AMBIENT AIR MONITORING IN 2006 IN MIAMI-DADE COUNTY

AMBIENT AIR

Air is a mixture of many different gases. The two major gases are oxygen and nitrogen. Together they comprise 99 percent of the dry mixture. Water vapor varies from 1-3 percent of the total mixture. The table below is percent by volume of dry air.

Name	% by Volume
Nitrogen	78.084
Oxygen	20.9476
Argon	0.934
Carbon Monoxide	0.0314
Neon	0.001818
Methane	0.0002
Helium	0.000524
Krypton	0.000114
Hydrogen	0.00005
Xenon	0.0000087

Table 1. Dry Air Composition

AIR POLLUTANTS AND STANDARDS

Air pollutants, which adversely affect Miami-Dade County's air quality, are emitted by pollution sources located both inside and outside Miami-Dade County. The County's air pollutants of concern are primarily Ozone (O_3) and Particulate Matter (PM10 and PM2.5). Ozone is the pollutant for which Miami-Dade County has been designated in the past as a non-attainment area.

The Clean Air Act of 1970 defined six criteria pollutants and established ambient concentration limits to protect public health and welfare. EPA periodically has revised the original concentration limits and methods of measurement, most recently in 1997. The criteria pollutants are ozone (O3), carbon monoxide (CO), nitrogen dioxide (NO2), particulates (PM10 [particulate matter with a diameter of 10 microns or less] and PM2.5 [particulate matter with a diameter of 2.5 microns or less, also called PM_{fine}]), sulfur dioxide (SO2) and lead (Pb). All of the criteria pollutants, with the exception of ozone, are emitted by mobile and stationary sources, including motor vehicles, industrial, agricultural and natural sources. You might expect that EPA would track emissions of the same pollutants. But ozone, an area wide pollutant, is not emitted directly; it forms by chemical reactions of volatile organic compounds (VOC) with nitrogen oxides (NOx) in the air, mediated by sunlight. Therefore, EPA tracks emissions of ozone precursors (volatile organic compounds and nitrogen oxides) and three other criteria pollutants:

- Carbon monoxide (CO)
- Sulfur dioxide (SO2)
- Particulate matter (PM10 and PM2.5)

Two types of National Ambient Air Quality Standards (NAAQS) were defined: primary and secondary. Primary standards were designed to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards were designed to protect public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. On September 16, 1997, the old ozone standard (0.12 ppm 1-hour average) was replaced with a new standard (the fourth highest 8 hour average greater than 0.08 ppm) and a new PM2.5 standard. The ozone standard was rendered unenforceable by a lawsuit in May 1998. On March 26, 2002 a federal appeals court upheld the new ozone standard.

Significant emissions of the remaining criteria pollutant, lead, are localized to a few industries such as lead smelters. Because there are relatively few lead sources nationwide, EPA does not include lead emissions in the database used for AirData reports and maps. Miami-Dade's lead sites were closed in 1996.

The six criteria pollutants and their respective standards are listed in Table 2. The spatial distribution of pollutant monitors throughout Miami-Dade County is shown in Figure 1.

As part of the Federal Clean Air Act Amendments (CAAA) of 1977, states and local governments were required to develop State Implementation Plan (SIP) revisions for all areas that were not attaining the NAAQS. Subsequent to these amendments, the EPA developed a list of "non-attainment" areas on a pollutant-by-pollutant basis. The list, which constituted formal notification, was published in the September 12, 1978, Federal Register. The counties of Broward, Miami-Dade and Palm Beach were among those listed as being non-attainment for photochemical oxidants; i.e., ozone. The 1-hour ozone NAAQS was 0.12 ppm averaged over one hour. More than three exceedances at a specific site over a consecutive three-year period could result in a non-attainment designation for ozone. A NAAQS violation exists once the fourth consecutive exceedance occurs at that specific site. The exceedances are tracked on a consecutive three-year basis. They were attainment for the other pollutants. The CAAA of 1977 also set specific steps for attainment and deadline dates that had to be met by the designated areas.

Although designated areas across the country attempted to meet the NAAQS by their respective deadlines, the realization surfaced that the target deadlines specified were unattainable as originally envisioned. In addition, it appeared that the CAAA of 1977 did not provide the most effective means to handle the problems associated with ozone non-attainment areas. The Clean Air Act Amendments required modification to facilitate reaching the goals in a more expeditious manner.

In November 1990, new Clean Air Act Amendments were passed. With these amendments, the U.S. Congress revised the mechanism used to meet attainment deadlines. The previously defined non-attainment areas were further subcategorized based upon severity of pollution, deadlines were revised and sanctions, originally reserved for non-attainment, were utilized as a means of ensuring compliance with the 1990 CAAA. Additionally, the CAAA also provided a mechanism for non-attainment areas to obtain redesignation once the area had achieved and maintained the NAAQS.

The tri-county area comprised of Broward, Dade and Palm Beach counties, was designated a moderate non-attainment area for ozone, so the EPA assigned an attainment deadline of 1996 for the area, commonly referred to as the Southeast Florida Airshed.

In response to the need to ensure compliance with the 1990 CAAA, state and local agencies in the Southeast Florida Airshed initiated several new pollution control programs. As soon as validated air monitoring data was available for the airshed to demonstrate conformance with the NAAQS, tri-county agencies were in a position to qualify and apply for redesignation to ozone attainment / maintenance status.

The tri-county area redesignation request and accompanying SIP revision was submitted to the EPA through the FDEP during November 1993. The EPA subsequently approved the SIP revision and redesignation request on April 27, 1995. The tri-county area became an ozone attainment area.

AMBIENT AIR QUALITY STANDARDS					
POLLUTANT	**UNITS**	**FEDERAL PRIMARY**	**FEDERAL SECONDARY**	**MIAMI-DADE COUNTY**	**STATE OF FLORIDA**
Inhalable Particulate Matter PM10					
Annual Arithmetic Mean	$\mu g/m^3$	50	Same	Same	Same
Maximum 24 Hour Value	$\mu g/m^3$	150	Same	Same	Same
PM2.5					
Annual Arithmetic Mean	$\mu g/m^3$	15	Same		
Maximum 24 Hour Value	$\mu g/m^3$	65	Same		
Sulfur Dioxide					
Annual Arithmetic Mean	ppm	0.03	------	0.007	0.02
Maximum 24 Hour Value	ppm	0.14	------	0.040	0.10
Maximum 3 Hour Value	ppm	-----	0.50	0.13	0.50
Carbon Monoxide					
Maximum 8 Hour Value	ppm	9	------	Same	Same
Maximum 1 Hour Value	ppm	35	------	Same	Same
Ozone					
Maximum 1 Hour Value	ppm	0.12	Same	Same	Same
Fourth Highest 8 Hour Average	ppm	0.08	Same	Same	Same
Nitrogen Dioxide					
Annual Arithmetic Mean	ppm	0.053	Same	Same	Same
Lead					
Quarterly (3 Month) Average	$\mu g/m^3$	1.5	Same	Same	Same

Table 2. EPA's Six Criteria Pollutants and their Corresponding Standards

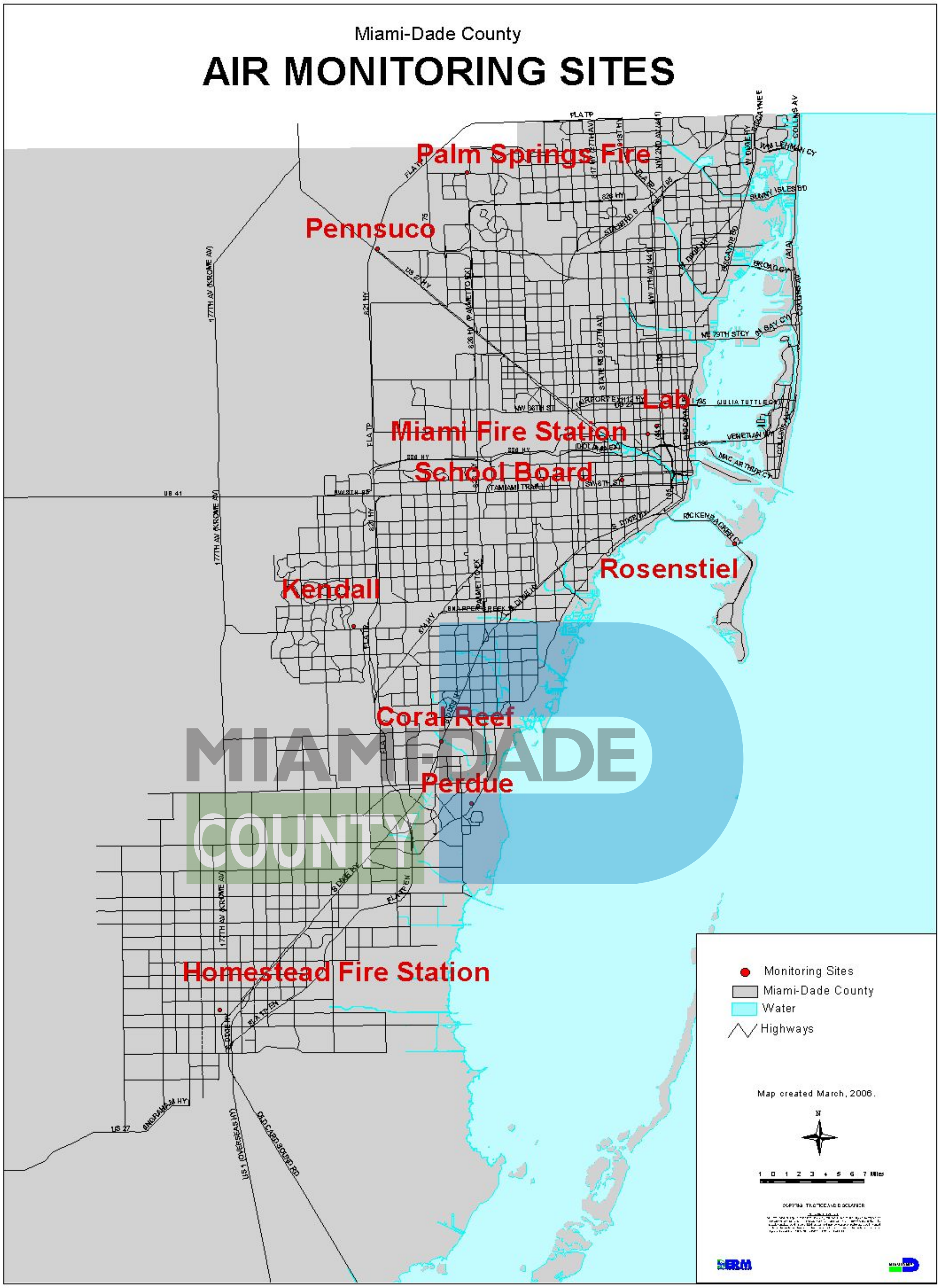


Figure 1. Miami-Dade County Air Monitoring Sites – 2006

OZONE (O_3)

Ozone is an odorless, colorless gas composed of three atoms of oxygen. Ozone occurs both in the Earth's upper atmosphere and at ground level and is considered good or bad, depending on where it is found:

> Good ozone is when ozone occurs naturally in the Earth's upper atmosphere—10 to 30 miles above the Earth's surface—where it forms a protective layer that shields us from the sun's harmful ultraviolet rays. Manmade chemicals are gradually destroying this beneficial ozone. An area where ozone has been significantly depleted—for example, over the North or South Pole—is sometimes called a "hole in the ozone layer".
>
> Bad Ozone is formed in the Earth's lower atmosphere, near ground level. It is formed by a chemical reaction between oxygen (O_2), nitrogen dioxide (NO_2) and reactive volatile organic compounds (VOCs) in the presence of sunlight. Some VOC sources include hydrocarbons in automobile exhaust and vapors from cleaning solvents or gasoline fueling stations. Other sources of these pollutants are power plants, industrial boilers, refineries and chemical plants. Ozone at ground level is a harmful pollutant. Ozone pollution is a concern during the summer months, when the weather conditions needed to form it—lots of sun, hot temperatures— normally occur.

Ozone is an irritant of the mucous membranes of the nose, throat and airways. Symptoms associated with ozone exposure include coughing, chest pain and throat irritation. Ozone can also increase susceptibility to respiratory infection, impair normal functioning of the lungs and reduce one's ability to perform physical exercise. All of these effects are exacerbated in individuals having a sensitive respiratory system. Studies have shown that moderate ozone exposure may impair the ability of individuals with asthma or respiratory disease to engage in normal daily activities. Roughly one out of every three people in the United States is at a higher risk of experiencing ozone-related health effects. Sensitive people include children and adults who are active outdoors, people with respiratory disease, such as asthma, and people with unusual sensitivity to ozone. People of all ages who are active outdoors are at increased risk because, during physical activity, ozone penetrates deeper into the parts of the lungs that are more vulnerable to injury. Ozone can inflame and damage the lining of the lungs. Within a few days, the damaged cells are shed and replaced—much like the skin peels after sunburn. Animal studies suggest that if this type of inflammation happens repeatedly over a long time period (months, years, a lifetime), lung tissue may become permanently scarred, resulting in less lung elasticity, permanent loss of lung function, and a lower quality of life. Moreover, ozone has been found to be responsible for agricultural crop yield loss in the U.S. and has caused noticeable foliar damage to many crops and species of trees. According to the EPA, forest and ecosystem studies indicate that damage is resulting from current ambient ozone levels.

The 8-hour ozone standard is the fourth highest 8 hour average greater than 0.08 ppm. If the three year average of the fourth highest reading is greater than 0.085 the area will be non-attainment. This applies to each site in the area.

There were two ozone-monitoring sites in Miami-Dade County during 2006. A central site, at the University of Miami's Rosenstiel School, is located along the Rickenbacker Causeway near the Miami Seaquarium. The southern site, at Perdue Medical Center, is located in the Cutler Ridge area. These sites are equipped with wind speed and wind direction (WS/WD) equipment.

The maximum one-hour readings for ozone in Miami-Dade County during calendar year 2006 were: 0.106 ppm at the Rosenstiel (RS) site and 0.112 ppm at the Perdue (PR) site. Over 90 percent of the readings were less than 0.055 ppm at both sites. Figure 2 indicates the maximum hourly average concentrations of ozone for each month compared to the old one-hour standard of 0.12 parts per million (ppm). The yearly average concentration of ozone was 0.034 ppm for Rosenstiel and 0.028 ppm for Perdue. There were no violations of the old one-hour ozone standard during 2006.

Both, Rosenstiel and Perdue had an 8-hour average concentration greater than 0.085 ppm on 5/4/06. The maximum Rosenstiel's maximum 8-hour average was 0.100 ppm and Perdue's was 0.095 ppm. The fourth highest 8-hour average at Rosenstiel was 0.081 ppm and at Perdue 0.071 ppm. In order for the site to be considered in attainment, the three-year average of the fourth highest 8-hour average must be less than 0.085 ppm. The three-year attainment averages were: Rosenstiel – 0.072 ppm and Perdue – 0.068 ppm. Both sites are in attainment.

The average monthly ozone concentration exhibited a similar pattern at all sites. The higher months were in the spring with April being the highest month. The lower months were in the summer with August being the lowest. The highest 1-hour and 8-hour averages occurred in September at Rosenstiel but at Perdue the highest 1-hour average was in September while the highest 8-hour average was in April. The early morning hours were low, with 7:00 a.m. and 8:00 a.m. (EST) having the lowest readings. Ozone levels increased to a peak between 1:00 p.m. and 3:00 p.m. (EST) followed by a subsequent decrease. This is the normal daily pattern for ozone.

The Air Quality Indexes at Perdue were in the Good range for 353 days, the Moderate range for 11 days, the Unhealthy for Sensitive Groups range for 1 day and there were 0 days without data. The Air Quality Indexes at Rosenstiel were in the Good range for 344 days, the Moderate range for 18 days, the Unhealthy for Sensitive Groups range for 1 day and there were 2 days without data.

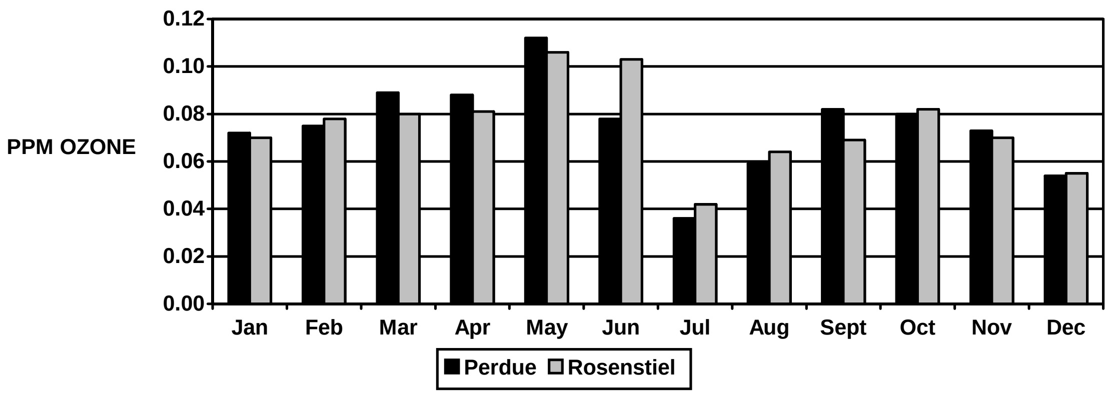


Figure 2. One-Hour Maximum Monthly Ozone Concentrations – 2006

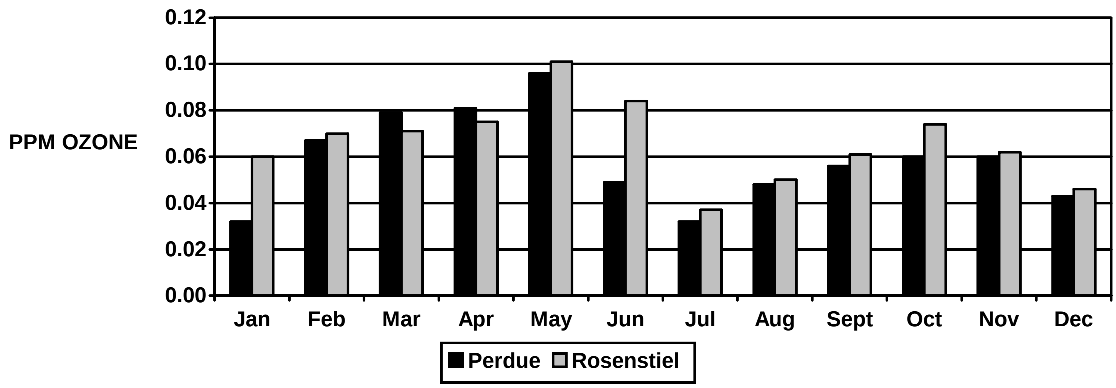


Figure 3. Eight-Hour Maximum Monthly Ozone Concentrations – 2006

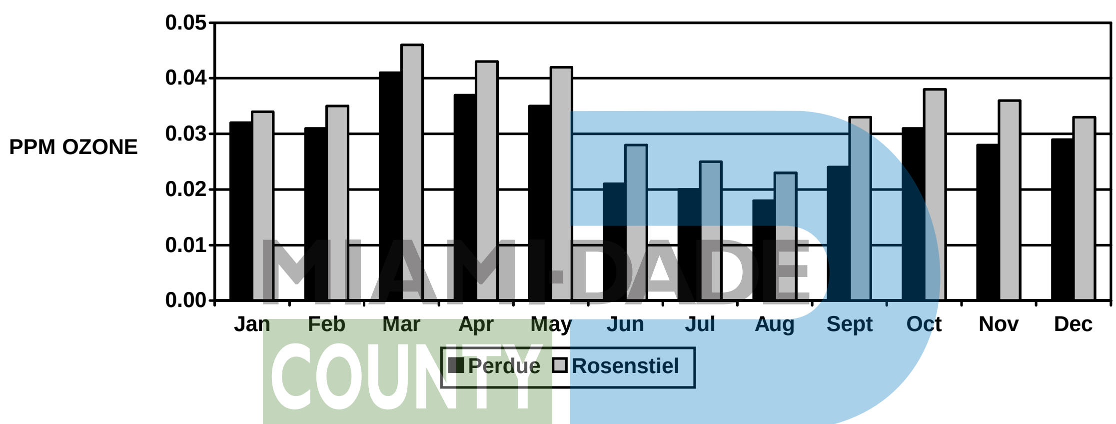


Figure 4. Average Monthly Ozone Concentrations – 2006

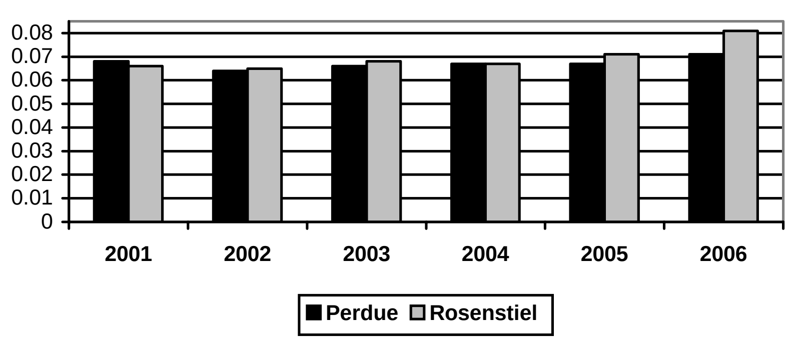


Figure 5. 4th Highest 8-Hour Average Ozone Concentrations

CARBON MONOXIDE (CO)

Carbon Monoxide (CO) is an odorless, colorless, poisonous gas that is a by-product of incomplete combustion of fuels. Vehicle exhaust is the main source of carbon monoxide in the atmosphere with industrial processes, solid waste facilities, electrical power generating plants and natural sources such as wildfires contributing the rest. Vehicles contribute approximately 60 percent nationwide and up to 95 percent in the urban areas. Unlike ozone, carbon monoxide pollution is localized and found mainly along major roads and intersections due to vehicular traffic.

After carbon monoxide is inhaled; it enters the bloodstream and binds chemically to hemoglobin, the substance that normally carries oxygen to cells. The decrease in available, unbound hemoglobin results in a reduction of oxygen delivered to all tissues in the body. Carbon monoxide also weakens the contractions of the heart, thereby reducing the amount of blood and oxygen supplied to various parts of the body. In a healthy person, this effect significantly reduces the ability to perform exercises. In persons with chronic heart disease, these effects can threaten the overall quality of life, since their systems are unable to cope with the decrease in oxygen. Adverse effects have been observed in individuals with heart conditions who are exposed to carbon monoxide.

At relatively low concentrations (several hours @ 200 ppm), carbon monoxide can affect mental function, visual acuity and alertness of healthy individuals. Symptoms include dizziness, headaches and lethargy. Exposure to higher carbon monoxide concentrations (30 minutes @ 2000-2500 ppm) can ultimately lead to death. Death results from asphyxiation due to the fact that body tissues, especially the brain, are deprived of an adequate oxygen supply. Concentrations of carbon monoxide normally encountered in urban environments are usually a small fraction of these levels.

The NAAQS primary carbon monoxide one-hour standard is 35 ppm; the eight-hour standard is 9 ppm. More than one exceedance of the carbon monoxide standard in any year could result in a non-attainment designation for carbon monoxide.

Four carbon monoxide monitoring sites were active in Miami-Dade County during 2006. The northernmost site, the Lab/Annex site, is located northwest of Downtown Miami, west of I-95 and north of SR 836. The second site, located at the School Board building, is approximately 2 miles west of the Downtown area. The third site, Coral Reef, is located along the Palmetto Golf Course near the intersection of SW 160th Street and US 1. The fourth site, Kendall, is located on Kendall Drive and SW 127 Avenue.

The maximum hourly readings in Miami-Dade County during 2006 were 5.2 ppm for the Lab/Annex site (LB), 3.8 ppm for the School Board (SB) site, 2.9 ppm for the Coral Reef (CR) site and 2.7 ppm for the Kendall site (KN). 100% of the 1-hour readings were less than 3.0 ppm at the Coral Reef and Kendall sites and more than 99.9% of the 1-hour readings at the School Board and Lab/Annex site were less than 3.0 ppm. Maximum 8-hour readings were 2.3 ppm for the Lab/Annex, 2.1 ppm for the School Board, 1.5 ppm for the Coral Reef site and 1.7 ppm for the Kendall site. There were no exceedances of the 1-hour or 8-hour standards for carbon monoxide during 2006. The yearly average concentration of carbon monoxide in Miami-Dade

County during 2006 was 0.60 ppm for the Lab/Annex, 0.57 ppm for the School Board, 0.39 ppm for the Coral Reef site and 0.61 ppm for the Kendall site.

While an average monthly carbon monoxide pattern was not evident at any site, the Lab/Annex, School Board, Coral Reef and Kendall sites exhibited a similar daily pattern of hourly readings. Carbon monoxide concentrations were generally low, with a noticeable increase then decrease from 5:00 a.m. to 10:00 a.m. with a peak at 7:00 or 8:00 a.m. (EST), which coincided with commuter rush-hour traffic.

The Air Quality Index for all sites was in the Good range for 2006.

PARTICULATE MATTER (PM10 / PM2.5)

Air pollutants called Particulate Matter (PM) (particles) include soot, dust, dirt, fly ash and small liquid drops in air (mists). Particulate matter sources include factories, power plants, cars, construction activity, fires and wind. Particulate matter also includes particles formed in the atmosphere by condensation or transformation of emitted gases such as SO_2 and VOCs.

Particles with an aerodynamic diameter of 10 micrometers or less (PM10) poses the greatest threat to human health, because they can be inhaled into and accumulate in the respiratory system. Particles less than 2.5 micrometers in diameter are referred to as “fine” particles. Sources of fine particles include all types of combustion (motor vehicles, power plants, wood burning, etc.) and some industrial processes. Particles with diameters between 2.5 and 10 micrometers are referred to as “coarse.” Sources of coarse particles include crushing or grinding operations, and dust from paved or unpaved roads.

Both fine and coarse particles can accumulate in the respiratory system and are associated with numerous health effects. Coarse particles can aggravate respiratory conditions such as asthma. Exposure to fine particles is associated with several serious health effects, including premature death. Adverse health effects have been associated with exposures to PM over both short periods (such as a day) and longer periods (a year or more).

Based on studies of human populations exposed to high concentrations of particles (often in the presence of sulfur dioxide) and laboratory studies of animals and humans, the major effects of concern for human health include effects on breathing and respiratory systems, aggravation of existing respiratory and cardiovascular diseases, alterations in the body’s defense systems against foreign materials, damage to lung tissue, carcinogenesis and premature mortality. The major subgroups of populations that appear likely to be most sensitive to the effects of particulate matter include individuals with chronic obstructive pulmonary or cardiovascular disease, individuals with influenza, asthmatics, the elderly and children. Particulate matter causes soiling and damage to materials, and is a major cause of substantial visibility impairment in many parts of the U.S. When exposed to particles, people with existing heart or lung diseases—such as asthma, chronic obstructive pulmonary disease, congestive heart disease, or ischemic heart disease—are at increased risk of premature death or admission to hospitals or emergency rooms. The elderly also are sensitive to PM exposure. They are at increased risk of admission to hospitals or emergency rooms and premature death from heart or lung diseases. When exposed to particles, children and people with existing lung disease may not be able to breathe as deeply or vigorously as they normally would, and they may experience symptoms such as coughing and shortness of breath. Particles can increase susceptibility to respiratory infections and can aggravate existing respiratory diseases, such as asthma and chronic bronchitis, causing more use of medication and more doctor visits.

During 1988, the EPA changed the then current TSP standard to a more restrictive PM10 standard, specifically 150 micrograms per cubic meter ($\mu g/m^3$) over any 24-hour period. The annual arithmetic mean PM10 standard is 50 $\mu g/m^3$. The EPA allows only one exceedance of the 24-hour standard per calendar year. The latest amendments have added PM2.5 standards to the PM10 standards. The PM2.5 standards are 65 micrograms per cubic meter ($\mu g/m^3$) over any 24-hour period. The annual arithmetic mean PM2.5 standard is 15 $\mu g/m^3$. PM10 is being phased out with the Marine Barracks and West Airport sites being closed in 2003. The Homestead Fire Station PM10 was shutdown in 2003.

There is one active PM10 monitoring site in Miami-Dade County in 2006. The Miami Fire station (MF) site near the Santa Clara Metrorail station is the only active PM10 site.

The maximum daily reading for PM10 in Miami-Dade County during 2006 was 53.00 $\mu g/m^3$, with most of the daily readings ranging between 20 to 35 $\mu g/m^3$. The annual arithmetic mean was 26.23 $\mu g/m^3$. There were no daily or annual arithmetic mean exceedances.

There were three active PM2.5 24-hour monitoring sites in Miami-Dade County during 2006. The 24-hour samplers run from midnight to midnight Eastern Standard Time. The Miami Fire Station (MF) site, near the Santa Clara Metrorail station, and the Homestead Fire Station (HF) site have daily 24-hour samplers (FRM). The Palm Springs Fire Station (PS) site has a 24-hour sampler that samples every third day.

The maximum daily reading for PM2.5 during 2006 was 20.50 $\mu g/m^3$ on July 30 at the Homestead Fire Station, 22.50 $\mu g/m^3$ on May 10 at the Miami Fire Station, and 22.20 $\mu g/m^3$ on May 11 at the Palm Springs Fire Station. More than 90 % of the daily readings were less than 15 $\mu g/m^3$. The annual arithmetic mean was 8.23 $\mu g/m^3$ at the Homestead Fire Station, 9.50 $\mu g/m^3$ at the Miami Fire Station and 8.49 $\mu g/m^3$ at the Palm Springs Fire Station. There were no daily or annual arithmetic mean exceedances.

The Air Quality Indexes for Homestead Fire Station FRM were in the Good range for 335 days, in the Moderate range for 29 days and there was 1 day with no data. The Air Quality Indexes for Miami Fire Station FRM were in the Good range for 336 days, in the Moderate range for 13 days and there were 15 days with no data. The Air Quality Indexes for Palm Springs Fire Station FRM were in the Good range for 108 days, in the Moderate range for 7 days and there were 7 days with no data. The Palm Springs sampler only operated once every three days. The FRM data is used for the final AQI but not the daily AQI because it takes several weeks to obtain the results.

Continuous PM2.5 analyzers (PM2.5 TEOM) were operated at the Miami Fire Station and the Homestead Fire Station in 2006. Both were used for the daily Air Quality Index, because the results are continuously available. The maximum daily reading was 29.6 $\mu g/m^3$ on June 15 for the Miami Fire Station and 28.8 $\mu g/m^3$ on July 30 for the Homestead Fire Station. The highest 1-hour reading was 81.7 $\mu g/m^3$ at 0400 on March 13 at the Miami Fire Station and 76.6 $\mu g/m^3$ at 0700 on March 13 at the Homestead Fire Station. The annual arithmetic mean was 12.86 $\mu g/m^3$ for the Miami Fire Station and 10.86 $\mu g/m^3$ for the Homestead Fire Station. 72 % of the 1-hour readings were 15 $\mu g/m^3$ or less at the Miami Fire Station and 81% at the Homestead Fire Station.

The TEOMs' PM2.5 daily averages are usually higher than the FRMs' corresponding daily concentration.

The Air Quality Indexes for the Miami Fire Station PM2.5 TEOM were in the Good range for 281 days, in the Moderate range for 83 days and there were 0 days with no data. The Air Quality Indexes for the Homestead Fire Station PM2.5 TEOM were in the Good range for 319 days, in the Moderate range for 43 days and there was 1 day with no data.

When the hourly data is averaged for each hour for the year, a noticeable increase then decrease is seen from 5:00 a.m. to 10:00 a.m. with a peak at 7:00 a.m. (EST), which coincided with commuter rush-hour traffic.

SULFUR DIOXIDE (SO_2)

Sulfur dioxide (SO_2) is a colorless, reactive gas that is odorless at low concentrations, but pungent at higher concentrations. It is emitted primarily when fossil fuels and coal that contains sulfur are burned or processed. Major sources of sulfur dioxide are fossil fuel-burning power plants, industrial boilers, refineries, pulp and paper mills, and non-ferrous smelters.

Exposure to sulfur dioxide can cause impairment of respiratory function, aggravation of existing respiratory diseases and a decrease in the ability of the lungs to clear foreign particles. It can also lead to increased mortality, especially if elevated levels of particulate matter are present. Several studies of chronic effects have found that people living in areas with high particulate matter and sulfur dioxide levels have a higher incidence of respiratory illness and symptoms than people living in areas without this synergistic combination of pollutants. Symptoms of sulfur dioxide exposure include wheezing, shortness of breath and coughing.

Sensitive populations include asthmatics, individuals with hyperactive airways, patients with chronic obstructive lung or cardiovascular disease (bronchitis or emphysema), elderly people and children. Sulfur dioxide also produces acid rain that causes foliar damage to trees and agricultural crops.

The air quality standard for sulfur dioxide is 0.14 ppm averaged over 24 hours. The annual arithmetic mean has been set at 0.03 ppm. The three-hour sulfur dioxide standard is 0.50 ppm. The first two sulfur dioxide standards are primary standards while the third (three-hour) is a secondary standard. The annual mean standard is not to be exceeded. More than one exceedance of the short term standard could result in a non-attainment designation for sulfur dioxide.

It should be noted that both the State of Florida and Metropolitan Miami-Dade County have set sulfur dioxide standards that are more stringent than the NAAQS. These standards are included in Table 1.

One sulfur dioxide site was active in Miami-Dade County in 2006. The sole SO_2 site (PN) is located in Pennsuco at the northeast corner of State Road 821 and State Road 27.

During calendar year 2006, the annual arithmetic mean of sulfur dioxide in Miami-Dade County was 0.0000 ppm, the maximum 24-hour average was 0.001 ppm, the maximum 3-hour average was 0.002 ppm and the highest 1-hour concentration was 0.003 ppm. Ninety-nine percent of the readings during 2006 were less than 0.001 ppm. There were no SO_2 exceedances of federal, state or Miami-Dade County standards during 2006.

Because of the low concentrations, sulfur dioxide was not used in the air quality index.

NITROGEN DIOXIDE (NO_2)

Nitrogen dioxide (NO_2) is a light brown gas that contributes to urban haze. Nitrogen oxides are produced as a result of high temperature combustion processes, such as those occurring in automobiles, power plants, home heaters and gas stoves.

Nitrogen dioxide can irritate the lungs, lower resistance to respiratory infection, such as influenza, and place a strain on the heart. The effects of short-term exposure are still unclear but continued or frequent exposure to concentrations higher than those normally found in the ambient air may cause increased incidence of acute respiratory disease in children. Another concern is that nitrogen dioxide contributes to the formation of ozone as well as acidic precipitation (acid rain).

Two nitrogen dioxide monitors were active in Miami-Dade County during 2006. The northernmost site, the Lab/Annex site, is located northwest of Downtown Miami, west of I-95 and north of SR 836 (adjacent to the Miami Stadium). The second site, at University of Miami's Rosenstiel School, is located along the Rickenbacker Causeway near the Seaquarium

The annual arithmetic mean air quality standard (EPA) for nitrogen dioxide is 0.053 ppm (53 ppb). Comparatively, the nitrogen dioxide values for Miami-Dade County were 0.013 ppm at the Lab/Annex (LB) site and 0.006 ppm at the Rosenstiel (RS) site. Over 99 percent of the readings at both sites were less than 0.050 ppm. The maximum hourly reading for the Lab/Annex site was 0.067 ppm. The Rosenstiel site's maximum hourly reading was 0.058 ppm. The average hourly nitrogen dioxide pattern was the same at both sites, with a significant increase starting at 5-6:00 a.m. EST and ending at 11-12:00 a.m., with a peak occurring around 7:00 to 8:00 a.m. EST at the Lab site and 8:00 to 9:00 a.m. EST at the Rosenstiel site. There were no nitrogen dioxide exceedances in Miami-Dade County during 2006.

Nitrogen dioxide was not used in the air quality index.

LEAD (Pb)

Historically, the major source of Lead (Pb) in the atmosphere has been due to combustion of leaded gasoline in motor vehicles. With the phase-out and complete ban of leaded gasoline, the already low levels of Pb decreased steadily to below detectable levels in Miami-Dade County in 1991. As can be seen in Figure 4. Other potential airborne Lead sources include municipal waste combustors, battery plants, lead processing or secondary lead smelting operations. Airborne lead can enter the body through inhalation; ingestion of food products or drinking water contaminated with lead particle deposits. Upon entering the body, lead can be absorbed in the bloodstream and distributed throughout the body where its toxic effects can cause damage. Sensitive organs and systems include the blood, brain and nervous system, the kidneys, liver and reproductive systems.

Young children are particularly at risk because the adverse health effects occur at lower lead levels than found in the average adult. Moreover, children are more likely to be exposed through the ingestion of soils and dust containing lead as a result of playing in heavily urbanized or industrialized settings and by ingestion of old paint containing lead. Studies have suggested that learning disabilities and lower IQs can occur in children having elevated lead levels in the blood. Recent studies have also shown that lead may be a factor in high blood pressure and subsequent heart disease in some middle-aged males.

The NAAQS Lead standard is set at a maximum quarterly average of 1.5 micrograms per cubic meter ($\mu g/m^3$).

There were two lead sites in Miami-Dade County. One site was located at Hialeah High School (HS) and the other was located west of the Palmetto Expressway South of West Flagler Street (PL). Both sites were closed on October 31, 1996.

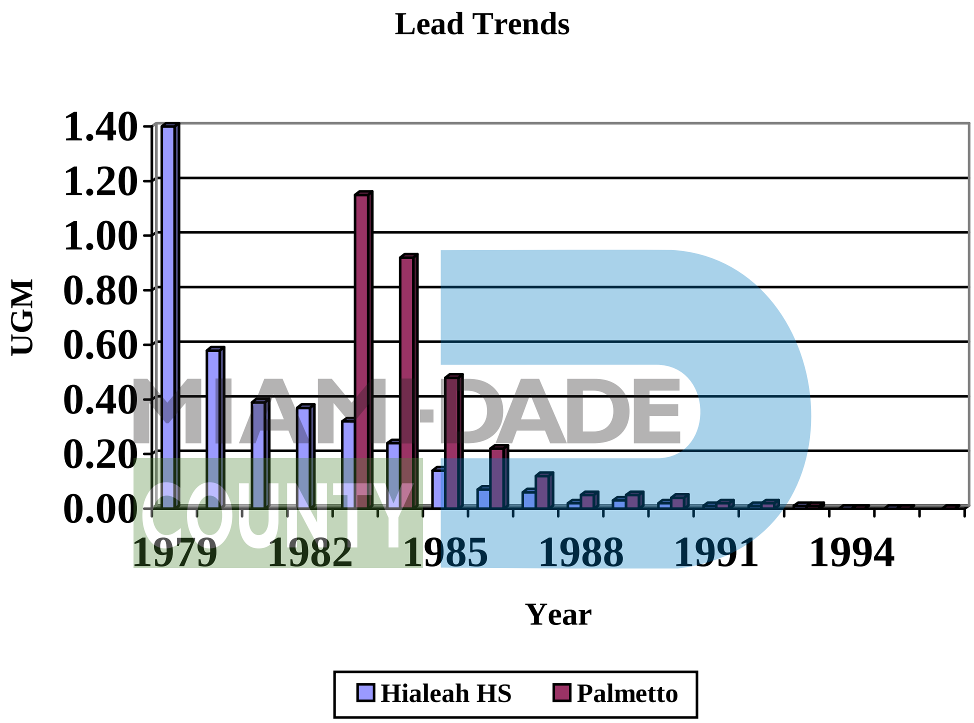


Figure 5. Lead Trends 1979 to 1996

DAILY AIR INDEX or AIR QUALITY INDEX (AQI)

The Air Quality Index (AQI) was developed by the EPA to provide accurate and easily understandable information to the community about daily air pollution levels and the associated health effects. The Index provides EPA with a uniform system of measuring pollution levels for the major air pollutants regulated under the Clean Air Act (CAA). Once the levels are measured, the AQI figures are reported in all metropolitan areas of the United States with populations exceeding 200,000. The AQI applies to five major pollutant NAAQS established under the CAA: particulate matter, sulfur dioxide, carbon monoxide, nitrogen dioxide and ground-level ozone.

The AQI figures also enable the public to determine whether air pollution levels for the day in Miami-Dade County in the "Good", "Moderate", "Unhealthy for Sensitive Groups" or worse category. The AQI converts each measured pollutant's concentration in a community's air to a number on a scale of 0 to 500 to which a category is assigned. Each category corresponds to a different level of health concern. For example, when the AQI for a pollutant is between 1 and 50, the category / health concern is "Good." Here are the six categories / levels of health concern and what they mean:

"Good" The AQI value for your community is between 0 and 50. Air quality is considered satisfactory and air pollution poses little or no risk.

"Moderate" The AQI for your community is between 51 and 100. Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of individuals. For example, people who are unusually sensitive to ozone may experience respiratory symptoms.

"Unhealthy for Sensitive Groups" AQI values are between 101 and 150. Certain groups of people are particularly sensitive to the harmful effects of certain air pollutants. This means they are likely to be affected at lower levels than the general public. For example, children and adults who are active outdoors and people with respiratory disease are at greater risk from exposure to ozone, while people with heart disease are at greater risk from carbon monoxide and people with either heart or lung disease are at risk from particulates. Some people may be sensitive to more than one pollutant. The general public is not likely to be affected when the AQI is in this range.

"Unhealthy" AQI values are between 151 and 200. Everyone may begin to experience health effects. Members of sensitive groups may experience more serious health effects.

"Very Unhealthy" AQI values between 201 and 300 trigger a health alert, meaning everyone may experience more serious health effects.

"Hazardous" AQI values over 300 trigger health warnings of emergency conditions. The entire population is more likely to be affected.

For more information about the air quality index and about the air quality in other areas, visit EPA's AIRNow web site at http://airnow.gov/.

The AQI is determined on weekdays using all of the operational carbon monoxide, ozone, nitrogen dioxide, sulfur dioxide and continuous particulate (PM2.5 TEOM) monitors. The highest AQI value of all the pollutants for the day is reported. Although the data for NO_2 and SO_2 is continuously recorded, neither has ever been high enough to be used as the basis for calculating the AQI. This AQI value is available to the public through DERM's Air Quality Management Division by 3:30 p.m. each workday. It is also available on the internet at http://www.miamidade.gov/derm/air/aqi_today.asp.

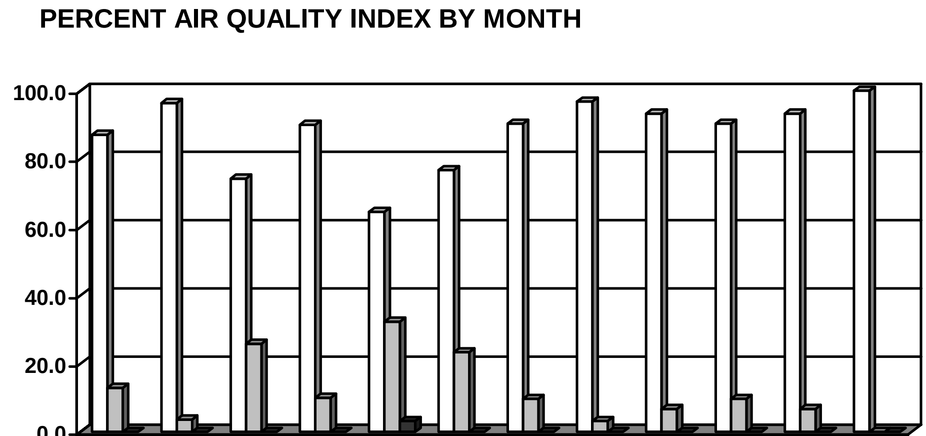
After all the continuous monitoring data for the month is corrected and verified, a corrected AQI is calculated for every day of the month using all air monitoring sites with the 24-hour PM2.5 (FRM) samples being used instead of the PM2.5 TEOM analyses. All of the daily AQI data for the quarter called the Final or Total AQI is reported to FDEP.

Historically, the AQI has never registered higher than unhealthy for sensitive groups in Miami-Dade County. The AQI registered as unhealthy for sensitive groups four days in 1989, one day in 1990, two days in 1991, one day in 1996, one day in 1998, four days in 1999, one day in 2001, one day in 2003, three days in 2004 and one day in 2006. In 2006, there was one day for ozone. The AQI value was reported as unhealthy for sensitive groups during 1989 when uncontrolled fires in the Everglades National Park produced significant pollution, which aggravated respiratory problems for some citizens of Miami-Dade and neighboring counties. Smoke warning are issued when necessary because of smoke from wildfires in the county and the Everglades. In May 1998, the Florida Department of Environmental Protection issued the first Florida statewide air advisory. This was because of air pollution caused by massive wild fires in Central America. The pollution plume had a detrimental effect on the air quality in the Southeastern United States.

Analysis of recorded AQI data for Miami-Dade County demonstrates that air quality has been good the last ten years, with the percentage of Good days varying from 75.8% to 94.5 %, with Moderate days varying from 5.2% to 23.9% and Unhealthy for Sensitive Groups days varying from 0.0% to 1.1%. Table 3 lists Miami-Dade's AQI data for 2006 as percent annual total by AQI parameter and Air Quality. Figure 6 shows the monthly percentage of Good, Moderate and Unhealthy for Sensitive Groups days for 2006. Figure 7 shows the trend of Good, Moderate and Unhealthy for Sensitive Groups days since 1997.

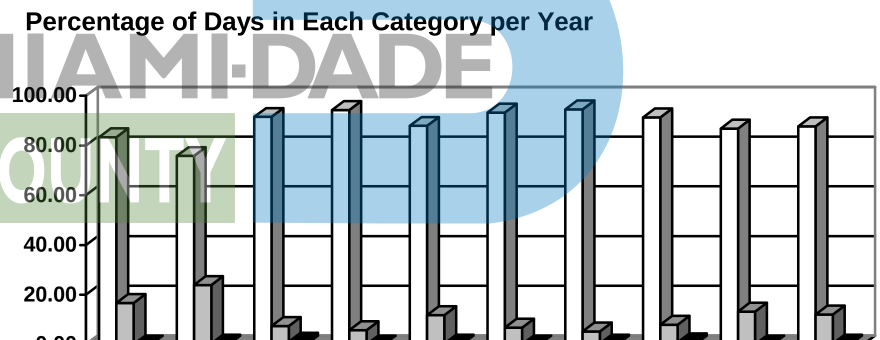
AQI / Parameter	**Number Of Days Total in 2006**
Good (0 to 50)	**320**
Ozone (O_3)	195
Carbon Monoxide (CO)	1
Particulate Matter (PM2.5)	124
Moderate (51 to 100)	**44**
Ozone (O_3)	21
Carbon Monoxide (CO)	0
Particulate Matter (PM2.5)	23
Unhealthy For Sensitive Groups (101 to 150)	**1**
Ozone (O_3)	1
Carbon Monoxide (CO)	0
Particulate Matter (PM2.5)	0

Table 3. AQI Parameters for 2006



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Good	87.1	96.4	74.2	90.0	64.5	76.7	90.3	96.8	93.3	90.3	93.3	100.0
Moderate	12.9	3.6	25.8	10.0	32.3	23.3	9.7	3.2	6.7	9.7	6.7	0.0
Unhealthy for Sensitive Groups	0.0	0.0	0.0	0.0	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Figure 6. Monthly AQI Breakdown for 2006



	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Good	83.30	75.80	91.50	94.30	87.90	93.20	94.50	91.30	86.80	87.70
Moderate	16.70	23.90	7.40	5.70	11.80	6.80	5.20	7.90	13.20	12.00
Unhealthy for Sensitive Groups	0.00	0.30	1.10	0.00	0.30	0.00	0.30	0.80	0.00	0.30

Figure 7. AQI Trend, FY 1997-2006

The comparison of the AQI over the last ten years (1997 to 2006) in Table 4 shows that the air quality in Miami-Dade County has remained constant with the percentage of Unhealthy for Sensitive Groups days being very small and over 80 percent of every year being in the Good range except for 1998 when the fires in Central America had a negative impact on the air quality. In 2001, the particulate sampled changed from being PM10 (Particulate Matter less than 10 microns) to being PM2.5 (Particulate Matter less than 2.5 microns) with a change in the Air Quality Standards for the PM2.5. This resulted in a shift from a final AQI based primarily on ozone (86 to 96 %) to one based on ozone (48 to 63 %) and particulates (37 to 48 %).

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
% Good (0 to 50)										
O3	79.73	73.1	84.1	82.2	49.9	62.2	46.8	47.0	45.5	53.4
CO	1.37	0.8	2.5	0.0	1.4	0.0	11.5	12.8	0.8	0.3
PM	2.19	1.9	4.9	12.0	36.7	31.0	36.2	31.4	40.5	34.0
% Moderate (51 to 100)										
O3	16.71	22.8	7.4	4.8	3.6	1.1	1.6	1.1	5.2	5.8
CO	0.00	0.0	0.0	0.0	0.3	0.0	0.0	0.8	0.0	0.0
PM	0.00	1.1	0.0	1.1	7.9	5.8	3.6	6.0	7.9	6.3
% Unhealthy for sensitive groups (101 to 150)										
O3	0.00	0.3	1.1	0.0	0.3	0.0	0.3	0.3	0.0	0.3
CO	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PM	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0

Table 4. Percent Annual Total by Parameter and Air Quality

LOCAL CLIMATOLOGICAL DATA

Table 5 lists the ambient temperatures, rainfall amounts and wind directions recorded at the Miami International Airport during 2006.

Month	Temperature, degrees Fahrenheit			Inches	Wind
	Minimum	Maximum	Average	Rainfall	Direction
January	46	83	69.3	0.32	90
February	44	84	67.6	3.47	90
March	52	90	72.1	1.10	90
April	64	92	77.3	0.23	100
May	66	92	79.5	8.62	110
June	71	93	82.7	7.05	110
July	73	92	83.0	7.32	100
August	70	96	83.8	12.95	110
September	73	95	82.8	16.73	100
October	60	91	80.2	1.64	70
November	45	87	73.0	1.63	60
December	56	84	74.5	3.11	80

Table 5. 2006 Local Climatological Data - Miami International Airport