

Tallying Nitrogen's Increasing Impact

For most of agricultural history, nitrogen has been a precious commodity. Only specialized bacteria and lightning could convert atmospheric nitrogen into biologically usable forms. Today, however, fertilizers and fossil fuels have made nitrogen so freely available that it has become too much of a good thing.

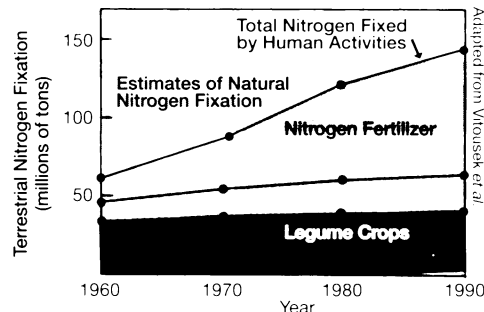
In a review of nitrogen's effects across the environmental spectrum, a team of ecologists headed by Peter M. Vitousek of Stanford University has concluded in no uncertain terms that human activities have dramatically increased the flow of nitrogen into the biological world—doubling the natural rate at which it is made available on land—with “serious and long-term” consequences.

“We are now the dominant force in the

nitrogen cycle,” says ecologist G. David Tilman of the University of Minnesota in St. Paul, one of the report's eight authors. “Humans are controlling more nitrogen than all natural processes.”

The Ecological Society of America is releasing a version of the report this week at the American Association for the Advancement of Science meeting in Seattle. The full report is slated to appear in the August *ECOLOGICAL APPLICATIONS*.

Although none of the data or processes summarized in the report is new, a synthesis was needed, says John M. Blair. “When people think of global change, they usually think of climate change and increasing carbon dioxide,” says Blair, a soil ecologist at Kansas State University in Manhattan. But the growth



and reach of human population has a global impact in other ways. “The nitrogen cycle is a terrific example of that.”

The ecologists trace most of the new nitrogen in the system to three human activities. The use of commercial fertilizer is the biggest source, and it is increasing sharply, especially in developing countries. Of all the manufactured fertilizer used through 1990, half was applied to crops in the 1980s.

Increased global cultivation of legumes and other crops that harbor nitrogen-fixing bacteria also adds to the influx. The burning of fossil fuels provides the third major source of newly available nitrogen compounds. These activities funnel about 140 million metric tons of nitrogen into the environment each year, the ecologists estimate—an amount roughly equivalent to 10 million semi trucks of dry nitrogen fertilizer, says Tilman.

The clearing of wildlands liberates perhaps another 70 million metric tons of nitrogen that had been stored in biomass.

The nitrogen glut is evident throughout the biogeochemical cycle, according to the report. Nitrous oxide, a potent greenhouse gas (*SN*: 9/18/93, p. 180), is accumulating in the atmosphere and can eat away at the stratospheric ozone layer. Other nitrogen compounds contribute to smog and acid deposition. They alter the pH and nutrient balance of soils and waters, triggering a cascade of effects (*SN*: 2/11/95, p. 90; 7/22/89, p. 56).

Researchers now think that the excess nitrogen is diminishing biological diversity in some areas. European heathlands, long adapted to nitrogen-poor conditions, are giving way to Eurasian grasses under the fertilizing effects of nitrogen. Such changes in species composition (*SN*: 12/7/96, p. 356) may be the newest and most surprising of nitrogen's consequences, says Vitousek.

The trends are likely to continue, in step with the growing, urbanizing world population, the ecologists say. They see a need for more efficient fertilizer use and greater control of nitrogen emissions.

— C. Mlot

Car phones jack up risk of collisions

Driving while phoning may soon become as notorious a traffic offense as driving while intoxicated. Both practices at least quadruple a driver's risk of having a collision, a new study shows.

Donald A. Redelmeier and Robert J. Tibshirani of the University of Toronto have produced what may be the first large-scale evidence of car phone risk. They studied 699 Canadian drivers with telephones, all of whom were “involved in motor vehicle collisions resulting in substantial property damage but no personal injury.”

The researchers drew their data from the drivers' cellular telephone records, police accident reports, and interviews with the drivers themselves. They then analyzed the drivers' telephone use on the day of their vehicular crack-ups and on the day before the collision.

Redelmeier and Tibshirani chose this method because it would enable them to “identify an increase in risk if there were more telephone calls immediately before the collision than would be expected solely as a result of chance.”

The investigators found that each driver used the car phone an average of nine times on days in which collisions occurred. Twenty-four percent of the drivers had begun a call within 10 minutes of the collision. By comparing the same drivers' calling patterns on the previous day, the researchers calculated that phone use increased the likelihood of a collision 4.3 times.

The duo decided against analyzing collisions that involved serious injury, because they did not want personal injury lawyers to seize on the study as potential evidence in lawsuits. In court, the researchers might have to violate their vow of privacy to the people who volunteered for the research, Redelmeier says.

The study, published in the Feb. 13 *NEW ENGLAND JOURNAL OF MEDICINE*, provides “the first direct evidence” that cellular phones contribute to roadway collisions, Malcolm Maclure of the Harvard School of Public Health and Murray A. Mittleman of Beth Israel Deaconess Medical Center, both in Boston, write in an accompanying editorial.

The study does not suggest that people who were using cellular phones caused collisions, Redelmeier emphasized. Many of the drivers couldn't avoid cars that veered into them—even when using phones that allowed them to keep two hands on the steering wheel.

“I thought that the most striking observation was that hands-free cellular telephones offered no large safety advantage, suggesting that the major factor in a motor vehicle collision was not limited manual dexterity, but the driver's limited attention,” Redelmeier says. Nearly 40 percent of the drivers used their phones to call for aid after the collision, he added. Half a million Canadians use cell phones to report emergencies each year.

Maclure and Mittleman found that the risk of a collision doubles within 5 minutes of starting a phone call. They calculate that if 1 driver in 10 has a car phone by the year 2000, driving while phoning could cost the United States alone up to \$4 billion per year.

— S. Sternberg