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Kim Wiens, science teacher at Warren Jr. High School in Bakersfield, California, contributed to this issue's Teacher's Edition.

April 22, 2009, is Earth Day! In this special edition of *Science World*, we explore different ways in which people are working to preserve all parts of the planet, from protecting far-away oceans and rivers to growing their own food and recycling. How do you plan to celebrate this Earth Day?

If you haven't already done so, please take our survey at www.scholastic.com/scienceworldspring09survey and share your thoughts about the magazine. And as always, feel free to e-mail any other comments or suggestions to us at: scienceworld@scholastic.com.

—The Editors

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Features

PAGE	CONTENT	TITLE SUMMARY	NATIONAL SCIENCE EDUCATION STANDARDS	LESSON IDEAS
6	Earth: Oceans	Protected Paradise Explore the Pacific's new ocean preserves.	Grades 5-8: Structure of the Earth system Grades 9-12: Energy in the Earth system	Where are these new preserves? Check out the map on p. 8 .
10	Physical: Technology	So Long to Sorting What are single-stream recycling centers?	Grades 5-8: Abilities of technological design Grades 9-12: Abilities of technological design	The activity on TE 6 will help students practice their chart-reading and graphing skills.
12	Life: Farms	Farm-Fresh Perspective Visit The Farm School to see where your food comes from.	Grades 5-8: Populations and ecosystems Grades 9-12: Interdependence of organisms	Students will make their own organic compost in the activity on TE 7 .
14	Earth: Rivers	Rough Waters Africa's Congo River has very diverse fish species.	Grades 5-8: Diversity and adaptations of organisms Grades 9-12: Biological evolution	Try out the Teacher-to-Teacher tip (below) with this story.

Coming Next Issue

- Find out how Indy drivers prep their bodies for races.
- How close are we to achieving *Star Trek* technology?
- Students erect a wind turbine at their school.
- Learn about the world's most extreme mammals.

Teacher to Teacher



Kim Wiens

Tips for using *Science World* in the classroom

Kim Wiens, this teacher's edition's contributor, suggests: It is important for students to take notes in class. But recording information verbatim is not the most effective technique. Help your students learn the Cornell Notes format (download a template here: www.lsc.sas.cornell.edu/LSC_Resources/cornellsystem.pdf). Provide partially completed Cornell Notes for any or all of the articles included in this issue. Have students work in groups to fill in the missing information and come up with possible test questions to write in the left margin. Finally, have them choose several key terms from their notes to include in the summary.





EARTH: Oceans
Protected Paradise

PRE-READING PROMPTS:

- Have you ever visited a national park, or any other protected land—even a city park? Is it important to set aside land for preservation? Why or why not?
- How do you think studying marine preserves will help scientists and governments protect and manage oceans all over the planet?

DID YOU KNOW?

- The Mariana Trench is the deepest place on Earth. The deepest part of the trench is called the Challenger Deep; it is 10,911 meters (35,797 feet) below the ocean's surface.
- In 1875, the crew on the *H.M.S. Challenger's* scientific expedition first measured the Challenger Deep. They used a sounding device, which consisted of a 200 kilogram (441 pound) lead weight attached to 232 kilometers (144 miles) of rope with flags attached at regular intervals. The crew would toss the rope overboard and watch how fast the flags went into the water and counted them. They knew it hit bottom when the speeding flags stopped.

CRITICAL THINKING:

- The marine monuments were created under the Antiquities Act, signed in 1906 by President Teddy Roosevelt. This act allows the President to set aside places of historic or scientific significance so they can be preserved for future generations without consulting Congress. What do you think may be the advantages and disadvantages of having the President be able to set aside areas without Congress's input? If you were President, what areas would you set aside for protection?

CROSS-CURRICULAR CONNECTIONS:

SOCIAL STUDIES: Visit the National Park Service Web site to learn more about the Antiquities Act of 1906: www.nps.gov/history/history/hisnps/NPSHistory/antiq.htm. At the bottom of the page is a list of Presidents and the national monuments they proclaimed. Have students make a timeline showing the national monuments in your state, when they were set aside, and which President established the monument.

RESOURCES

- Take a virtual trip to the Mariana Islands' volcanoes with the scientists of Scripps Institution of Oceanography via this Web site: <http://sio.ucsd.edu/marianas/expedition>.
- Learn more about the unusual fish that live near the geothermal vents on the Pacific Ocean's floor at the U.S. Geologic Survey's Web site: <http://pubs.usgs.gov/gip/dynamic/exploring.html>.

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PHYSICAL: Technology
So Long to Sorting

PRE-READING PROMPTS:

- Do your school and/or community recycle?
- Do you know what happens to your recycled goods once they are dropped off at the recycling center?
- What are some strategies you think would get more people in your community to recycle?

DID YOU KNOW?

- Some say the current recycling movement was started in 1987 by the *Mobro 4000*, a barge that hauled the same load of garbage from New York to Central America and back, looking for a facility that would accept the trash. It took a long legal battle to get an incineration facility in Brooklyn to burn the garbage, and the ashes were eventually buried in the Long Island community where the garbage originated.
- According to the EPA, in 2007 Americans generated about 254 million tons of trash. That works out to be about 2.1 kilograms (4.6 pounds) of trash from every person every day! Approximately 85 million tons (33.4 percent) was recycled.

CRITICAL THINKING:

- What are we going to do in the next 20 years to reduce the amount of garbage we create and increase the percent that we recycle? What combination of incentives and penalties would be most effective? How committed are you personally to reducing the amount of garbage you contribute to the pile?

CROSS-CURRICULAR CONNECTIONS:

MATH: Have your students calculate the approximate amount of garbage generated by their family on a daily basis (2.1 kg multiplied by the number of family members). What about on a weekly and annual basis? Take it further and calculate the amount of garbage generated each day in the city or town you live in! (*Answer: For a four-person household: 8.4 kg per day; 58.8 kg per week; and 3,057 kg per year.*)

RESOURCES

- Can I recycle that? Plug in the material you want to recycle and your postal code here to find out what your local recycling plant takes: www.earth911.com.
- Learn more about each step of the single-stream recycling system at this interactive Web site: www.explorethecycle.com.
- Check out the most recent facts and figures about Municipal Solid Waste in the U.S. at the EPA's Web site: www.epa.gov/osw/conserves/rrr/recycle.htm.

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LIFE: Farms
Farm-Fresh Perspective

PRE-READING PROMPTS:

- Where does your food come from and what happens to it before it ends up on your grocery-store shelf?
- Would you want to go to school on a farm and learn how to care for animals, grow vegetables, or gather maple syrup?
- What do you think “organic” means and how is organic food different from other food sold in our grocery stores?

DID YOU KNOW?

- According to the U.S. Department of Agriculture, the total number of certified organic farms in the country has more than doubled from 3,587 in 1992 to 8,493 in 2005.
- On average, the produce you eat in the U.S. travels approximately 2,100 kilometers to 3,200 kilometers (1,304 miles to 1,988 miles) from where it is grown to your house.
- According to the National Sustainable Agricultural Information Service, a nonprofit organization, approximately 80 percent of energy used in the U.S. food system goes to processing, packaging, transporting, storing, and preparing food. Only 20 percent of the total energy consumed is used to grow the food.

CRITICAL THINKING:

- Over the past few years, people have become more interested in where their food comes from. Some people believe that eating locally-produced food is better for them and for the environment. Can you think of some advantages and disadvantages of becoming a “locavore” (a person who is committed to eating local food as much as possible)? Would you like to become a locavore? Why or why not?

CROSS-CURRICULAR CONNECTIONS:

ART: Some organic farms use a method called companion planting, where they plant certain plants near each other to control pests or improve yield. For example, many gardeners plant marigolds near their tomato plants so that the pests will be attracted to the bright flowers instead of the tomato plant. Using the chart of companion plants at this Web site:

<http://attra.ncat.org/attra-pub/complant.html>, have students draw a plan for an organic garden at school that abides by these companion planting principles.

RESOURCES

- Find out ten ways to become a locavore and watch a video about growing local and eating local on this PBS Web site: www.pbs.org/now/shows/344/locavore.html.
- How far has your food traveled? Check out this food miles calculator: www.organiclinker.com/food-miles.cfm.
- Read all about Michael Pollan’s quest to find out where his food comes from in his book *The Omnivore’s Dilemma* (Penguin, 2007).



EARTH: Rivers
Rough Waters

PRE-READING PROMPTS:

- Do you know where the Congo River is?
- Africa’s Congo River has one of the most diverse fish populations of any river on Earth. What do you think created this exceptional diversity?
- What human activities do you think could be threatening the Congo River’s habitat?

DID YOU KNOW?

- The Congo River is Africa’s most powerful river and Earth’s second largest river by volume, after the Amazon River in South America. The Congo River drains a basin of 3.68 million square kilometers (1.42 million square miles).
- At 4,700 km (2,920 mi) in length, the Congo is the eighth longest river in the world and the second longest river in Africa (after the Nile).
- The Congo River drains water from both the Northern and Southern Hemispheres and crosses the equator twice. This unique route causes the river’s volume to be relatively stable throughout the year because some part of its watershed is always in a rainy zone.

CRITICAL THINKING:

- The Congo River has the potential to be a rich source of hydroelectric power for West Central Africa. It also is a transportation and communication resource for large areas not served by roads. How do you think the people and governments of the countries surrounding the Congo River balance their needs for power and transportation with the need to protect the river’s incredible diversity of plant and animal life?

CROSS-CURRICULAR CONNECTIONS:

LANGUAGE ARTS: When Melanie Stiassny studies the Congo River, she enlists the help of world-class kayakers that navigate the rough waters. Have students write a short story about what it is like to brave those rapids in search of the special fish that Stiassny researches.

RESOURCES

- Take a look at the American Museum of Natural History’s animation of land-cover mapping of the Congo River using satellites and computers: www.amnh.org/sciencebulletins/bio/v/congoriver.20060601.
- Check out the nonprofit group International River’s fact sheet about the proposed hydroelectric dams on the Congo River. www.internationalrivers.org/en/node/345.
- Watch clips from National Geographic’s Explorer episode about the bizarre fish of the lower Congo at their Web site: <http://channel.nationalgeographic.com/series/explorer/3826/Overview>.

Name: _____



Science News



DIRECTIONS: Read the Science News section on pages 3 to 5.

Then, test your knowledge by filling in the letters of the correct answers below.

1. A spike in serotonin levels drives locusts to ____.

- Ⓐ mate
- Ⓑ swarm
- Ⓒ camouflage themselves
- Ⓓ migrate

2. Which is NOT one of the conditions that can cause locusts to go from being solitary to outgoing?

- Ⓐ A plentiful food supply.
- Ⓑ Locusts bumping into one another.
- Ⓒ Seeing other locusts.
- Ⓓ If the locusts smell each other.

3. What is one way that scientists hope to reduce bird strikes?

- Ⓐ Having airplanes fly at a lower altitude so they are below flocks.
- Ⓑ Using radar and satellite tracking devices to predict birds' flight patterns.
- Ⓒ Erecting scarecrows to keep birds off runways.
- Ⓓ Restricting the flights to and from airports near bird habitats.

4. Bird-airplane strikes have increased for all of the following reasons EXCEPT ____.

- Ⓐ a boost in bird population due to successful conservation programs
- Ⓑ quieter, faster aircraft
- Ⓒ increased air traffic
- Ⓓ lights on airplanes attracting birds

5. Cellulose is a material that makes up ____.

- Ⓐ enzymes
- Ⓑ cast iron
- Ⓒ plants' cell walls
- Ⓓ human hair

6. What makes the new paper superdurable?

- Ⓐ A fine, evenly distributed fiber structure.
- Ⓑ A coating of chemicals.
- Ⓒ It is thicker than regular paper.
- Ⓓ It's made from fibers 5,000 times thicker than human hair.

7. A cold-blooded animal ____.

- Ⓐ uses its own energy to keep warm
- Ⓑ has a temperature range between 24°C and 26°C (75°F and 79°F)
- Ⓒ relies on its surroundings to regulate its body temperature
- Ⓓ can only survive in cold climates

8. What can be learned from *Titanoboa's* fossil remains?

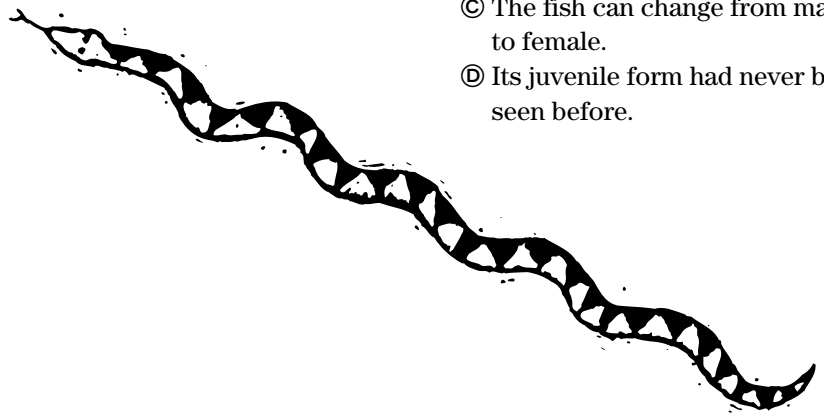
- Ⓐ The giant snake's eating habits.
- Ⓑ That *Titanoboa* was not the world's largest snake.
- Ⓒ That Colombia was underwater 60 million years ago.
- Ⓓ Clues about Earth's past climate.

9. How much more milk will Elsie the cow produce per year than a cow without a name? (Hint: Cows on average produce 7,500 liters of milk per year.)

- Ⓐ 360 liters
- Ⓑ 3,250 liters
- Ⓒ 7,140 liters
- Ⓓ 7,865 liters

10. What discovery did scientists make about the fish species *Cetomimidae*?

- Ⓐ It is actually three different species.
- Ⓑ Its females, males, and juveniles all look completely different.
- Ⓒ The fish can change from male to female.
- Ⓓ Its juvenile form had never been seen before.



Name: _____

PAGE **6** Protected Paradise

DIRECTIONS: Fill in the blanks to complete the sentences below.

1. Three new marine monuments located in the _____ Ocean were created by President _____ during his last days in office.
2. Researchers sail to the Mariana Trench to study the bubbling cauldron of _____ deep below the ocean's surface.
3. The Mariana Trench lies on the boundary of two _____.
4. The location of the Mariana Trench Monument also harbors some of the world's largest _____, which spew out superheated water.

PAGE **10** So Long to Sorting

DIRECTIONS: At a single-stream recycling facility, the latest technology is used to separate the mixed recyclables that arrive every day. Complete the chart below to explain how each material is separated for *baling*, or bundling.

Material	Method for Separating
Cardboard	
Paper	
Steel	
Glass	
Aluminum	
Plastics	

PAGE **14** Rough Waters

DIRECTIONS: Match the word in the left column with the correct phrase in the right column.

- | | |
|----------------------|---|
| ___ 1. ichthyologist | a. belonging exclusively to a certain place; found no place else |
| ___ 2. endemic | b. animals with a backbone |
| ___ 3. hydroelectric | c. scientist who studies fish |
| ___ 4. vertebrates | d. having to do with the generation of electricity from the energy of falling water |

Name: _____

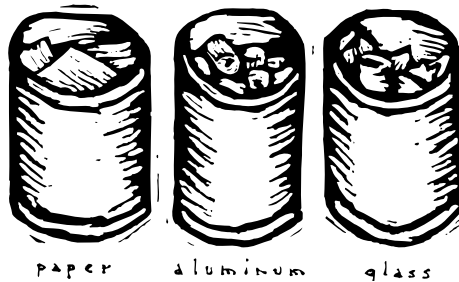
Recycling by the Numbers

In “So Long to Sorting” (p. 10) you read about a new type of curbside recycling program that allows residents to dispose of all their recyclable materials in one large bin. Every year, the Environmental Protection Agency produces a report about how much *municipal solid waste* (trash) is generated and recycled in the United States. Complete the chart and answer the questions below in complete sentences to find out more about the materials in your garbage can and recycling bins.

Generation and Recovery of Municipal Solid Waste in 2007 by Type of Material (in millions of tons)

Material	Weight Generated	Weight Recycled	Weight Recycled as a Percent of Weight Generated (Weight Recycled x 100/Weight Generated)
Paper & Paperboard	83.0	45.2	54.5 percent
Glass	13.6	3.2	
Steel	15.6	5.3	
Aluminum	3.6	0.7	
Plastic	30.7	2.1	

SOURCE: Municipal Solid Waste Generation, Recycling and Disposal in the United States: Facts and Figures for 2007, EPA



Graph it

Create a double bar graph that compares the weight of each material generated with the weight of each material that is recycled. Don't forget to give your graph a descriptive title and label both the x and y axes. You will also need to design a key to show which bars show "Weight Generated" and which bars show "Weight Recycled."

Analyze it

1. Which material is recycled the most, as a percentage of the weight generated? Which is recycled the least?
2. What reasons can you think of to explain why some materials are recycled at a higher percent?
3. What do you think happens to the materials that are not recycled?
4. In some states, such as California, consumers pay a deposit on recyclable beverage containers. How do you think this affects the percent of the containers that get recycled?

Name: _____

Make Your Own Compost!

In “Farm-Fresh Perspective” (p. 12) you learned about The Farm School in Massachusetts where kids visit a farm and produce their own organic food. In order to grow organic fruits and vegetables, a farmer does not use synthetic fertilizer or pesticides. Instead, the farmer uses *composted* fertilizer made from decayed organic material like plant-based food scraps.

Predict

How long does it take food scraps to turn into compost?

Materials

large flowerpot • enough dirt to fill the pot halfway • food scraps • large trash bag • spoon or fork • water

Procedure

- Using the dirt, fill the flowerpot so it is approximately $\frac{1}{4}$ full.
- Add some leftover food scraps from lunch, such as bread crusts, apple cores, banana peels, and leftover salad. **IMPORTANT:** Do not add meat, dairy products, or fatty foods because they will smell bad and may attract pests.
- Cover the mixture with a thin layer of soil. This will keep the compost from smelling.
- Put the pot outside in a spot where no one will disturb it.
- Cover the pot with the trash bag.
- Stir your compost mixture every few days with the spoon or fork.
- Keep your compost damp by adding a little water to it every few days.
- Repeat steps 6 and 7 until your food scraps turn into compost.
- Put a flower or vegetable plant in your flowerpot and watch it grow!

Conclusions

- How long did it take for your food and dirt mixture to turn into compost?
- What do you think helped break down the food?
- What variables could you change to make the process take more or less time?

