sciences ISEF finalists, I have been disappointed to see so few. At the 2003 ISEF, the number of earth and space sci-

ences entries ranked 12th out of the 14 various sciences, mathematics and engineering categories — a weak showing for such a vital science, especially with a rising need for more professional geoscientists, particularly as earth science teachers. It is essentially a catch-22 situation: It takes more teachers to inspire more students and more students to become better earth science teachers.

Earth science being eclectic, with teachers or students sometimes errantly place earth science projects in categories other than the earth and space sciences, AGI judges have always reviewed ISEF finalists' projects in all 14 categories. In the past, AGI awardees have come from such categories as physics, zoology, engineering, chemistry and environmental science — a category second only to engineering in the number of ISEF finalists. Because of the

**It takes more teachers to inspire more students and more students to become better earth science teachers.**

relatively close relationship between environmental science and earth science, we often find a number of earth science projects entered in the environmental science category. In 2003, two of the AGI awardees were environmental science entries.

In the last decade the distribution of the average number of finalists in each of the earth and space sciences subcategories recognized by Science Service were as follows: astronomy and planetary science, 15; climatology and weather, 6; geochemistry and mineralogy, 5; geophysics, 3; tectonics, 1; other, 9.

The total number of finalists in the earth and space sciences has remained almost constant. Numbers modestly increased from 30 finalists to a high of 51 finalists in the year 2000 — an increase that correlates to a marked increase in the number of finalists entered in the astronomy and planetary science subcategory. Since 2000, the total number of earth and space sciences finalists has decreased slightly (48 in 2003) as the number of astronomy and planetary science finalists has remained essentially the same. In the last decade, the number of ISEF finalists in astronomy and

planetary science has risen from 16 percent to 48 percent of all the finalists in the earth and space sciences.

The rising interest in the "space" aspect of the category is obvious — easily explained by the increased levels of recognition current space and planetary science research affords, as well as by the educational initiatives supported by NASA. However, the appallingly low numbers in the other areas of earth science call to mind several possible reasons. One, already mentioned, is that there are not enough well-trained earth science teachers in our schools to encourage good students to pursue research in the geosciences; two, there are not enough professionals taking the initiative to seek out and mentor bright students with earth science interests; and three, geoscience departments in colleges and universities are not doing all that is possible to encourage and support the research of promising pre-collegiate students.

Geoscience departments in higher-education institutions could affect the number of young pre-collegiate earth and planetary sciences researchers in several positive ways. They could recommend teaching careers to geoscience majors, sponsor Earth Science Week activities and support the research efforts of high school students. A real benefit for universities and colleges that mentor potential ISEF finalists is the opportunity to recruit top-notch students.

Earth scientists can also step up to the plate — I would like to challenge you to take proactive roles in local and regional science fairs. Contact the science supervisors in nearby high schools and offer services as mentors for students with interests in earth and planetary sciences. Also, Earth Science Week affords an excellent opportunity for contacting students and teachers. You owe it to our profession.

---

**Byerly is professor emeritus at the University of Tennessee in Knoxville and adjunct professor of geology at the University of Tennessee in Martin.**

**AGI affiliate organizations that might be interested in future collaboration with ISEF should contact AGI's Director of Education Mike Smith. ☞**

# MU geoscientists help state's economy, environment

This week (Oct. 12-18) is Earth Science Week. Its purpose is to promote an understanding and appreciation of the value of earth science research and its applications and relevance to our daily lives.

West Virginia has a critical need for trained geologists, and Marshall University has one of only two baccalaureate programs statewide in this discipline.

Geologists are responsible for exploration and production of fossil fuels and other mineral deposits. They also manage the environmental impact of extraction and consumption of these resources.

West Virginia is ranked second in the country in coal production and 11th in natural gas production. It is likely that coal and natural gas will continue to be the main fuels used for electric power generation for decades to come.

The training of Mar-



Ron  
MARTINO

shall geoscientists often involves joint research projects with faculty on West Virginia coal and petroleum deposits.

Presentation of student research at professional meetings makes graduates of our geology program highly sought after by geoscience employers. They regularly receive lucrative offers from BP, Texaco, Columbia Natural Resources, Allegheny Energy, Cabot Oil and Gas, Horizon, Arch Minerals and Penn Coal.

West Virginia's mountainous terrain makes it both scenic and challenging to develop. Landslides and soil creep, along with flooding, constitute the

main geologic obstacles to construction.

Graduates of Marshall's geosciences program work with engineers in site selection, design, maintenance and remediation of highways, railways and building foundations. These projects are key to avoiding catastrophes such as occurred in 1972 at Buffalo Creek, where 125 West Virginians died and 1,100 were injured when piles of waste rock from mining collapsed and major flooding ensued.

Our state is home to the largest inland port in the nation. The U.S. Army Corps of Engineers employs Marshall geoscientists to help manage these waterways that facilitate transportation, recreation and flood control. Other responsibilities include permitting for extractive industries and waste disposal in mining impoundments and landfills.

Fresh water is necessary for human consumption and for commercial, industrial and agricultural purposes, and is managed by hydrogeologists.

West Virginia has more than 35,000 miles of rivers and streams, more than any other state in the Eastern United States. The headwaters of most major rivers in the mid-Atlantic region are found in our state. Our watersheds and ground waters influence flows and water quality as far away as the Chesapeake Bay and Gulf of Mexico.

Marshall faculty and students conduct environmental research on wetlands, lake sedimentation and levels of toxic metals associated with acid mine drainage, which can adversely impact groundwater as well as surface waters.

Pollution potential from mining was dramatically illustrated by the recent

failure of a coal slurry impoundment in Martin County, Ky., that polluted the Tug Fork and Big Sandy rivers.

Marshall's geoscience faculty are actively engaged in achieving the objectives of Earth Science Week which are:

- To engage students in discovering the earth sciences.
- To remind people that earth science is all around us.
- To encourage earth stewardship through understanding.
- To share their knowledge and enthusiasm about the earth.

Their efforts as well as those of many of their graduates make a significant contribution to West Virginia's economic development and to the protection of its environment.

Ron Martino is a geology professor at Marshall University.

Herald-Dispatch  
October 14, 2003

## BATTLE CREEK

### Museum to observe Earth Science week

Kingman Museum will observe Earth Science week Oct. 12 to 18 with activities prepared by the national Earth Science Teachers Association involving students in using the museum's gigantic world map to located important earth features.

This week's N.E.A.T. program, "Falling into Fall," on Saturday will feature the study of leaves, why they change color and many activities with fall leaves.

There also will be a planetarium show at 2 p.m. Saturday. Museum hours are 9 a.m. to 5 p.m. Tuesday through Friday, and 1 to 5 p.m. Saturdays. Admission is \$5 for adults, \$4 for seniors, \$3 for students and \$15 for a family of up to six. For more information, call 965-517.

Battle Creek Enquirer  
October 8, 2003

## Earth Science Week

Framingham State College science students will be visiting many sites of interest to astronomers, geologists and oceanographers during Earth Science Week, today through Oct. 19.

The trips include a visit to the Purgatory Chasm in Sutton to study the rock outcrops, and Plum Island in Newburyport, shaped by tides, currents, waves, glaciers, winds and wildlife.

Field trips are also scheduled to Great Blue Hill that the students will climb, and the Harvard Museum of Natural History.

Metro West Daily News  
October 13, 2003



### Mobile aquarium schedule

The Conservation Department's mobile fish aquarium is again on the road in 2003, bringing entertainment and education to communities statewide. This touring facility can teach you all about fish and their behavior. You can learn, for example, what makes largemouth bass bite and what color jigs crappie prefer. Scheduled appearances for the fish aquarium include:

- April 10-13 - Powder Valley Nature Center, Kirkwood;
- April 21-25 - Earth Science Week, CMSU, Warrensburg;
- May 5-9 - Community and Public School Curriculum Tie-in, St. Robert;
- May 16-18 - Roaring River State Park Kids Fishing Day, Cassville;
- June 5-8 - Shepherd of the Hills Hatchery, Branson;
- June 12-14 - Bushwhacker Days, Nevada;
- June 19-22 - Summer Fun Days, Brookfield;
- July 2-5 - Tom Sawyer Days, Hannibal;
- July 16-19 - Sweet Springs Festival, Sweet Springs;
- July 21-26 - Northeast Missouri District Fair, Kirksville;
- Aug. 7-17 - Missouri State Fair, Sedalia;
- Aug. 29-Sept. 1 - St. Louis County Fair and Air Show, Chesterfield;
- Sept. 6-13 - Southeast Missouri District Fair, Cape Girardeau;
- Sept 18-20 - Hootin' and Hollerin' Folk Festival, Gainesville;
- Oct. 3-5 - Gladfest Fall Family Festival, Gladstone;
- Oct. 12-18 - Maple Leaf Festival, Carthage;

For more information about these events or to schedule an aquarium appearance in your area, call Jeff Finley at 573/884-6861 |

Missouri Conservationist  
March 2003

## Resources focus of Earth Science Week

From THE DEPARTMENT OF  
ENVIRONMENTAL QUALITY

LANSING — Earth Science Week is being observed this week in Michigan as proclaimed by Governor Jennifer M. Granholm.

Earth Science Week is a nationwide observance emphasizing the importance of earth sciences to the health, safety and economic well being of citizens. The governor's proclamation makes Michigan one of 35 states recognizing the week.

Most people are unaware of the important role played by geology and the other earth sciences in providing for mineral and fuel resources, and in protecting the environment, public health and welfare, said Sharon Carter, an official with the Department of Environmental Quality (DEQ).

The DEQ's Geological and Land Management Division is taking the lead in celebrating the week in Michigan.

Geologic knowledge provides the basis for finding and developing Michigan's valuable oil and gas resources, a \$2 billion-a-year industry.

Michigan ranks 12th among the states in natural gas production and 17th in oil, producing about 27 percent of the natural gas and a substantial part of the crude oil used in the state, Ms. Carter said.

Geology also is essential in developing Michigan's other mineral resources, which have an annual produced value of over \$1.6 billion.

Michigan ranks first among the states in the production of magnesium. It is second in the production of iron ore, sand and gravel, bromine and peat, and is third in potash.

The state is a significant producer of cement, gypsum, crushed stone, lime, clay and steel.

Michigan's scenic and varied terrain includes rugged remnants of ancient volcanoes and mountains, rolling sandy glacial hills and flat lakebed plains, and the Great Lakes themselves.

All of these features are the results of geologic processes that are ongoing today.

The DEQs GLMD develops and distributes a variety of geological data, maps, and publications for industry and public use.

The division has compiled a list of geologists from state government, academia, industry, and professional organizations who can give presentations to schools and community groups on earth science topics.

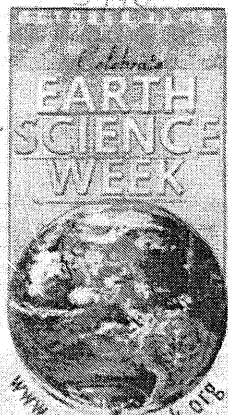
Requests for speakers can be made at [www.deq.state.mi.us/eforms/speakerrequest.html](http://www.deq.state.mi.us/eforms/speakerrequest.html).

Information on geologic maps and publications are available by contacting Ms. Carter at (517) 241-1520.

Monroe Evening News  
October 13, 2003



## "Eyes on Planet Earth: Monitoring Our Changing World"



**D**endrochronology...the dating of past events through the study of tree-ring growth. Each year, a tree adds a layer of wood to its trunk and branches, creating annual rings that can be used to estimate the tree's age.

**T**rees record climate change. Each year a tree forms a new layer of tissue. The width of each year's ring reflects growing conditions such as moisture or sunlight. A wide ring indicates faster growth (good conditions), whereas a narrow ring indicates slower growth (poor conditions). When the tree is cut, these rings can be "read" like a diary of the climate. Can you tell when growing conditions were good and when they were poor?

### Challenge—

Since we just had Hurricane Isabel and high winds, many trees and tree branches have fallen. See if someone will cut a tree ring for you to study at home.



Prince George's Sentinel  
October 16, 2003

Montgomery County Sentinel  
October 16, 2003

# These Earth books help kids learn

Earth Science Week is Oct. 12-18. This presents a good opportunity to highlight some of the juvenile and young adult books available at the Ouachita Parish Public Library in that subject area.

**Earth Cycles**, by Michael Elsohn. Ross. Millbrook Press, 2001.

Ross helps young children explore the cycles of earth: daylight and dark, stages of the moon and the seasons of the year. His simple text is accompanied by attractive artwork by Gustav Moore. This is a nice book to introduce primary-grade children, or even older preschoolers, to these basic earth facts.

**The Earth Science Book: Activities for Kids**, by Dinah Zike. John Wiley, 1993.

**Geology Crafts for Kids: 50 Nifty Projects To Explore the Marvels of Planet Earth**, by Alan Anderson and others. Sterling Publishing Co., 1996.

**Geology Projects for Young Scientists**, by Bruce Smith and David McKay. Franklin Watts, 1992.

**Geology Rocks! 50 Hands-on Activities To Explore the Earth**, by Cindy Blobaum. Williamson, 1999.

**Janice Van Cleave's A+ Projects in Earth Science: Winning**

### MARTHA JORDAN



Columnist

**Experiments for Science Fairs and Extra Credit**, by Janice Van Cleave. John Wiley, 1999.

**Janice Van Cleave's Earth Science for Every Kid: 101 Easy Experiments That Really Work**, by Janice Van Cleave. John Wiley, 1991.

These six books provide a wealth of learning activities, projects and experiments for students of all ages. The craft-oriented activities are fun, yet provide opportunities for learning as well. Some activities serve as educational tools, either for the young geology buff working alone or for classroom use. Other activities, for serious students, provide guidance for experi-

ments and projects suitable for major school assignments. Van Cleave's A+ Projects and the book by Smith and McKay are for kids in grades 7 and up, while the other books are for the elementary grades.

**The Magic School Bus Inside the Earth**, by Joanna Cole. Scholastic, 1987.

Most children in elementary school are familiar with Ms. Frizzle and her magical school bus that can transform itself into any shape or size, can travel through time and into any environment, even the human body. Here the bus, which has transformed itself into a steam shovel, takes the class deep into the earth's core to discover some amazing facts about the earth's crust, the formation and function of rocks, volcanoes and more. The imaginative illustrations in bright colors add interest.

**The Pebble in My Pocket: A History of Our Earth**, by Meredith Hooper. Viking Children's Books, 1999.

**Shaping the Earth**, by Dorothy Hinshaw Patent. Clarion Books, 2000.

These two books on the history and formation of the earth are aimed at slightly different age levels, Hooper's

for the younger set, about 7-10, and Patent's for slightly older children, about 9-12. Hooper's book is illustrated by Chris Coady in sweeping landscapes that feature flora and fauna of each geological era, while Patent's uses a combination of photographs by William Muñoz, satellite shots, maps and drawings, focusing more on the physical history of the earth. Hooper includes a timeline at the end of her book, and Patent includes a glossary.

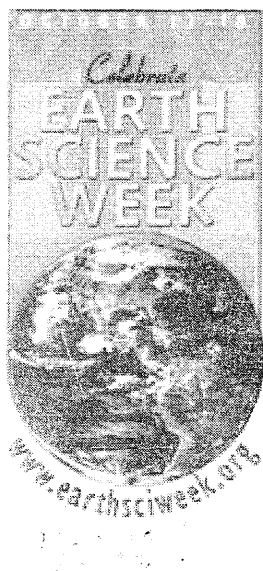
**Planet Earth/Inside Out**, by Gail Gibbons. Morrow Junior Books, 1995.

Gibbons explains the formation and development of our planet and describes the earth's core and crust. She describes the seven major plates that cover the earth and how they are in constant motion, moving apart and together again. Faults, earthquakes, volcanoes, oceans and the sea floor, glaciers and climate are among the other topics covered, ending with a picture identification of the most common kinds of rocks and several earth facts. Gibbons' artwork in brilliant color was created with watercolors, colored pencils and India ink.

Write Martha Jordan of the Ouachita Parish Library System's Children's Division, at 1800 Stubbs Ave. Monroe, La., 71201.

News-Star  
October 6, 2003





# Eyes on water

Water is called a renewable resource. What does that mean? Is it unlimited? What happens to water after we use it? Do we really have to be careful with our water? Why?

This year's Earth Science Week theme is *Eyes on Planet Earth: Monitoring our Changing World*. Let's monitor our water use...just for a day. We'll find out how much water we use in our home and how we can keep from wasting water.

**W**ater Uses: First, make a list of how we use water in our home each day. Work in a group if your teacher will let you. Share your answers with others, just in case you forgot something.

**M**onitor Home Water Use: Now let's see how much your family uses each day. Just for one day Use this list to help you:

Using water from a tap/faucet	1.5 gallons per minute
Washing clothes	30 - 35 gallons/cycle
Using the dishwasher	25 gallons/cycle
Taking a shower	2.5 gallons/minute
Taking a bath	50 gallons
Flushing the toilet	3.5 gallons/flush

\*\*Don't forget to count the number of times and/or people who do each thing and then multiply to find the total use for the day.

**C**ompare Results: Bring your calculations into class. Record your totals on a chart. What is the same (similar)? What is different? Can you explain why these are the same or different?

What do we use most water for? Why? What could we cut back on? Explain your reasoning.

Calculate the average household water usage for everyone.

**P**redict: What could we do if we had a water shortage in the area? We had one last summer (2002). How much were we affected? Probably not as much as someone who lives in a desert, but there were some things we had to do to conserve our water resources. Do you remember what we did to save water?

<http://www.earthsciweek.org>

Montgomery County Sentinel  
October 9, 2003

Prince George's Sentinel  
October 9, 2003

## Local mineral society displays

The Smoky Mountain Mineral Society Inc., a non-profit club, currently has a display at Stokely Memorial Library.

One of the club's charters is to "stimulate interest in education, collection, study classification and preservation of gems, minerals and fossils" Members also enjoy the lapidary arts such as wire wrapping, beading, stone carving, cabbing and metal working.

Club members also welcome the opportunity to show specimens, samples, and crafts from their individual collections. The display was put at the library in recognition of Earth Science Week, Oct. 12-Oct. 18, but will remain there throughout this week as well.

For more information about the

Smoky Mountain Mineral Society Inc., visit a monthly meetings, which is held the first Thursday of each month at 7:30 p.m. in the community room at Newport Utilities.

The club can be contacted by writing: Smoky Mountain Mineral Society Inc., 4200A Bennett Br. Road, Hartford, TN 37753-2239.

For an opportunity to meet some of the club's members and see more displays, visit the Rock, Mineral, Fossil and Gem Show, which will be held Nov. 8-9 at the Jefferson County Rescue Squad Building, 915 Industrial Park Road, Dandridge.

For more information about the show, visit the Jefferson County Web site at [www.jefferson-tn-chamber.org/Visitor/SpecialEvents.htm](http://www.jefferson-tn-chamber.org/Visitor/SpecialEvents.htm).

Newport Plain Talk  
October 21, 2003

# Pat Quinn Is Honored For Service To Petrified Forest National Park

Holbrook Tribune-News  
February 14, 2003

By JoLynn Fox

Petrified Forest National Park staff members gathered Jan. 29 for a farewell luncheon for Pat Quinn, chief ranger and acting superintendent at the park. Quinn has been assigned to Glen Canyon after seven years of service at Petrified Forest.

Posters outlining the various improvements, additions and accomplishments during the past few years at the park were on display. Some of the highlights follow.

In administration, several modifications and additions to computer databases, such as work orders, a web-based calendar, time card programs and fixed assets were implemented. A new patrol vehicle, entrance station, solar lights, flooring, phone system and telephones were purchased.

Under fee collections/dispatch, the operation has been completely computerized, and new cash registers were purchased for efficiency and accuracy. Dictaphone equipment was installed to provide an accurate record of communications between field staff and dispatch. Implementation of the new National Park Pass Program created needed revenue for the park, as 80 percent of the fees collected stay in the park. Three emergency phones have been installed throughout the park, which ring directly to a fee collector/dispatcher, and the park was certified to utilize the Arizona Criminal Justice Information System with staff trained as certified operators. This system provides information on suspects to field rangers in a timely manner, increasing safety and the ability to serve.

In interpretation, Rim Trail waysides and ancillaries were developed. The park's website was updated, the Volunteers in Parks program was placed on the website and an intern program was developed. Special events such as Earth Science Week, National Parks Week, Archaeologi-

cal Month and career fairs, were organized, offering activities, programs and displays. Waysides in the park were updated and developed, rotating displays in the plaza were installed, Educator's Workshops were presented, and awards were for the Junior Ranger Booklet. New site bulletins were developed, existing publications were edited, park and the National Park Service were represented at the 2002 Winter Olympics, and staff members took part in the Navajo Nation Fair and the Navajo County Fair.

It was noted that over the past five years, interpretation has given walks and talks to more than 73,000 visitors, responded to nearly 9,600 information requests, spoke to more than 73,000 visitors during roving trails and overlooks, worked with more than 22,000 students and other people during environmental education and community outreach programs, and interacted with more than 2.5 million people at the Rainbow Forest Museum, Painted Desert Inn and Painted Desert Visitor Center combined.

Under protection, the staff worked with resources management to assist with paleontological and archeological site condition reports, helped in the

arrangement of barriers to reduce resource damage, facilitated a mass casualty incident involving five area agencies, assuring organizational structure, cooperation and efficiency in case of a real event, completed training in extrication of trapped individuals from vehicles and fossil training to become more familiar with the park's resources.

Resource management was made a separate division, aligning the park with National Park Service mandates for a resource challenge initiative. A fee demonstration program funded paleontological site inventory project was implemented, and a paleontologist is on staff. Protocols developed for this project may become standard for the National Park Service paleontological inventories. A rare skeleton of *Stagonolepis wellesi* was discovered and excavated, and a historic preservation specialist has been hired to develop National Register nominations. Basic inventories of park resources were completed, placing the park ahead of other Colorado Plateau parks in natural resource inventory and monitoring. Nearly \$500,000 in non-park funds were secured for projects, including petrified wood protection, pronghorn and tamarisk research, an archeological survey of Rainbow Forest Wilderness, historic structure reports and exotic plant mapping. A research laboratory is to be installed, new museum housing has been obtained and more than 30,000 objects in all categories in the museum collections have been catalogued.

Under maintenance, a new traffic interchange on Interstate 40 and the new Jim Camp Bridge was completed. Also finished were new display cases and carpeting at Rainbow Forest, stucco and roof at the Painted Desert Inn, new carpet and tile at the Painted Desert Visitor Center, seal crack overlays and striping of roads, fencing repairs, sewer and water line maintenance and

repairs, and work on the Blue Mesa Trail and drainage.

The Petrified Forest Museum Association has established an off-site sales area in Holbrook to encourage visits to the park, and enhance partnerships with the park's gateway community and Navajo County. The association office and warehouse moved into new quarters, and PFMA officials secured the continued operation of the park's contract postal unit for the benefit of the park, the museum, the concessionaire, patrons and visitors. A foundation product program was initiated, developing and producing association products as a publisher. During 2002, the association provided the park with \$190,000 in direct and indirect aid from its \$540,000 revenues, continuing among the higher return ratios of park associations. In the past six years, the association has contributed aid to the park in excess of \$1 million, merely from the sales of educational material.

The Fred Harvey Trading Co. has built new Americans with Disabilities Act compliant guest restrooms, purchased three new vehicles, upgraded the leak detection system at the service station, made improvements to the retail displays, printed new menus, added Fred Harvey and Route 66 historical information, made improvements in kitchens, added a credit card system and upgraded the alarm system.

A recap of volunteers in the park was also on display, noting that volunteers put historic photos into a database, assisted at information desks, filled roving and information requests, photographed park, its resources and park events, developed temporary exhibits and displays, organized the library, and assisted with boundary surveys and resource management projects.

Park staff members also participated in fairs, the Parade of Lights, and the Pony Express spur ride.



Sun Photo By Velma S. Presley

### Rocks, Minerals, Dinosaur Dung On Display At Library

Charles Fleming, left, and Mary L. Davis were photographed at the Greeneville-Greene County Library with the display of rocks and minerals on display there. Fleming is president of the Smoky Mountain Mineral Society, and Davis, of Bulls Gap, is a member of the Society. They were in Greeneville on Thursday working on the exhibit, which is in observance of Earth Science Week, Oct. 12-18. In the display are a number of geodes, including one of quartz from Dale Hollow Lake and a solid, polished geode from Mexico. There are several fossils included in the display. The rarest is probably the petrified dinosaur dung, according to Fleming. Also on display are both rough and polished stones to promote the lapidary arts, which will be demonstrated at the Society's Nov. 8-9 show to be held in the Jefferson County Rescue Squad Building in Dandridge. For more information about the library's display or the upcoming show, call Fleming at 1-423-581-8505, David Wiles at 1-865-429-3883, or Joe Milner at 1-865-397-7689.

Greeneville Sun  
October 11, 2003

## Keep Your Eyes on the Planet for Earth Science Week

Mark your calendars for Earth Science Week, Oct. 12-18, 2003. This year's theme, "Eyes on Planet Earth—Monitoring Our Changing World," focuses on the many ways that geoscientists study and record our dynamic Earth's systems.

Earth Science Week events will take place locally, nationally, and internationally. Visit the website [www.earthsciweek.org](http://www.earthsciweek.org) to learn about events in your area. The "For Teachers" section of the website contains K-12 classroom activities aligned with the National Science Education Standards.

The American Geological Institute, the event's official sponsor, publishes *Earth Science Week Update*, a free monthly electronic newsletter that presents the latest information about planning for Earth Science Week. It contains news stories about Earth Science Week happenings and important dates. The newsletter can be viewed on [www.earthsciweek.org/newsletter](http://www.earthsciweek.org/newsletter), and it will also be disseminated via e-mail. To receive the newsletter, send an e-mail message to [info@earthsciweek.org](mailto:info@earthsciweek.org) with the word "subscribe" as the subject heading.

This fall, teachers can order AGI's 2003 Earth Science Week kit, which has materials for conducting activities for Earth Science Week or for any time of year. Each kit, priced at \$4.95, contains an *Earth Science Week Activities Book*, a poster, and additional earth science educational materials appropriate for classroom or home use. Bulk prices are available. Consult [www.agiweb.org/pubs/pubdetail.html?item=609606](http://www.agiweb.org/pubs/pubdetail.html?item=609606) to order kits.

For more information about Earth Science Week, call Cindy Martinez at 703-379-2480, ext. 227; e-mail [cmm@agiweb.org](mailto:cmm@agiweb.org). Another contact person is Lynsey Ellis, who can be reached at 703-379-2480, ext. 552; e-mail [lee@agiweb.org](mailto:lee@agiweb.org).

**Earth Science Week**  
**Educators Kits** offer materials and information designed to involve students in Earth Science Week (October 12–18, 2003). Each kit comes with a teachers guide that includes suggested classroom activities, an Earth Science Week poster, Earth Science Week bookmarks, a global geographic information system CD-ROM of North American data and accompanying classroom activities, and more. Order for \$4.95 from American Geological Institute, Publications Dept., 4220 King St., Alexandria, VA 22302-1502; 703-379-2480; fax 703-379-7563; [www.earthsciweek.org](http://www.earthsciweek.org).

**NSTA Reports**  
**August 2003**

**EARTH SCIENCE WEEK:** This year marks the sixth year for this annual event, which is hosted by the American Geological Institute, a nonprofit federation of forty scientific and professional associations that represent more than 100,000 geologists, geophysicists, and other earth scientists. The week was established to give students and citizens new opportunities to discover Earth sciences and to encourage stewardship of Earth.

Earth Science Week 2003 will be celebrated 12–18 October; its theme is Eyes on Planet Earth: Monitoring Our Changing World. For the latest information on associated activities—and there are many—visit [www.earthsciweek.org](http://www.earthsciweek.org).

### Earth science exhibits on display this week

To celebrate Earth Science Week this week, the Department of Geosciences at Southeast Missouri State University and the NASA Educator Resource Center, 222 N. Pacific, will have displays and exhibits on the first floor of Rhodes Hall. Call 590-5255 for more information.

The public is invited to visit these displays, which include maps of the Lewis and Clark expedition, the New Madrid Seismic Zone, Missouri geology, U.S. geology and the 1993 Mississippi River flood.

Specimens of minerals, rocks and fossils will be identified for the public by Nicholas Tibbs, professor of geosciences, from noon to 2 p.m. today, Tuesday and Wednesday. No appointment is necessary. Call 651-2168 for more information.

At noon and 2 p.m. Tuesday, Gary Lowell and Gary Cwick will demonstrate remote sensing techniques; at noon Wednesday, Michael Aide and John Holbrook will demonstrate how soil investigations are conducted.

— From staff reports

**Southeast Missourian**  
**October 13, 2003**

**Rocks & Minerals**  
**September/October 2003**

5446

The theme of this year's Earth Science Week (October 12–18), "Eyes on Planet Earth—Monitoring Our Changing World," focuses on the many ways that geoscientists study and record our dynamic Earth's systems.

Go to [www.earthsciweek.org/](http://www.earthsciweek.org/) to learn about events in your area. The "For Teachers" section contains K–12 classroom activities aligned with national science standards.



One way to participate is through the soil moisture sampling campaign. You and your students will be participating in an important scientific project, collecting student research data, preparing for future science fairs, and learning about the soils and climate in your area.

Anytime during Earth Science Week, students will collect near-surface soil moisture over as large an area as possible. More details about this effort and special data collection worksheets are available at [www.hwr.arizona.edu/globe/sci/SM/SMC](http://www.hwr.arizona.edu/globe/sci/SM/SMC).

Science and Children  
October 2003



#### Earth Science Week kits

Earth Science Week Educators Kits offer materials and information designed to involve students in Earth Science Week (October 12–18, 2003). Each kit comes with a teachers' guide that includes suggested classroom activities, an Earth Science Week poster, Earth Science Week bookmarks, a global geographic information system CD-ROM of North American data and accompanying classroom activities, and more. Order for \$4.95 from American Geological Institute, Publications Dept., 4220 King St., Alexandria, VA 22302-1502; phone (703) 379-2480; fax (703) 379-7563; or visit [www.earthsciweek.org](http://www.earthsciweek.org).

Science Scope  
October 1, 2003

# Eyes on PLANET EARTH!

## Exploring your Local Watershed

5446 P.39

by Michael J. Smith and John B. Southard

**T**he American Geological Institute is helping teachers and geoscientists to emphasize the importance of inquiry and active investigation of the world around us by selecting "Eyes on Planet Earth: Monitoring Our Changing World" as the theme of this year's Earth Science Week. The activity on the back of this month's poster insert, "Monitoring the Quality of Your Water Resources," encourages students to investigate their watershed and consider how they can become actively involved in assessing and monitoring the quality of water in their community.

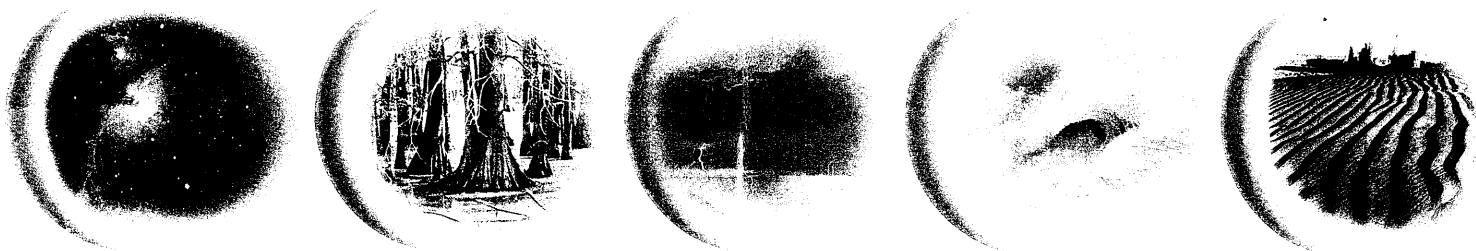
### *Surface water*


In most rivers, water flow is too variable from season to season to be a reliable direct source of water supply. Most surface water supplies come from large lakes or artificial reservoirs, which fluctuate less over time.

Dams are beneficial in providing water sources and controlling floods, but they have disadvantages as well. Reservoirs behind dams displace wildlife and people, and they cover cropland. Dams can disrupt the natural migration of fish. The sediment carried by a river is deposited in the reservoir behind the dam. Over time, the reservoir slowly fills up with sediment, leaving less room for water.

Most cities and towns that use rivers for their water supply take out only a small fraction of the river discharge. In some places, however, the demand for river water is so great that the natural discharge of the river is greatly decreased. For example, so much of the discharge of the Colorado River in the southwest is used for water supply that by the time the river reaches its mouth in the Gulf of California, the flow is only a trickle!

Not all of the water in rivers comes from surface runoff. Rain also infiltrates the Earth to become groundwater. Below





a certain depth, the rock and/or sediment is saturated with groundwater.

Flowing rivers, as well as lakes and springs, indicate places where the groundwater table comes to the surface. At times of high river flow, some of the river water feeds the groundwater. At times of low river flow, however, the groundwater feeds the river. This is why most large rivers flow even during long droughts. On average, groundwater supplies as much as 40 percent of the water that flows in streams and rivers. During times of drought the figure is much greater, and during times of flood the figure is much smaller.

### Drainage networks

Few river systems involve just a single river, with no tributaries. Almost always, there is a network of streams feeding a single river, which empties into the ocean or into a large lake. Drainage networks are similar in some ways to the network of branches on a tree. If you follow a river upstream, you come to a fork where the stream (branch) divides into two smaller streams (branches). In a stream system, such a fork is more technically called a *confluence* (flowing together).

A *watershed*, also called a *catchment* or a *drainage basin*, is the land area drained by a river system, including all of its tributaries. The watershed is the area of the land surface from which runoff collects to flow out through a particular stream, either to where that stream joins another, or where the stream empties into the ocean. Watersheds collect water from all sources of precipitation. The boundaries of a watershed can be determined by looking at the topography of the land and determining drainage patterns. In planning surface water supplies for municipal or industrial use, the volume of water available depends not only on the amount of rainfall but on the area

of the land surface on which it falls, and where the collection area is located.

The concept of a *divide* is simple; a divide is a locus of points on the land surface, as well as a corresponding line on a map, that separates areas that drain into one stream system from areas that drain into an adjacent stream system. In areas of high, sharp, mountainous relief, the drainage divide is easy to see; however, in areas of low relief, with broad, gentle slopes, the drainage divide is often much more difficult to discern.

Even when students understand the concept of drainage divides clearly, they often have trouble tracing them on a topographic map. The best way to locate drainage divides is to follow up each stream system until you reach the small, *fingertip streams* (those with no tributaries themselves), and then look in the high area between the fingertip streams of the two drainage systems to find *saddle points*. A saddle is a point on the land surface where the ground rises in two opposite directions but slopes downward in the two directions that are perpendicular to the rising areas. Actual horse saddles have such a shape, as do many unbroken potatoes. A mountain pass (a place that affords the lowest route across a mountain range) is a saddle point.

To locate a drainage divide using saddle points, trace a curve on a topographic map by starting at a saddle point and proceeding upslope, always staying perpendicular to local contour lines, until you reach a mountain summit. You have then completed one segment of the divide. Do the same for adjacent segments, starting at saddle points and working upward to the crests or peaks of hills or mountains. With some practice, this works very well, except in areas with such low relief that contour lines are far apart or in areas where the stream drainage has been disrupted by recent glacial erosion and deposition.

### Water pollution

The land area over which the water flows, as well as the subsurface material through which the water flows, affects the quality of the water. Water dissolves or picks up mate-

---

*Michael J. Smith is director of education and co-author of four Earth science curriculum projects at the American Geological Institute in Alexandria, Virginia. John B. Southard is professor emeritus of geology at the Massachusetts Institute of Technology in Cambridge, Massachusetts.*



rial from rocks and sediments. It is very important to know the location of a community's watershed area so that present land use patterns can be studied to determine whether the water is being polluted. It is equally important for community leaders to be informed about where the watershed area is located so that future land use will be compatible with protection of the water supply. Water pollution may or may not be visible or have an odor. Long-term use of water with undetected pollutants can have devastating effects on the health of humans who have consumed the water, both before birth and throughout life (see Table 1).

Both surface water and groundwater can become polluted. Surface water generally contains a greater variety of pollutants, from a greater variety of sources. That's because there are so many ways a pollutant can get into a river or lake. Polluted groundwater may contain fewer kinds of pollutants, but there may be a larger amount of each pollutant than in a typical surface water supply. It's usually much more difficult to solve problems of groundwater pollution than problems of surface water pollution. That's because groundwater moves far more slowly than surface water. It might take many human lifetimes for pollution to clear from a large aquifer by natural groundwater flow.

**Domestic sewage**—About three-quarters of homes in the United States are served by municipal sewage systems. The remaining one-quarter discharge their sewage into home septic systems (or even directly into the ground!). The human wastes in sewage are not themselves especially harmful; however, disease-causing microorganisms, which are common in sewage, are hazardous to health. Many illnesses, such as cholera and typhoid, are caused by contact with sewage. Such illnesses are much less common in the United States than in areas of the world where people have greater exposure to untreated sewage. Coliform bacteria, which live in the intestinal tracts of all warm-blooded animals (including humans), are generally not harmful. However, their presence in water is commonly used as a signal of sewage contamination.

**Nutrients from fertilizers**—Plants need many inorganic chemical nutrients for good growth. The most important of these are the elements nitrogen and phosphorus. Nitrogen is the most abundant gas in the Earth's atmosphere, but it cannot be used directly by plants. Certain soil bacteria convert nitrogen gas into soluble forms of nitrogen, mainly nitrate ions, which can be used by plants. Lightning bolts do the same thing, and, of course, human-made chemical fertilizers contain soluble nitrogen. The problem with nitrogen-con-

taining fertilizers is that they can be "too much of a good thing." Excess nitrogen promotes the growth of algae in natural surface waters, and when the algae die and decay they rob the waters of the oxygen needed by aquatic animals. Runoff from croplands is not the only culprit; fertilizer on lawns, golf courses, and home gardens often carries even more excess nitrogen than croplands.

Human waste contains water-soluble nitrogen compounds. In areas where untreated or inadequately treated sewage finds its way into groundwater supplies, nitrate levels in drinking water can be excessive. Human infants can be harmed by drinking water that has

## Topographic maps

The principal feature of a topographic map is a set of contour lines. A contour line is a line (more precisely, a curve) that connects all of the points on the map that have the same elevation. Contour lines never cross,



although they can merge together where there is a vertical cliff on the landscape. The contour interval is stated in the legend of the map and indicates the difference in elevation between two successive contour lines. Where contour lines are close together, the land surface is relatively steep; where contour lines are far apart, the slope of the land surface is relatively gentle.

Like all good maps, topographic maps have a scale, which indicates the relationship between horizontal distance on the land surface and distance on the map. The scale is usually given both as a bar or line with tick marks labeled with distances, and as a fraction that gives the ratio of distance on the map to distance on the land surface. For example, a scale of 1:25,000 means that one unit of distance on the map is equal to 25,000 units of distance on the land surface.

Topographic maps also give latitude and longitude, or east-west and north-south position relative to some other conventional grid system, along the margins of the map. There is always a north arrow as well. Color is important on a contour map. Contour lines are brown, water is blue, human-made features are black, wooded areas are shaded in green, and urban areas are shaded in red.

TABLE 1

Most common pollutants

Organic pollutants	Non-organic pollutants
sewage	nutrients in fertilizers (mainly nitrates and phosphates)
livestock wastes	industrial and commercial chemicals
pathogenic (disease-causing) microorganisms	road salts
	agricultural pesticides
	acidic mining wastes
	waste heat
	radioactive waste

high nitrate levels because nitrate reduces the amount of oxygen carried by red blood cells. Too much nitrate can cause "blue-baby syndrome," which can lead to suffocation.

Plants use phosphorus in the form of phosphate ions. The most common form of phosphorus in fertilizers is ground-up phosphate rock, a type of sedimentary rock. Deposits of a material called *guano*, the excrement of bats and seabirds, are also mined for phosphorus. The problem with soluble phosphorus is similar to the problem with nitrogen: it causes algal blooms in natural waters. Another problem related to the use of phosphorus is that the phosphates contained in household soaps and detergents can pollute groundwater supplies. In many heavily populated communities that rely on groundwater for water supplies, restrictions have been placed on the phosphate content of detergents.

**Toxic chemicals**—In earlier times, the number of artificial chemicals and materials used by people in their daily lives was small. Today, however, such substances number in the tens of thousands, and the list grows rapidly. A large percentage of these are potentially or definitely a health hazard. Some of the major chemical pollutants are gasoline, chemical solvents, agricultural pesticides and herbicides, and compounds of heavy-metal elements like copper, zinc, lead, mercury, and cadmium used in industrial processes.

Unfortunately, the rate of development of new substances is far greater than the ability of government and private testing laboratories to investigate their toxicity. Inevitably, many of these toxic substances find their way into surface water supplies and groundwater supplies. Partly, this is from everyday use. In many places, however, toxic chemicals have been dumped, illegally, on the land surface or stored in decaying drums at dumpsites. Cleaning up such sites all around the United States is a multi-billion-dollar task.

**Waste heat**—Most of the electricity in the United States is generated in power plants where burning of fossil fuels produces steam to drive turbines, which in turn drive electrical generators. Enormous quantities of water are used to cool and condense the steam back into liquid water, to be recycled in the power plant. The cooling water is put into rivers, lakes, or the ocean. It is typically 5–10 degrees Celsius warmer than the water bodies it enters. This causes three major problems. Because warm water cannot hold as much dissolved oxygen as cool water, less oxygen is available for aquatic animals. The higher temperatures also tend to lead to the disappearance of some species of organisms and replacement with warmer-water organisms. Sudden temperature changes, *thermal shock*, can kill organisms outright.

**Water hardness**—As water moves through soil, sediment, or bedrock, it dissolves some of the minerals. Water hardness reflects the concentration of dissolved solids—mainly calcium and magnesium—in the water. Groundwater tends to be harder than surface water, because it has had more time to be in contact with the solid materials. Hard water is also more common in areas where the bedrock is limestone; limestone consists of the calcium carbonate mineral, calcite, which is slightly soluble in water. Some degree of hardness in drinking water is considered healthy, because calcium and magnesium are essential nutrients. Hardness also lowers the concentration of lead dissolved from the lead-based solder that is often used in copper plumbing systems. A disadvantage of hard water is that it reduces soapsuds. It also can leave hard, white deposits in teapots, on shower walls, and in water heaters and boilers. Water softeners reduce hardness by replacing the calcium and magnesium ions with sodium ions. However, the high sodium levels in softened water render it undesirable as drinking water for persons with high blood pressure.

### Earth Science Week

For information, resources, and ideas about participating in Earth Science Week, including activities and student competitions related to its central theme of Eyes on Planet Earth, visit [www.earthsciweek.org](http://www.earthsciweek.org). Links to further information and resources related to monitoring water (and tips for obtaining the topographic map of your watershed) can be found at AGI's Investigating Earth Systems website at [www.agiweb.org/ies](http://www.agiweb.org/ies). ■

NASA CONNECT™  
THE PROGRAM THAT CONNECTS YOU TO  
MATH, SCIENCE, TECHNOLOGY, AND NASA!



NASA's Center for Distance Learning

[Home](#) | [About](#) | [Feedback](#) | [Contact](#)

VISIT OUR PARTNER SITES

## NEWS

Do you know what event will take place on December 17, 2003 in Kitty Hawk, North Carolina? Check out the following [web site](#) to learn more!

- ▶ Awards
- ▶ Broadcast Info
- ▶ Careers & Staff
- ▶ Classroom Mentor
- ▶ Episodes
- ▶ Parents
- ▶ Partners
- ▶ Register
- ▶ View Online

Select a TV Station

State:

Select ---->

GO

## episodes

### Virtual Earth



[Educator Guide](#)  
[Challenge](#)  
[Multimedia](#)  
[NASA LIVE™](#)  
[Resources](#)  
[Squeak Challenge](#)  
[Web Activity](#)

In *Virtual Earth*, students will be introduced to Earth system science. They will learn what a system is and how to apply the concept of systems to learn more about how the Earth functions. Students will understand the only way to really comprehend the workings of our planet is to look at the Earth as a whole system. They will also focus on Earth science applications of national priority to expand and accelerate the use of knowledge, science, and technologies resulting from the Earth Science Enterprise mission of improving predictions in weather, climate, and natural hazards. By conducting inquiry-based and web activities, students will make connections between NASA research and the mathematics, science, and technology they learn in their classrooms.



Produced by the NASA LaRC Office of Education  
Responsible NASA Official: Dr. Thomas Pinelli, Distance Learning Officer.  
Questions or Comments? Email them to [dcenter+mail@larc.nasa.gov](mailto:dcenter+mail@larc.nasa.gov)  
[Privacy Policy](#) • [Rights & Use Information](#)

NASA Connect™  
October 16, 2003

## Highlights and News Clippings Index

<u>Where to find information on:</u>	<u>Page</u>	
AGI Member Societies	1-9	1-14
	2-14	3-2
	3-3	
Libraries	1-7	1-10
	3-8	3-9
	3-11	
Museums and Science Centers	1-4	1-5
	1-6	1-8
	1-9	1-10
	1-11	1-12
	1-14	2-19
	2-23	2-28
	2-30	3-6
National and State Parks	1-4	1-8
	1-9	1-12
	2-18	2-29
	3-2	3-10
Schools and Teachers	1-4	1-5
	1-6	1-7
	1-8	1-9
	1-10	1-11
	1-12	1-13
State Government	1-2	1-5
	1-6	1-7
	1-8	1-10
	1-11	2-7
	2-20	2-27
	2-33	2-36
Universities	1-4	1-5
	1-6	1-7
	1-8	1-9
	1-11	1-12
	1-13	1-14
	2-24	2-32
U. S. Geological Survey	3-6	3-12
	1-4	1-5
	1-6	1-10
	1-11	2-10
	2-21	2-31