

SPECIAL REPORT: BUSINESS OF GREEN

# As Ethanol Booms, Critics Warn of Environmental Effect

By ERICA GIES  
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SAN FRANCISCO — Scrambling to find a silver lining to the dark cloud of [oil](#) in the Gulf of Mexico, ethanol advocacy groups are pressing for more government support for the biofuel industry, with advertising campaigns targeted at lawmakers in Washington.

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Michael Stravato for The New York Times

Plant managers inspect chopped up energy cane at an ethanol plant in Jennings, La.. Some activists are calling for more study of the local effects of ethanol production, including water pollution and consumption.

One group, Growth Energy, has blanketed the Metro subway station closest to the U.S. Capitol with ads that send a pointed message: "No beaches have been closed due to ethanol spills," they read, calling ethanol "America's clean fuel."

But is it?

There has been hot debate about whether carbon emissions from ethanol production and use are lower than those from oil and whether the 33 percent of the U.S. corn crop diverted to ethanol drives up the price of food. Local effects of ethanol production, however, including water pollution and consumption, have received less scrutiny.

Encouraged by legislative measures, including notably the 2007 Energy Security and Independence Act, which mandated the use of 36 billion gallons, or 136 billion liters, of [biofuels](#) annually by 2022, the U.S. ethanol industry has boomed in the last few years. There are now at least 200 ethanol plants in at least 27 states, almost all using corn as a feedstock.

Nearly all the gasoline sold in the United States today is mixed with 10 percent ethanol, known as E10. Because ethanol provides about two-thirds the energy content of oil per unit, that 10 percent volumetric replacement equals about a 6 to 7 percent gasoline displacement, minus fossil fuel inputs for growing and processing.

The industry is on track to produce 12.5 billion gallons this year and is therefore nearing market saturation to supply E10, as the United States consumes about 138 billion gallons of oil annually. In March 2009, Growth Energy petitioned the U.S. [Environmental Protection Agency](#) to grant a waiver to allow gasoline to be blended with 15 percent ethanol. Because the fuel can corrode conventional car engines at higher percentages, the agency is running tests. A final ruling had been expected this month but has now been pushed to the fall.

Refineries that blend ethanol into gasoline receive a tax credit of 45 cents per gallon, making the market for ethanol more viable. The credit is set to expire at the end of 2010, but ethanol groups are advocating its extension.

The Environmental Working Group, a research and advocacy organization, reported that U.S. taxpayers spent more than \$22 billion on the tax credits from 2005 to 2010 and will pay another \$31 billion if the credits are extended to 2015.

As ethanol plants have sprouted, mostly in the midwestern Corn Belt, environmental effects have followed. An analysis by Perry Beeman, a reporter for The Des Moines Register in Iowa, found 394 violations of environmental regulations by ethanol processing

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Still, corn farming is the biggest source of pollution associated with ethanol production. Corn requires vastly more [fertilizer](#) and pesticides than soybeans or other potential biofuel feedstocks, such as perennial grasses, according to a 2007 report from the [National Academy of Sciences](#). “Per unit of energy gained, [biodiesel](#) from soy requires just 2 percent of the nitrogen and 8 percent of the phosphorous needed for corn ethanol,” and the differentials in pesticide use are similar, the report said.

Fertilizer and pesticide runoffs from the U.S. Corn Belt are key contributors to “dead zones” in the Gulf of Mexico and along the Atlantic Coast. A 2008 study by independent researchers, published in the academy’s Proceedings journal, calculated that increasing corn production to meet the 2007 renewable fuels target would add to nitrogen pollution in the Gulf of Mexico by 10 to 34 percent.

Careful use of fertilizer and irrigation water and the preservation of unplanted land buffers between crops and water bodies can reduce fertilizer pollution, soil erosion and water consumption. “The efficiency of fertilizer application has increased tremendously in the past 10, 15, 20 years,” said Geoff Cooper, research vice president for the Renewable Fuels Association, an ethanol trade group.

Buffer zones, however, have shrunk by about 3 million acres, or 1.2 million hectares, between 2008 and 2010, according to the [U.S. Department of Agriculture](#), as farmers have returned conservation land to cultivation.

“There may be a small number of acres coming into production, but they are likely highly environmentally sensitive,” said Craig Cox, senior vice president for agriculture and natural resources for the Environmental Working Group and a former undersecretary for natural resources at the Agriculture Department.

Water use for ethanol also concerns scientists, particularly in light of a 2003 U.S. [Government Accountability Office](#) report that found that water managers in at least 36 states expect shortages by 2013.

“It can be a very local problem. If an ethanol plant is withdrawing groundwater from major pumping wells, they can have a deleterious effect on local wells,” said Mr. Cox, who lives in Iowa.

Modern plants use about three gallons of water to produce one gallon of ethanol. The National Academy of Sciences report estimated that a plant producing 100 million gallons a year uses as much water as a town of 5,000 people.

Still, that is a lot less than older plants, countered Tom Buis, the chief executive of Growth Energy. “Back in the mid-1980s when the ethanol industry was getting started, it took 16 gallons of water to produce a gallon of ethanol,” Mr. Buis said.

Mr. Cooper, of the Renewable Fuels Association, said ethanol plants were required to have water use permits before construction. “This industry is not going to be expanding in areas that already have significant pressures on water resources,” he said.

But the permit requirement does not cover water used for irrigation. According to a G.A.O. report last year, 12 Midwestern states produced 89 percent of the U.S. corn crop in 2007 and 95 percent of the ethanol, using 7 to 321 gallons of water for corn irrigation for every gallon of ethanol produced.

The 2007 report by the National Academy of Sciences calculated that it required 780 gallons of irrigation water to produce a gallon of ethanol in Nebraska, the second-largest U.S. ethanol producer, behind Iowa.

Reflecting environmental concerns over the expansion of biofuel crops, the 2007 energy bill called for 20 billion gallons of biofuel to be made from “advanced” feedstocks, such as cellulosic ethanol or algae, which are believed to have a lighter environmental footprint.

But there are no commercial-scale cellulosic ethanol or algae plants operating in the United States, mainly because they are not yet competitive on costs. U.S.D.A. projections this year show corn as the primary feedstock for U.S. ethanol production through 2020.

Nevertheless, the industry views the 2007 target as a launching pad, not an end goal. “We think biofuels can contribute much larger volumes in the long term,” Mr. Cooper said. Both his organization and Growth Energy want the government to require car

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manufacturers to make vehicles that could run on higher ethanol blends and to help pay for filling station infrastructure. Yet even with increasing corn yields, there are doubts about whether U.S. land and water resources can support the projected production.

A 2009 study by Jan F. Kreiger, a [University of Colorado](#) chemical engineer, found that at just 25 percent gasoline displacement, corn ethanol would require 180 gallons of water per gallon of fuel and use 51 percent of all U.S. cropland. Even cellulosic ethanol would require 146 gallons of water per gallon and 35 percent of the cropland.

“Our appetite for transportation fuels is too gargantuan,” said Jerald L. Schnoor, lead author on the National Academy of Sciences report. “We can’t grow our way out of it.”

Investment in corn ethanol “seems like a very expensive detour from an energy policy point of view,” said Mr. Cox, of the Environmental Working Group. “This is really agricultural policy masquerading as energy policy.”

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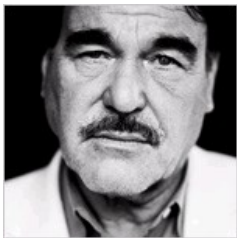
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