

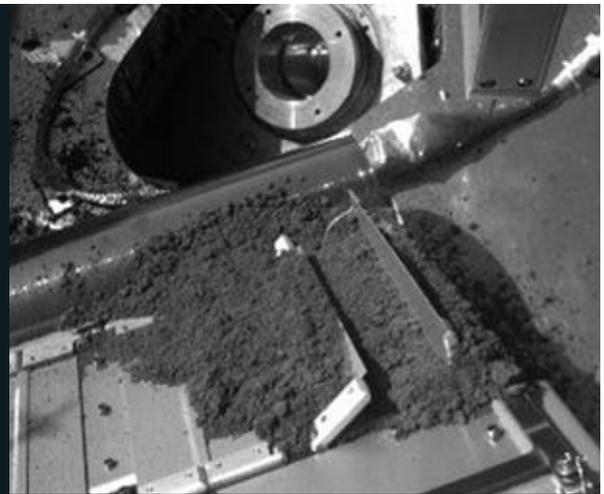


polygonal patterns (*left*), which probably result from the seasonal expansion and contraction of ice near the surface. Curiously, the polygons, about 1.5 to 2.5 meters in diameter, were much smaller than estimates made from earlier orbital images, suggesting that the area may be more complex and dynamic than previously thought.

With its 2.4-meter-long robotic arm, Phoenix scooped up some Martian dirt on June 6, but the first attempt to deliver the sample to onboard equipment for analysis—the hope is to find water—stalled when the Martian soil proved to be clumpier than anticipated. The sample sat on top of metal screens meant to sift out smaller particles (*above*). Mission controllers had to come up with a means to bypass the problem, including instructing Phoenix to turn on a mechanical screen shaker in an effort to dislodge the material. The seventh and final round of shaking did the trick.

Phoenix should last to September but probably not much beyond that. For most of 2009, it will be encased in dry ice, as the Martian winter arrives and carbon dioxide condenses out of the atmosphere, covering the region.

For the latest coverage, see www.SciAm.com/aug2008



NASA/JPL-CALTECH/UNIVERSITY OF ARIZONA (*left*);
NASA/JPL-CALTECH/UNIVERSITY OF ARIZONA/MAX PLANCK INSTITUTE (*right*)

ENVIRONMENT

The Puzzling Inferno

When saving trees means less carbon storage **BY KEREN BLANKFELD SCHULTZ**

Wildfires wreaked havoc across southern California last year, resulting in billions of dollars in irreparable damage. Not surprisingly, land managers and agencies this season have mobilized fire crews and equipment to stop the flames before they spread. In the meantime, however, researchers studying the amount of carbon that forests and vegetation harbor have stumbled on a finding that presents an added quandary to fire management: suppressing fires means that less carbon is stored in trees.

The team, led by Michael L. Goulden of the University of California, Irvine, compared the biomass of California's wild forests in the 1930s with those in the 1990s using data compiled by two forest

census takers: the Wieslander Vegetation Type Mapping Project at the University of California, Berkeley, and the U.S. Forest Service's Forest Inventory and Analysis program. In evaluating the two sets of data, the scientists found that the density in midaltitude conifer forests increased by 34 percent during the 60 years that elapsed.

Yet contrary to conventional wisdom—that more trees mean additional carbon storage—they found that the amount of carbon held actually decreased by 26 percent in the same period.

“This is a nice example of a counter-intuitive result,” remarks Richard Houghton of the Woods Hole Research Center,

Going to Blazes

Last year in the U.S., 85,705 wildfires burned 9,328,045 acres, according to the National Interagency Coordination Center. California suffered some 9,000 fires, more than any other state. This year's wildfire outlook continues the recent trend of increased risk. The National Interagency Fire Center Predictive Services has forecast “above normal significant fire” potential in the deserts of southern California through September. Although the number of wildfires has decreased during the past 200 years, the severity has risen as human populations encroach on natural ecosystems, according to the U.S. Geological Survey.

NEWS SCAN

who was not a part of the study but had come up with the idea for it when researching large carbon sinks in North America.

The logic behind the unanticipated finding comes down to the size of the trees that are being saved by fire suppression, says Goulden, whose study is being published this summer by *Geophysical Research Letters*. Over the past few decades firefighters have stopped the ground blazes common in California that would have otherwise likely wiped out the smaller trees and undergrowth. Instead these forests now have many small and midsize trees, adding to the forest's density.

In turn, Goulden adds, when forests in the western U.S. inevitably go through periods of extreme drought, the entire forest is put under severe stress. The larger trees, which require more water and oxygen to survive and experience higher exposure to the drying sun and wind, tend to be the casualties of the drought. Trees measuring 90 centimeters or more in height might contain as much carbon as 50 to 75 small trees that measure between 10 and 30 centimeters in height.

"In terms of trying to nail down the United States net carbon budget," Houghton says, "we should be more careful of counting forest thickening as a sink."

Preserving the heftier trees is the easy solution to augmenting carbon storage and allowing them to play their ecological roles—they offer varied habitats and shape the land—but the responsibility of fire management remains complex. Nathan L. Stephenson, a research ecologist at the U.S. Geological Survey's Western Ecological Research Center, is not so sure that Goulden's findings will change much of the current efforts in fire management.

As the climate changes and puts stress on plant life, Stephenson says, it is probably better for the forest to get back to the way it used to look: thinner and less crowded. In fact, the national parks of the Sierra Nevada Mountains, with which he closely works, already use prescribed fire to thin forests. Burning or cutting down trees will release some carbon into the atmosphere. But at least, Stephenson notes, "you reduce the chance that you're going to lose all [the carbon] in a catastrophic wildfire."



FIRE AWAY: Wildfires, such as this one that raged near Cerritos, Calif., in 2004, may in the long run actually improve a forest's ability to sequester carbon.

STEVEN K. DOLZUMA/Corbis

MATHTUTORDVD.COM Press Play For Success!

Having Math Problems? WE CAN HELP!

SUBJECTS:

- BASIC MATH
- BASIC MATH WORD PROBLEMS
- PRE-ALGEBRA
- ALGEBRA 1 & 2
- ALGEBRA WORD PROBLEMS
- ADVANCED ALGEBRA
- GEOMETRY
- TRIG/PRECALCULUS
- CALCULUS 1, 2, 3
- PHYSICS

AVERAGE COURSE
LENGTH: 8 HOURS
MOST COURSES COST
ONLY \$26.99

Subjects Coming Soon: Matrix Algebra, Unit Conversions, and Probability/Statistics.

VISIT OUR WEBSITE
TO VIEW SAMPLE
VIDEO CLIPS OF
EVERY COURSE

#1 Rated Math &
Physics Tutorial DVDs

All topics taught entirely through worked example problems.

Raise grades or your money back
877-MATH-DVD

Visit: MathTutorDVD.com/sciam

SUBSCRIBE, RENEW OR GIVE A GIFT ONLINE!

To give a gift subscription
of Scientific American:

www.SciAm.com/gift

To renew your subscription
to Scientific American:

www.SciAm.com/renew

To subscribe to
Scientific American Mind:

www.SciAmMind.com

To subscribe to
Scientific American Digital:

www.SciAmDigital.com

SCIENTIFIC
AMERICAN

SCIENTIFIC AMERICAN
MIND