

## **CHAPTER 2**

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### **LOCAL AIR QUALITY**

**Introduction**

**Climate of Santa Barbara County**

**Air Quality Monitoring**

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**Pollutants That Violate Standards**

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## **2. LOCAL AIR QUALITY**

### **2.1 INTRODUCTION**

This chapter provides the background for this Clean Air Plan by presenting an overview of the climate and current air pollution levels in Santa Barbara County. This information is important for understanding the factors that influence air quality in the county, and for assessing progress towards attainment of air quality standards.

There are two related terms that are used frequently in this chapter: standard *exceedance* and standard *violation*. A *standard exceedance* occurs when a measured concentration exceeds any applicable air quality standard. A *standard violation* occurs after a certain number of exceedances have been measured and is dependent on the standard in question. For example, a federal 1-hour ozone standard violation occurs when four federal ozone standard exceedances are measured during a three-year period at a single air monitoring station. Attainment and nonattainment designations are based on violations of standards.

The next section of this chapter, Section 2.2, discusses the local climate of Santa Barbara County in terms of precipitation, temperatures, winds, and inversions, and their relationship to air quality. Section 2.3 describes the air quality monitoring network in the county. Section 2.4 briefly discusses attainment pollutants and Section 2.5 examines ozone and particulate matter in greater detail. Finally, Section 2.6 highlights the conclusions of the chapter.

### **2.2 CLIMATE OF SANTA BARBARA COUNTY**

Santa Barbara County's air quality is influenced by both local topography and meteorological conditions. Surface and upper-level wind flow varies both seasonally and geographically in the county and inversion conditions common to the area can affect the vertical mixing and dispersion of pollutants. The prevailing wind flow patterns in the county are not necessarily those that cause high

ozone values. In fact, high ozone values are often associated with unusual wind flow patterns. Meteorological and topographical influences that are important to air quality in Santa Barbara County are as follows:

- Semi-permanent high pressure that lies off the Pacific Coast leads to limited rainfall (around 18 inches per year), warm, dry summers and relatively damp winters. Maximum summer temperatures average about 70 degrees Fahrenheit near the coast and in the high 80s to low 90s inland. During winter, average minimum temperatures range from the 40s along the coast to the 30s inland. Additionally, cool, humid, marine air causes frequent fog and low clouds along the coast, generally during the night and morning hours in the late spring and early summer. The fog and low clouds can persist for several days until broken up by a change in the weather pattern.
- In the northern portion of the county (north of the ridgeline of the Santa Ynez Mountains), the sea breeze (from sea to land) is typically northwesterly throughout the year while the prevailing sea breeze in the southern portion of the county is from the southwest. During summer, these winds are stronger and persist later into the night. At night, the sea breeze weakens and is replaced by light land breezes (from land to sea). The alternation of the land-sea breeze cycle can sometimes produce a "sloshing" effect, where pollutants are swept offshore at night and subsequently carried back onshore during the day. This effect is exacerbated during periods when wind speeds are low.
- The terrain around Point Conception, combined with the change in orientation of the coastline from north-south to east-west can cause counterclockwise circulation (eddy) to form east of the Point. These eddies fluctuate temporally and spatially, often leading to highly variable winds along the southern coastal strip. Point Conception also marks the change in the prevailing surface winds from northwesterly to southwesterly.
- Santa Ana winds are northeasterly winds that occur primarily during fall and winter, but occasionally in spring. These are warm, dry winds blown from the high inland desert that descend down the slopes of a mountain range. Wind speeds associated with Santa Ana's are

generally 15-20 mph, though they can sometimes reach speeds in excess of 60 mph. During Santa Ana conditions, pollutants emitted in Santa Barbara, Ventura County, and the South Coast Air Basin (the Los Angeles region) are moved out to sea. These pollutants can then be moved back onshore into Santa Barbara County in what is called a "post Santa Ana condition." The effects of the post- Santa Ana condition can be experienced throughout the county. Not all post Santa Ana conditions, however, lead to high pollutant concentrations in Santa Barbara County.

- Upper-level winds (measured at Vandenberg Air Force Base once each morning and afternoon) are generally from the north or northwest throughout the year, but occurrences of southerly and easterly winds do occur in winter, especially during the morning. Upper-level winds from the south and east are infrequent during the summer. When they do occur, they are usually associated with periods of high ozone levels. As with the surface winds, upper-level winds can move pollutants that originate in other areas into the county.
- Surface temperature inversions (0-500 ft) are most frequent during the winter, and subsidence inversions (1000-2000 ft) are most frequent during the summer. Inversions are an increase in temperature with height and are directly related to the stability of the atmosphere. Inversions act as a cap to the pollutants that are emitted below or within them and ozone concentrations are often higher directly below the base of elevated inversions than they are at the earth's surface. For this reason, elevated monitoring sites will occasionally record higher ozone concentrations than sites at lower elevations. Generally, the lower the inversion base height and the greater the rate of temperature increase from the base to the top, the more pronounced effect the inversion will have on inhibiting vertical dispersion. The subsidence inversion is very common during summer along the California coast, and is one of the principal causes of air stagnation.
- Poor air quality is usually associated with "air stagnation" (high stability/restricted air movement). Therefore, it is reasonable to expect a higher frequency of pollution events in the southern portion of the county where light winds are frequently observed, as opposed to the northern part of the county where the prevailing winds are usually strong and persistent.

## 2.3 AIR QUALITY MONITORING

The State of California has established ambient air quality standards to protect human health. The federal government has also established health-based standards ("primary" standards), which are generally less protective of public health than state standards. In addition, the federal government has established "secondary" standards to protect public welfare. State and federal standards have been established for ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, suspended particulate matter 10 micrometers or less in size (PM<sub>10</sub>), and lead. On July 18, 1997, federal standards were promulgated for ozone (8-hour) and suspended particulate matter 2.5 micrometers or less (PM<sub>2.5</sub>) in size. These two standards were successfully challenged before the U.S. Court of Appeal for the District of Columbia Circuit and are currently under review by the U.S. Supreme Court. In addition, California has standards for sulfates, hydrogen sulfide, vinyl chloride, and visibility-reducing particles. All applicable state and federal standards are shown in Table 2-1.

Monitoring of ambient air pollutant concentrations is conducted by the ARB, APCD and industry. Monitors operated by the ARB and the APCD are part of the State and Local Air Monitoring System (SLAMS). The SLAMS monitors are located to provide local and regional air quality information. Monitors operated by industry, at the direction of the APCD, are called Prevention of Significant Deterioration (PSD) stations. PSD stations are required by the APCD to ensure that new and modified sources under APCD permit do not interfere with the county's ability to attain and maintain air quality standards. Historically, ambient air quality monitoring stations have operated in northern Santa Barbara County and San Luis Obispo by the Environmental Research Foundation (ERF), which is a non-profit organization funded by local industry. Methods and procedures used in monitoring follow guidelines prescribed by the ARB and the USEPA to ensure consistency with the standards.

Figure 2-1 shows the locations of all past and present monitoring stations that have operated in Santa Barbara County. Many of the sites depicted in Figure 2-1 have been de-commissioned, but are presented here for informational purposes. The installation dates, status, and parameters measured

for all stations are listed in Table 2-2. Several of the stations have been in operation for more than 12 years and some for over 20 years. Figure 2-2 summarizes the current monitoring network.

### **2.3.1            ENHANCED MONITORING**

On December 10, 1997, the USEPA reclassified the Santa Barbara County one-hour ozone non-attainment area from “moderate” to “serious.” That action precipitated the requirement to establish a Photochemical Assessment Monitoring Station (PAMS) program. This USEPA-funded program involves collecting low-level (3,500 feet) upper-air meteorological measurements and speciated hydrocarbon, oxides of nitrogen, and ozone measurements. As agreed with USEPA, PAMS data are collected from equipment installed at the APCD Goleta office; upper-air measurements are taken at the Santa Barbara Airport.

In addition to the APCD’s PAMS program, the ARB is conducting PM<sub>2.5</sub> monitoring at their downtown Santa Barbara and Santa Maria sites, which began in 1999. A third sampler will be installed around the middle of year 2002 near the San Rafael Wilderness and operated by the federal land manager.

With the recent promulgation of regional haze regulations, the USEPA is drafting guidance on regional haze or visibility monitoring to be instituted under the Interagency Monitoring of Protected Visual Environments (IMPROVE) program. An IMPROVE site is scheduled to be co-located with the PM<sub>2.5</sub> site located near the San Rafael Wilderness. The PM<sub>2.5</sub> monitoring regulations in 40 CFR Part 58 allow the use of the IMPROVE protocol for the purpose of characterizing background or transported levels of PM<sub>2.5</sub>.

## **2.4        ATTAINMENT POLLUTANTS**

The Federal Act establishes air quality standards for the following “criteria” air pollutants: ozone, nitrogen dioxide, sulfur dioxide, carbon monoxide, PM<sub>10</sub>, and lead. State standards also exist for

each of these criteria pollutants. In addition, state standards are in place for visibility-reducing particles, sulfates, hydrogen sulfide and vinyl chloride. With the exception of ozone and PM<sub>10</sub>, Santa Barbara County complies with all state and federal air quality standards. Health effects information and historical concentrations of attainment pollutants have been documented in the air quality plans discussed in Chapter 1.3.

## **2.5 POLLUTANTS THAT VIOLATE STANDARDS**

Santa Barbara County violates the state PM<sub>10</sub> standard and has historically violated both state and federal ozone standards. The following sections discuss these pollutants.

### **2.5.1 OZONE**

Ozone has been monitored in the county for over 25 years. Data collected at monitoring stations, in conjunction with the various air quality studies performed in the region provide valuable insight into the county's ozone problem.

Ozone is formed in the atmosphere through a series of chemical reactions involving NO<sub>x</sub> and ROG, and sunlight occurring over a period of several hours. The major source of NO<sub>x</sub> in the county is combustion of fossil fuels for transportation, energy and heat. ROG sources include natural seeps of oil and gas, solvents in paints, consumer and industrial products, mobile sources, natural vegetation, and processes in the petroleum industry. Since ozone is not emitted directly into the atmosphere, but is formed as a result of chemical reactions in the atmosphere, it is classified as a "secondary" pollutant and is considered "regional" because it occurs over a wider area than that in which the pollutants are emitted. Because ozone-forming photochemical reactions take time, peak ozone levels are often found several miles or more downwind of major source areas. This is particularly true when winds are persistent from one direction.

Elevated ozone concentrations aggravate asthma, bronchitis and other respiratory disorders. Eye irritation, nausea, headaches, coughing and dizziness are other symptoms of ozone exposure. Ozone also interferes with photosynthesis, thereby damaging natural and ornament vegetation, and agricultural crops.

Figure 2-3 presents the number of state (1-hour) and federal (1-hour and 8-hour) ozone exceedances measured in the county from 1990 through 1999 for all monitoring stations in continuous operation during the last 10 years. As seen in the figure, Santa Barbara County experienced between 3 and 40 days per year on which the state ozone standard was exceeded and 1 to 6 days per year on which the federal 1-hour standard was exceeded. Figure 2-3 also presents the number of exceedances of the new federal 8-hour ozone standard that is more protective of public health than the existing federal 1-hour standard, but slightly less protective of public health than the state 1-hour ozone standard.

The most striking feature of Figure 2-3 is the dramatic drop in ozone exceedances from 1996 to 1999. In fact, 1999 was the cleanest year on record in Santa Barbara County. It should be pointed out that the weather conditions that existed between 1997 and 1999 may have contributed to improved air quality. El Nino conditions existed during 1997 and 1998, which were followed by La Nina conditions during 1999. Both these conditions may have inhibited poor air quality during this period. A more detailed discussion of ozone air quality in Santa Barbara County is provided in Section 2.5.1.3.

#### 2.5.1.1 New Federal 8-Hour Ozone Standard

In addition to the federal 1-hour ozone standard, the USEPA promulgated (July 18, 1997) a new 8-hour ozone standard (0.08 ppm) that is generally more protective of public health. Compliance with the new standard is judged by taking the average of the 4th highest 8-hour concentration, each year, for a three-year period.

On May 14th 1999, an appeals court placed the 8-hour standard on hold, pending further clarification from USEPA on how it determined the level of the standard. The court stated that the factors EPA used to determine the degree of public health concern were reasonable, but found that



USEPA did not clearly specify the rationale for selecting the standard. The court left the 8-hour standard in place, but prevented USEPA from implementing it. The court did, however, note that although USEPA cannot implement the standard, the Clean Air Act requires EPA to finalize designations to fulfill its statutory obligations. USEPA and the Department of Justice requested a review of the case before the Supreme Court. The Supreme Court agreed to review the case, and on February 27, 2001 ruled that the EPA has the authority to implement the revised ozone standard. EPA is currently reviewing the results of the litigation to determine the approach and schedule for moving forward with implementing the new ozone standard.

The Clean Air Act requires states to submit recommendations on initial air designations and boundaries for the new federal 8-hour ozone standard. On March 23, 2000, the ARB approved recommendations for submittal to USEPA. Table 2-3 provides 8-hour ozone design value calculation using data from 1997 through 1999. Based on these monitoring data, Santa Barbara County will be designated as attainment for the federal 8-hour ozone standard.

#### 2.5.1.2 Peak Ozone Levels

According to USEPA policy, the 4<sup>th</sup> highest 1-hour ozone concentration measured at a particular monitoring station during a three-year period constitutes the design value for that station. These design values are used to classify the attainment status of Santa Barbara County pursuant to the federal Clean Air Act Amendments of 1990. Santa Barbara County was originally classified as “moderate” nonattainment based on ozone concentrations recorded in the county from 1987 to 1989.

Santa Barbara County was required to develop the 1994 Clean Air Plan to comply with the federal 1-hour ozone standard by the statutory attainment date for “moderate” areas of November 15, 1996. Based on 1994 through 1996 monitoring data, three sites in the county continued to violate the federal 1-hour ozone standard, prompting USEPA to reclassify Santa Barbara County as a “serious” nonattainment area for the 1-hour ozone standard. The “serious” re-classification triggered the development of the 1998 Clean Air Plan to provide for attainment of the federal 1-hour ozone standard by November 15, 1999.

Table 2-4 summarizes the four highest ozone values recorded in Santa Barbara County from 1997 through 1999 at all monitoring locations. As seen in the table, the maximum recorded 1-hour ozone concentrations range from 73 to 137 ppb. The fourth highest value is 108 ppb, which is less than the federal 1-hour ozone standard (120 ppb). This shows that Santa Barbara County has complied with the federal 1-hour ozone standard for this three-year period.

For the state ozone standard, attainment is also based on a design value. The definition of the state design value, however, differs considerably from the federal design value definition. The state design value is the highest measured concentration remaining at a given site after all measured concentrations affected by extreme concentration events are excluded. Extreme concentrations are determined through statistical calculations that provide an Expected Peak Daily Concentration (EPDC). The EPDC is the concentration that statistically is estimated to recur once per year and is based on the most recent three-year period for which air quality data are available. Concentrations that are higher than the EPDC are identified as being caused by extreme events and are not considered violations of the state standard. It is the concentration that is equal to or lower than the EPDC that is considered the state design value for each monitoring site. Based on the state design value, Santa Barbara County continues to violate the state ozone standard.

#### 2.5.1.3 Ozone Standard Exceedances

Figures 2-4 and 2-5 present state and federal ozone exceedance data throughout the county for selected SLAMS and PSD stations. The majority of the SLAMS stations have been in operation since 1980, while the PSD stations were installed in the mid to late 1980's. The figures, however, show SLAMS and PSD data from the period of 1990 to 1999 to assess trends during the past ten years.

Figure 2-4 shows the variability of ozone standard exceedances at the SLAMS stations in the county. Stations located in the south coast area experience a greater number of exceedances

compared to northern Santa Barbara County, where the Santa Ynez station generally measures a higher number of exceedances than other north county sites.

Figure 2-5 shows selected PSD stations around the county. This figure reveals that there are areas in the county that experience a greater number of ozone standard exceedances than indicated by the SLAMS stations. For example, Las Flores Canyon - Site 1, and Paradise Road have experienced from 3 to 24 state ozone standard exceedances and up to 6 federal standard exceedances per year. In general, areas of south coast experience less healthful air quality than areas to the north and west. Paradise Road, at the eastern end of the Santa Ynez Valley however, has experienced a significant number of days with unhealthful air quality.

To gain a better understanding of ozone exceedances across the county, the APCD performed a study entitled, "Selection, Classification, and Analysis of Ozone Violations in Santa Barbara County" (SBCAPCD, 1990). The primary focus of the study was to assess the geographical and meteorological patterns associated with ozone standard exceedances.

Eighteen ozone exceedances were grouped into five categories based on the geographical extent of the observed exceedance: Countywide, Paradise Road, Lompoc, south county, and Carpinteria. Meteorological data during the ozone episodes were then compiled and the data were analyzed. Results of the 1990 study show that ozone exceedances in Santa Barbara County occur under diverse meteorological conditions and that the topography of the county plays an important role in the distribution of ozone exceedances.

Additionally, the APCD has prepared an update to the 1990 study that analyzes ozone exceedances between 1990 and 1999. In contrast to the previous study, the current analysis looks at all federal exceedances that have occurred in the past 10 years without primary regard to the spatial or geographical extent of the exceedance. After reviewing the meteorology associated with all federal exceedances, it was apparent that the focus of the study should be placed on comparing meteorological differences between high ozone events that have occurred in summer against those that have occurred in spring and fall.

Some important conclusions from the current study are:

- There are contrasting meteorological conditions that occur between episodes that occur during summer to those that occur during spring and fall. The primary difference between summer and spring/fall episodes is that summer events are characterized by weak onshore pressure gradients while spring/fall events are characterized by moderate offshore gradients.
- A greater frequency of southeasterly winds aloft occurs during spring/fall events than during summer episodes. Southeasterly winds aloft suggest potential transport of pollutants from Ventura County and/or the Los Angeles Basin, which may be mixed with locally generated pollution leading to high ozone concentrations. Some episodes, regardless of season, also showed indications of transport at the surface from areas to the southeast of Santa Barbara County.
- Transport plays a role in some of the ozone exceedances experienced in Santa Barbara County. Federal exceedances appear to be related to a combination of meteorological conditions that are conducive to high ozone formed locally and to transport from outside the county.
- Given the widespread nature of exceedances of the state ozone standard in the county, and given that the entire San Luis Obispo County, Santa Barbara County, and Ventura County area is nonattainment for the state 1-hour ozone standard, the evidence suggests that emissions generated locally contribute to some degree to the regional problem.

### 2.5.2 PM<sub>10</sub> (PARTICULATE MATTER)

Particulate matter with an aerodynamic diameter of 10 microns or less (PM<sub>10</sub>) is generated by a wide variety of natural and man-made sources. Particulate matter is a respiratory irritant. Large particles are effectively filtered in the upper respiratory tract, but particles smaller than 10 microns can cause serious health effects. The chemical makeup of the particles is an important factor in determining the health effect.

PM<sub>10</sub> is produced either by direct emissions of particulates from a source (primary PM<sub>10</sub>), or by formation of aerosols as a result of chemical reactions in the atmosphere involving precursor pollutants (secondary PM<sub>10</sub>). Based on emissions data, the largest single source of PM<sub>10</sub> emissions in the county is entrained paved road dust. Other major sources include dust from construction, demolition, agricultural tilling, entrained road dust from unpaved roads, natural dust and sea-salt, and particulate matter released during fuel combustion.

PM<sub>10</sub> has been measured consistently at both SLAMS and PSD stations since 1986 with measurements at the Santa Maria Library SLAMS site going back to 1985. Figure 2-6 presents the maximum 24-hour average concentration measured each year and the annual geometric mean for the Santa Barbara and Santa Maria SLAMS sites. As shown in the figure, Santa Barbara County violates both the state PM<sub>10</sub> 24-hour and annual standards. As a result, Santa Barbara County is currently designated nonattainment for the state PM<sub>10</sub> standard.

The county does not exceed the federal 24-hour PM<sub>10</sub> standard. Figure 2-7 presents the annual arithmetic mean PM<sub>10</sub> concentrations measured in Santa Maria, where highest annual values are usually recorded. As shown from this figure, Santa Barbara County complies with the federal annual PM<sub>10</sub> standard.

To investigate the county's PM<sub>10</sub> problem, the APCD started a specialized sampling and analysis study in 1989 called the Santa Barbara County Particulate Matter Emission Reduction Study. The study collected and analyzed ambient samples of PM<sub>10</sub> at sites located throughout the county to identify chemical constituents, and identified potential source characteristics and assessed control

strategies for reducing PM<sub>10</sub> concentrations. The major findings of the study include: 1) background sources (primarily sea-salt) are major contributors to PM<sub>10</sub> concentrations; 2) on average, 70% of the locally generated PM<sub>10</sub> (primary) is directly emitted; 3) locally generated geological dust and motor vehicle exhaust are the most significant sources of primary PM<sub>10</sub> in the county; and 4) potential control measures should concentrate on these primary sources of PM<sub>10</sub>.

Although Santa Barbara County has developed an excellent database for PM<sub>10</sub> attainment, there is much additional work to be performed. Non-traditional controls (e.g., controls for fugitive dust) will have to be evaluated along with the more traditional controls. Therefore, attainment of the state PM<sub>10</sub> standards may depend on the development of innovative control technologies and their effectiveness upon implementation. In any case, implementation of ozone control measures adopted in the 1998 Clean Air Plan, and ozone precursor (ROC and NO<sub>x</sub>) emissions reductions required by the California Clean Air Act will result in PM<sub>10</sub> air quality benefits by reducing secondary PM<sub>10</sub>. Some progress is already underway, but additional steps will have to be taken to attain the state PM<sub>10</sub> standards.

### 2.5.3 NEW FEDERAL PM<sub>2.5</sub> (FINE PARTICULATE MATTER) STANDARD

On July 18, 1997, EPA revised the primary and secondary air quality standards for particulate matter by establishing annual and 24-hour PM<sub>2.5</sub> standards and also revised the form of the existing 24-hour PM<sub>10</sub> standard. The PM<sub>2.5</sub> standards are set at 65 ug/m<sup>3</sup> for 24-hour and 15 ug/m<sup>3</sup> for an annual average.

As with the 8-hour ozone standard, the revised federal particulate standard was challenged before the U.S. Court of Appeals. On May 14, 1999 the Court ruled that the new PM<sub>2.5</sub> standards shall remain in place, but vacated the revised “coarse” particle (PM<sub>10</sub>) standard. As such, the pre-existing PM<sub>10</sub> standard continues to apply. The Supreme Court ruling on February 27, 2001 allows EPA to move forward with the fine particulate standards. EPA cannot start implementing the fine particulate standards until they and the states collect three years of monitoring data to determine which areas are not attaining the standards.

The characteristics, sources, and potential health effects associated with larger or “coarse” particles (from 2.5 to 10 micrometers in diameter) and smaller or “fine” (smaller than 2.5 micrometers) can be very different. Coarse particulates generally come from windblown dust and dust kicked up from mobile sources. Fine particulates are generally associated with combustion processes as well as being formed in the atmosphere as a secondary pollutant through chemical reactions. Since fine particles are more likely to penetrate deeply into the lungs, they increase respiratory symptoms and disease, decrease lung function, alter lung tissues and structures, and impact respiratory tract defense mechanisms.

PM<sub>2.5</sub> is monitored at two locations in Santa Barbara County, one at the Santa Maria Library, and the other in downtown Santa Barbara. As noted earlier, a third sampler will be installed near the San Rafael Wilderness around the middle of year 2002. Once the data have been processed, USEPA will be designating attainment and nonattainment areas (action expected between 2002 and 2005) with State Implementation Plans due starting in the year 2005.

## **2.6 CONCLUSIONS**

The County continues to violate both the state 1-hour ozone standard and state PM<sub>10</sub> standard. The County is in compliance with all other applicable state and federal ambient air quality standards. Note that while the revised federal standards for ozone and fine particulate matter have been discussed in this chapter for informational purposes, they are not applicable to this Plan.

Analyses of 1997 through 1999 monitoring data shows that Santa Barbara County has complied with the federal 1-hour ozone standard. In addition, data from this period show that Santa Barbara County has complied with the federal 8-hour ozone standard. Santa Barbara County has also made progress toward the state 1-hour ozone standard although remains out of compliance with the standard. While 1997 through 1999 were the cleanest years on record, various meteorological conditions existed during the three-year period, that were conducive to good air quality.

Ozone studies prepared by the APCD have shown that ozone exceedances can occur under a wide variety of meteorological conditions. Additionally, based on analyses of ozone episodes occurring during the past ten years (1990 through 1999), there is an indication that federal exceedances may be related to meteorological conditions that are conducive to high ozone formed locally combined with transport of pollutants from outside the county. The analyses also suggest that our airshed may be able to support ozone concentrations in excess of the state ozone standard, but that an additional influx of pollution due to transport is characteristic of federal ozone exceedances.



**Table 2-1**  
**Ambient Air Quality Standards**

Pollutant	Averaging Time	California Standards <sup>1</sup>	National Standards <sup>2</sup>	
			Primary <sup>2, 4</sup>	Secondary <sup>2, 5</sup>
Ozone	1 Hour	0.09 ppm (180 ug/m <sup>3</sup> )	0.12 ppm (235 ug/m <sup>3</sup> )	Same as Primary
	8 Hour		0.08 ppm (157 ug/m <sup>3</sup> )	Same as Primary
Carbon Monoxide	8 Hour	9 ppm (10 mg/m <sup>3</sup> )	9 ppm (10 mg/m <sup>3</sup> )	Same as Primary
	1 Hour	20 ppm (23 mg/m <sup>3</sup> )	35 ppm (40 mg/m <sup>3</sup> )	
Nitrogen Dioxide	Annual Average	--	0.053 ppm (100 ug/m <sup>3</sup> )	Same as Primary
	1 Hour	0.25 ppm (470 ug/m <sup>3</sup> )	--	
Sulfur Dioxide	Annual Average		80 ug/m <sup>3</sup> (0.03 ppm)	
	24 Hour	0.04 ppm <sup>6</sup> (105 ug/m <sup>3</sup> )	365 ug/m <sup>3</sup> (0.14 ppm)	--
	3 Hour	--		1,300 ug/m <sup>3</sup> (0.5 ppm)
	1 Hour	0.25 ppm (655 ug/m <sup>3</sup> )		--
Suspended Particulate Matter (PM <sub>10</sub> )	Annual Geometric Mean	30 ug/m <sup>3</sup>	--	--
	24 Hour	50 ug/m <sup>3</sup>	150 ug/m <sup>3</sup>	Same as Primary
	Annual Arithmetic Mean	--	50 ug/m <sup>3</sup>	
Particulate Matter (PM <sub>2.5</sub> )	Annual Arithmetic Mean		15 ug/m <sup>3</sup>	Same as Primary
	24 Hour		65 ug/m <sup>3</sup>	Same as Primary
Sulfates	24 Hour	25 ug/m <sup>3</sup>		--
Lead	30 Day Average	1.5 ug/m <sup>3</sup>	--	--
	Calendar Quarter	--	1.5 ug/m <sup>3</sup>	Same as Primary
Hydrogen Sulfide	1 Hour	0.03 ppm (42 ug/m <sup>3</sup> )		--
Vinyl Chloride (chloroethene)	24 Hour	0.010 ppm (26 ug/m <sup>3</sup> )		--
Visibility Reducing Particles	1 Observation	In sufficient amount to reduce the prevailing visibility <sup>7</sup> to less than 10 miles when the relative humidity is less than 70%		--

## Table 2-1 (Concluded)

### NOTES:

1. California standards for ozone, carbon monoxide, sulfur dioxide (1 hour), nitrogen dioxide and particulate matter - PM<sub>10</sub>, and visibility reducing particles are values that are not to be exceeded. The sulfur dioxide (24-hour), sulfates, lead, hydrogen sulfide, and vinyl chloride are not to be equaled or exceeded.
2. National standards, other than ozone and those based on annual averages or annual arithmetic means, are not to be exceeded more than once a year. The ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is equal to or less than one.
3. Concentration expressed first in units in which it was promulgated. Equivalent units given in parenthesis are based upon a reference temperature of 25 °C and a reference pressure of 760 mm of mercury. All measurements of air quality are to be corrected to a reference temperature of 25 °C and a reference pressure of 760 mm of mercury (1,013.2 millibar); ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.
4. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health. Each state must attain the primary standards no later than three years after that state's implementation plan is approved by the Environmental Protection Agency.
5. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Each state must attain the secondary standards within a "reasonable time" after the implementation plan is approved by the EPA.
6. At locations where the state standards for ozone and/or suspended particulate matter are violated. National standards apply elsewhere.
7. This standard is intended to limit the frequency and severity of visibility impairment due to regional haze and is equivalent to a 10-mile nominal visual range when relative humidity is less than 70 percent.

**TABLE 2-2**  
**AIR QUALITY MONITORING STATIONS - OPERATIONAL STATUS AND PARAMETERS MEASURED**

	SITE	TYPE	START	END	PARAMETERS MONITORED (✓)													
					O <sub>3</sub>	NO <sub>2</sub>	SO <sub>2</sub>	CO	THC	H <sub>2</sub> S	TSP	PM <sub>10</sub>	ROC	WS	VWS	WD	AMT	TRS
N 1	Santa Maria Refinery	PSD	02/1987	10/1992			✓							✓		✓		
N 2	Bonita School Road	PSD	02/1987	10/1992			✓							✓		✓		
N 3	West Main Street	PSD	02/1987	11/1989			✓							✓		✓		
N 4	Guadalupe	PSD	02/1987	11/1989			✓							✓		✓		
N 5	Casmalia Hills	PSD	02/1987	10/1992			✓							✓		✓		
N 6a	Santa Maria – Main Street	SLAMS	Pre-1980	10/1981	✓		✓							✓		✓		
N 6b	Santa Maria – McClelland	SLAMS	01/1982	09/1987	✓		✓											
N 6c	<b>Santa Maria - Broadway</b>	<b>SLAMS</b>	<b>09/1987</b>	<b>Active</b>	✓							✓						
N 7	Battles	PSD	09/1985	11/1995	✓		✓		✓	✓			✓	✓	✓	✓	✓	
N 8	Santa Maria – Briarwood	ERF	3/1979	12/1990			✓				✓							
N 9	Santa Maria – Glacier Lane	ERF	3/1979	12/1990		✓	✓			✓								
N 10	Airox Road	PSD	9/1986	11/1987	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	
N 11a	Watt Road	SLAMS	01/1983	05/1988	✓	✓	✓	✓			✓			✓		✓		
N 11b	VAFB Watt Road	PSD	05/1992	03/1997	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	
N 12	<b>Lompoc HS&amp;P</b>	<b>PSD</b>	<b>09/1985</b>	<b>Active</b>	✓	✓	✓		✓					✓	✓	✓	✓	
N 13	<b>Lompoc HS&amp;P Odor</b>	<b>PSD</b>	<b>01/1988</b>	<b>Active</b>						✓				✓		✓	✓	✓
N 14	Herado Road	SLAMS	03/1982	10/1986	✓	✓	✓	✓			✓			✓		✓		
N 15a	Lompoc – G Street	SLAMS	07/1980	04/1983	✓		✓				✓			✓		✓		
N 15b	<b>Lompoc – H Street</b>	<b>SLAMS</b>	<b>06/1983</b>	<b>Active</b>	✓	✓	✓	✓				✓		✓		✓		
N 16	<b>VAFB STS</b>	<b>PSD</b>	<b>02/1987</b>	<b>Active</b>	✓	✓	✓	✓	✓			✓		✓	✓	✓	✓	
N 17	Point Arguello	PSD	09/1985	11/1995	✓	✓			✓				✓	✓	✓	✓	✓	
N 18	Lompoc – Jalama	ERF	03/1979	12/1990			✓				✓			✓		✓		
S 19	Jalama Beach	PSD	11/1985	11/1995	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	
S 20	Point Conception	PSD	12/1986	03/1998	✓	✓	✓				✓	✓			✓	✓	✓	
S 21	Government Point	PSD	02/1985	01/1992	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	

**TABLE 2-2**  
**AIR QUALITY MONITORING STATIONS - OPERATIONAL STATUS AND PARAMETERS MEASURED**

	SITE	TYPE	START	END	PARAMETERS MONITORED (✓)													
					O <sub>3</sub>	NO <sub>2</sub>	SO <sub>2</sub>	CO	THC	H <sub>2</sub> S	TSP	PM <sub>10</sub>	ROC	WS	VWS	WD	AMT	TRS
N 22	GTC B	PSD	06/1987	Active	✓	✓								✓	✓	✓	✓	
S 23	Gaviota West	PSD	09/1984	03/1998	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	
S 24	Gaviota Odor West	PSD	07/1988	Active						✓				✓		✓	✓	✓
S 25	GTC A	PSD	09/1985	11/95	✓	✓	✓				✓	✓		✓	✓	✓	✓	
S 26	Gaviota East	PSD	12/1987	03/1998	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	
S 27	GTC C	PSD	06/1987	04/1998	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	
S 28	Gaviota Odor East	PSD	07/1988	Active						✓				✓		✓	✓	✓
S 29	Molino	PSD	04/1984	06/1987	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	
N 30	Santa Ynez Airport	SLAMS	09/1980	Active	✓									✓	✓	✓	✓	
S 31	Las Flores Canyon – LFC Site 1	PSD	01/1988	Active	✓	✓	✓	✓	✓			✓		✓		✓	✓	
S 32	Las Flores Canyon – LFC Site 2	PSD	04/1988	01/1999		✓	✓					✓		✓		✓	✓	
S 33	Las Flores Canyon – LFC Site 3	PSD	01/1988	01/1999		✓	✓					✓		✓		✓	✓	
S 34a	Las Flores Canyon – ARCO Site 4	PSD	07/1986	08/1987	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	
S 34b	Las Flores Canyon – LFC Site 4	PSD	01/1988	03/1999	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	
S 34c	Las Flores Canyon – LFC Odor	PSD	04/1999	Active					✓									
S 35a	POPCO –North	PSD	06/1991	03/1999						✓								
S 35b	POPCO –South	PSD	06/1991	03/1999						✓								✓
S 35c	POPCO –Meteorological	PSD	06/1991	02/1993			✓							✓		✓	✓	
S 36	El Capitan	PSD & SLAMS	Pre-1980	Active	✓	✓			✓			✓		✓	✓	✓	✓	✓
S 37	Naples	PSD	06/1987	03/1991					✓		✓	✓	✓	✓	✓	✓	✓	
S 38	Ellwood	PSD	09/1985	10/1992										✓		✓		
S 39	Ellwood Odor – Venoco	PSD	01/2000	Active										✓		✓	✓	✓
S 40	Venoco – Meteorological	PSD	11/1999	Active						✓				✓		✓	✓	✓
S 41a	West Campus – ARCO Site 2	PSD	12/1985	10/1987	✓	✓	✓		✓		✓	✓	✓		✓		✓	
S 41b	West Campus – Exxon Site 10	PSD	06/1988	07/1998	✓	✓	✓		✓	✓	✓	✓	✓		✓		✓	
S 41c	West Campus - Venoco	PSD	08/1998	Active			✓		✓	✓				✓		✓	✓	✓

**TABLE 2-2**  
**AIR QUALITY MONITORING STATIONS - OPERATIONAL STATUS AND PARAMETERS MEASURED**

	SITE	TYPE	START	END	PARAMETERS MONITORED (✓)													
					O <sub>3</sub>	NO <sub>2</sub>	SO <sub>2</sub>	CO	THC	H <sub>2</sub> S	TSP	PM <sub>10</sub>	ROC	WS	VWS	WD	AMT	TRS
S 42	Ocean Road – ARCO Site 1	PSD		10/1987	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	
S 43	<b>Goleta</b>	<b>SLAMS</b>	<b>Pre-1980</b>	<b>Active</b>	✓	✓	✓	✓						✓		✓	✓	
S 44	Cathedral Oaks	SLAMS	Pre-1980	10/1982	✓													
N 45	<b>Paradise Road</b>	<b>PSD</b>	<b>01/1986</b>	<b>Active</b>	✓	✓								✓	✓	✓	✓	
S 46a	Santa Barbara – State Street	SLAMS	Pre-1980	01/1983	✓	✓	✓	✓	✓		✓			✓		✓		
S 46b	Santa Barbara – Canon Perdido	SLAMS	02/1983	06/1988	✓	✓	✓	✓	✓		✓							
S 46c	Santa Barbara – West Carrillo	SLAMS	06/1988	Active	✓	✓	✓	✓			✓	✓		✓		✓	✓	
S 47	<b>Carpinteria</b>	<b>PSD</b>	<b>09/1985</b>	<b>Active</b>	✓	✓								✓	✓	✓	✓	
S 48	<b>Santa Rosa Island</b>	<b>SLAMS</b>	<b>03/1996</b>	<b>Active</b>	✓									✓		✓		
S 49	ARCO – Platform Holly	PSD	08/1986	11/1987										✓	✓	✓	✓	

PARAMETERS

O<sub>3</sub> Ozone  
 NO<sub>2</sub> Nitrogen Dioxide  
 SO<sub>2</sub> Sulfur Dioxide  
 CO Carbon Monoxide  
 THC Total Hydrocarbon  
 H<sub>2</sub>S Hydrogen Sulfide  
 TSP Total Suspended Particulate

PARAMETERS

PM<sub>10</sub> Particulate Matter (less than 10. microns)  
 ROC Reactive Organic Compounds  
 WS Wind Speed  
 VWS Vertical Wind Speed  
 WD Wind Direction  
 AMT Ambient Temperature  
 TRS Total Reduced Sulfur

NOTES

Active - Operational as of October 2001  
 S - station located in south county  
 N - station located in north county  
 SLAMS - state and local air quality monitoring station  
 PSD - prevention of significant deterioration station  
 ERF - Environmental Research Foundation

**Table 2-3**

**Design Value Report for Monitoring Stations in Santa Barbara County  
Federal 8-Hour Ozone Standard  
1997-1999**

<b>Station Name</b>	<b>1997 4<sup>th</sup> High</b>	<b>1998 4<sup>th</sup> High</b>	<b>1999 4<sup>th</sup> High</b>	<b>Average</b>
<b>PSD STATIONS (ppb)</b>				
<b>Carpinteria</b>	73 05/16/97:11	69 09/11/98:10	65 07/08/99:11	69
<b>GTC B</b>	63 09/29/97:10	63 08/30/98:09	63 10/24/99:11	63
<b>Lompoc HS&amp;P</b>	71 05/16/97:11	68 10/06/98:10	72 04/16/99:13	70
<b>Paradise Road</b>	81 08/05/97:10	86 04/21/98:11	79 04/17/99:10	82
<b>Exxon 1</b>	62 11/05/99:11	82 08/10/98:11	74 04/18/99:13	78
<b>VAFB STS</b>	63 09/28/97:14	66 04/21/98:18	67 10/19/99:12	65
<b>SLAMS STATIONS (ppb)</b>				
<b>El Capitan</b>	68 05/15/97:10	62 10/13/98:10	62 11/05/99:11	64
<b>Goleta</b>	74 09/23/97:10	63 10/11/98:09	61 04/17/99:10	66
<b>Lompoc H Street</b>	64 03/16/97:09	57 10/21/98:10	63 10/23/99:11	61
<b>Santa Barbara</b>	66 03/15/97:09	62 04/22/98:15	60 07/11/99:09	62
<b>Santa Maria</b>	58 11/01/97:13	49 03/10/98:21	52 03/28/99:23	53
<b>Santa Ynez</b>	70 05/16/97:12	67 08/03/98:10	66 07/12/99:09	67

**Table 2-4**

**Design Value Report for Monitoring Stations in Santa Barbara County  
Federal 1-Hour Ozone Standard  
1997-1999**

<b>Station Name</b>	<b>1<sup>st</sup> (Date:Hr)</b>	<b>2<sup>nd</sup> (Date:Hr)</b>	<b>3<sup>rd</sup> (Date:Hr)</b>	<b>4<sup>th</sup> (Date:Hr)</b>
<b>PSD STATIONS (ppb)</b>				
<b>Carpinteria</b>	122 10/10/99:14	113 09/29/97:13	108 09/28/97:16	108 08/29/98:12
<b>GTC B</b>	95 09/23/97:14	92 04/21/98:16	90 10/10/99:16	88 07/18/98:15
<b>Lompoc HS&amp;P</b>	100 04/21/98:15	94 09/23/97:15	89 09/24/97:00	88 10/10/99:15
<b>Paradise Road</b>	125 04/22/98:13	116 07/17/98:14	110 07/18/98:17	107 08/14/98:15
<b>Exxon 1</b>	137 09/23/97:21	135 10/10/99:14	130 04/21/98:15	108 08/30/98:18
<b>VAFB STS</b>	95 10/10/99:13	90 09/23/97:23	88 05/16/97:14	85 09/28/97:14
<b>SLAMS STATIONS (ppb)</b>				
<b>El Capitan</b>	99 04/21/98:14	88 10/10/99:13	87 09/28/97:16	84 05/16/97:13
<b>Goleta</b>	103 10/10/99:14	95 04/21/98:16	94 08/29/98:14	91 09/28/97:13
<b>Lompoc H Street</b>	80 04/21/98:16	78 10/10/99:14	77 11/05/99:14	77 10/28/97:15
<b>Santa Barbara</b>	98 10/10/99:13	98 09/28/97:14	98 09/23/97:14	94 04/21/98:16
<b>Santa Maria</b>	73 04/21/98:15	70 10/10/99:14	69 10/28/97:13	68 10/29/97:12
<b>Santa Ynez</b>	104 07/18/98:15	99 08/07/97:12	98 04/21/98:14	90 08/22/99:15
<b>Santa Rosa Island</b>	93 04/16/99:21	82 04/17/99:21	82 10/06/98:23	81 09/28/97:12

**Table 2-5**

**1990 Clean Air Act Amendment Attainment Target Dates**

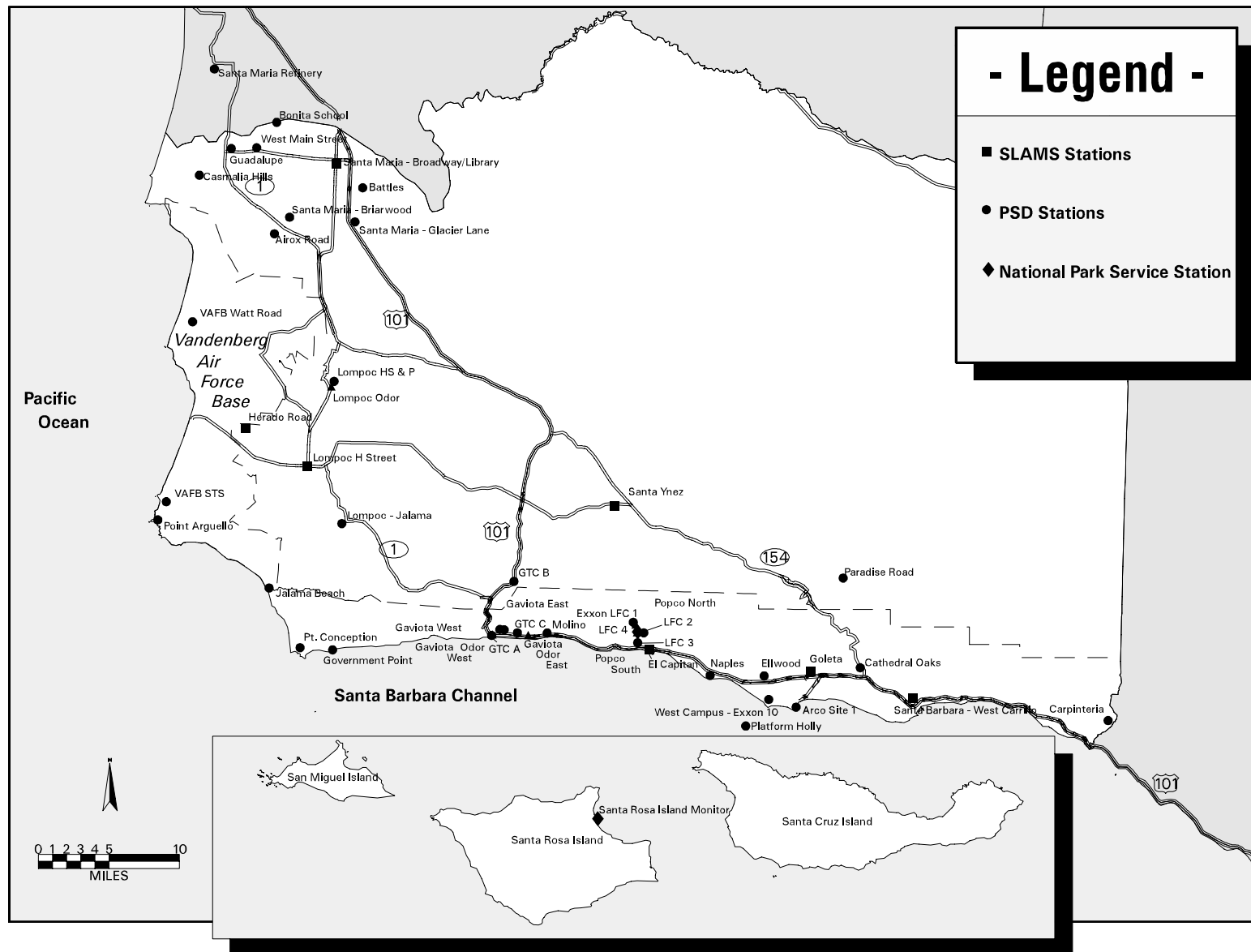
<b>AREA CLASS</b>	<b>DESIGN VALUE*</b>	<b>ATTAINMENT TARGET DATE</b>
Marginal	0.121 up to 0.138	3 years after enactment (1993)
Moderate	0.138 up to 0.160	6 years after enactment (1996)
Serious**	0.160 up to 0.180	9 years after enactment (1999)
Severe	0.180 up to 0.280	15 years after enactment (2005)
Extreme	0.280 and above	20 years after enactment (2010)

\* The design value is measured in parts per million (ppm).

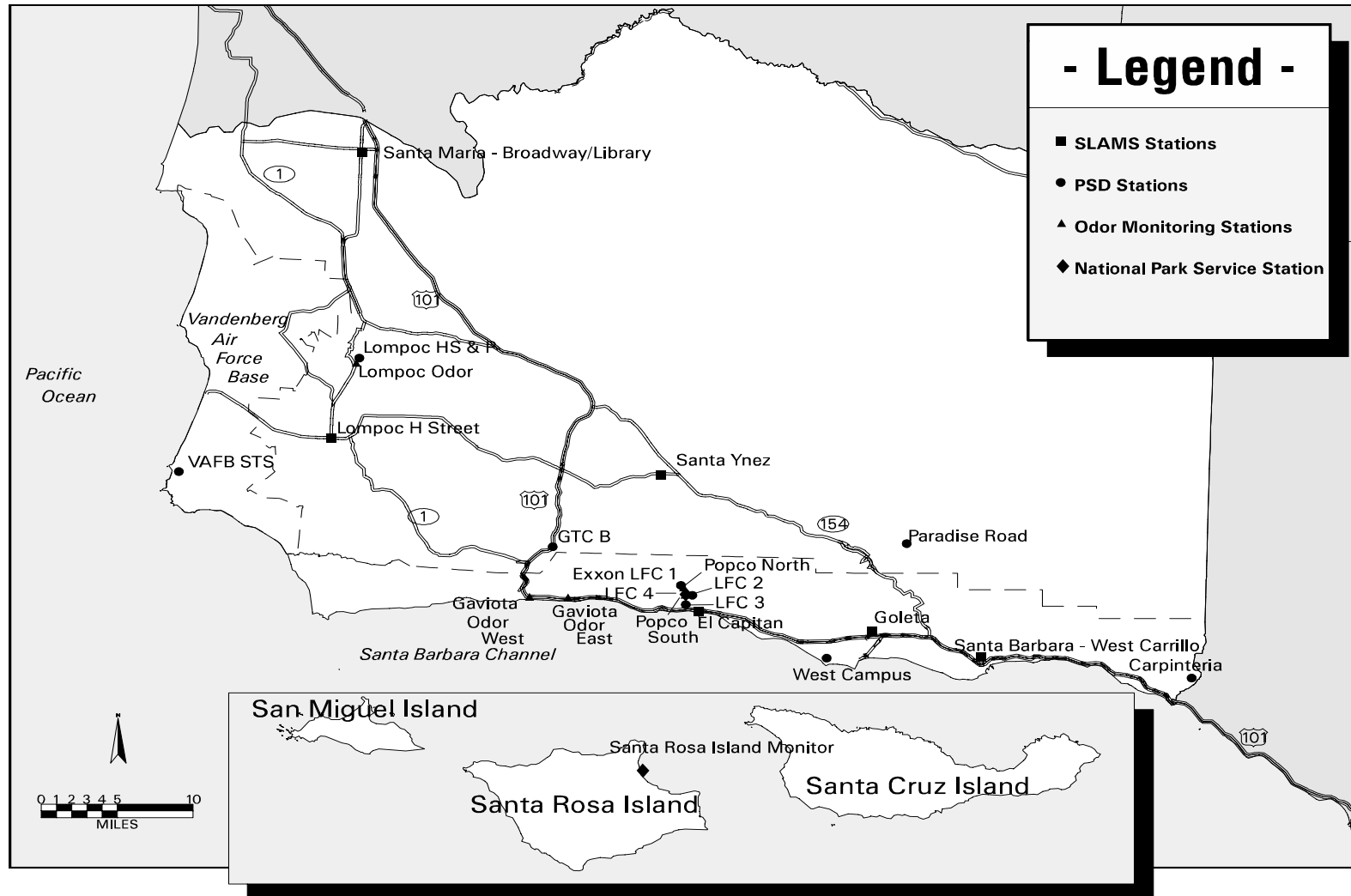
\*\* This is Santa Barbara County's revised classification.



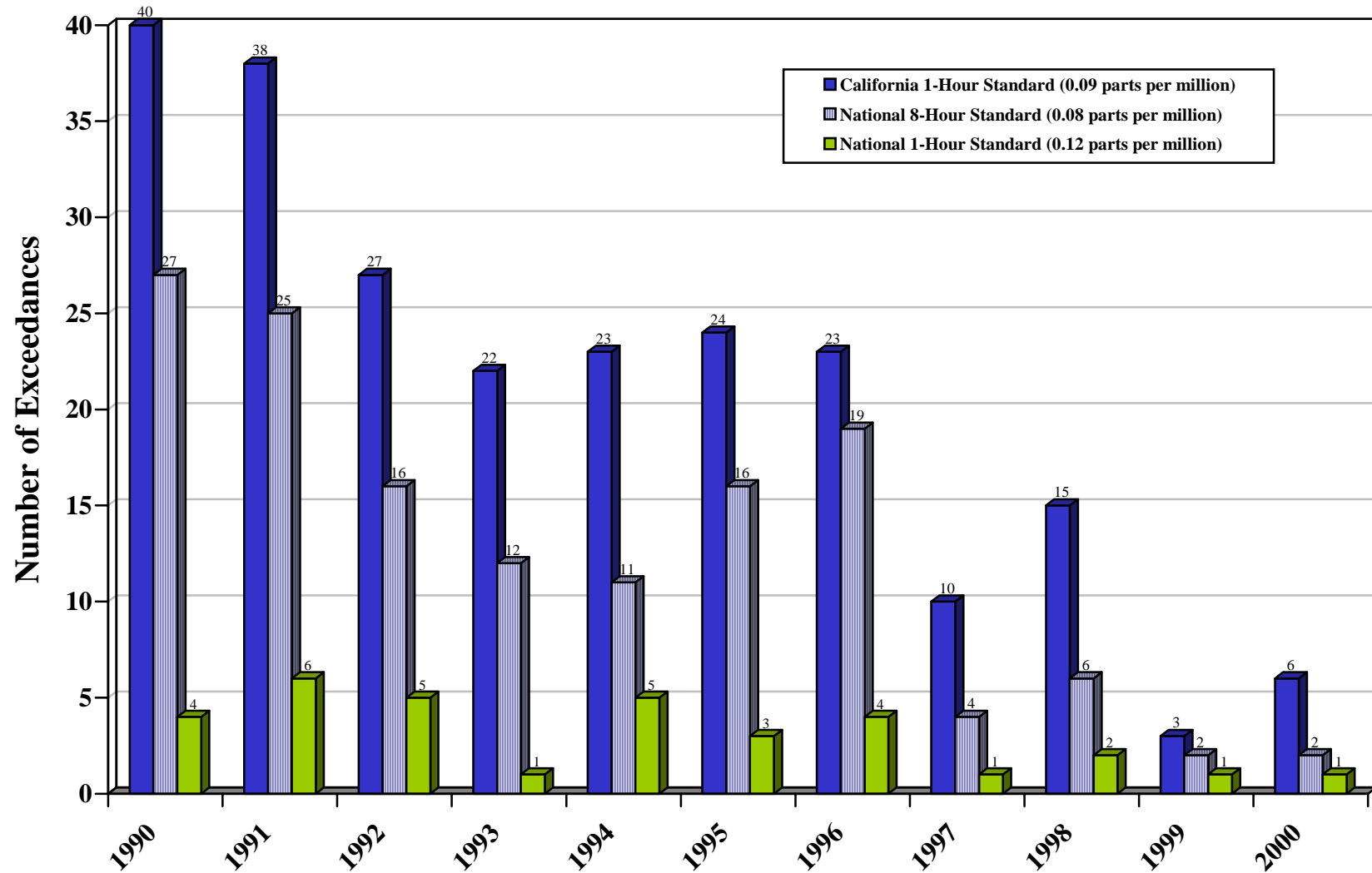
**Figure 2-1**  
**Past and Present Air Quality Monitoring Stations**



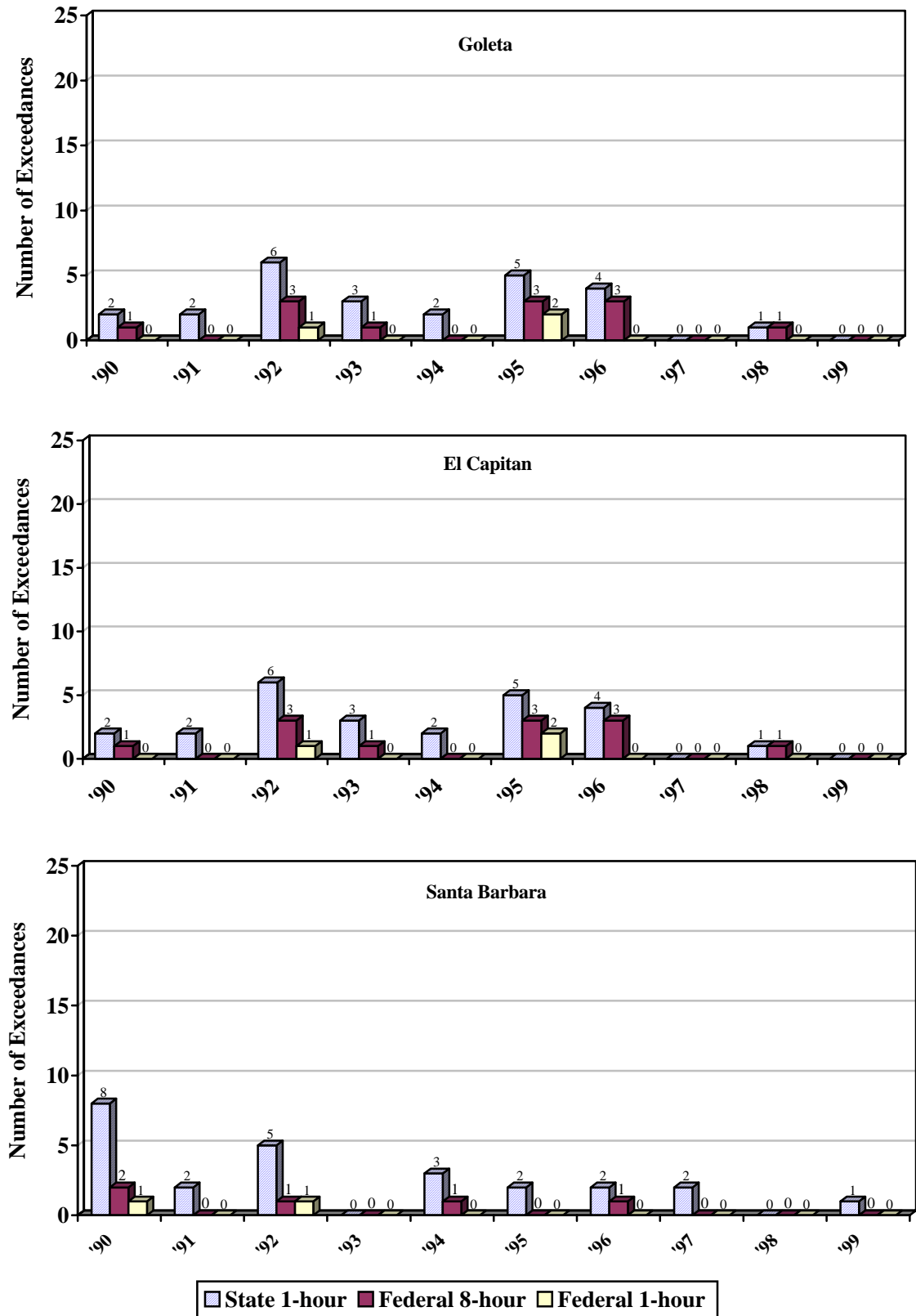
**Figure 2-2**  
**Current Air Quality Monitoring Stations**



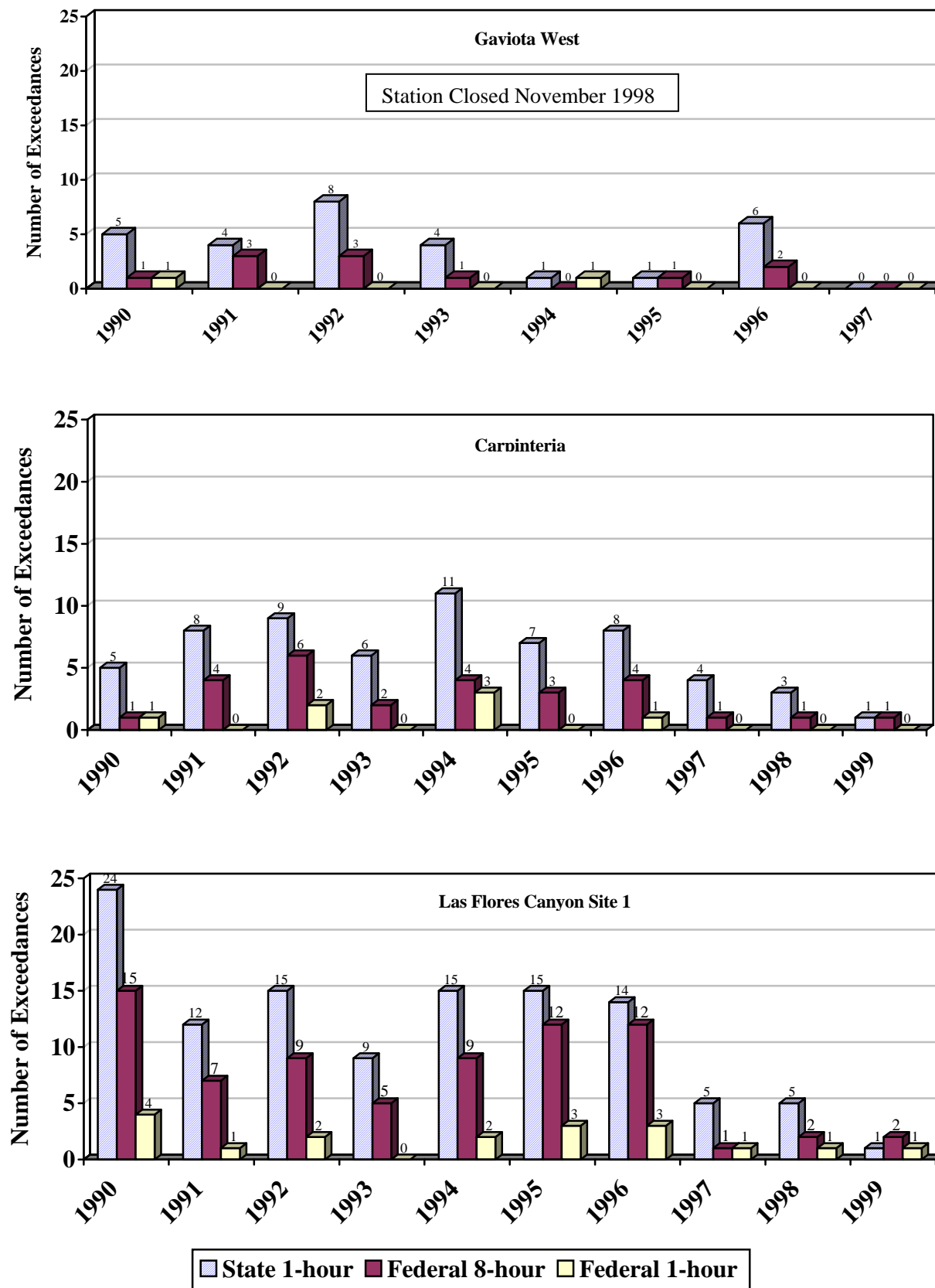
**Figure 2-3**  
**Days Exceeding Ozone Standards in Santa Barbara County**  
**1990-2000**



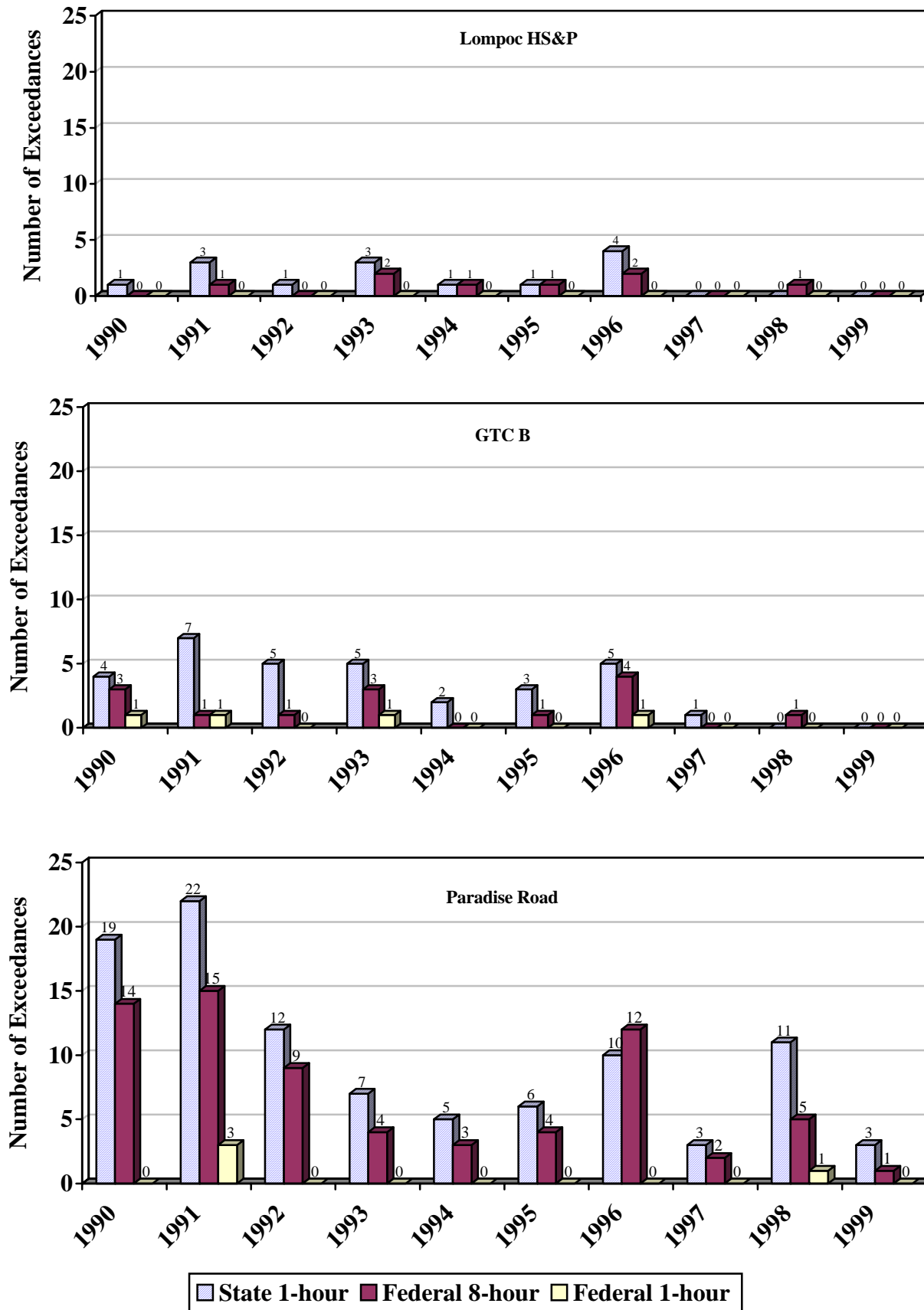
**Figure 2-4**  
**Station-by-Station Ozone Standard Exceedances**  
**SLAMS Stations 1990-1999**



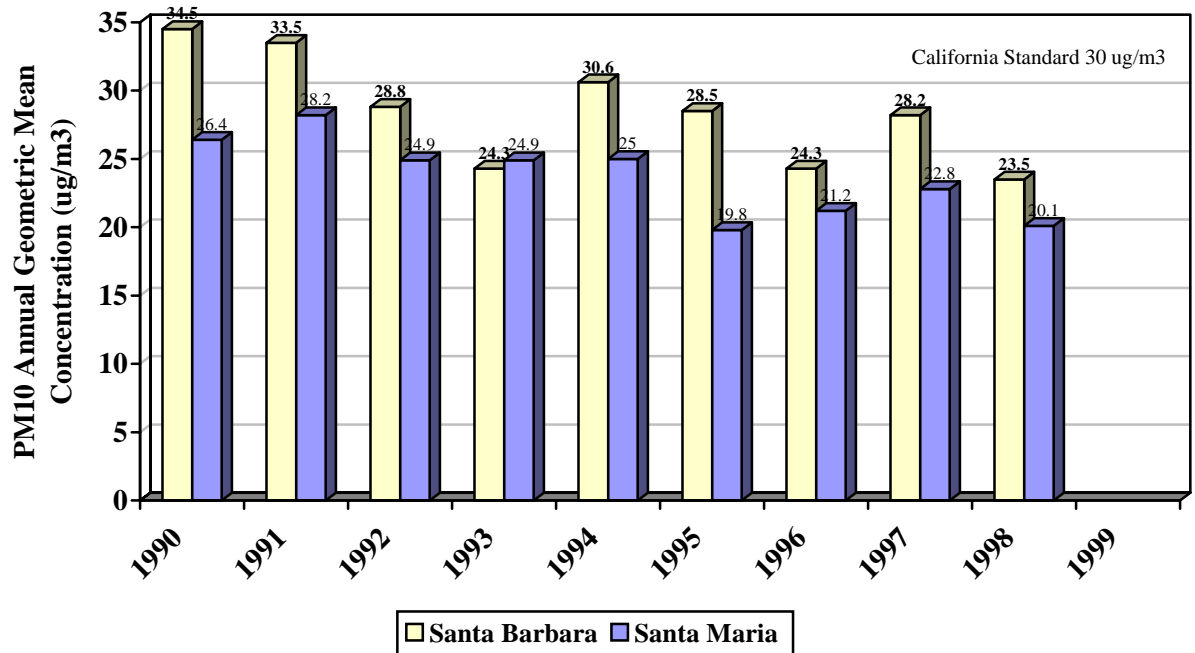
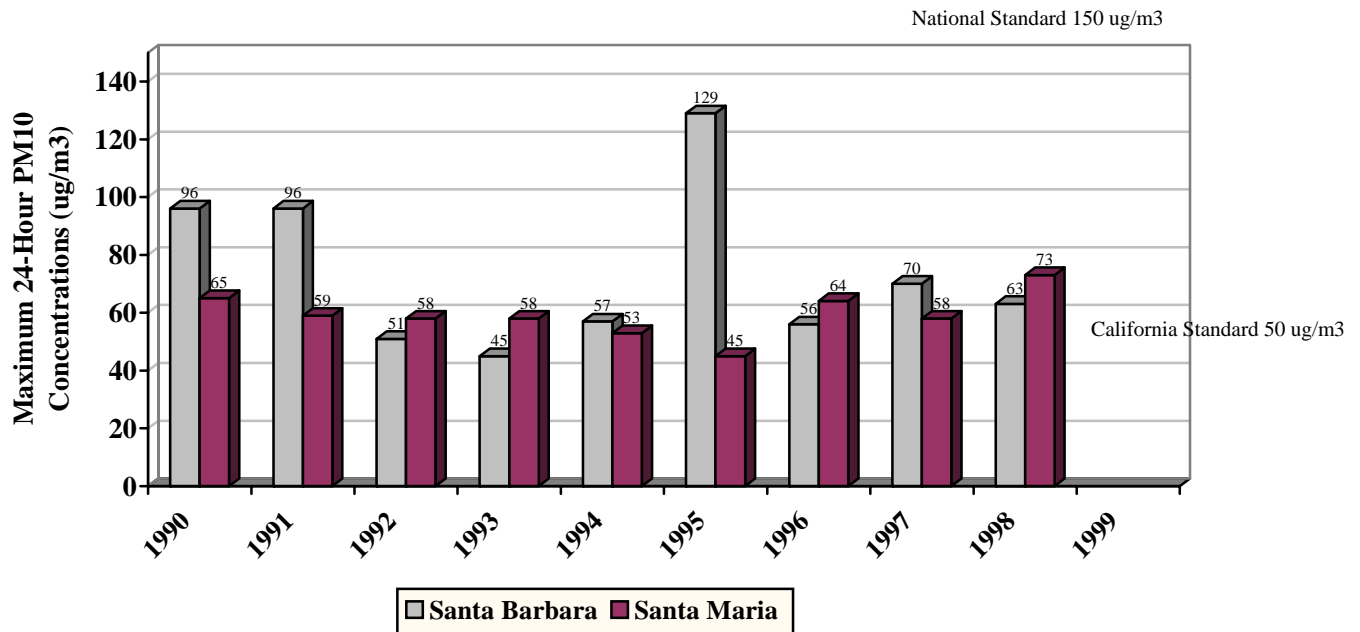
**Figure 2-5**  
**Station-by-Station Ozone Standard Exceedances**  
**PSD Stations 1990-1999**



**Figure 2-5 continued**  
**Station-by-Station Ozone Standard Exceedances**  
**PSD Stations 1990-1999**



**Figure 2-6**  
**Maximum 24-Hour Average and**  
**Annual Geometric Mean PM<sub>10</sub> Concentrations**  
**For Santa Barbara and Santa Maria 1990-1999**



**Figure 2-7**

**Annual Arithmetic Mean PM<sub>10</sub> Concentrations  
At Santa Maria 1990-1999**

