

The case of the missing carbon dioxide

Tropical countries are releasing far less carbon dioxide into the atmosphere than scientists previously thought, according to preliminary results from a new study. This conclusion, if borne out by subsequent work, would solve part of a mystery concerning the ultimate fate of carbon dioxide pollution.

The findings call into question a widely used estimate of the carbon dioxide emitted when residents of the tropics chop down trees, burn vegetation, and convert forests into pastures and crop fields. This original calculation, made in 1914 by Richard A. Houghton of the Woods Hole (Mass.) Research Center, has such activities adding 1.6 billion tons of carbon to the atmosphere each year, a figure adopted by the Intergovernmental Panel on Climate Change.

Andrew Friend and Elaine Matthews of NASA's Goddard Institute for Space Studies in New York City developed a computer model to track how vegetation and soils change as people alter the landscape. They computed the effects of deforestation in a model of a generic rainforest plot and found only half to two-thirds the carbon dioxide emissions predicted by Houghton's formulations. The new computer model indicates that some of the downed vegetation will decay more slowly than originally thought, says Matthews.

To make a global estimate, the researchers will have to determine how land areas have changed in recent years and then plug those findings into the computer model—a process the team has just begun. The results from the initial test, however, indicate that the new estimate will fall far below the original figure.

The predicted drop in carbon dioxide emissions should let some scientists breathe easier. For a decade, researchers have been trying to locate a missing sponge for carbon produced by human activities. More than a billion tons per year have not been accounted for. Some scientists have proposed that northern forests are absorbing that portion, but ecologists see no evidence of such substantial carbon storage. With the NASA study, much of the discrepancy could disappear in a puff of smoke.

Susan Trumbore of the University of California, Irvine calls the original estimate highly uncertain. "It's been a long time that someone's needed to redo that," she says. —R.M.

The stifling side of Asian exports

Increasing air pollution over China in the next decade will significantly boost concentrations of harmful ozone above North America, making it harder for states to meet federal air quality standards, reports a team of atmospheric chemists.

Daniel J. Jacob and his colleagues at Harvard University employed a computer model of atmospheric winds and chemical reactions to estimate the effects of rapidly growing Chinese pollution. With increasing use of coal and oil to fuel its economy, China is expected to triple its emissions of ozone-forming compounds between 1985 and 2010.

The computer simulations indicate that ozone from China readily crosses the Pacific during spring, raising the concentrations of this pollutant across the United States. The projections for 2010 indicate that springtime ozone values will jump by 5 parts per billion in California and 3 parts per billion in the eastern states. Many states are already struggling to meet the proposed new standard of 80 parts per billion.

"Getting a 5-part-per-billion enhancement represents a significant offsetting factor" to these efforts, says Jacobs.

Researchers from the University of Oslo and the University of California, Irvine are also modeling pollution transport. In apparent conflict with the Harvard group, they don't see appreciable ozone movement from Asia to the United States. They caution that they have only simulated a single year, 1996. "There's a lot more work that needs to be done," says Bryan J. Hannegan of UC Irvine. —R.M.

British birds are nesting earlier . . .

Birds in the United Kingdom have adjusted their nesting habits to accommodate climate changes, according to an analysis of 57 years of data on egg-laying.

In the cool spell of the 1960s and 1970s, British birds began laying eggs later in the year than they had before, the study shows. In recent years, however, a warmer climate has prompted the birds to push their nesting calendars forward.

"Birds that lay earlier produce more young and healthier young who have a better chance of surviving until the following year, so in that sense [the trend] could be quite a good thing," says Humphrey Q.P. Crick of the British Trust for Ornithology in Norfolk, England. "But it could be a bad thing if the food supplies that the chicks rely on don't shift in the same way."

Crick and coauthor Timothy H. Sparks of the Institute of Terrestrial Ecology in Cambridgeshire, England, tracked the nesting habits of 36 bird species throughout the United Kingdom.

The study indicates that the average egg-laying date for 31 species is linked to temperature or rainfall. Temperature, particularly in March and April, explained long-term trends in laying time for 17 species, the researchers report in the June 3 *NATURE*.

Previously, researchers had noted trends toward earlier laying, says Crick (*SN*: 8/30/97, p. 141). "Then, we sort of waved our arms a bit and said, 'It's likely to be global warming,'" he adds, "but now we're showing that all of these changes can really be explained statistically in terms of changes in temperature."

On the basis of projected climate changes, Crick and Sparks estimate that by 2080, 27 bird species will have moved their egg laying schedule forward by 8 to 18 days. —S.C.

. . . and moving a bit north

Breeding ranges of British birds have edged north by almost 19 kilometers in 20 years, report University of Leeds in England researchers.

"The most parsimonious explanation is climate," say Chris D. Thomas and Jack J. Lennon in the May 20 *NATURE*.

Thomas and Lennon spotted the trend by comparing the outer edges of nesting ranges recorded in two atlases of bird breeding grounds in Great Britain. The first atlas covered 1968 through 1972, and the second, 1988 through 1991. Population booms and busts can affect range margins. Taking such shifts into account, the researchers report that 42 of Great Britain's southerly species further extended their northern nesting border over the 2 decades.

The researchers suspect that climate drove the shifts because it affects so many features of bird life. Other work links warmer spring weather to variations in timing and success of nests and shows that temperature correlates with patterns of bird distribution in Britain. Also, the range shift occurred during a time of climate warming, Thomas and Lennon point out.

Others find similar shifts among European butterflies. —S.M.

Family life heats up for Mexican jays

Mexican jays in southeastern Arizona are starting families about 10 days earlier than they did in 1971.

The beginnings of nest building and egg laying in a jay population under long-term study have jumped forward, note Jeram L. Brown of the State University of New York at Albany and his colleagues. During the same period, monthly minimum temperatures tended to creep up, the researchers report in the May 11 *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES*.

Biologists have long predicted that climatic warming could fast-forward animal reproduction. Yet, Brown and his colleagues observe that there hasn't been much documentation for that trend in North America. The problem deserves more attention, they warn. A recent study of grasslands showed minimum temperature gains paralleling changes in the mix of species. —S.M.