

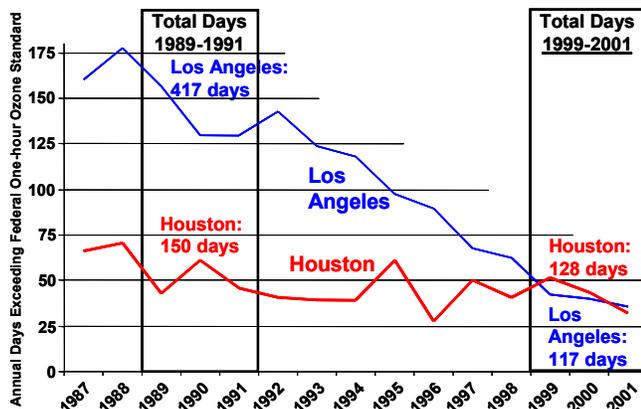
How Bad is Houston's Smog?

Houston Leads the Nation in Exposures to Ozone Smog

There is no indication that air pollution has been reduced in Houston since smog overcame young athletes at Deer Park High School on October 7, 1999. Over the past three years, Houston has had more days with ground-level ozone exposures above the federal health standard than any other city.

In the three years since 1999, Houston area residents have been exposed to ozone smog more often and at higher concentrations than residents of any other area of the United States. Progress toward cleaning up Houston's air has been almost imperceptible (figure 1).

Figure 1: Steady Progress in Los Angeles Leaves Houston With Most Exposures to Ozone Smog



Sources: South Coast Air Quality Management District; Texas Natural Resource Conservation Commission; and US Environmental Protection Agency.

A decade ago, Los Angeles exceeded the one-hour ozone standard 2½ times as often as Houston. Strong action by state and local regulatory agencies has reduced Los Angeles' three-year total below that of Houston. When considering air quality trends, the U.S. Environmental Protection Agency uses three years of data to assess whether ozone standards are met. This approach reduces year-to-year fluctuations caused by weather. With 128 days of exceedances over three years, 11 more days than Los Angeles, Houston is recognized as having the nation's most ozone smog exposures.

Health Risks of Ground-Level Ozone

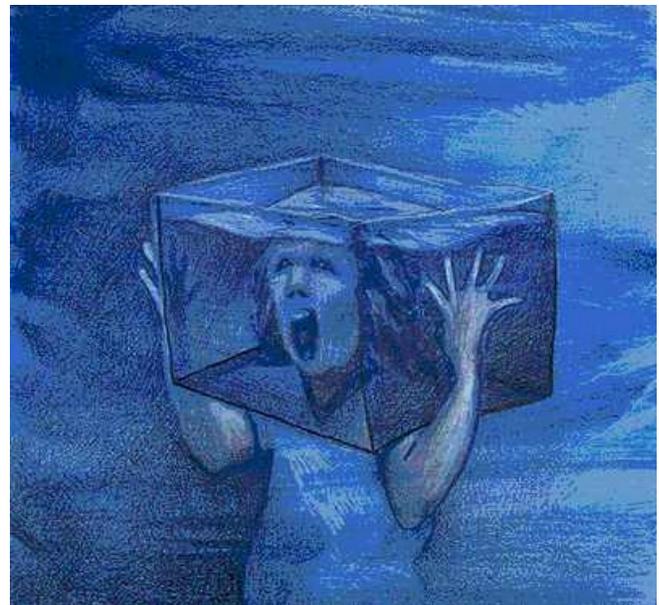
Ozone, a byproduct of human activity, is a corrosive gas formed in midair on hot bright days, when winds are light. Its precursors are man-made pollutants: particularly nitrogen oxides (NOx), which are products of combustion, and volatile organic

compounds (VOCs) such as benzene and propylene. Along with tiny particles, these pollutants collectively form a white or brown haze known as ozone smog. Ground-level ozone is different from the naturally forming ozone in the upper atmosphere that protects us from ultraviolet light. Ground-level ozone affects the health of humans and animals, damages plants, and degrades buildings and other surfaces.

A person exposed to elevated levels of ozone for only a few hours may experience inflammation of air passages, increased mucus production, and airway constriction. These changes reduce breathing capacity and are especially serious in persons with respiratory disease. Exposure to ozone also increases one's susceptibility to allergens (such as pollen), to colds and other respiratory infections, and to the adverse effects of other air pollutants. Among asthmatics, exposure to ozone smog has been associated with increased emergency room visits, hospital admissions, and deaths (figure 2).

Children, the elderly, persons who work or exercise outdoors, and persons with existing respiratory or

Figure 2: A Self-Portrait by an Asthma Sufferer



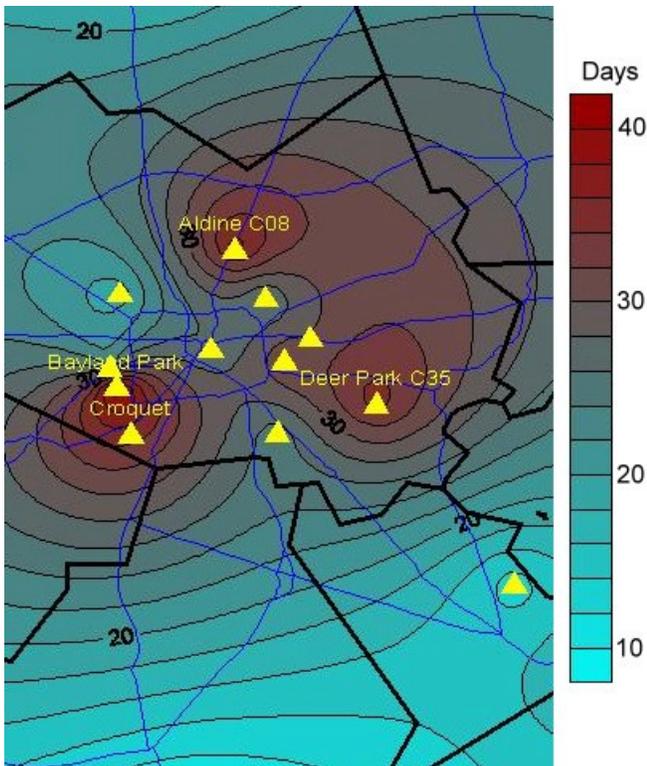
Source: Internet exhibition, Zeneca Limited. Artist: Daryl from Canada.

cardiovascular disease are most vulnerable to ozone smog. Repeated exposure to elevated levels of ozone smog can, over time, cause permanently enlarged air sacs and scarring in the lungs.

Houston's air is often polluted even when ozone levels are low. The pollutants that form ozone (NOx and VOCs) are themselves health hazards. NOx is highly irritating and can form small carcinogenic particles. Some VOCs, such as benzene and butadiene, are called "hazardous air pollutants" because research has linked them at very low levels to cancer, reproductive problems, birth defects, and neurological damage. Hazardous air pollutants are regulated more closely than are other VOCs.

The other pollutants frequently found in Houston's smog may cause even more health problems than ozone. For instance, while Houston is fortunate not to have the levels of particulates found in some other cities, current levels are more than sufficient to damage the health of Houston residents. Public agencies focus on ground-level ozone because the region is in clear violation of federal health standards, and because ozone is an indicator of the other dangerous pollutants present in ozone smog.

Figure 3: Ozone Exposures Clustered in Harris County
Average Annual Days Above One-Hour Ozone Standard, 1998 - 2000



Source: Texas Natural Resource Conservation Commission (2001).

Ozone Exposure in the Houston Area

Since the 1970s, the US Environmental Protection Agency has designated the Houston region as a "severe nonattainment area" for ground-level ozone because the region has consistently failed to meet the one-hour federal health standard for ozone. The nonattainment region includes eight counties: Harris, Galveston, Brazoria, Fort Bend, Waller, Montgomery, Chambers, and Liberty. The standard is exceeded most severely and most frequently in Harris County, as illustrated in Figure 3.

High levels of ground-level ozone are most often detected along the Houston Ship Channel and in suburbs to the north and southwest. Depending on afternoon winds, which often blow pollution to the north or to the southwest, ozone smog can be transported to any area of Houston region.

It is likely that ozone levels exceed the federal health standard more frequently than the official records indicate. Ozone measurements depend on a network of public and private monitors located in only five of eight Houston-area counties. The measurements are sampled and rounded in a manner that underestimates the actual peak one-hour ozone averages.

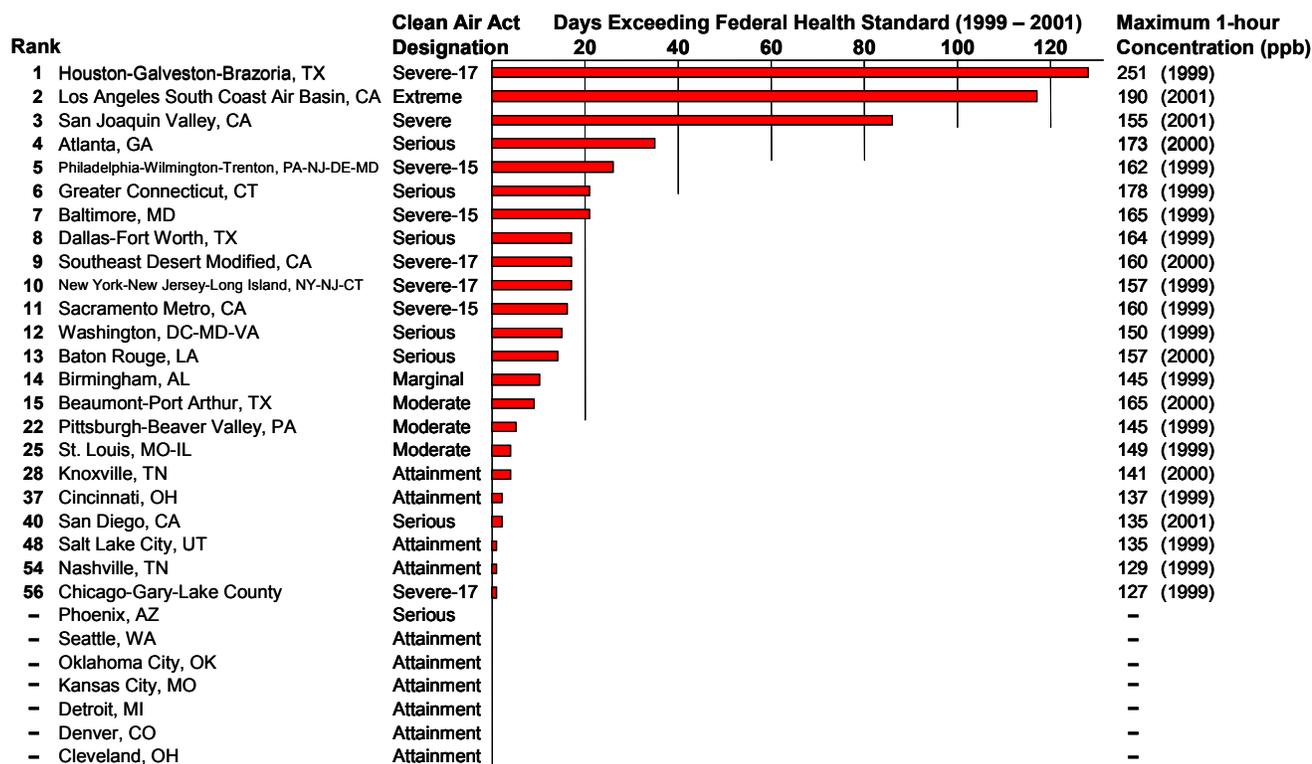
Other Cities Have Far Healthier Air than Houston

Although 2001 was Houston's second-cleanest year on record, over the most recent three-year period ground-level ozone in Houston was worse than in any other area of the country (figures 1 and 5). Because weather conditions that affect ozone formation vary from year to year, the U.S. Environmental Protection Agency averages data over three years to assess progress. In contrast with Houston, cities such as Chicago, Phoenix, and Denver have been or are well on the way to being designated as in "attainment" of federal health standards because of efforts by city, state, and federal officials to reduce air pollution.

Houston's ozone problem is more than frequent; it is particularly hazardous because of its intensity. Houston had by far the highest maximum one-hour ozone concentrations during 1999 - 2001. One-hour ozone concentrations above 175 parts per billion (ppb) are almost unheard of outside of Houston and Los Angeles, but between 1999 and 2001 such levels were observed on 21 days in Houston.

Houston's ozone smog forms in an unusually rapid and concentrated manner. In other areas of the

Figure 5: Houston Smog is More Frequent and Intense than in Every Other U.S. City, 1999 – 2001
Performance of 15 Most Polluted Cities and 15 Other Selected Cities on One-Hour Federal Health Standard for Ozone



Sources: US Environmental Protection Agency and various state environmental agencies. Data selected from an analysis that includes 63 cities.

country, ozone is formed more gradually by emissions from traffic and power generation. In Houston, a very few industrial VOCs (particularly propylene, ethylene, and butadiene) combine with NOx from industry and power generation to cause extremely rapid formation of ozone on hot bright days when the winds are light.

October 7, 1999: A Day that Left Houston Gasping

On October 7, 1999, Houston suffered an air pollution episode that transformed the air quality debate. Until then, state environmental officials, many elected officials, and representatives of business and industry at the Greater Houston Partnership could not imagine that Houston would displace Los Angeles as the city with the worst ozone smog in the country.

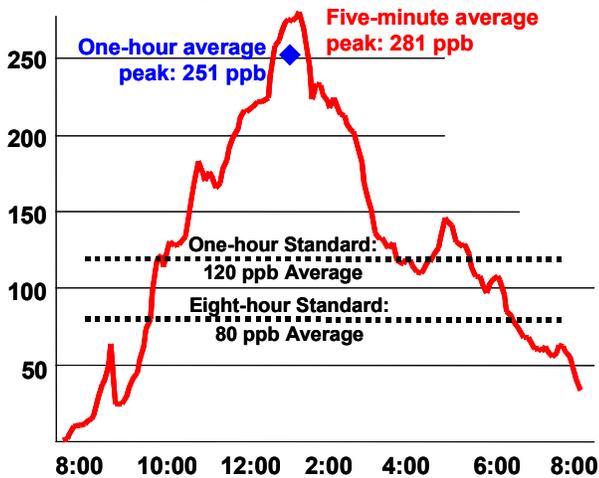
On October 7, a hazardous cloud of ozone formed over the Deer Park section of Houston and slowly traveled northwest. Ozone levels exceeded the federal health standard at 10 of 20 monitors, and levels exceeded 180 ppb at 5 monitors. In Deer Park, the ozone level reached an hourly average of 251 ppb – Houston’s highest level in a decade.

The frightening consequences of the October 7 pollution episode became clear three weeks later, when the *Houston Chronicle* reported the impacts on student athletes at Deer Park High School (*Houston Chronicle*, October 30 and November 9, 1999). The extreme level of pollution to which they were exposed was recorded at a nearby monitor (figure 4). This smog caused many members of the girls track team, the boys soccer team, and the freshman football team to experience severe coughing, aching chests, sore throats and other respiratory difficulties.

It remains unclear whether the October 7 event was the result of one of the 44 industrial “upsets” that occurred that day, or a product of unfavorable weather conditions. A major Cedar Bayou chemical plant was suspected of accidentally releasing the chemicals that caused the event. However, the large number of industrial sources in the area made it difficult to pinpoint a specific cause.

After the October 7 event, Houston’s air quality debate finally shifted from *whether* to clean up the air to *how* the job should be done. Delay in Houston has been costly. For the past decade, residents of

Figure 4: Deer Park Ozone Monitor, October 7, 1999
 Five-minute average ozone record, 8 am - 8 pm



Source: Texas Natural Resource Conservation Commission.

Los Angeles have experienced fewer days of air pollution each year; 1999 marked a milestone when Los Angeles enjoyed a year without a Stage I Smog Alert for the first time in four decades. The success of aggressive regulatory programs in Los Angeles is part of a trend across California, where air pollution levels have declined significantly in major cities.

Future Plans to Control Ozone

The 1990 Clean Air Act Amendments require state and federal agencies to enact measures that will bring Houston's air into compliance with federal health standards by 2007. In 2001, Texas issued a plan that it believes will reach this goal.

The 2001 clean air plan for Houston is incomplete. It includes promises that additional measures will be added to the plan in 2004. Another concern with the plan is that most emissions reductions will not actually occur until 2005 or later, with some actually scheduled for mid-2007.

Although parts of the state's clean air plan are intended to reduce emissions of VOCs, most of the plan is aimed at reducing NOx emissions. The

Houston region has plenty of polluting vehicles and heavy equipment, but industrial and utility sources must make the greatest reductions in NOx emissions. The region contains the nation's largest concentration of refineries and petrochemical facilities. These industries are concentrated in the Houston Ship Channel, where the area's highest levels of pollution are usually found.

The state's clean air plan for Houston includes the following planned pollution reductions, in tons per day of NOx, or tpd, as estimated by the state:

- **Industrial and utility sources – 90% reduction**
 Non-utility sources – 412 tpd
 Utility sources – 176 tpd
- **Autos and trucks – 50% reduction**
 Enhanced vehicle inspection & maintenance - 36 tpd
 Cleaner diesel fuel and low sulfur gasoline – 4 tpd
 Five-minute idling limit, heavy-duty vehicles – 0.5 tpd
 55 mph speed limit – 12 tpd
 Clean fleet vehicles (and other CMAQ programs) – 23 tpd
- **Planes, boats, lawn care, and construction equipment – 42% reduction**
 Financial incentives (Texas Emissions Reduction Program) - ?
 Cleaner diesel fuel – 3 tpd
 Airport reductions – 5 tpd
 Limits on morning commercial lawn care – 5 tpd
 California standards for new spark engines – 3 tpd

Further steps that could be taken are additional controls on heavy-duty vehicles, massive tree planting efforts, and controls on equipment found at ports and construction sites. Increasing public transit and reducing subsidies for suburban sprawl can improve mobility and help reduce air pollution, but many of the benefits would occur after 2007.

An enormous amount of work must be done before 2007. The Clean Air Act originally set a deadline of 1994 for a complete plan, which would have been implemented over a 13-year period. The challenge to clean up our air is compounded because the regulations are seven years late.



The Galveston-Houston Association for Smog Prevention (GHASP) is a community-based environmental organization dedicated to improving the quality of our region's hazardous air through public education, participation in the state and federal planning process, and active advocacy in appropriate venues.

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