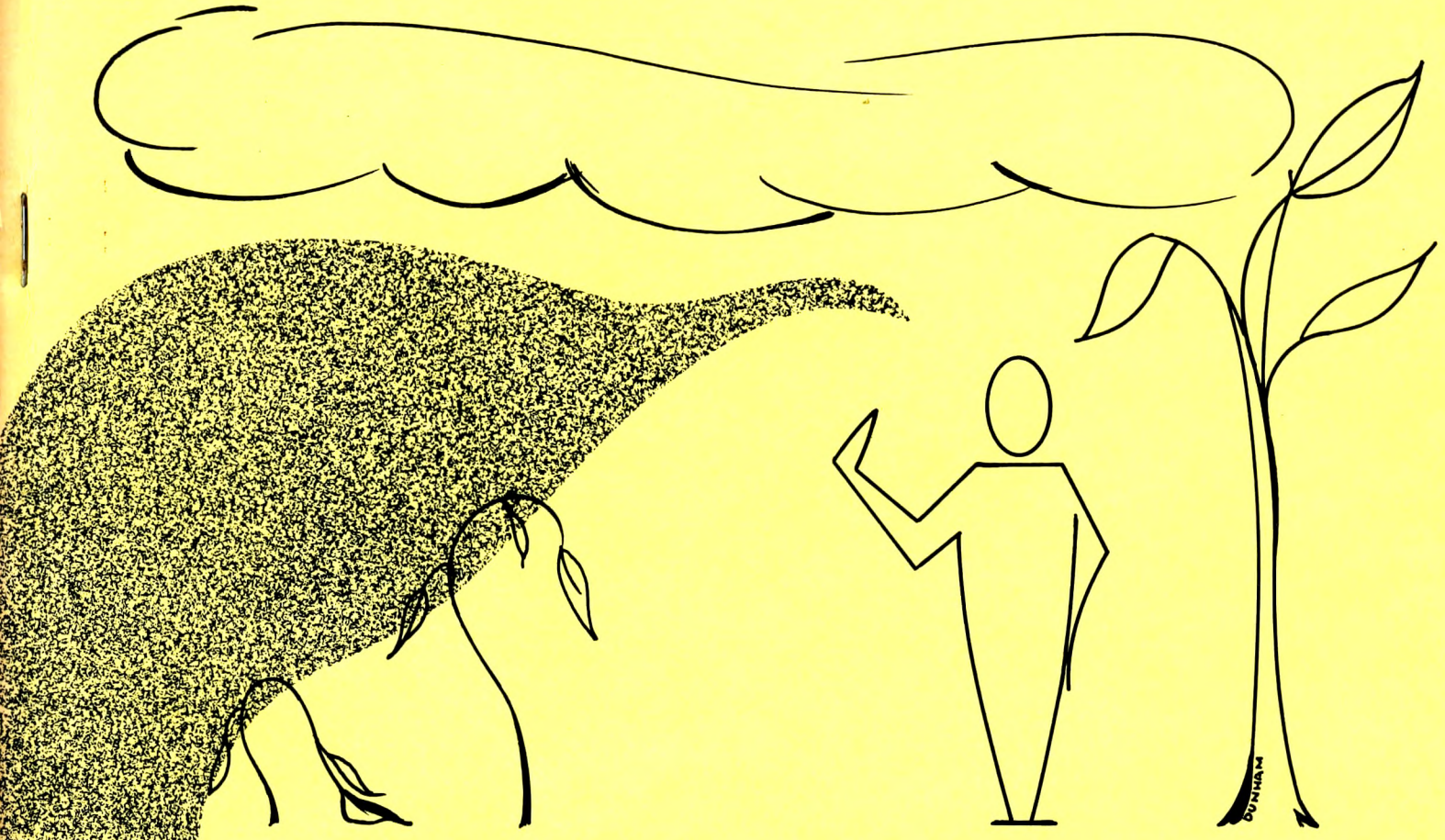


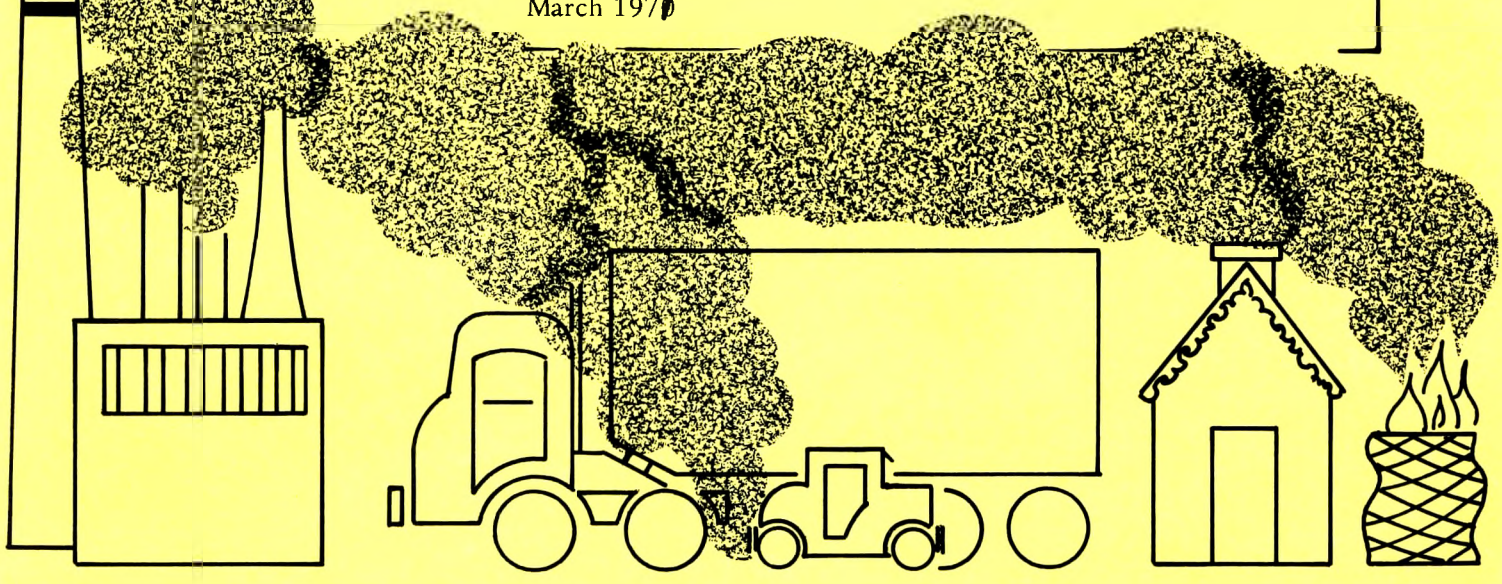
AIR POLLUTION IN VENTURA COUNTY

• SOURCES • WEATHER • EFFECTS • REMEDIAL ACTIONS •

ENVIRONMENTAL COALITION

P. O. Box 68, Ventura, California 93001

March 1970



The Air Pollution Committee of the Environmental Coalition is composed of both professional and lay people. All members of the Coalition are welcome to join and participate in its activities. This report was written by a working group of the Committee:

- Newton Friedman, M.D. — work-group chairman; internist specializing in diseases of the heart and lungs and conducting cardiologic research
- Richard W. Drisko, Ph.D. — research chemist and past chairman of the National Association of Corrosion Engineers Western Regional Division
- Peter J. Hearst, Ph.D. — research chemist and past chairman of the Sierra Club Council
- Duane A. Lea — atmospheric physicist and member of the Ventura County Air Pollution Control Advisory Committee
- Roger A. Helvey — research meteorologist
- Philip C. White — mechanical engineer with experience in developing combustion devices
- Mrs. Bernard Blat — conservationist

ABSTRACT

Air pollution is a present problem in Ventura County and threatens to become worse as a consequence of increasing population and industrial growth. The five important types of pollutants are carbon monoxide, organic compounds, oxides of nitrogen, particulates, and sulfur dioxide. While the automobile is the chief source of these pollutants, steam power plants, incineration, the petroleum industry, and agriculture make significant contributions.

Weather is a very important factor in the build-up or dispersion of air pollutants. The inversion condition that prevails in Ventura County most of the summer and much of the winter acts as a lid to retain pollutants.

Threshold values of pollutant concentrations have been established above which adverse effects on human health and on crops can be expected. These pollutants have also been shown to abrade, corrode, tarnish, soil, erode, crack, weaken, and discolor materials of all kinds.

Recommendations are made for new rules for the Ventura County Air Pollution Control District and for other methods for improving air quality in Ventura County.

The major air pollution sources in Ventura County and their relative contributions in each category are shown in Table 1. Motor vehicles appear as the number one source of all pollutants. They account for 95% of the reactive hydrocarbons and for over half of the oxides of nitrogen. The major stationary source of oxides of nitrogen is the steam power plant at Mandalay Beach, which, at almost 13 tons/day, is responsible for about 20% of the County total. This amount is due to rise sharply in the next few years when the two additional steam units now under construction at Ormond Beach go into operation. Substantial quantities of sulfur dioxide will also be released by these plants during periods when natural gas is unavailable and fuel oil is burned.

It is important to note that the tonnage figures for each type of pollutant do not reflect their relative effects. For example, the 1-hour concentration specified by the California Department of Public Health as a "serious level" for carbon monoxide is 40 ppm (parts per million), while that for nitrogen dioxide is 0.25 ppm, more severe by 160 times. Also, nitrogen dioxide is a key component in the photochemical reactions that produce smog, while carbon monoxide is believed to have no appreciable effect in the production of smog. Another point to remember is that while motor vehicles constitute the greatest source of each pollutant, the amounts from other sources are quite significant, since concentrations may be quite high in the vicinity or downwind of a source, and a number of small sources may bring concentrations of a pollutant above a critical level.

INFLUENCES OF WEATHER ON POLLUTION

Physically speaking, there are two fundamental factors in the creation of a pollution problem. One is the rate at which contaminants are emitted into the air; the other is the rate at which these contaminants are subsequently diluted or otherwise reduced in concentration. On a global scale, there is considerable concern that climatic alterations are now, or may be in the future, occurring because of man-made air pollution. Although huge, the gaseous envelope surrounding the earth is finite and is becoming more polluted because of the limited ability of the natural cleansing processes, such as rainfall, to remove the ever increasing contamination.

On a smaller scale, the dispersive capabilities of the atmosphere are very important in determining the concentration of air pollution in a given region. Dispersion of a cloud of pollutants (and thereby reduction of concentrations) takes place when turbulence mixes and dilutes them with the relatively clean surrounding air. Wind speed is an important factor, because

Table 1. Ventura County's Air Pollutants and Their Sources in 1968

Pollutant	Daily Tonnage	Source*	Percentage of Total
			0 10 20 30 40 50 60 70 80 90 100
Carbon monoxide, CO	496	Incineration	2.3
		Agriculture	0.5
		Motor vehicles	95.8
		Aircraft	0.6
		Ship and rail	0.8
Organic compounds	128	Petroleum	2.1
		Organic solvents	5.3
		Incineration	4.4
		Fuel combustion	0.3
		Agriculture	5.1
		Motor vehicles	71.8
		Aircraft	0.5
		Ship and rail	0.8
Oxides of nitrogen, NO_x	64	Petroleum	13.2
		Incineration	2.4
		Fuel combustion	27.5
		Agriculture	0.2
		Motor vehicles	52.7
		Aircraft	0.9
		Ship and rail	3.1
Particulates	14	Petroleum	1.4
		Mineral	23.2
		Incineration	14.8
		Fuel combustion	4.9
		Agriculture	15.5
		Motor vehicles	31.0
		Aircraft	4.9
		Ship and rail	4.2
Sulfur dioxide, SO_2	4	Petroleum	31.6
		Agriculture	10.5
		Motor vehicles	52.6
		Ship and rail	5.3

* Note: Sources of pollutants (from State of California Air Resources Board)

Stationary
- Petroleum—production, refining, marketing
- Organic solvents—surface coating, dry cleaning, degreasing
- Incineration—open burning (dumps and backyards) and incinerators
- Fuel combustion—steam power plants, industrial, domestic and commercial
- Agriculture—debris burning, orchard heating, processing

Mobile
- Motor vehicles—gasoline (exhaust, blow-by, evaporation) and diesel
- Aircraft—jet and piston

air turbulence is greater with greater speeds. Also, the more rapid the flow past the pollution source, the greater the ventilation rate and the volume of air into which the pollution is being dispersed.

Another basic factor affecting dispersion is what meteorologists call "stability." In the atmosphere a warm air mass atop a cool air mass represents a stable condition which restricts vertical motion. The lower cool air is heavier and resists displacement or mixing into the warm air above. With such a condition the atmosphere is stratified in layers like fluids of different density in a container. The layer in the atmosphere where the temperature increases with height is known as an "inversion," because it represents a reversal or inversion of the normal decrease of temperature with height. Pollution released into an air mass below an atmospheric inversion largely remains confined to that air mass, allowing a buildup of contaminants.

In Southern California, the prevailing weather is such that the above condition acts to aggravate atmospheric contamination most of the time. Our famous moderate climate results from our location on the eastern edge of the Pacific Ocean, usually far south of storm tracks except in winter and spring. Thus, frontal passages followed by fresh air masses which completely flush out pollution are uncommon except during the wet season.

Coastal winds are usually controlled by day-night variations in the temperature difference between sea and land. These variations arise from the greater thermal inertia and slower temperature response of ocean surfaces to radiative heating or cooling as compared to land surfaces. The resultant alternation between onshore and offshore flow is called the sea breeze (daytime) and the land breeze (nighttime), respectively. The sea breeze normally carries much of the pollution away to the east, but this is partially offset by the nighttime land breeze which blows some of it a short distance out to sea. This stale air then returns with the next sea breeze, compounding the effect of pollutants emitted over the coastal plains.

Atmospheric stability increases enormously the pollution problem west of the coastal mountains in Southern California. The ocean off this area is covered by a cool marine air layer from several hundred to a few thousand feet in thickness, which in turn is overlain by warm, dry air. The marine layer is present over the coastal regions about 80% of the time (50% in winter and 99% in summer) and averages about 1,000 feet in depth over the southern half of Ventura County. The upward escape of contaminants through the temperature inversion separating the two air layers is severely limited.

Topography in Southern California also has a generally adverse influence on pollution. The cool marine air mass resists being lifted over the mountains between the coast and desert, thus reducing the ventilation provided by the sea breeze. Furthermore, the prevailing northwest winds that blow over the ocean west of California have difficulty in rounding the bend in the coastline at Point Arguello and in surmounting the Santa Ynez Mountains to the east. Because of this, a stagnant circulation tends to develop in the region downwind.

Weather conditions that decrease the thickness of the marine layer or decrease the sea breeze ventilation bring about seiges of smog. Some of the worst pollution near the coast prevails before or after periods of Santa Ana winds (strong east winds), which occur frequently in the late fall or winter. Offshore winds blow aloft but do not extend down to the surface at the coast, and abnormally low inversion heights and sluggish, recirculating winds occur in the lee (west) of the coastal mountains. Wind direction has an important influence on pollution levels in Ventura County. On many days there is a drift of smog into Ventura County from the Los Angeles Basin. Some of it enters the Thousand Oaks area by way of the San Fernando Valley and Malibu Canyon, and some other comes up the coast by way of Point Mugu. It is not yet known, however, to what extent this contributes to "background" pollution levels experienced locally.

EFFECTS OF POLLUTION ON HUMAN HEALTH

In 1968, the California Department of Public Health compiled from medical literature data which demonstrated threshold concentration levels for individual atmospheric pollutants that would cause measurable adverse effects on human health. These threshold levels were adopted by the Ventura County Air Pollution Control District and the State of California Air Resources Board as *air quality standards.* Pollutant concentrations must be maintained below these levels in order to prevent adverse health effects.

The air quality standards and the epidemiologic consequences of exceeding them are listed in Table 2. The air quality standards for oxidants (including ozone), particulate matter, and nitrogen oxides have been exceeded in various parts of the County as demonstrated by APCD measurements this past year. The levels of sulfur dioxide measured in Oxnard in 1965-1966 approached the air quality standard. The daily peak averages at that time were approximately two thirds of the air quality standard. Only two monitoring stations have been in operation for measuring carbon monoxide, and they have not recorded values exceeding the standard. One would expect the highest carbon monoxide concentrations to be along roadways that are congested with vehicular traffic. A summary of the air quality monitoring data for oxidant and nitrogen dioxide is included in Figures 1 through 4.

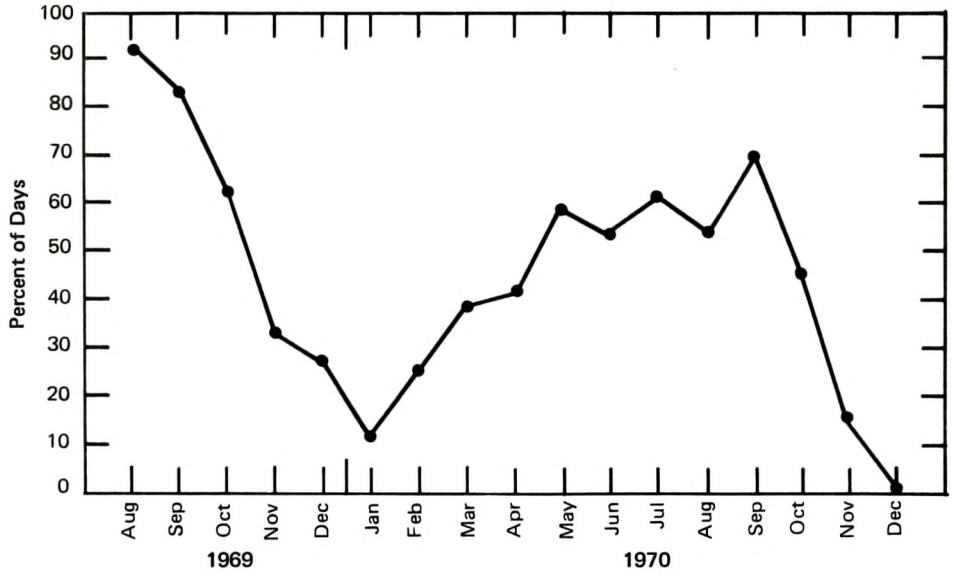


Figure 1. Percent of days oxidant level exceeded state standards as measured at Camarillo Station.

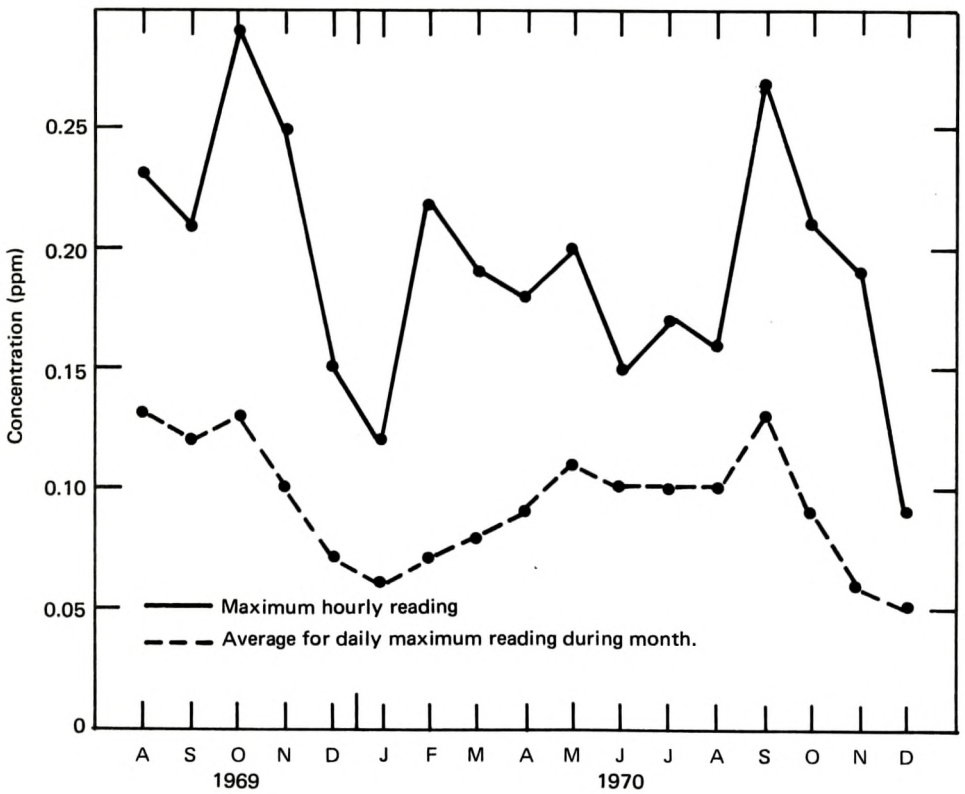


Figure 2. Oxidant concentration measured at Camarillo Station.

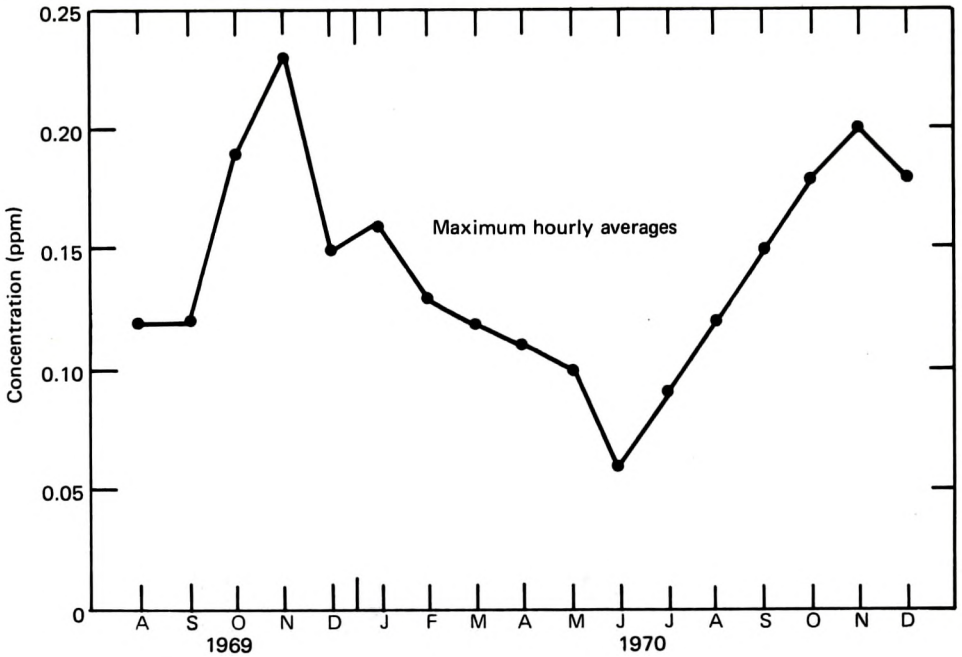


Figure 3. Nitrogen dioxide concentrations measured at Camarillo Station.

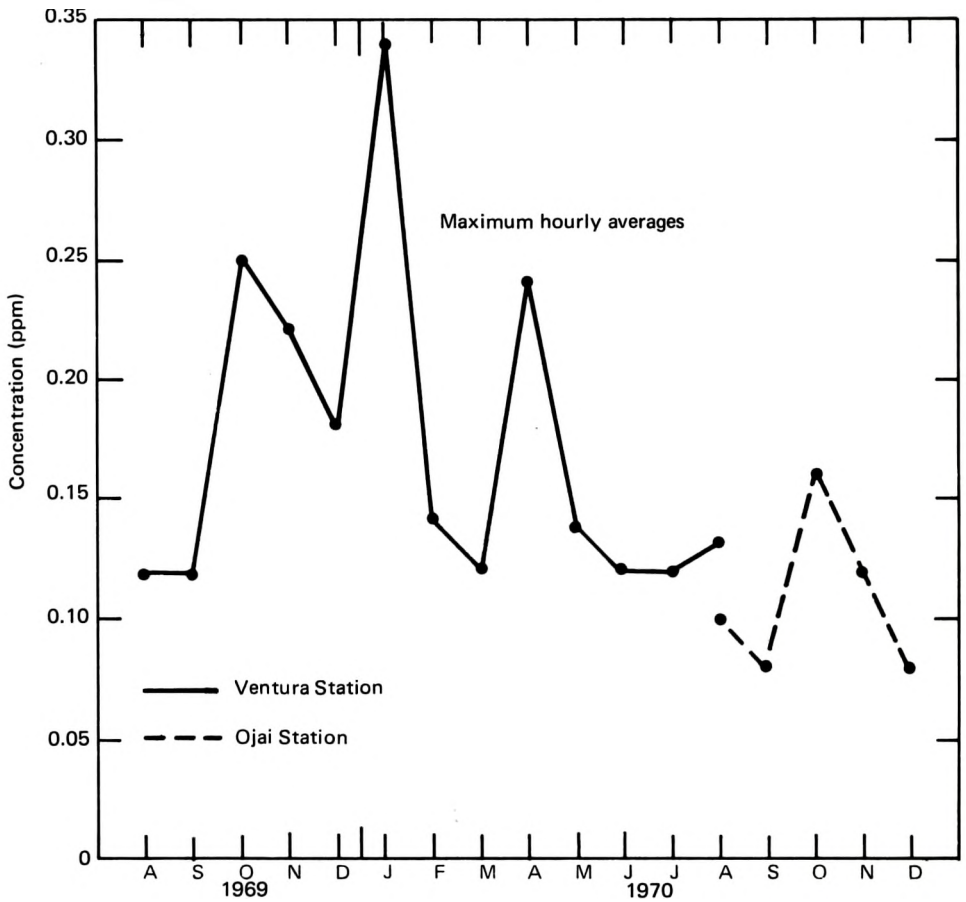


Figure 4. Nitrogen dioxide concentrations measured at Ventura Station and Ojai Station.

Table 2. Air Quality Standards in Relation to Ventura County

Pollutant	Air Quality Standard[a]	Adverse Health Effects[b]	Remarks
Oxidant (including ozone)	0.10 ppm, 1 hour	Acute deterioration of lung function[1]; worsening of asthma[2]	Almost half of the days exceeded standards (in Camarillo)
Sulfur dioxide, SO_2	0.5 ppm, 1 hour 0.04 ppm, 24 hours	Respiratory symptoms, impaired lung function in children, mortality from influenza and pneumonia; effects difficult to separate from those due to particulate when it is also present[3-7]	0.067-ppm mean daily peak levels, Oxnard, 1965-66. No figures on number of days SO_2 exceeded standards.
Particulates	60 $\mu g/m^3$, 24 hours (annual geometric mean) 100 $\mu g/m^3$, 24-hour sample	Mortality from cardiac and pulmonary disease, increased evidence and severity of chronic lung disease; effects difficult to separate from those due to SO_2 when it is also present[4, 8, 9]	30% of the days that were sampled exceeded standards
Nitrogen dioxide, NO_2	0.25 ppm, 1 hour	Decreased oxygen carrying capacity of blood (extrapolated data from human studies; not definitely known to impair health)[10]; emphysema and increased susceptibility to infection (twice these levels produce emphysema in guinea pigs).[11, 12]	2% of the days exceeded standards in Ventura
Carbon monoxide, CO	40 ppm, 1 hour 10 ppm, 12 hours	Impaired oxygen capacity of blood, increased auto accidents, possible increased fatality from heart attacks.[13-16]	Over a 17-month period the monthly maxima ranged from a high of 0.96 ppm in June 1970 to a low of 0.23 ppm in November 1969.

[a] State of California and Ventura County (Nov-Dec 1970).

[b] Epidemiologic population studies and/or studies on individuals undergoing acute exposure; effects are for acute or chronic exposure at the threshold level given for the air quality standard with exceptions noted in table.

It may take time to detect the adverse effects of air pollutants on human health just as it does to detect side effects from newly released drugs. Because many adverse effects are cumulative and irreversible, it may be too late to prevent disease or early death in some human subjects once these levels are exceeded. Improvements in local air quality are mandatory if a possible public health problem is to be avoided in Ventura County.

EFFECTS OF POLLUTION ON VEGETATION

Air pollutants have long been known to cause damage to vegetation.[17-19] This damage has been shown not only by field observations, but also by extensive laboratory experimentation. Gaseous pollutants cause much more damage than do particulates (e.g., soot, dust, etc.). Gases known to cause plant damage include ozone, peroxyacetyl nitrate (PAN), nitrogen dioxide, sulfur dioxide, hydrogen flouride, ethylene, and chlorine. These gases cause damage by destroying plant chlorophyll, thus inhibiting the photosynthesis required for production of plant food. Combinations of air pollutants (e.g., ozone and sulfur dioxide) may have synergistic effects that cause more severe plant damage than either pollutant alone. Interactions even at low concentrations can cause injuries that are not readily apparent. Such injuries may appear as growth suppression, dwarfing, or delayed maturation.

Various plant species differ widely in their sensitivity to specific air pollutants. Thus injuries to particular plants may be a very good method of detecting these pollutants. One variety of tobacco is a good ozone detector; pinto beans, a good PAN detector; petunias, a good total oxidant detector; dahlias and petunias, good sulfur dioxide detectors; and gladiolas, a good fluoride accumulation detector.

Some of the specific effects of individual pollutants found in Ventura County are described in Table 3.

Plant damage from air pollutants has been reported in at least 27 states and numerous foreign countries. Resultant agricultural losses in the United States are estimated at $500,000,000 annually. Crop damage in California alone is estimated to cost $132,000,000 with a 50% loss in citrus fruit. No estimates have been made of the losses from suppression of growth, delayed maturation, and reduction in yield.

In 1969, Southern California suffered an estimated $39.5 million smog damage to crops. (In the nine counties surrounding San Francisco Bay, such losses were placed at $5 million.) Hardest hit was the citrus industry which suffered a $33.5 million loss. Other major crop losses included:

Table 3. Specific Effects of Pollutants on Plants

Pollutant	Source	Damage Symptoms	Injury Threshold
Ozone	Results from reactions of oxygen in the air with hydrocarbons and nitrogen oxides.	Fleck, stipple, bleaching of pigmentation, growth suppression; tips of conifers become brown and necrotic.	0.03 ppm
Peroxyacetyl nitrate (PAN)	Results from reactions of oxygen in the air with hydrocarbons and nitrogen oxides.	Glazing, silvering, or bronzing on lower surface of leaves.	0.01 ppm*
Nitrogen dioxide	Results mostly from fuel combustion in vehicles, power plants, and other stationary plants.	Irregular white or brown collapsed lesions on leaves.	2.5 ppm
Sulfur dioxide	Results mostly from fuel combustion in vehicles and stationary plants.	Bleached areas, chlorosis, growth suppression, early abscission, reduction in yield.	0.3 ppm

* Especially sensitive because PAN is highly toxic to many species of plants.

Grapes	$935,000
Beans	826,000
Alfalfa	500,000
Celery	387,000
Tomatoes	270,000
Sweet Corn	163,000

Pine trees are especially vulnerable to ozone damage. Such damage has been extensive in the Lake Arrowhead area, extending more than 200 miles northward into the Sierra Nevadas and affecting pines at altitudes of 6,000 feet in the mountains east of Fresno.

Agriculture is a big commodity in Ventura County. The total value of its crops in 1969 was $170.7 million. A partial breakdown of this total is as follows:

Fruit and nut crops	$86.6 million
Vegetable crops	44.2 million
Livestock and poultry	24.7 million
Field crops	5.2 million
Dairy crops	3.6 million

Citrus crops, which are especially sensitive to air pollution, contributed nearly $75 million to Ventura County's economy in 1969. Excluding mushrooms and crops grown for seed, the value of vegetable and field crops totaled $45.9 million.

Air pollution damage to crops has been studied in detail in Southern California since the early 1950s. Almost all of the commonly grown crops have been classified as being either sensitive, intermediate, or resistant to damage from pollutants. The following is a partial list of those plants (crops) which have been judged as sensitive to smog damage.[20] Beside each crop name is the total value of that plant or crop produced in Ventura County in 1969.[21]

Crop	Value
Celery	$15,900,000
Tomatoes	9,943,000
Green Cabbage	1,727,000
Spinach	1,002,000
Romaine Lettuce	968,000
Sugar Beets	898,000
Bell Peppers	470,000
Green Chili Peppers	457,000
Parsley	420,000
Pimento Peppers	345,000

Cherry Tomatoes	$228,000
Red Cabbage	54,000
Chards and Greens	42,500
Oats and Barley	37,500
Alfalfa Hay	15,300
Total Value	$32,507,300

These fifteen crops that are classified as sensitive to air pollution damage constitute 70.7% of the total value of vegetable and field crops in Ventura County. Crops classified as intermediate constitute 20.2% of the total, and only 7.5% of the total result from crops judged to be resistant to smog.

No monetary estimate has been reported of crop damage by air pollution in Ventura County, but in 1966 a study[22] was made which determined the amount of damage and type following a severe air pollution period (see Table 4). Presently the air pollution in Ventura County is not thought to be a major crop problem, but the level is expected to increase sharply along with increased population and industrial growth. Unless action is taken now to control this increase, it may soon be impossible to grow the fifteen previously listed sensitive crops and others.

EFFECTS OF POLLUTION ON MATERIALS

It is well established[18] that air pollutants abrade, corrode, tarnish, soil, erode, crack, weaken, and discolor materials of all kinds. Specific pollutants vary greatly in the type and extent of their adverse effects.

Ozone

Ozone oxidizes and thus degrades polymeric materials such as rubber with olefinic unsaturation. Stressed rubber has cracked after less than one hour's exposure to commonly occurring concentrations of ozone. In 1970, ozone pollution added at least $500 million to the purchase price of rubber products in the United States.[23]

Sulfur Dioxide

Sulfur dioxide attacks and destroys even the most durable of materials. It is reported[24] to be the pollutant most corrosive to materials, as well as the most irritating to humans. Steel corrodes two to four times faster in urban

Table 4. Type and Amount of Damage to Plants Following a Severe Air Pollution Episode in Ventura County (After Reference 22)

Plant	Ozone Damage				PAN Damage			
	None	Light[a]	Moderate[b]	Heavy[c]	None	Light[a]	Moderate[b]	Heavy[c]
Petunia		●						●
Beet								
Sugar	●						●	
Table	●							●
Swiss chard	●				●			
Tomato	●							●
Spinach			●			●		
Lettuce								
Butterhead	●					●		
Salad Bowl	●					●		
Bronze (Great Lakes)	●						●	
Cos or Romaine	●							●
Pepper								
Chili	●				●			
Bell	●				●			
Radish		●				●		
Onion		●			●			
Cabbage (Chinese)	●					●		

continued

Table 4. Continued

Plant	Ozone Damage				PAN Damage			
	None	Light[a]	Moderate[b]	Heavy[c]	None	Light[a]	Moderate[b]	Heavy[c]
Orange (Valencia)		●			●			
Lemon		●			●			
Avocado			●		●			
Troyer Citrange			●		●			
Barley	●				●			
Wild Oat	●					●		
Little Leaf Nettle	●							●
Dwarf Meadow Grass		●						●
Cheese Weed		●			●			
Sow Thistle	●						●	
Lambs Quarters	●						●	

[a] Light—One to three leaves of the plant injured; less than 10% of the leaf area covered by lesions. Light damage would not be expected to cause economic loss to crops except possibly in the following two examples: (1) In the case of leafy vegetables, if the timing of the air pollution episode was such that it occurred when the crop was ready for harvest, the wholesaler might downgrade the quality of the crop because of appearance or the grower might incur added expense because he had to remove damaged leaves or portions thereof in special processing. (2) In the case of flower crops, light damage would be expected to adversely affect the retail sales of sensitive plants, such as petunias.

[b] Moderate—Three to six leaves damaged and up to 30% of leaf area affected. Or, fewer leaves damaged and up to 50% of the area affected.

[c] More than six leaves damaged and more than 50% of the area affected. Or, fewer leaves damaged and almost 100% of the area affected.

and industrial areas burning coal and oil than in rural areas. It has been estimated that one-third of the replacement costs of steel rails in England is attributable to sulfur dioxide pollution. It has been shown[25] that the reduced life of zinc is directly related to air containing sulfur dioxide. Electrical equipment manufacturers are forced in some cases to use gold for electrical contacts, because other materials, such as silver and palladium, corrode in sulfur dioxide atmospheres, hampering the passage of electric current. Sulfur dioxide also accelerates the erosion of stone and masonry structures.

Oxides of Nitrogen

The oxides of nitrogen react with water to form various acids of nitrogen and oxygen which are corrosive to metals. Adverse effects of such materials have not been fully documented.

Hydrogen Sulfide

Hydrogen sulfide is slightly acidic and is thus slightly corrosive to metals. Also, it reacts with lead in paints to form a black stain. Thus, lead-pigmented paints are not used where hydrogen sulfide pollution occurs, such as near sewage disposal plants and natural sulfur waters.

Particulates

Particulates, such as soot from smoke stacks or automobile exhausts or dust from grinding or pulverizing plants (e.g., cement plants), not only accelerate the corrosive action of other pollutants, but are also largely responsible for the grime of life. This necessitates more frequent cleaning of clothes, cars, buildings, etc.

No estimate has been made of the extent of damage by air pollutants to materials in Ventura County. It is probably appreciably less than the damage to health and vegetation.

DISCUSSION

Data presented in this report indicate that threshold levels for air pollutants known to produce adverse effects on human health and/or crops have been exceeded in Ventura County. In order to avoid possible

danger to public health, further escalation of air pollutant levels must be prevented. In order to avoid cumulative adverse health effects, a reduction of our present contaminant levels is in order.

The state and federal governments should be assisted by local governments in their attempt to clean up our major sources of pollution. Therefore, several considerations are presented for immediate action:

1. Four rules are proposed for adoption by the Ventura County Air Pollution Control District.
2. Seven recommendations are made for methods of improving the air quality in Ventura County.
3. A policy statement is made on the gathering of information relative to air pollution by the Environmental Coalition.

Proposed Ventura County Air Pollution Control District Rules

Sulfur Content of Fuels. Emissions of oxides of sulfur (measured as sulfur dioxide) from stationary sources must be rigidly controlled to prevent escalation to levels in the atmosphere which would increase the likelihood of impaired human respiratory function and significant damage to crops and materials. The Los Angeles County Air Pollution Control District (LACAPCD) has had its Rule 62 covering sulfur content of fuel in some form since 1959. The rule proposed for the Ventura County Air Pollution Control District (VCAPCD) is the following restatement of LACAPCD's Rule 62:

"A person shall not burn any gaseous fuel containing sulfur compounds in excess of 50 grains per 100 cubic feet of gaseous fuel, calculated as hydrogen sulfide at standard conditions, or any liquid or solid fuel having a sulfur content in excess of 0.5 percent by weight within Ventura County at any time. It shall not be a violation of this rule to burn such fuel for a period not to exceed three calendar days when other fuel which complies with this Rule cannot be used due to accident, strike, sabotage, or act of God."

De-Escalation of Emissions of Oxides of Nitrogen. Control of emissions of oxides of nitrogen (NO_x), measured as nitrogen dioxide (NO_2), from sources existing prior to the passage of VCAPCD Rule 60 should result from a reasonable de-escalation schedule. At a prearranged future time, sources currently exceeding the limits of VCAPCD Rule 60 should comply with its requirements. The following schedule of de-escalation is proposed:

Year	Nitrogen Dioxide Not to Exceed—	
	lb/hr/source	ppm
1970	1,510	250
1972	960	150
1975	600	100

Additional de-escalation should be considered periodically by the VCAPCD Advisory Committee to keep the County consistent with future state of the art in control of emissions of oxides of nitrogen. A maximum amount of total emissions of NO_x, as well as all pollutants in Ventura County, should eventually be accepted.

Sulfur Dioxide Emission Concentrations. Current VCAPCD regulations covering emission concentrations of sulfur dioxide (SO_2) allow excessive local concentrations in the vicinity of stationary sources. Thus, Rule 54 allows 0.2% by volume of sulfur compounds (calculated as SO_2) at the point of discharge and 0.5 ppm of these compounds for 1 hour or 0.1 ppm for 24 hours at ground level at the property line of the source operation. Since VCAPCD Rule 60 strongly limits stack concentrations of NO_2 emissions as well as the amount per hour of both NO_2 and SO_2 from stationary sources, it is only logical to adopt a similar stringent standard for stack concentrations of SO_2. The following rule is recommented for adoption as Rule 54.1 or 60.1:

"A person in control of a stationary emission source operation shall not permit such operation to emit into the atmosphere gases exceeding 250 ppm (by volume) in concentration of sulfur dioxide measured at the point of discharge."

Organic Solvents. Certain organic fluids stored in an unsealed container may appreciably increase reactive hydrocarbon concentrations in our atmosphere, thereby increasing concentrations of photochemical reactants and products. In order to control ambient hydrocarbon concentrations in our atmosphere, adoption of a rule similar to LACAPCD's Rule 66, but without the inappropriate subsection "m," is recommended.

Recommendations for Improving Air Quality

Enforcement of VCAPCD Rules. The VCAPCD should carry out strict and aggressive enforcement of its existing and future rules. This should be accomplished according to the following guidelines:

a. Legal means should be acquired for quickly obtaining pollution emission concentrations at their sources. An agent of the VCAPCD should be allowed, upon presentation of proper credentials, to measure source emissions within the property boundaries of the emission operation. Legal enforcement should include adoption of specific penalties for violation of VCAPCD Rules.

b. VCAPCD should acquire additional equipment for measuring concentrations of source emissions.

c. VCAPCD should acquire additional equipment for measuring air quality. This equipment should be placed in continuous operation with means for rapid and efficient data retrieval so that individual violations and deteriorating atmospheric conditions may be quickly traced. Currently, VCAPCD stationary monitoring equipment is limited as follows:

Ojai—oxides of nitrogen, oxidant, carbon monoxide, particulates
Ventura—oxides of nitrogen, oxidant, particulates
Oxnard—particulates
Camarillo—oxides of nitrogen, oxidant, carbon monoxide
Thousand Oaks—particulates

Acquisition by the summer of 1971 of the following equipment is recommended:

(1) Equipment for stationary, continuous measurement of concentrations of oxides of nitrogen, sulfur dioxide, oxidant, and particulates downwind of the industrial complex between Port Hueneme and Point Mugu.

(2) Equipment for stationary, continuous measurement of concentrations of oxides of nitrogen, sulfur dioxide, oxidant, and carbon monoxide at Thousand Oaks.

(3) Equipment for stationary, continuous measurement of concentrations of oxides of nitrogen and oxidant at Simi.

(4) Equipment for stationary, continuous measurement of oxidant at Santa Paula.

(5) Equipment for mobile (trailer) measurement of oxides of nitrogen, sulfur dioxide, oxidant, hydrocarbons, and carbon monoxide.

(6) A telemetric system for relaying data from all monitoring stations to the VCAPCD office.

(7) Sufficient staffing of qualified personnel for efficient up-to-date operation of present and future VCAPCD monitoring and data retrieval equipment.

Construction Permits. All applicants for nondwelling building permits in Ventura County should be required to provide advanced data on their expected air pollutant emissions and proposed methods for their control. In order to accomplish this on a uniform basis throughout VCAPCD, either (a) Ventura County's Board of Supervisors should create a building permit authority that supercedes that of individual municipalities within the County or (b) VCAPCD's Rule 11 covering permits for possible polluting operations should be extended to cover all planned nonresidential buildings with combustive operations. This latter permit should be required before a municipality in the County could grant a building permit, and no variance of the permit should be allowed if the preconstruction permit is denied by VCAPCD or its Hearing Board.

Moratorium on Construction of Fossil-Fuel Burning Power Plants. Approval for construction in VCAPCD of any new power plants designed to burn fossil fuels should be withheld until the air pollution effects of Southern California Edison Company's Ormond Beach Plant No. 1 are assessed. Operation of Ormond Beach Plant No. 2 should not commence until the air pollution effects of Plant No. 1 are adequately evaluated and determined by VCAPCD to be acceptable.

Alert System. An alert system is a means by which excessive air pollutant concentrations are immediately determined and actions to curtail them are initiated. Currently, a type of alert system exists in this County. One school district has adopted a policy of limiting physical education activity when predetermined oxidant levels are exceeded. VCAPCD has been requested to provide daily information on levels of air pollutants.

An alert system, which limits the output of pollutants into the atmosphere when predetermined levels are exceeded, should be adopted in cooperation with Ventura County's physicians, perhaps in cooperation with the Ventura County Medical Society. If there should arise a critical air pollutant level that might have imminent, acute, adverse effects on human health, a mechanism for immediate cessation of emissions and a legal means for its implementation must be available. Each state of alert should be triggered by appropriately chosen ambient pollutant concentrations. These should be subject to periodic review by the VCAPCD Advisory

Committee as new scientific data become available. This procedure is part of LACAPCD Rule 163. Methods for enforcing a three-stage alert system should be considered by the Environmental Coalition.

Composition of VCAPCD Advisory Committee. In the past, the VCAPCD Advisory Committee has lacked a few key professionals. In order to prevent this reoccurrence, it is recommended that the Advisory Committee always contain at least one of each of the following: (a) a physician with knowledge of effects of air pollution on health, (b) a lawyer with knowledge of environmental law, (c) a meteorologist, (d) an engineer, and (e) a chemist. The composition of the Committee should also be such as to minimize representation of special interest groups.

Unified Efforts of South Coast Air Basin. Promotion of cooperative efforts by all air pollution control districts in the South Coast Air Basin is recommended. This mechanism provided by Assembly Bill 83 is important to the VCAPCD, since significant amounts of air pollution in Ventura County are frequently produced in adjacent counties.

Promotion of Alternative Methods of Travel. Legislation at all governmental levels that encourage or provide for alternative methods of travel to the automobile should be supported. These include rapid transit systems and safe bicycle trails between important areas in the County.

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