

# Bush Moves to Protect Ozone Layer, Speeds Up Ban on CFCs

Washington Post

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President Bush yesterday announced that the United States will stop making the industrial chemicals known as chlorofluorocarbons four years earlier than planned because of new estimates of their damage to the protective ozone layer over the Northern Hemisphere.

The president's pledge to halt production by Dec. 31, 1995, commits the United States to a faster phaseout schedule than most of the industrialized nations that signed the Montreal Protocol, an international treaty that sets a deadline of the year 2000 for elimination of the chemicals, which are widely used in consumer products.

The new timetable will pose little or no hardship to American producers, most of which have long been planning to get out of the declining market for CFCs.

The decision does not speed the phaseout of many substitutes already in use that are less damaging than CFCs but still erode the veil of ozone molecules. The ozone layer in the stratosphere screens out much harmful ultraviolet radiation, which can cause skin cancer, cataracts and damage to the immune system.

Bush called for a re-examination of plans to stop production of the substitutes by 2030.

"The president has taken at best a half step," said Senator Albert Gore, D-Tenn., who has called for a faster phaseout of

CFCs and their substitutes. "His deadline is welcome, but still inadequate."

The destructive power of CFCs was first reported in the 1970s, prompting a U.S. ban on them in aerosol products in 1978. But industry found increasing uses for the inexpensive gases as refrigerants, computer chip solvents and foam-blowing agents. By 1986, the world was producing 720 million pounds of CFCs per year.

Unlike many pollutants, CFCs do not break down in the lower atmosphere. Gradually, they waft high into the stratosphere, where they come apart under the intense bombardment of solar rays.

Chlorine released in the process snares oxygen atoms from three-atom ozone molecules, changing them into conventional

two-atom oxygen molecules that do not absorb ultraviolet light.

The CFCs explosion of the past 20 years has put so much of the chemicals into the atmosphere that there is no way of stopping continued depletion of the ozone shield. Even with the faster phaseout, the protective layer is not expected by scientists to be restored to its 1970s condition until the middle of the next century.

Last week, National Aeronautics and Space Administration scientists reported that a research plane flying over New England and eastern Canada recorded the highest level of ozone-threatening chlorine compounds measured anywhere in the world. The level was 50 percent higher than previously seen over Antarctica,

where an ozone hole was first discovered in 1985.

Scientists predict an additional 1.6 million cases of cataracts a year and 300,000 new cases of skin cancer as result of ozone depletion by the year 2000.

To keep pace with the phaseout schedule announced yesterday, U.S. industry will have to cut its production to half of the 1986 baseline in the protocol. But industry already has cut output by 42 percent, spokesmen said.

Bush provided for "limited exceptions" to the ban, allowing continued CFCs production to service the \$135 billion in existing equipment that uses the chemical. According to industry estimates, 15 percent of 1986 levels will be needed for such servicing.

## Plants With Built-In Sunscreens

Scientists note some species' ability to protect themselves from ozone loss

By David Perlman  
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Chicago

As the expanding "hole" in Earth's protective ozone layer grows more ominous, plant scientists are finding that some vital food crops face serious genetic damage from increased solar radiation but others can invoke unique strategies to protect themselves against the lethal rays.

A group of botanists and molecular biologists from Europe and America teamed up yesterday to report some fascinating insights that offer a measure of hope for the planet's ecological future, even as they warned that science is far from solving the ozone problem on Earth.

The occasion was a symposium on plant genetics and ozone at the closing session of the annual meeting of the American Association for the Advancement of Science. During the past week, more than 6,000 scientists and engineers have

some are welded together to become tightly bound chemicals called thymine dimers.

Thymine is one of the chemical bases that make up every gene in every living organism, and the dimers can completely disrupt the genetic functioning of plant cells damaged by ultraviolet radiation.

### Replacement Parts

Fortunately, however, some plants possess sets of specialized "excision enzymes" that locate the disrupted segments of DNA and literally snip them out of the genes, allowing still other enzymes to repair the defects by inserting new replacement parts, Soyfer said.

If the repair work is completed before the plant cells reproduce, Soyfer said, the plants can grow normally. But if reproduction takes place first, the repair work is too late and the result is a mutation in the plant, a harmful one

duce plants such as beans, barley, cabbage, mustard and even begonias to synthesize dense pigments — some colorless and some red — that appear to protect the plants from radiation damage.

### Some Signs of Hope

At the newly independent Lithuanian Academy of Sciences in Vilnius, Karolis Cieminis has labeled the DNA of barley and tobacco cells with radioactive carbon to study the kinds of damage that they undergo when ultraviolet light is intensified. Most of the plant genes are severely disrupted, he reported, but in some cases the mechanism of "thymine dimer repair" seems to save the plants from continued damage.

To Barnes, who often conducts his experiments in open fields, one of the most serious threats from the ozone hole is ecological.

For example, he said, when some crops such as wheat are growing in fields where wild oats

depletion and intensified ultraviolet radiation can completely alter the balance among plants, insects and animals, a balance vital for the survival of all three, Barnes said.

### Technological Fix

Although the industrialized nations of the world have already agreed to end production of ozone-destroying chemicals by the end of this decade, Soyfer said, that may not solve the problem entirely.

One hope, now being researched at the U.S. Department of Agriculture's experiment stations, lies in genetically engineering crucial crop plants to increase their resistance to ultraviolet radiation or their ability to repair damage to their genes quickly.

But that would be only a technological fix, and all scientists agree that technological fixes are unlikely to solve global environmental problems that are largely caused by human intervention in the biosphere.

## Report Calls U.S. Military Biggest Destroyer of Ozone

By Dan Turner  
Chronicle Correspondent

The biggest threat to the Earth's protective ozone layer comes from the U.S. military, according to a national environmental group.

The National Toxics Campaign Fund says in a report released yesterday that military facilities and defense contractors release two-thirds of the nation's total production of ozone-destroying chemicals.

"This is the most serious environmental crisis we have ever faced," said Ted Smith, head of the Silicon Valley Toxics Coalition.

The results of the study come just one week after scientists at NASA announced that an ozone hole over the North Pole is much larger than previously believed. Scientists fear that the northern ozone layer will be depleted by as much as 40 percent this winter, endangering human beings in parts of the world as far south as France and New England.

Under the 1987 Montreal Protocol, industry and government have been directed to eliminate the use of ozone-destroying chlorofluorocarbons (CFCs) by the year 2000. But although industry is making rapid progress in finding substitutions for the chemical, according to Smith and Lenny Siegel, the author of the study, the military is dragging its feet.

Toxics Fund members in Boston sent a letter to President Bush yesterday urging him to take immediate action to reduce military use of CFCs.

Glen Flood, a spokesman for the Department of Defense, said the military is working to eliminate the chemicals but will continue to use them until effective substitutes are developed.

"We're not talking about just hair spray or something like that," Flood said. "It's a whole different set of specifications we're looking at."