



Reconnect with your environment

Learn about environmental issues, their effect on your community and actions for your involvement.



BY THE NUMBERS

2010

Hottest year on record, globally, in a tie with 2005. It was also the wettest year ever recorded — think Pakistan, Australia, Tennessee, and California and their epic floods.

34

Consecutive years that global temperatures have been above the average for the 20th century.

14

Consecutive years that temperatures in the U.S. have been above the long-term average.

9

Number of the 10 warmest years on record since 2000.

58.12

Average planet surface temperature last year, in degrees Fahrenheit

57

Average planet surface, in degrees Fahrenheit, during the 20th century.

1976

The last year that global average temperatures were below normal.

SOURCE: NASA and NOAA

Humanity's Carbon Emissions

88% 7.7 billion metric tonnes per year



photo credit: Kodda

Fossil Fuels & Cement

2000 to 2009

12% 1.1 billion metric tonnes per year



Land Use Change

2000 to 2009

Where Humanity's Carbon Goes

47% 4.1 billion metric tonnes per year



photo credit: @imgrey/istock

Atmosphere

2000 to 2009

27% 2.4 billion metric tonnes per year



photo credit: J.P. Webster/istock

Land

2000 to 2009

26% 2.3 billion metric tonnes per year



photo credit: BAS

Oceans

2000 to 2009

Data published Nov. 21 2010 at Nature Geoscience + GlobalCarbonProject.org

Graphic Production: **CO2Now.org**



LEARN MORE

What: Visit the TREC between Jan. 15 and March 25 and receive a chance to win a guided tour of the Presque Isle Lighthouse on May 29.

Cost: No fees; participants must be age 16 and up to enter.

When: 10 a.m. to 6 p.m. daily

For more information, contact: Stacey Marendt at 217-9638

What: Outside the Window pre-school program; kids ages 3-5 with an accompanying adult can explore the natural world with books, crafts and outdoor activities.

When: 10 a.m. to 11 a.m. on the following days: Feb. 12 and 18;

Groundhogs; March 12 and 25: Animals Wake Up; April 9: Frogs; May 14: Plant a Garden

Where: At the Tom Ridge Environmental Center and other Presque Isle locations (dress for outdoor activities)

Cost: \$3 per child per class, registration required

For more information, contact: the Park Office at 833-7424



CONTRIBUTED PHOTO

Earth Action Education Director Pat Lupo, OSB, gives Fort LeBoeuf students the opportunity to share what they learned about human impact on oceans and aquatic ecosystems.

Students acquire skills to save our ecosystem

By ANNA MCCARTNEY
Contributing writer

How does an underwater struggle for survival off the "Wild Coast" of South Africa relate to students from Fort LeBoeuf Middle School?

The Earth Action Youth Training Day at the Tom Ridge Environmental Center involved students in grades 6-8 in activities to bring home the message that human activity impacts the survival of the entire aquatic ecosystem.

The day began with an introduction and viewing of the "Wild Ocean" on the Big Green Screen. Students then attended a variety of workshops that helped them explore aquatic organisms and their interaction within an ecosystem.

"My favorite part of the day was playing the predator/prey game. I learned about the animal food

chain and how herbivores are typically on the bottom with carnivores and top carnivores on top," said Samantha Weryha.

When students were asked to share what we can do to protect the aquatic ecosystem, Skylar Fox and Jacob Burkley both agreed it's important to get friends and families together to pick up trash on the beach so it does not make its way to the water. Rachael Wilson suggests you use recyclable containers.

The all-day event was made possible with a grant from the Pennsylvania Department of Environmental Protection's Coastal Resources Management Program.

ANNA MCCARTNEY, a communications and education specialist for Pennsylvania Sea Grant, can be reached by e-mail at axm40@psu.edu.

Filling the atmosphere with too much carbon dioxide is a huge experiment, and we're in the test tube.

By burning fossil fuels that were trapped underground for millions of years, humans have rapidly created an excess of this greenhouse gas in the wake of the Industrial Revolution.

Ocean and forests suck some of this carbon dioxide (CO2) out of the air.

That's a scientific fact. In addition to soil, these carbon sinks play an important role in maintaining proper levels of CO2 in the earth's atmosphere by absorbing more carbon dioxide than they emit.

The question is: Can they keep pace with all the extra human-produced CO2?

When Inez Fung joined a climate-modeling team at NASA's Goddard Institute for Space Studies at Columbia University, she began earnestly thinking about the earth's carbon cycle. It was obvious to her that the earth's ability to absorb CO2 is vital for analyzing climate change.

Fung's commitment and work to account for every gram of heat-trapping carbon dioxide on the planet earned her recognition as one of Scientific American's 50 most influential scientists in 2005. Currently she is the director of the Berkeley Institute of the Environment at the University of California-Berkeley. Her childhood love of math, her training in mathematics at MIT, her work at NASA and her passion for tackling big problems make her a perfect choice.

While Charles Keeling and other scientists clearly showed that CO2 concentration is rising and causing the planet to warm, Fung's research gives us a better understanding of the current and future role played by carbon sinks. Any decrease in their capacity to absorb CO2 could dramatically increase the speed and intensity of global climate change.

Using her detailed data analysis, Fung built a large-scale computer model to represent the CO2 sources and sinks and where and when they vary. More recently, Fung has coupled her carbon-



CONTRIBUTED PHOTO/National Academy of Sciences

Climate scientist Inez Fung's job is to try to predict the future of the earth's climate. Her tools are mathematical equations and models, and superfast computers. Like any good scientist, she is always asking new questions and searching for new puzzles to solve so she can help us better understand and respond to the changes.

cycle model onto existing large-scale computer climate models to project how land and ocean carbon sinks are likely to change as the average global temperatures rise.

Until now, earth's land, vegetation and oceans have soaked up roughly half of all the CO2 from fossil fuels. But one of Fung's major findings is that droughts have already diminished the land's ability to take up CO2 and will continue to do so on a global scale. Observational data supports her research.

Her model also projects that the tropics are likely to become hotter and drier in the summer, causing plants to slow their CO2 intake to avoid water loss. Atmo-

spheric measurements over the past decade have already confirmed this effect. Fung worries that increasing regional droughts will further hasten warming trends because her research shows that soil moisture is a key variable.

In 2013 a new satellite, the Orbiting Carbon Observatory (OCO-2), is expected to launch, giving Fung volumes of data on atmospheric levels of CO2. She will go from drawing upon roughly 100 observations every two weeks to a million. And because the OCO can read CO2 levels of the entire atmospheric column, it will eliminate the need to guess about variations at different altitudes.

Fung's colleagues are paying

FAST FACTS

- Carbon dioxide is produced naturally but human activity has greatly increased the amount of this greenhouse gas since the Industrial Revolution.
- Vehicles alone produce almost one-fourth of the CO2 released into the air.
- Scientists are seeing evidence of climate extremes that have never been seen before.
- Arctic sea ice has thinned and mountain glaciers have shrunk. Four-fifths of the glaciers in Montana's Glacier National Park have disappeared in the past 100 years and if warming continues, they could all disappear in the park by 2030.
- The loss of land ice and the warming of oceans have caused a slow but steady rise in sea levels.
- The number of days with frost has decreased over most areas of the earth.
- The 20th century was the warmest in the past 1,000 years. And 9 of the 10 warmest years in the last 150 have occurred since 1990.
- Droughts are more severe in some areas.
- Some trees are budding earlier in the spring and some plants are growing in places that were once too cold for them.
- The carbon dioxide content of the earth's oceans has been increasing since 1750, and is currently increasing about 2 billion tons per year. This has increased ocean acidity by about 30 percent.

close attention to her analysis, and her work is widely cited. It is hoped that policymakers and regular citizens will use the information to take action before the carbon sinks become saturated with all the extra CO2 we are producing. Using less oil, coal and gas and replacing them with renewable sources of energy that don't produce CO2 will certainly help.

To extend today's learning, teachers can find lessons at www.goerie.com/nie.

ANNA MCCARTNEY, a communications and education specialist for Pennsylvania Sea Grant, can be reached by e-mail at axm40@psu.edu.

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Check out these websites to learn more:

- <http://co2now.org/>
- www.globalcarbonproject.org/science/sfi.htm
- www.oar.noaa.gov/climate/t_observing.html
- www.seagrant.psu.edu/extension/climatechange.htm

Collect articles about climate change with an international, national, state and local focus. Compare what you read about climate change with what you hear about climate change. Make sure to reference the science of climate change. Is climate change a serious problem we should address? Do you want to convince others to stop producing CO2 and other greenhouse gases? Send your thoughts to axm40@psu.edu.

