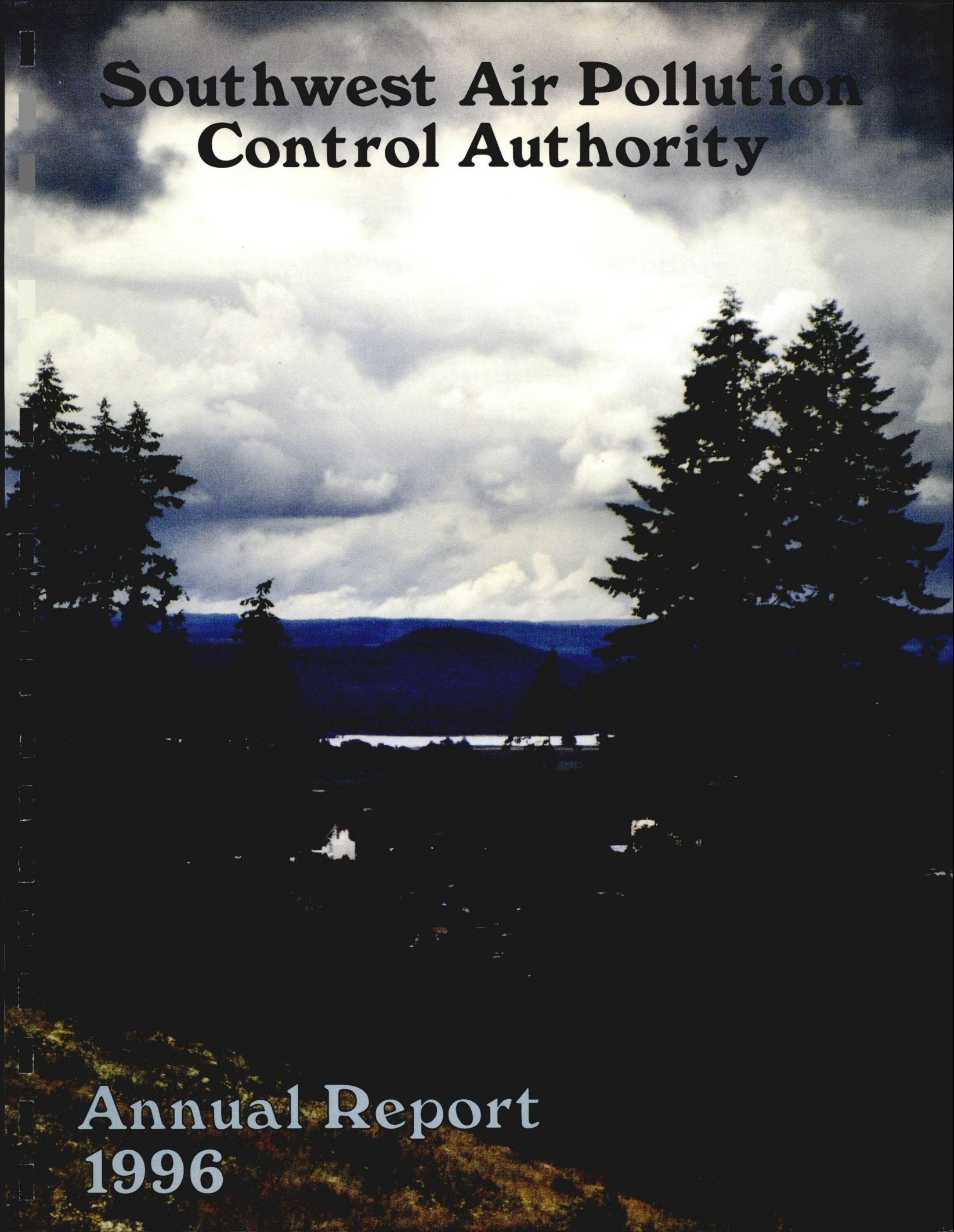
Southwest Air Pollution Control Authority



Annual Report 1996

1996

Southwest Air Pollution Control Authority
Vancouver, Washington

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The Southwest Air Pollution Control Authority (SWAPCA) board members represent each county and the major cities within the region. In addition, one member-at-large completes the eleven member board. The board is the policy making arm of the Agency and adopts Agency regulations.

.... From the Executive Director

Calendar year 1996 presented several interesting challenges for the agency, particularly with respect to our ground level air pollution levels.

SWAPCA submitted in early June 1996 an Ozone Maintenance Plan to the U.S. Environmental Protection Agency (EPA) in which we requested approval of a redesignation to a "clean air" status for ground level ozone. Within 60 days of forwarding this submittal to EPA, the Vancouver/Portland area experienced the need for 14 Clean Air Action Days because of potential high ozone air pollution levels. Clean Air Action Days involve encouraging citizens to utilize free rides on C-Tran buses, car pool, avoid using gasoline powered lawn mowers, and act upon other voluntary action possibilities. In spite of these efforts, 3 exceedances of the ozone air quality standard were experienced. Fortunately, our community's decision in early 1996 to adopt additional ozone control measures as part of the Maintenance Plan is going to help Vancouver avoid further exceedances.

In late 1996, the U.S. EPA formally approved our other redesignation request so that Vancouver became a "clean air" community for carbon monoxide. Carbon monoxide is a winter time problem in Vancouver. The Carbon Monoxide Maintenance Plan indicated that the oxygenated fuels program could be dropped while still keeping the region in compliance with the carbon monoxide air quality standard. Other programs being kept in place, such as the vehicle emission inspection program, made this possible.

Discussions between the National Park Service, Forest Service, SWAPCA, U.S. EPA, and the eight owners of the 1,340 Megawatt coal-fired Centralia Power Plant were successfully brought to a close. In December 1996, this group of federal, state, and local agencies announced a target solution involving the Centralia Owner's expenditure of about $250 million to reduce SO_2 emissions from an average of about 65,000 tons per year to an annual cap of 10,000 tons per year.

SWAPCA achieved a reduction in its permit application approval backlog (i.e., Notices of Construction) to historically low levels. This achievement allows SWAPCA to provide the business community with the expeditious permit approvals which they need. SWAPCA also made enhancements to its ambient air monitoring and meteorological measurements system this year. Two ozone monitoring instruments were purchased in preparation for two new monitoring sites to be established north of the Vancouver area. In a separate project, a meteorological measurement tower was installed near the Bonneville Power Administration's Ross Complex.

Enhancements to the public education efforts of SWAPCA included making available to schools and the public 2 kiosks which contain an interactive computer and software. This educational equipment was circulated throughout the Agency's jurisdiction, including numerous school districts and several businesses. Finally, SWAPCA received a clean audit report from the State Auditor's Office on the agency's finances covering the two-year time period of July 1, 1994 through June 30, 1996.

Robert D. Elliott

Introductory Comments to the 1996 Southwest Air Pollution Control Authority Annual Report

This report is compiled annually by the Southwest Air Pollution Control Authority (SWAPCA) staff. An attempt was made to present this data in a clear, concise manner and in a format that would serve an audience having wide and varying needs. We hope that we have succeeded in making it easy to read and understandable so that it can serve for both informational and educational purposes.

The reader will be able to compare the air quality in previous years to that measured in 1996 by reviewing the ambient sampling statistics. In areas where the air quality is good, SWAPCA carries out many activities designed to preserve that status; and in areas where the standards have been exceeded SWAPCA has established programs to insure attainment will be achieved. These activities include maintaining a permit and inspection program for industrial facilities, developing pollution control strategies, enforcement of the regulations and encouraging public involvement in the environmental policy process.

We hope you find this report useful and informative. Please contact us if you have any questions or comments regarding this report or SWAPCA activities in general.

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I. CLEAN AIR WASHINGTON ACT

A. WASHINGTON'S CLEAN AIR ACT OF 1991

The Clean Air Washington Act was signed into law in May 1991. This was the most important legislation in the history of clean air in Washington. The Act declares that air pollution is our most important environmental problem, and establishes two objectives: 1) to prevent the deterioration of air quality in areas that already have clean air, and 2) to return the air quality in other areas to levels that protect human health and the environment. The Act encompasses such issues as outdoor burning, wood stoves, motor vehicles, industrial pollution, global warming and ozone depletion.

B. OPEN BURNING

Open burning includes many kinds of fires, from leaf burning in a resident's backyard to burning of forest harvest slash. Outdoor fires account for more than ten percent of the state's air pollution. This includes a wide range of contaminants from carbon monoxide, volatile organic compounds (which lead to ozone pollution), particulate matter and toxic air pollutants.

Although fire is a quick and easy way to dispose of backyard and land clearing debris, open burning is also causing a growing health problem and is the number one cause of public nuisance complaints. Alternatives to burning are becoming more common. Clean Air Washington requires commercial and residential open burning to be phased out in urban growth areas by no later than the year 2001, as composting and other alternatives become available. In areas that do not meet federal standards for carbon monoxide or particulate matter, open burning is banned. In many areas of SWAPCA the local fire protection districts have taken over the program of permit issuance and enforcement of the rules. Within the Clark County non-attainment area all backyard burning has been curtailed. State legislation has allowed agricultural burning to continue in the non-attainment areas of Washington. Under the definition provided in the legislation, agricultural burning can take place if the land use can be determined to be commercial in nature. In this case the farmer must be able to produce a recently filed Schedule F IRS form indicating that the venture is a commercial operation, or that the land on which the burning will take place is classified for tax purposes as agricultural. Burning can only take place on those days having good dispersion of the air contaminants generated. No burning is allowed when an air stagnation advisory has been called by SWAPCA. Major efforts have been devoted to defining "agricultural burning" on a statewide basis, as opposed to "open burning" or "backyard burning". The scope of this definition is important, as it affects many members of the agricultural community and the citizenry as a whole.

C. WOOD STOVES AND FIREPLACES

There has been a rapid rise in ownership of wood stoves, pellet stoves, fireplace inserts and fireplaces. Wood burning devices are the most polluting means of home heating. This problem is magnified because they are used only about one half of the year - during the winter heating season, which is commonly a time of stagnant air and inversions. This atmospheric condition causes wood smoke to be trapped close to the ground where it is inhaled. In addition, burning often takes place in the neighborhoods we live in, where our children, and adults as well, spend two-thirds of their time. Clean Air Washington set tougher emission standards for new wood stoves and fireplaces. The Act also established an increase in fees assessed on new wood stove or fireplace inserts to $30. This revenue is used for wood stove education and enforcement

programs. Installation of used, uncertified stoves is banned. New buildings in areas that exceed federal standards for particulate matter must have an adequate non-wood heat source.

D. MOTOR VEHICLES

Motor vehicles are southwest Washington's largest air pollution producer, and their use is steadily increasing. Motor vehicle use is growing significantly faster than our rate of population growth. Clean Air Washington is designed to reduce motor vehicle pollution and remove tens of thousands of vehicles from southwest Washington's roads during peak commute hours. This will not only improve air quality, but also reduce traffic congestion at the same time. To do this, Clean Air Washington concentrates on three separate motor vehicle issues: motor vehicle emission inspections, clean fuels and conformity. Transportation Demand Management, a companion effort, is authorized by separate legislation.

E. MOTOR VEHICLE EMISSION INSPECTION AND MAINTENANCE (I & M)

Vehicles registered in certain areas of the state must pass an inspection of their emission control systems - or be granted a waiver - in order to be re-registered. The inspection program identifies the worst polluting cars and trucks and requires vehicle owners to correct the problem. And, for the first time, Clean Air Washington adds diesel vehicles to the inspection program. Federal law expanded the vehicle testing and inspection program to include the greater Vancouver area in 1993. The first test station opened in June 1993 in the north Vancouver area, followed in May 1995 by a second location in the Cascade Park area of Vancouver. In 1996, the testing area was expanded to include the areas of Battle Ground, Brush Prairie, LaCenter and Ridgefield as part of the Agency's ozone maintenance. Vehicles in this expanded area were scheduled to begin testing in April of 1997.

F. CLEAN FUELS

Clean Air Washington requires the development of specifications for "clean fuels" - fuels that result in lower emissions of air pollutants than today's gasoline and diesel motor fuels. Some potential clean fuels include compressed natural gas and electricity. Thirty percent of new vehicles purchased by state government must be clean fuel vehicles. This requirement increases 5% every year. A matching grant program is established to promote local government clean fuel programs. Through federal regulations the lead content in gasoline steadily declined until December 31, 1995. After that date it was illegal to sell leaded gasoline throughout the U.S.

G. CONFORMITY

Conformity means ensuring that transportation construction dollars are spent on projects in ways that improve - or at least, do not worsen - air quality. Clean Air Washington mirrors federal requirements for federally funded transportation plans and projects to conform to air quality improvement plans.

H. TRANSPORTATION DEMAND MANAGEMENT

Transportation Demand Management (TDM) or Commute Trip Reduction, although enacted under legislation separate from the Clean Air Washington Act, is closely related to the motor vehicle issues addressed by Clean Air Washington. TDM helps solve transportation-related air pollution, energy and

congestion problems by promoting changes in driving behavior. TDM in Washington focuses on commute trip reduction efforts. It promotes alternatives to single occupant vehicles, such as transit, carpools and vanpools, cycling, walking and telecommuting. Clean Air Washington directs local governments in Clark County to adopt Commute Trip Reduction ordinances and plans. It also requires major public and private employers to adopt and implement Commute Trip Reduction programs after local jurisdictions have adopted their plans. To do this, companies and local governments can offer incentives such as parking incentives for car-poolers and alternative work schedules. The Washington State Energy Office has the main responsibility for implementing Transportation Demand Management. Further details can be obtained by contacting C-TRAN at (360) 696-4494 for their progress with TDM in 1996.

I. INDUSTRIAL SOURCES

Clean Air Washington requires the largest industrial air pollution sources (major sources) in the state to have federally enforceable air operating permits (AOP). Prior to this requirement, Washington was one of the few states in the United States without renewable industrial permits. These permits will be renewed every 5 years or less and in many cases will require additional monitoring and record keeping. Smaller sources that emit hazardous air pollutants (HAP) or operate in areas where air quality exceeds federal health-based standards may also require an AOP. Clean Air Washington authorizes SWAPCA to request delegation of this air operating permit program from the U.S. EPA so that this issue can be handled at the local level. The Southwest Air Pollution Control Authority received delegation of the AOP program in December 1994 and is swiftly moving toward meeting all the necessary commitments of the program.

J. GLOBAL WARMING AND OZONE DEPLETION

Chlorofluorocarbons (CFCs), carbon dioxide, methane, nitrous oxide and certain other gases are known as "greenhouse" gases. They trap energy from the sun in the lower atmosphere, contributing to a gradual warming of the earth's surface. CFCs also contribute to depletion of the layer of ozone in the upper atmosphere that filters harmful ultraviolet rays. Clean Air Washington requires people who repair, service or dispose of any motor vehicle air conditioning system, commercial or industrial air conditioning, heating or refrigeration system or consumer appliance that uses ozone depleting chemicals to recover and recycle them. It also bans the sale of nonessential products containing gases harmful to the ozone layer if substitutes for the products are readily available. Examples of these products include air horns, noisemakers, party streamers and certain cleaning sprays.

K. FUTURE PRIORITIES

SWAPCA is developing a strategic plan to identify program priorities and the measurements that will be used to identify air quality improvements and success in achieving those priorities. SWAPCA's future priorities include:

* Obtaining a "clean air" classification for the entire SWAPCA region, then maintaining that designation through well established maintenance and contingency measures.

* Reducing motor vehicle exhaust emissions by supporting the Washington Department of Ecology's (WDOE) efforts in the inspection of all registered vehicles in emission inspection areas and ensuring they are properly tuned or repaired as needed.

* Reducing vehicle miles traveled in the region through increased public awareness of motor vehicle pollution and resulting lifestyle changes which are needed.

* Increasing ambient monitoring capabilities for "real-time" measurements that provide better efficiency for burn ban alert calls and better protection of the public's health.

* Assisting WDOE with development of urban visibility standards, establishing a visibility monitoring site in the urban Vancouver area, and adding visibility recommendations to state implementation plans.

* Reducing emissions of toxic air pollutants and criteria air pollutants from existing industrial facilities through reasonably available control technology (RACT).

* Assisting the Waste Reduction, Recycling and Litter Control program in meeting its goal of reducing hazardous waste generation by 50 percent through encouragement of technologies that reduce hazardous air emissions.

* Implementing an enhanced ambient air monitoring network to provide a better tool to assess ambient air quality status and trends in air quality.

* Continuing intensive monitoring of ozone and related precursor pollutants during the ozone season to develop information necessary for designing effective ozone control strategies.

* Developing comprehensive strategy and curriculum materials for grades K through 12 on air quality education, including teacher workshops.

* Developing and implementing a comprehensive inventory for air quality emissions.

* Providing timely review of industrial and commercial permits for new construction.

* Assisting with the development and long range improvement of intra-county transportation.

* Integrating the goal of the Intermodel Surface Transportation Efficiency Act (ISTEA) to more adequately integrate clean air planning and transportation planning.

* Developing rewards and incentives for citizens to switch to solar energy and electric vehicles.

* Promoting bicycle lanes and the use of bicycles as a means of transportation.

* Stepping up public education and public information efforts to expand citizen awareness on air quality issues and the impact of individual activities on the air quality environment.

* Involving our citizens in the regulatory process.

* Promoting life style changes that contribute to improved air quality not only in Southwest Washington, but also throughout the state.

Many of the priorities listed above are readily achievable today.

L. SIGNIFICANT ACTIVITIES COMPLETED DURING 1996

* Completion in December of 1996 of the Collaborative Decision Making (CDM) process with the National Park Service, Forest Service, EPA, Department of Ecology, and Centralia Plant owners to establish lower SO_2 emission limits for the 1300 Megawatt Centralia Coal Fired Power Plant.

* Redesignation to "clean air" status for carbon monoxide approved by EPA in October of 1996.

* The Ozone Maintenance Plan was adopted by SWAPCA's Board of Directors in March of 1996 and the Redesignation Request was submitted to EPA in June of 1996.

* The vehicle inspection and maintenance boundary was expanded to include the Ridgefield, Battle Ground, Brush Prairie, and LaCenter areas.

* The use of oxygenated gasoline was discontinued in November of 1996.

* SWAPCA's ambient monitoring network was expanded to include a meteorological monitoring station and a continuous nitrogen oxides (NO_x) monitor at separate sites in the Vancouver area.

* Developed and deployed two interactive video kiosks as public education tools throughout the five county region.

* Increased the agency's public education and outreach efforts with participation in county fairs, scouting functions, school field trips and community and neighborhood environmental functions, and development of public education/outreach materials.

* Two day Teacher Workshops were held in Clark and Lewis counties, training teachers to offer instruction about air pollution issues.

* Regulation revisions and updates were made to SWAPCA's rules including General Regulations for Air Pollution Sources - SWAPCA 400, Asbestos – SWAPCA 476, Volatile Organic Compounds (VOC) – SWAPCA 490, Gasoline Vapors - SWAPCA 491, and Oxygenated Fuels – SWAPCA 492. A new set of rules was added for VOC Area Sources – SWAPCA 493.

* The public VOC Credit Bank from the shutdown of Carborundum facility expired in August of 1996.

* 1996 was the first full year that leaded gasoline was no longer legally sold in the area.

II. PROGRAM DESCRIPTION

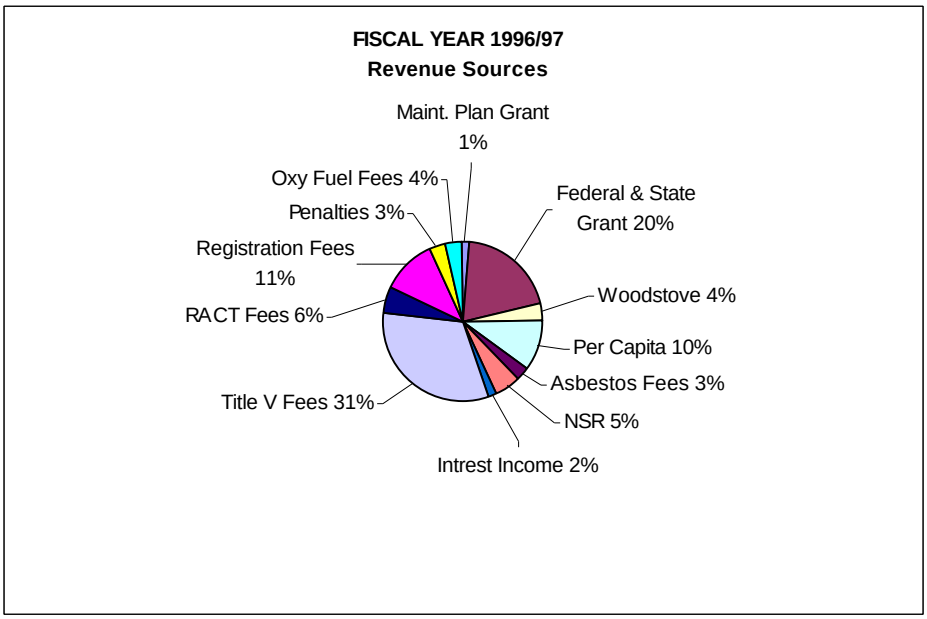
A. HISTORY

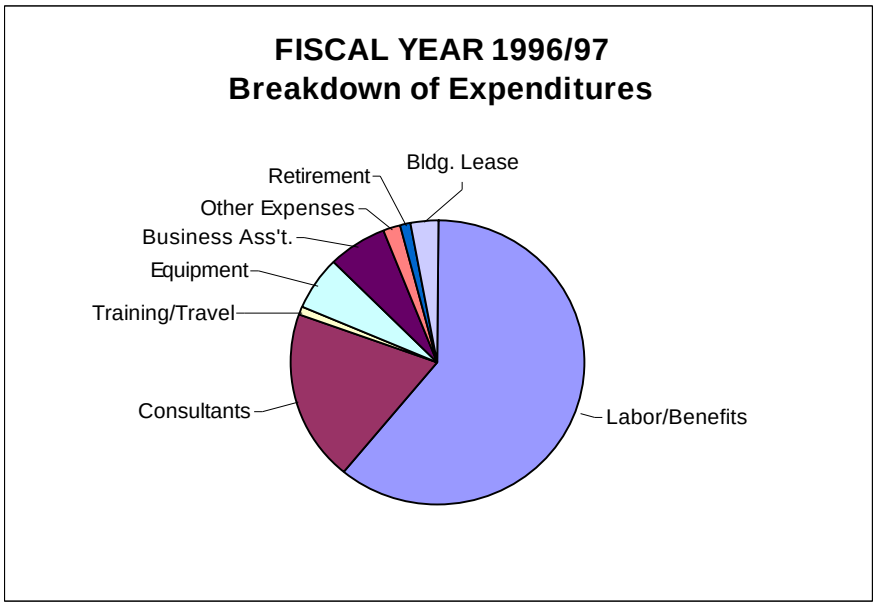
In October 1967 the Agency was formed as a single county jurisdiction serving Clark County. For a time the agency's work was accomplished by the Southwest Washington Health Department. In April 1968 a resolution was passed and recorded that expanded the agency's jurisdictional boundaries to 5 counties and established the agency as the Southwest Air Pollution Control Authority. Business rules were adopted in 1968 followed by the first regulation, known as "Regulation 1" on December 17, 1968. On October 28, 1969 "Regulation 2" was added. While Regulation 1 dealt primarily with general requirements, Regulation 2 expanded this regulatory base by addressing such things as permissible ambient concentrations, acceptable contaminant levels from industrial stacks and odor limits. These two regulations remained in effect until December 1979 at which time they were superseded in order to comply with federal and state laws and to include many of the provisions within the federal and state regulations. The Agency's General Regulations for Air Pollution Sources was then adopted. These regulations closely paralleled the Washington State Department of Ecology's General Regulations, yet included specific portions of the Agency's earlier versions. Over the years, SWAPCA has attempted to maintain current regulations that include the most up to date standards as mandated by the federal and state statutes.

The Southwest Air Pollution Control Authority (SWAPCA) is a five county regional air pollution control agency responsible for the vast majority of air pollution control in that region. SWAPCA's jurisdictional area consists of Clark, Cowlitz, Lewis, Skamania and Wahkiakum counties.

B. AGENCY FUNDING

The Southwest Air Pollution Control Authority's (SWAPCA) budget is based on a fiscal year concept beginning July 1 and ending June 30 of each year, as provided in RCW 70.94.092. Revenue to fund the programs administered by SWAPCA comes from a wide range of sources. Grants are received from both Washington State and the U.S. Environmental Protection Agency as core or supplemental funds. Core grants are relatively general in nature and can be used to cover the costs incurred by the Agency's basic core programs. Supplemental grants are sometimes provided to fund dedicated special tasks, for example the development of ozone and CO maintenance plans. SWAPCA currently has a per capita assessment in the amount of $0.2549 per citizen, which is levied through the normal taxation process of the counties and cities.

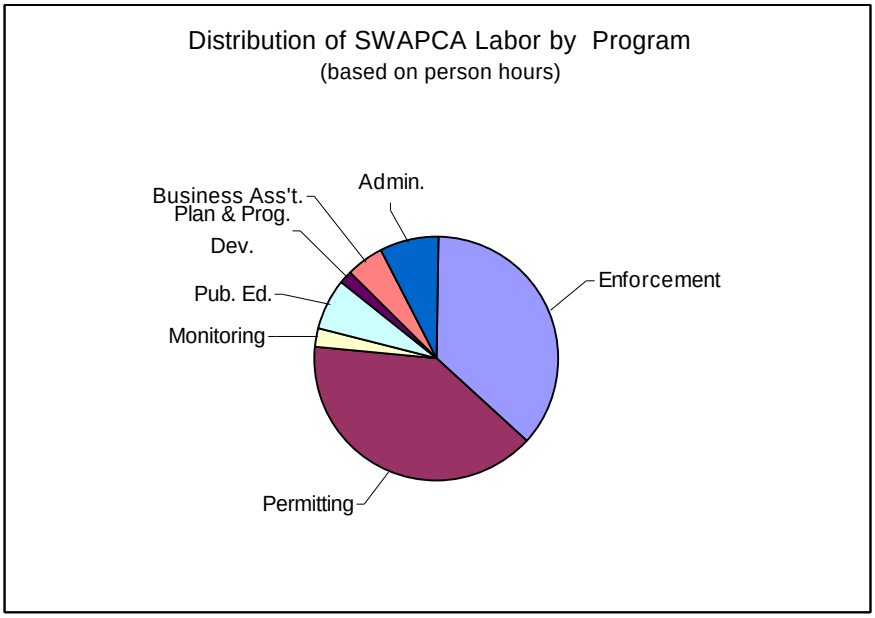




Of the regional air pollution control agencies in the state, the next closest per capita assessment is $0.31 and the highest is $1.42. SWAPCA has not raised its per capita rate since before 1980. The Agency also receives revenue from registration fees, new source review fees and Title V permit fees. Penalties collected for violation of the rules and regulations of SWAPCA are transferred into the fiscal year budget in the following year after collection. The above pie chart provides an overview of the relative contribution from each funding source to SWAPCA's fiscal year 1996/97 budget. The adjacent pie chart shows the relative distribution of expenditures for the same budget period. The pie chart below shows SWAPCA staff labor distribution for fiscal year 1996/1997.

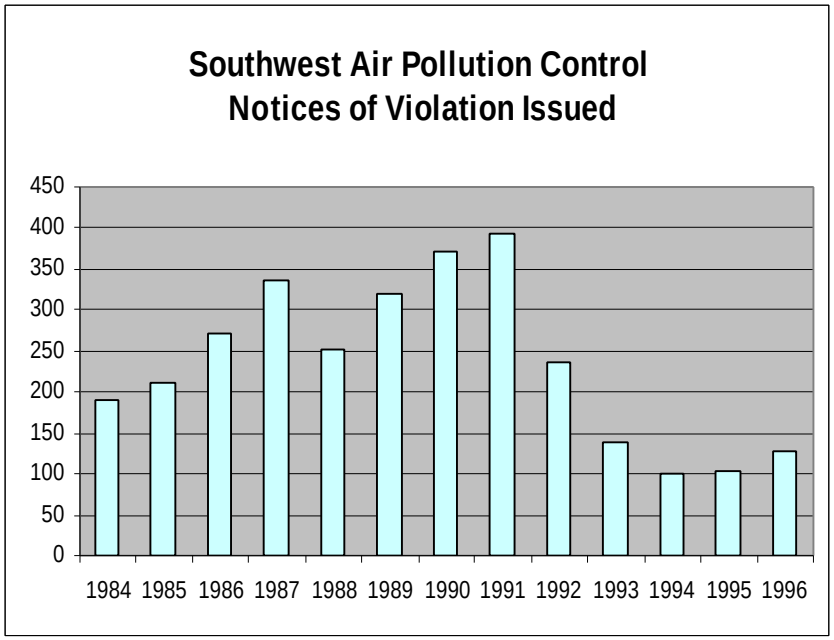
C. FIELD OPERATIONS

1. Introduction



SWAPCA's field operations consist of a diverse blend of inspections, complaint response, public education, ambient air monitoring, emissions inventory and enforcement activities. Each employee is expected to be certified to record visual emissions. This is accomplished through a coordinated effort of certification through the Washington State Department of Ecology and Oregon Department of Environmental Quality. Once the employees have received their initial certification, utilizing the criteria of EPA Method 9, recertification is required every 6 months. This method enables the inspector to record the degree of opaqueness of a plume and record this as a number from 0 to 100 percent opacity. The field staff is often called upon to issue Field Notices of Correction/Violation. These can be the result of a verified citizen complaint, excessive visual emission readings, illegal open burning, violation of the operating stipulations contained in a company's Order of Approval, odor violations or exceedence of emission limits in new source review approvals. After the Field Notice of Correction/Violation has been issued a determination is made by management on appropriate follow-up actions. The Executive Director may take several courses of action as a result of these field notices. The Agency could issue a formal corrective notice outlining what action is required to regain compliance. This is sometimes done in first offense cases or when it is felt that the violating party was not aware of the regulatory requirements. A civil

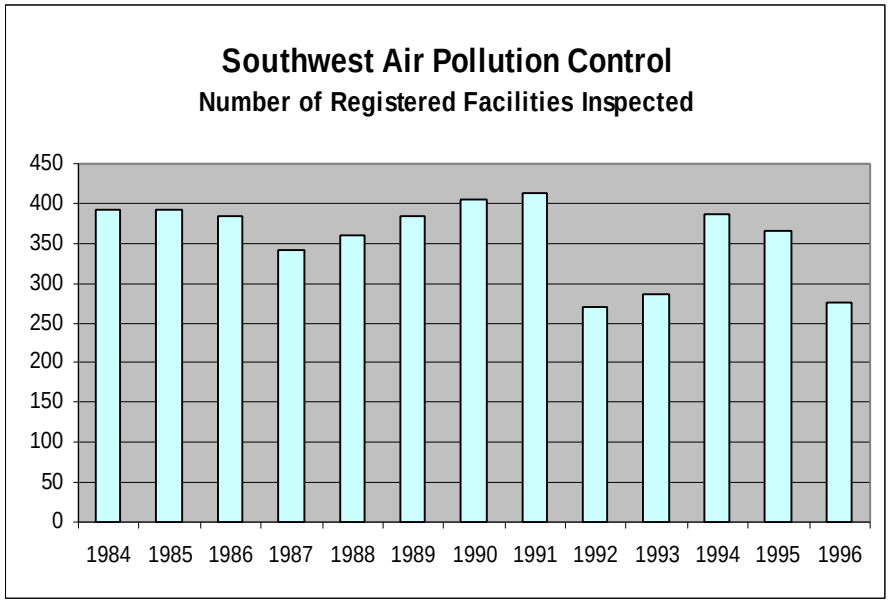
penalty assessment of up to $10,000 per violation, and/or an Order requiring corrective actions are other options. The agency also has the ability to proceed with criminal charges, or any combination of these actions. Since 1991 SWAPCA has experienced a trend showing a reduction in Notices of Violations. This trend continued through 1996. This decline is due to a number of factors. The banning of open burning in the major population areas and good citizen compliance could be credited for some of this reduction. In addition, it is believed that the Agency's stepped-up public outreach program has made the private sector more aware of the open burning issues, as well as environmental issues in general.



Any punitive decision involving a violation of the Agency's regulations can be appealed. Normally these appeals are heard by the Washington State Pollution Control Hearings Board (PCHB). The purpose of the PCHB is to give all litigants a full and complete public hearing and provide a fair and impartial written decision based on the facts and the law. By establishing the PCHB to preside over environmental cases it speeds up the hearing process and reduces the caseload on the other court systems. To insure the Board's impartiality, the state Legislature created this independent, quasi-judicial state agency, entirely separate from any other state, regional or local unit of government. The Board consists of three full-time members, who are appointed by the Governor and confirmed by the State Senate for staggered six-year terms. One of the three must be an attorney. All are salaried employees of the State, who also serve on the Shorelines Hearings Board.

2. Registration of Sources

Each facility having a potential for emissions of 1 ton per year of criteria pollutants, but less than 100 tons per year is carried on a registration tracking system by the Agency. In order to offset the cost of inspections to the taxpayer, SWAPCA charges an annual fee of $100.00 per emission unit to these sources. The exception is in the case of gasoline transport tanks that are charged $50.00 per emission unit. A facility may have only one emissions unit, or many, depending upon the type of operation. While this fee is not adequate to pay for the entire



registration and permitting program, it does defray some of the cost. SWAPCA registers numerous air contaminant facilities. This is accomplished through a program of inspections and permitting. After an inspection has been completed, a determination is made regarding the facility's compliance status. If the facility is deemed "in compliance", a document called an "Order of Authorization to Operate" is issued. This Order outlines the air contaminant emitting equipment, authorized operating parameters and restrictions necessary for the facility to operate in compliance. These documents are updated either annually or bi-annually, based on the size, emission impacts and the complexity of the sources. If a source is found to be in violation, follow-up enforcement action often results.

3. Title V Operating Permit Program

Title V of the Federal Clean Air Act, and subsequently 40 CFR Part 70, requires permitting authorities to issue renewable Operating Permits to major sources of criteria and hazardous air pollutants for a fixed term of up to five years. These permits apply to sources greater than 100 tons of emissions per year and are to be uniform in nature and content throughout the United States. The purpose of the operating permit program is to compile all applicable requirements into one document. The goal is to improve source compliance. The permit issuance process begins with submittal of applications and certification statements by the owners or operators of sources and includes provisions for a public comment period, hearings if necessary, as well as review of draft permits by EPA and affected states.

EPA published a notice in the Federal Register on November 9, 1994 granting interim approval of SWAPCA's Operating Permit Program. The Program became effective on December 9, 1994. Minor deficiencies prevented SWAPCA and other Washington local air agencies from obtaining final approval of the program. All corrective measures requiring action by Ecology and the Washington legislature have since been completed.

Of the 13 Title V (major) sources in SWAPCA jurisdiction, 12 have submitted complete Title V Air Operating Permit applications. One additional source is required to submit a Title V application in early 1998. Substantial SWAPCA staff time was expended in the review of these applications during 1996. Upon receipt, the staff evaluated each application for completeness. Additional information was requested for several of the applications. In addition to SWAPCA reviewing their own permit applications, Oregon's permits were also reviewed under procedures established for "affected states review". SWAPCA submitted early draft Title V permits to EPA which were used to develop an acceptable format, and existing Orders of Approval were modified in preparation for the Title V permitting process. However, no draft Title V permits were issued by SWAPCA in 1996. Two additional facilities received voluntary limits on their emissions to obtain synthetic minor status and avoid permitting under Title V. Synthetic minors are facilities that can ensure that they will maintain their emission level below the threshold for requiring a Title V permit. There are 17 synthetic minor sources in SWAPCA jurisdiction.

4. Open Burning

In late 1992, SWAPCA adopted a program to permanently eliminate open burning within the southern Clark County carbon monoxide non-attainment area by the end of 1994. Three phases of curtailment were established based on availability of alternate methods of disposal. The burning in the last phase came to a conclusion on November 6, 1994. In all other areas of SWAPCA's jurisdiction, citizens must obtain approval in order to burn natural vegetation.

Open burning is the number one cause of public nuisance complaints received by the Agency. Virtually hundreds of complaints are received and investigated each year by the field staff as is shown in the graph on page 23. Of the 397 complaints received by SWAPCA in calendar year 1996, 184 of these were the result of

open burning activities. Most of these complaints fall into one of three categories: 1) smoke nuisance, 2) burning by sources that are not legally permitted to burn, or 3) the burning of prohibited materials. These complaints are investigated and if a violation is noted, a Field Notice of Correction/Violation is issued.

The way agricultural burning is managed has changed dramatically in Washington State in recent years. This change is part of a comprehensive revision of the state's air pollution laws that affects not just agriculture, but many other commercial, industrial, residential and municipal activities. In December 1994, WAC 173-430 "Agricultural Burning" was adopted and became effective early in 1996. WAC 173-430 makes it possible for continued agricultural burning in some areas where all other forms of open burning are prohibited, for example in areas that are deemed to exceed the federal standards. Burning is only allowed by individuals that can show that their land is classified for agricultural purposes by the county, or where an Internal Revenue Service Schedule F form can be provided, indicating a commercial operation. Thus qualified, the individual may or may not need a permit, depending on the nature of the proposed burning.

5. Wood Stoves and Fireplaces

The smell of wood smoke evokes pleasant memories for many people, but for others it presents a health problem. Wood smoke, largely from wood stoves and fireplaces, has become a major part of the air pollution problem in the United States and particularly in the Northwest. Many residents are operating under the belief that burning wood will cut their heating bills. In actuality, this may not be the case when all of the costs of wood burning are considered. A growing body of evidence suggests that we cannot ignore the medical consequences of extensive exposure to wood smoke.

Smoke is composed of many small particles of carbon compounds from the burning of organic matter such as wood or in some cases, coal and oil. These small pieces of organic matter are called particulate matter. Particulate matter is regulated by the EPA and by SWAPCA as one of the criteria air pollutants.

In Washington State, wood stoves and fireplaces account for approximately 12 percent of the total air pollution. Particulate matter pollution from wood stoves is produced mostly during the winter months. This is also the time when stagnant air and temperature inversions limit air movement, "trapping" the pollution close to the ground and keeping it within our breathing space. All new stoves sold in the state of Washington must be EPA certified stoves that are required to meet federal standards of emission control. In addition, there are visual emission standards that are enforced by SWAPCA on all wood heating devices. Dry fuel and adequate amounts of combustion air for the fire are necessary to avoid exceeding these standards. A good fire produces no smoke with only heat waves visible at the outlet of the chimney.

SWAPCA curtails fireplace and wood stove use when the ambient concentrations of either carbon monoxide or particulate matter approaches or threatens to exceed health standards. When this happens, the local newspapers, radio and television stations are notified. A Stage I alert prohibits the use of fireplaces and uncertified stoves. A Stage II alert is called as ambient levels of contamination reaches higher levels. When this happens the prohibition is extended to include certified wood stoves. Wood stoves that are the sole source of heat for the residence are not affected by these prohibitions. However, no wood stove is ever allowed to have visible smoke that exceeds 20 percent opacity. No curtailments were called in 1996.

SWAPCA received 81 complaints related to wood stove and fireplace activities during 1996. These complaints were either followed-up in the field for compliance purposes or the party received a letter providing information on proper use of their wood burning devices and how to limit impact to the airshed and neighbors.

The Agency maintains a recorded message in order to disseminate burning information. The public can call either the normal business number of 574-3058 or the 24 hour burn information hot line of 574-0057.

6. Asbestos

Asbestos is a name given to a group of minerals found naturally in our environment. They are flexible in nature and provide an excellent insulation for fire and heat resistivity. Unfortunately, asbestos is also comprised of tiny respirable fibers that have been directly linked to serious health problems. These fibers can cause asbestosis, a scarring of the lungs, which can lead to breathing problems and heart failure. In addition, it can cause cancer of the lungs and mesothelioma, a rare cancer of the chest or abdominal lining. There is also evidence that links asbestos to cancer of the stomach, intestines and rectum.

Unlike many other air contaminants, asbestos has no known safe exposure level. It is believed that minute concentrations of asbestos fibers, either breathed in or swallowed, can cause cancer in humans.

For many years, asbestos was commonly used for insulation against heat damage and fire hazard. It was used for insulation around commercial and industrial boilers and their steam pipes, as well as in floor tile, glues, roofing, insulation around fireplaces and wood stoves, plaster, patching and spackling compounds, and in automotive brake linings. In all, there are more than 3,000 products in use today containing asbestos.

There is no question asbestos has distinct advantages for thermal insulation. Unfortunately, the related health effects far outweigh the beneficial properties it possesses. Also tragic is the fact it takes from fifteen to forty years for any sign of health problems to manifest themselves. This is why it was not until many years after the completion of World War II that the problem was recognized and corrective actions began. During the war years, shipyard workers were exposed to large quantities of asbestos in the ship building process.

In order for asbestos to become a health problem it must first be released into the air we breathe, or contaminate products we ingest. As long as the asbestos stays "encased" or intact and never gets to the air - there is little danger associated with it. Unfortunately, asbestos is not always closely contained. As insulation, fire proofing, roofing materials and other products are exposed to normal day-in and day-out traffic, the material begins to break down and the asbestos fibers begin to separate from their bonding agents. As a consequence, the fibrous compounds can eventually become airborne. Asbestos subject to airborne release by such mechanisms is termed “friable”.

During remodeling or demolition projects, glues and adhesives are often sawed and sanded. If those products contain friable asbestos, significant airborne contamination and an unhealthful atmosphere for the workers and residents can result. Even at dump sites, if not handled properly, friable asbestos can become airborne as a result of heavy earthmoving equipment and other vehicles driving over it. For this reason, special precautions must be implemented even during the ultimate disposal.

Prior to beginning any demolition work on structures within SWAPCA's jurisdiction, an asbestos survey must be completed by an AHERA certified contractor. Before any friable asbestos can legally be removed, or encapsulated, the contractor must submit a request and obtain prior approval, called a "Notice of Intent to Remove or Encapsulate Asbestos". In order to process this request and insure that all responsible parties, including the Washington Department of Labor and Industries (L&I), are properly notified, the application must be received at least ten days prior to commencement of the job. Information required includes a site description, method of handling the waste, amount of material, specific type of asbestos, and final disposition of the material. For significant demolition projects, including the intentional burning of structures for firefighter training, a “Demolition Notification” must be submitted to SWAPCA, even if no asbestos is found by the survey. This insures that only asbestos free structures are being demolished. Heavy emphasis has been placed on the removal and/or encapsulation of asbestos laden products throughout the nation in recent years. Working with L&I and the U.S. EPA, SWAPCA tracks removal, encapsulation, and demolition projects and makes sure all jobs are conducted by licensed contractors, who are trained and certified in

survey, removal, and disposal practices.

The asbestos is tracked to its ultimate disposal site in order to insure it is properly handled and disposed of. This material, because of the health risks associated with it, is not intermingled with the other refuse, but handled separately and covered daily.

During 1996 a total of 239 asbestos removal/encapsulation project applications were received and reviewed by SWAPCA, 13 asbestos related complaints were received, and 116 asbestos removal and encapsulation projects were inspected. In order to offset the cost of administering this program, a fee is required on each notification. The fee amount varies depending upon the type and size of the project.

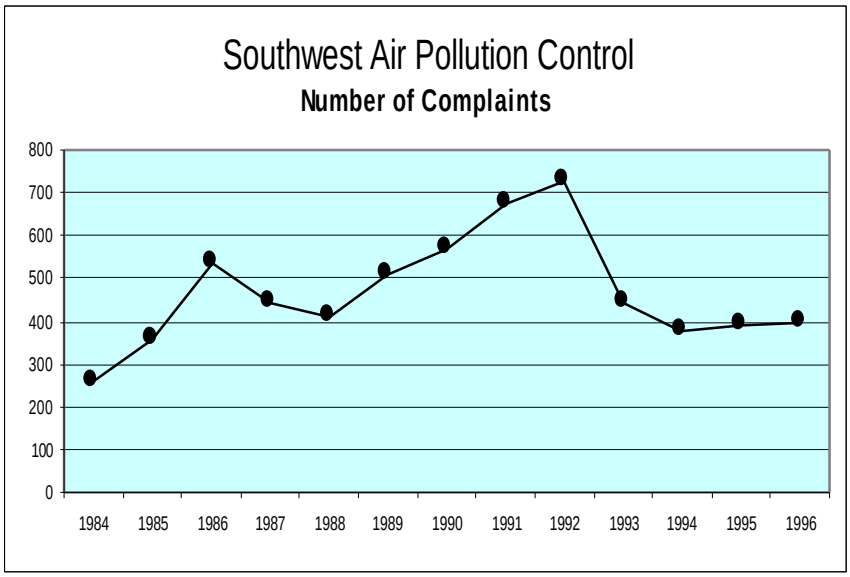
7. Gasoline Vapor Recovery

Gasoline dispensing facilities, bulk handling terminals and gasoline hauling tank trucks can release fumes into the ambient air. These vapors contribute to ozone smog and contain toxic and cancer causing compounds. Toluene, xylene and the state's second leading cancer causing air pollutant, benzene are contained in these emissions. As gasoline enters an enclosure, vapors are displaced. In the past these vapors were vented directly into the atmosphere, however new requirements prohibit many of these uncontrolled emissions sources. Many gasoline-dispensing facilities are now equipped with Stage II vapor recovery controls. These controls capture and recover the displaced vapors as your vehicle's gasoline tank is filled. All of the larger gasoline dispensing stations were required to install Stage II vapor recovery controls by May 1, 1994. In 1996 thirty gasoline stations applied for approval to install Stage II vapor recovery systems. That number consisted of 19 facilities located in Clark County, 4 in Cowlitz, 7 in Lewis, 0 in Skamania and 0 in Wahkiakum.

Even more gasoline dispensing facilities are equipped with Stage I control, which captures and controls the fumes during tank truck delivery operations. Vapors can be lessened with Stage I control as a result of submerged fill tubes. By extending the fill tube in the bulk storage tanks below the surface of the gasoline, less vapor results. All new and upgraded tanks and all facilities with greater than 360,000 gallons per year throughput are equipped with this type of control.

8. Citizen Complaints

SWAPCA tries to effectively cover the five county area of its jurisdiction as frequently as possible, but the Agency's field staff can not be everywhere all of the time. For this reason, citizen complaints are used to help locate problems and violations. The sharp reduction in complaints occurring in 1993-94 and sustained through 1996 appears to coincide with the curtailment of outdoor burning in southern Clark County. Yet, in 1996 there were still 184 complaints received by SWAPCA that related to open burning activities. This is nearly one half of all of the 397 complaints received by the agency in that year.



9. Public Outreach

While early efforts to control air pollution successfully focused exclusively on industrial and commercial sources, the burden of responsibility for polluted air has shifted in recent years to individual southwest Washington residents--people who drive single occupant vehicles, burn yard debris, or heat their homes with wood.

Beyond encouraging voluntary cooperation from citizens to minimize air pollution, SWAPCA assists and/or operates several air quality control programs that focus on "people-caused" pollution. Probably the most familiar of these programs is the mandatory motor vehicle emissions testing that was implemented in June of 1993. Other examples are the phase out of backyard burning in the Vancouver metropolitan area and the statewide wood stove certification program designed to reduce emissions.

A major public education program was initiated in 1994 by SWAPCA. This included classroom training for teachers in air pollution issues. In 1996 this training program was expanded with two-day workshops in Clark and Lewis counties. An interactive video program, which explains a variety of air pollution subjects, was placed in 16 public and private facilities throughout SWAPCA jurisdiction. Schools, businesses and governmental facilities wanting to use this equipment should call SWAPCA for information and scheduling. In an important continuing program, C-Tran provided free bus rides on high ozone air pollution days that are called Clean Air Action Days. This program is offered in conjunction with Portland's Tri-Met bus system. Fourteen Clean Air Action Days were called in 1996, and a significant increase in C-Tran ridership was noticed on these days.

Residents of southwest Washington are encouraged to participate in air pollution control. No regulations affecting the area's air quality are adopted by the Agency's Board of Directors without a prior public hearing, and the participation of any interested person is welcome. Copies of proposed rules, or rule changes, are available well in advance of the hearings. We encourage the public to contact SWAPCA for handouts and further information.

Successful government relies on the support of an informed public. This report, published every year, updates SWAPCA's air quality activities, and summarizes air-monitoring data collected. SWAPCA publishes other reports and pamphlets that are available to the public. Increasing emphasis will be placed by the Agency on this program in the future.

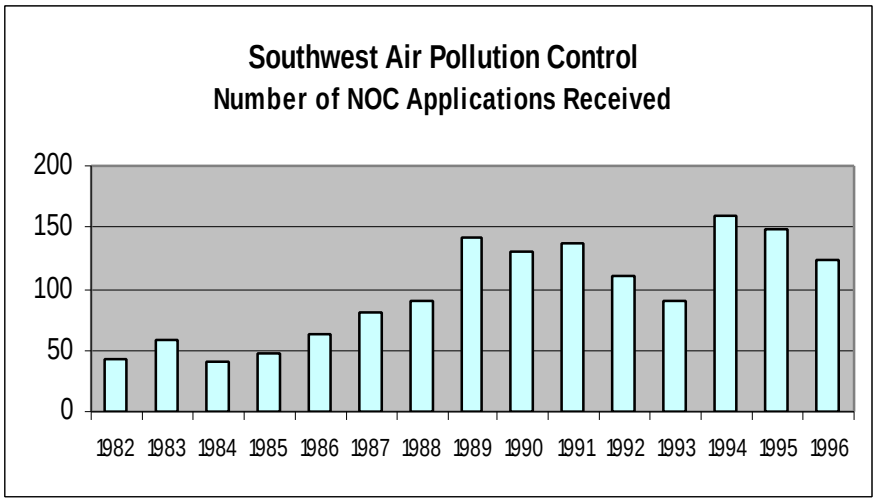
10. Business Assistance

Clean Air Washington requires that SWAPCA establish a business assistance program to help companies understand air quality regulations and to aid them in complying with the requirements of those regulations. SWAPCA decided to enter into a contract with the Columbia River Economic Development Council (CREDC) to provide this service throughout its 5 county jurisdiction. This approach was developed in order to establish an environment where companies would feel more at ease in seeking assistance. The program is entirely under the control of SWAPCA, although the business assistance individual is home-based at CREDC's office. This individual works closely with the Planning Departments and Economic Development personnel within each of the five SWAPCA counties. The business assistance program is multifaceted and provides general, technical and developmental assistance to the business community. Public assistance is provided on Best Available Control Technology (BACT) analysis and emissions calculations. For more information on this program, you can contact Mr. Jim Davis with the Columbia River Economic Development Council in Vancouver at (360) 910-8100.

D. ENGINEERING

1. New Source Review

Prior to the construction of any new source of air contaminants, or modification to existing sources, SWAPCA must review the proposal in order to determine if the project will conform to the criteria generally associated with Best Available Control Technology (BACT). SWAPCA's approval must be granted before any construction can legally take place. In order to help offset the cost of this review a $75.00 filing fee is required with each application plus an additional review fee. The additional amount is based upon the size and complexity of the source.



After the Agency's review has been completed and SWAPCA is satisfied that the proposal can be built in a manner that will not violate any portion of the State or Federal laws pertaining to air pollution, an order called a "Preliminary Determination" is issued. This document is sent to the Applicant and EPA. A public notice for the project is published in the local newspaper where the construction is intended to take place, announcing their plans. The document and its recommendations remain open for public input and comment for thirty days. It is then reviewed by the engineering staff once again, including any public comments that may have been received. The public's input is then used in order to make the final approval determination. If the comments do not outweigh the initial preliminary determination results, "final approval" is granted. A copy is mailed to the U.S. Environmental Protection Agency and the original is sent to the Applicant.

A total of 121 "Applications for Approval/Notices of Construction" were received during calendar year 1996. That number consisted of 77 Applications in Clark County, 21 in Cowlitz, 21 in Lewis, 2 in Skamania and 1 in Wahkiakum County. One hundred and twenty two Applications for Approval/Notices of Construction were preliminarily approved in calendar year 1996.

Once built, the projects are inspected in order to determine: 1) whether the proposed equipment was actually installed as approved, and 2) whether the systems and equipment are capable of continued compliance with all applicable regulations in actual field application. If the answer to both of these questions is "yes", an Order of Authorization to Operate is issued.

2. Emission Reduction Credits

There are two program elements that address emission reduction credits (ERCs) at SWAPCA. The first element is referred to as emission offsets. In accordance with 40 CFR 51 and SWAPCA 400-112, non-attainment areas must include provisions for establishing offset requirements for major new sources or major modifications of sources in non-attainment areas. The rules require that allowable emissions of the pollutant for which the area has been designated non-attainment must be offset by reductions in actual emissions and that any offsets must provide for a net air quality benefit. Emission reduction credits can be credited if the

amount of emissions exceeds the amount required for the new source or modification. These offsets could not be traded, swapped, or sold but could only be used by the source that achieved the reduction. This provided no means to take advantage of reductions that may occur as a result of a company shutdown. The second element of the program is referred to as banking emission reduction credits. In 1986 a public and private bank was established by SWAPCA for the purpose of tracking emission reduction credits for particulate matter and volatile organic compounds. This bank was established based on actual emission reductions that occurred as a result of the closure of the Carborundum Company plant in Vancouver. The bank was originally established because of ozone problems in Vancouver and the submittal of a State Implementation Plan (SIP) in the mid 1970s. The SIP was reexamined in the early 1980s and the Vancouver area was incorporated into a bi-state plan with the Portland area. Because of the non-attainment status, the bank was established as one way of providing an emission offset so that the air quality does not deteriorate, but continually improves and still allows for an expanding economy and allows clean air to be maintained.

The Carborundum Company facility was shutdown for business reasons in December of 1982. The company maintained registration for the emission units and control equipment for the following two years. A site survey performed on July 8, 1986 verified that the air pollution control devices at the facility were being removed from the site and was used to establish the date for when emission reduction had been accomplished. The actual emission reductions achieved at the facility exceeded the reductions required in the State Implementation Plan and therefore the amount exceeded was eligible to be banked. The Port of Vancouver purchased the Carborundum Company facility in 1986. An emission reduction credit application was submitted by the Port of Vancouver and an Order of Approval (SWAPCA 86©843) was issued by SWAPCA. The Order of Approval granted an emission reduction credit to the Port of Vancouver in the amount of 500 tons per year for particulate matter to be available until July 8, 1996. Of this amount, 400 tons per year were assigned to SWAPCA for use in the public bank, and 100 tons per year were retained by the Port of Vancouver. In addition, the Port of Vancouver was granted an emission reduction credit in the amount of 240 tons per year of volatile organic compounds to be available until July 1, 1996. Of this amount, 140 tons per year were assigned to SWAPCA for use in the public bank, and 100 tons per year were retained by the Port of Vancouver.

Emission Credits in the Public Bank (12/31/96).....……..……..504.8 lbs/day

Emission Credits Withdrawn from the Public Bank in 1996….939.39 lbs/day

Emission Credits Reclaimed by Public Bank in 1996.....……0.0 lbs/day
0.0 lbs/yr

SWAPCA simplified its requirements in early 1993 for obtaining offsets for releases of volatile organic compounds, nitrogen oxides (NO_x - a precursor for ozone) and carbon monoxide (CO) by amending its General Regulations. In as much as volatile organic compounds (VOC) and NO_x are precursors to the chemical formation of ozone, it is necessary to control these emissions at the source. Any new source of VOC or NO_x emissions of over 100 tons per year or modification exceeding 40 tons must be "offset" by a ratio of 1.1 to 1.0. Similarly, any CO source is required to offset by a ratio of 1.0 to 1.0. In other words, a major source expecting to increase its VOC or NO_x emissions by 40 tons/year, would have to locate offsets in the amount of 44 tons per year before they would be allowed to expand the facility. Offsets can be either purchased outright from any facility that may be holding credits or they may apply for publicly held credits.

SWAPCA maintains a public bank and under established guidelines can issue credits to new and modified sources. If, however, the amount requested is over 10% of the total bank balance, SWAPCA Board approval is necessary.

3. Emissions Inventory

The Federal Clean Air Act Amendments of 1990, passed by Congress, recognized that many areas across the United States were in violation of the National Ambient Air Quality Standards (NAAQS) for ozone and/or carbon monoxide (CO). To develop and implement an effective air quality control strategy, an air pollution control agency must compile information on the important sources of these pollutants. The role of the emission inventory is to identify the source types present in an area, the amounts of each pollutant emitted and the types of processes and control devices employed at each plant.

a. Emission Sources

Air pollutants are emitted from a wide variety of sources in southwest Washington. Sources are often lumped into three broad categories: point sources, area sources and mobile sources. Point sources are traditionally stationary facilities like factories. Mobile sources represent motor vehicles of all types. Area sources are widely dispersed usually non-regulated and non-controlled sources such as dry cleaning and spray painting operations, and biogenic sources (i.e., naturally occurring activities) such as brush fires.

Point sources emit relatively large volumes of pollutants from a single location. Examples include rock quarries, lumber mills, and other manufacturing plants and processes. Each source over 100 tons per year (major source) operates under a Title V Air Operating Permit. Each source less than 100 tons per year operates under one or more Orders of Approval or, if grandfathered, an Order of Authorization to Operate issued by SWAPCA. Each source must demonstrate that it can operate with its emissions at or below the emission rate prescribed by SWAPCA and stated in the Operating Stipulations of their permit with the applicable Order of Approval as its basis.

Area sources are classified as categories of relatively small individual sources of pollution, usually spread over a broad geographic area, that collectively contribute significant levels of emissions. Wood stoves, slash and field burns, forest fires, backyard burning, and dust emissions from roads are examples of area sources. Area sources usually do not operate under the emission permit system.

Mobile sources, a sub-category of area sources, includes cars, trucks, and other vehicles. While each individual unit in the area or mobile source categories may emit only a small amount of pollution, taken as a whole their emissions are generally much larger than those from point sources in southwest Washington. In fact, transportation accounts for over 50% of all air pollution nationwide.

SWAPCA maintains a detailed inventory of air pollution emissions in southwest Washington (See Appendix F). Our inventory is normally compiled and reported to EPA once per year.

b. Particulate Emissions

In recent years, the Portland/Vancouver Air Quality Maintenance Area (AQMA) has seen considerable variation in particulate emissions from industrial sources as a result of fluctuating production levels. The overall trend suggests that emissions from point sources are decreasing. This is probably a result of improved pollution control equipment. However, the benefits of these reductions appear to have been offset to a certain degree by increased emissions from area sources, most predominantly home heating with wood.

The EPA Wood Stove Testing and Certification Program, is expected to help in reducing particulate

emissions in the future by ensuring that both new and replacement wood stoves are of the cleaner burning variety.

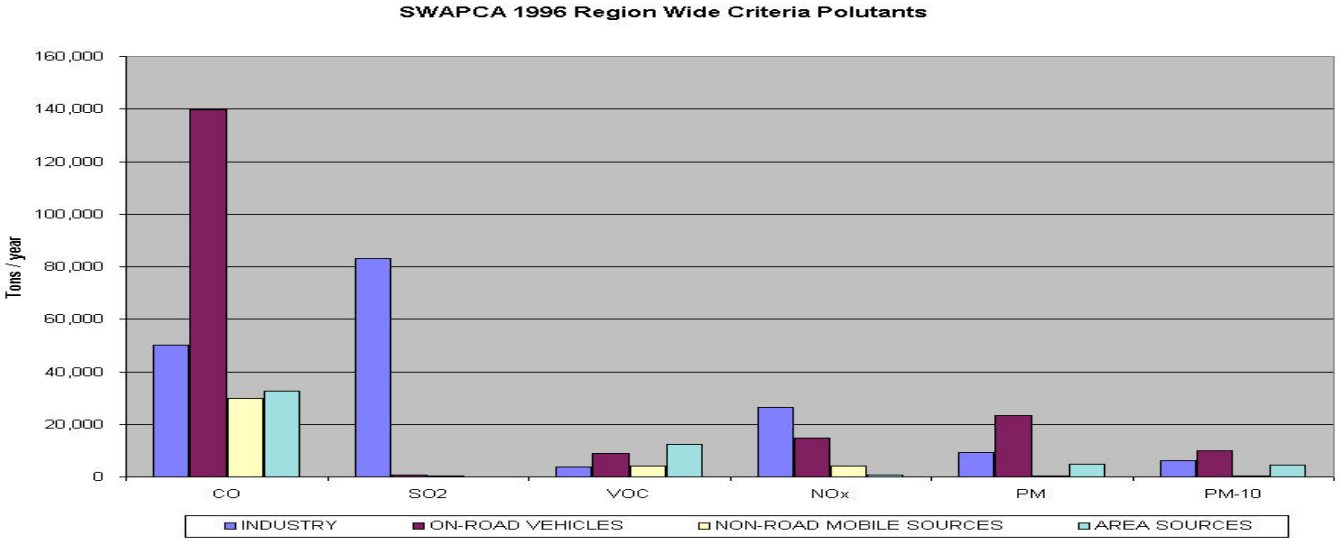
It is in the interest of SWAPCA and its citizens to be able to the monitor ambient air on a continuous basis and in a manner that provides for the generation of accurate and timely data. Until 1994, monitoring for particulate matter was only conducted with high volume PM_{10} samplers. While these units provide very accurate data, they do not provide it instantaneously. Currently the standards are based on a 24-hour average and annual rolling average data in micrograms per cubic meter. The high volume samplers provided this data in a manner that allowed SWAPCA and other control agencies to monitor the quality of the air based on these standards. The drawback to this method is that there is often a several day lag period between when the sample is collected and when it can be processed, weighed and evaluated. In some cases by the time this analysis has been completed, the problem condition has either passed or worsened. For this reason, it became obvious that an alternate or supplemental method of monitoring was appropriate.

SWAPCA placed into operation its first tapered element oscillating microbalance mass monitoring unit or "TEOM" in 1994. This equipment provides accurate measuring of the PM_{10} levels. When the sampler is linked with a computer and modem located in SWAPCA's office, the staff is able to instantaneous monitor the ambient concentrations. By being able to monitor particular matter in the air continuously and generate data in the form of 15 or 60 minute averages it provides SWAPCA with the ability to take action before violations or health effects occur. Used in a program of wood stove and open burning curtailment alerts, the TEOM unit will be a very useful tool in SWAPCA's overall program of air pollution control.

The first TEOM was installed at the Moose Lodge in Vancouver. At the end of 1994 the unit was operating and collecting data, but it was not until mid 1995 that all the necessary phone lines, modifications and connections were complete. Since 1995, SWAPCA has been able to telemeter the data to the agency's computers. This permitted the Agency to more closely monitor the changing situations. This is very helpful in providing data for curtailment calls in open burning and wood stove/fireplace use. It is our hope that this will be the first of several similar units that will be strategically placed throughout the SWAPCA jurisdiction.

c. Carbon Monoxide Emissions

Trends indicate a gradual reduction in ambient levels of carbon monoxide (CO) in the Vancouver area. Because CO accumulation is so dependant on weather conditions and patterns, trends of this nature should be viewed with cautious optimism. During 1987 the Vancouver sampling site experienced four exceedances of



the 8 hour average standard of 9 parts per million. In 1992 and 1993, there were no exceedances recorded, but one exceedance was recorded in January 1994. None were recorded in 1995 or 1996. The charts and graph contained in Section IV depict this trend in more detail.

The federal Clean Air Act Amendments of 1990 passed by Congress required that carbon monoxide attainment be reached by December 31, 1995 in order for southern Clark County to avoid sanctions from the U.S. Environmental Protection Agency. Southern Clark County had not violated the carbon monoxide health standards for three consecutive years and only exceeded the standards once in 1994, making it eligible to request redesignation. A technical advisory committee, made up of interested individuals from the community, was formed for this endeavor in early 1994 and worked throughout that year and 1995 on a 10-year Maintenance Plan for the region. The redesignation request provided for the removal of the oxygenated fuel program upon EPA approval of the plan. This was done because projections indicated that the carbon monoxide emission reductions from the vehicle fleet and maintenance programs would keep the area in attainment. This proposal was adopted by SWAPCA's Board on December 19, 1995, and a state implementation plan (SIP) hearing was held on January 30, 1996. Redesignation was approved by the EPA in October of 1996 and the use of oxygenated fuel was discontinued in November of 1996.

d. Ozone

The ozone trend in the Vancouver area had been fairly constant until the mid 1990s. Historically, exceedances had not been recorded on the Washington side of the Columbia River. Over the years, nearly all exceedances have occurred in the Portland, Oregon area of the non-attainment area. SWAPCA, however, experienced its first exceedance since 1982 on July 20, 1994. There were no ozone exceedances recorded in 1995 in either Vancouver or Portland, but three exceedances were recorded in the Portland area during the 1996 ozone season. The federal Clean Air Act Amendments of 1990 passed by Congress require that ozone attainment be reached by December 31, 1993 in order for southern Clark County to avoid sanctions from the U.S. Environmental Protection Agency. The Portland/Vancouver area met that deadline and applied for redesignation. SWAPCA, in conjunction with the Oregon Department of Environmental Quality (ODEQ) requested redesignation to attainment status for ozone in mid year 1996. SWAPCA's technical advisory committee developed a 10-year Ozone Maintenance Plan, simultaneously with the Carbon Monoxide Maintenance Plan. Additional control measures were implemented in Clark County so our population growth does not cause a return to dirty air or non-attainment status. These measures, including an expanded vehicle inspection boundary and better vehicle emission test methods, were part of the redesignation request. The better testing procedure will not raise individual testing fees. Additional ambient sampling was also planned in the region for volatile organic compounds (VOC), ozone (O_3) and nitrogen oxides (NO_x). This expanded testing was begun in 1996 and will result in data needed to analyze the ozone formation process in southwest Washington and to determine whether there are any impacts caused in the metropolitan area by upwind sources. In addition, more meteorological monitoring sites were planned as well. A Vancouver site was established in 1996 and additional sites to the north were planned for 1997.

e. Volatile Organic Compound Emissions

The relationship between volatile organic compound emissions and ambient ozone levels is not a simple one. This is largely because of the complex nature of ozone formation and its dependence on sunlight, temperature and atmospheric mixing. Generally the ozone-forming potential of an airshed increases with increasing VOC and NO_x emissions.

Emission inventories show steady and substantial decreases in VOC emissions within the

Portland/Vancouver ozone non-attainment area in recent years, but this trend is expected to reverse itself because of our population growth. Major reductions in VOC emissions have been achieved through the federal new automobile program, and industrial emissions control. Future major reductions will come from Vancouver's vehicle inspection and maintenance program and local transportation control strategies, even though traffic volumes continue to increase significantly. Industrial and commercial emissions from gasoline handling have also been substantially reduced by improved controls on gasoline storage, transportation, and delivery systems. Further reductions have been realized by additional controls and process changes in surface coating, degreasing technology, and other industrial processes.

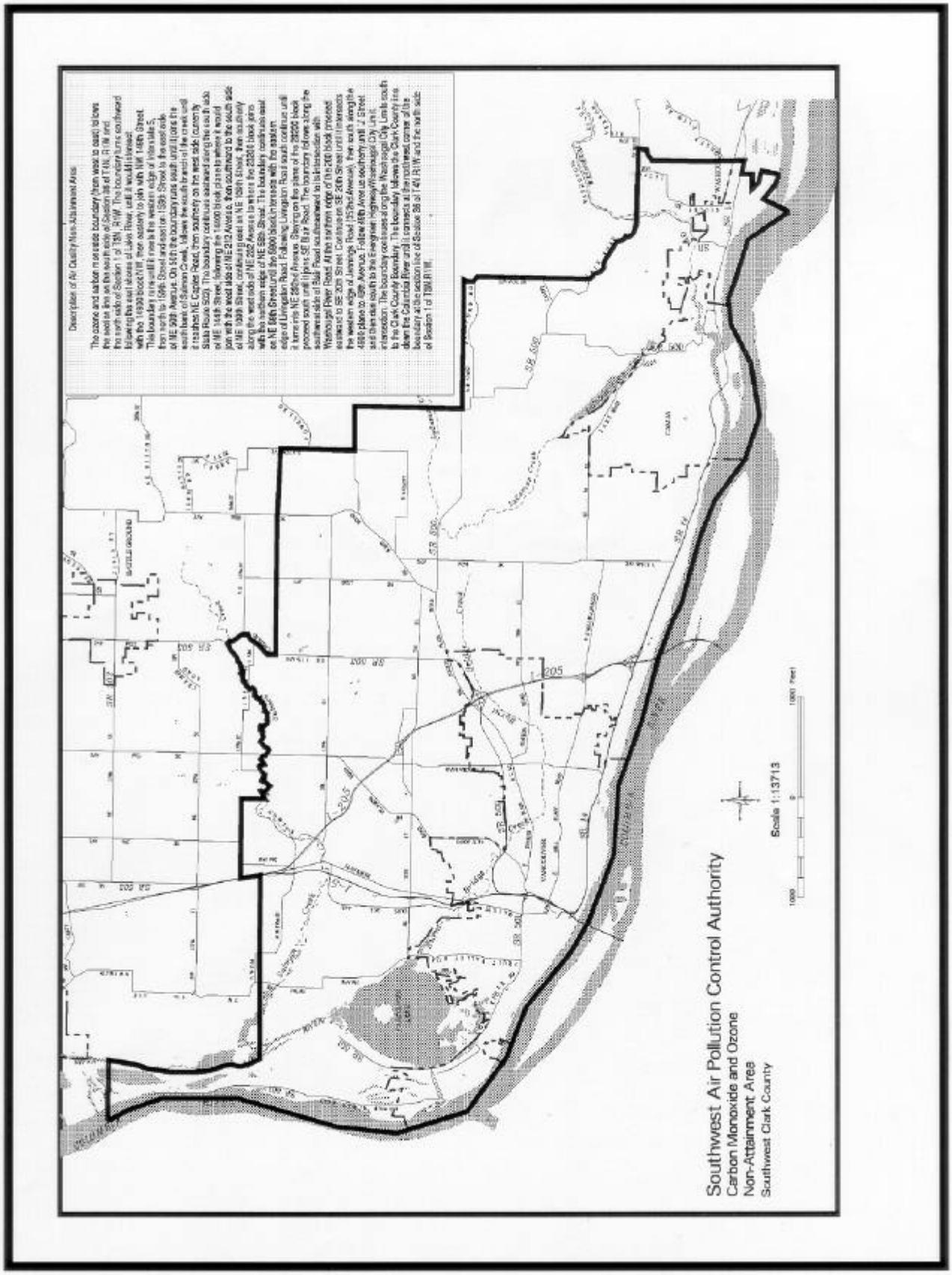
Vapor recovery at gasoline stations is seen as one method of significantly reducing VOC emissions. The system captures vapors from gasoline dispensing equipment instead of releasing them into the air. Implementation of this program began in 1991 when all gasoline stations were required to install equipment controlling the vapors when transferring gasoline to underground storage tanks (Stage I). The second stage of the program involves installing special nozzles and hoses so that vapors are captured and recovered when gasoline is dispensed into vehicles (Stage II). This equipment has the added advantage of reducing public and attendant exposure to the harmful volatile components in gasoline. When fully implemented, this program is expected to reduce total VOCs in the Portland/Vancouver airshed by roughly 3000 tons per year. Continued traffic growth is expected to be the greatest challenge to maintaining compliance with the ozone standard in future years.

4. Carbon Monoxide and Ozone Maintenance Plans

By the end of 1996 the Portland/Vancouver area was classified as "non-attainment" for ground level ozone and “attainment” for carbon monoxide. For the few years prior, the area had met the standards for these pollutants and was able to apply to the U.S. EPA for redesignation to "attainment" status. In order to do this. SWAPCA was required to submit a 10-year Maintenance Plan for both pollutants. A committee of community representatives, including business owners and concerned citizens, was established to help in the development of these plans. The first meeting of the Maintenance Plan Technical Advisory Committee (TAC) was in February 1994. The TAC met monthly throughout a 1 1/2-year period to discuss and evaluate potential control measures. Each control strategy was evaluated for its cost effectiveness as well as its ability to insure no further violations of the National Ambient Air Quality Standards (NAAQS). These meetings concluded in the fall of 1995 after the development of the final recommendations. The carbon monoxide plan, which provided for the removal of the oxygenated fuels program on the EPA approval date, was adopted by the SWAPCA Board of Directors on December 19, 1995, and redesignation granted in October, 1996.

The ozone plan was adopted early in 1996. This plan called for expansion of the existing vehicle inspection and maintenance program and enhanced testing. The plan also required the TAC to review any exceedances that may occur over the term of the plan and report their recommendations, including any corrective measures. The TAC reconvened in December of 1996 to begin review of three exceedances of the ozone standard that occurred in Portland during the 1996 ozone season. Following the TAC review and recommendations, the redesignation to attainment status for ozone has since been granted.

Non - Attainment Map



III. AIR POLLUTANTS: HEALTH AND WELFARE EFFECTS

A. SUMMARY

National Ambient Air Quality Standards (NAAQS) were adopted to protect the public health and welfare from the known adverse effects of air pollution. The U.S. EPA has set primary standards that define levels of air quality that protect the public health. Secondary ambient air quality standards define levels judged to be necessary to protect the public welfare. Southwest Washington's control strategies have been directed to meet the more stringent primary air quality standards.

The results and conclusions of a very extensive study were recently released by Harvard School of Public Health. Researchers at Harvard were joined by Brigham Young University and the American Cancer Society. The study focused on the increased risk of death as a result of being exposed to smoke and soot in most American cities. It encompassed ten years, one half a million people and 151 American cities. The study concluded that people living in the most polluted areas had a 15% to 17% increased risk of death compared with people living in the least polluted areas. Douglas Dockery, Professor of Environmental Epidemiology at the Harvard School of Public Health and co-author of the study commented:

> "The danger is not just in Los Angeles or New York. We found unexpectedly large results, that is to say, modest air pollution exposures are shortening the lives of Americans by several years. The adverse health effects of air pollution are cumulative, placing stress on health, and therefore leading to our observation of increased deaths associated with pollution over a period of almost 10 years. Not only are levels of pollution in these cities below EPA standards, but the impact on life and health is more pervasive than previously thought. Smokers as well as nonsmokers are at increased risk of death from breathing the air of U.S. cities."

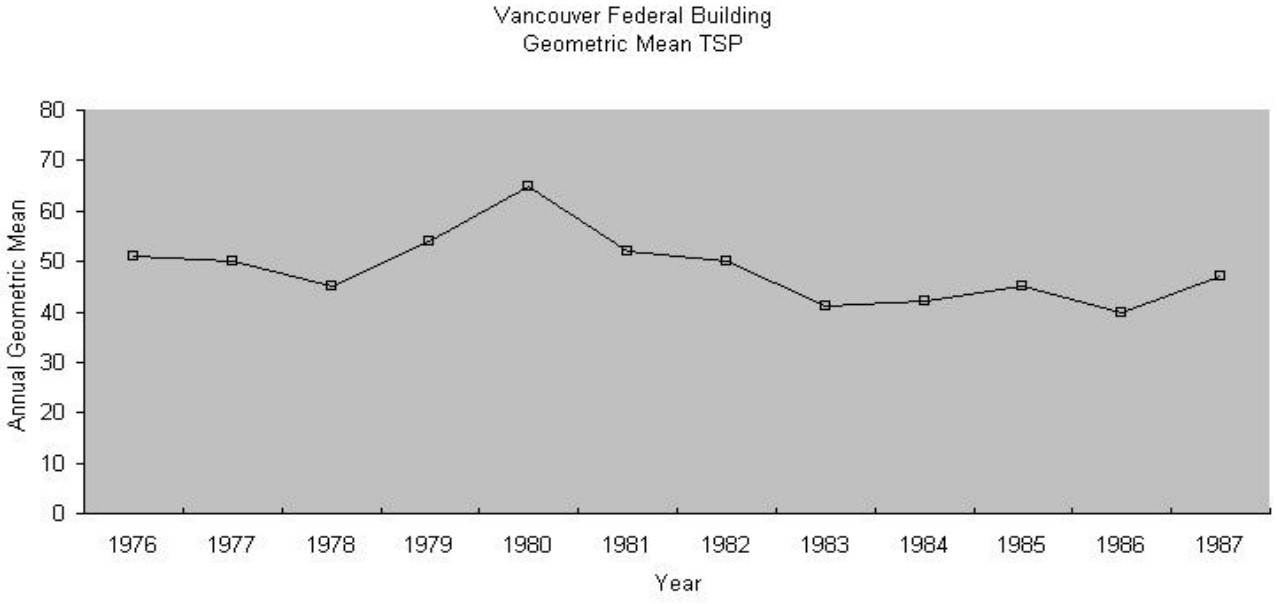
The pollutants for which standards have been established are common pollutants that have been shown to be harmful. These standards are shown in the table below and Appendix A.

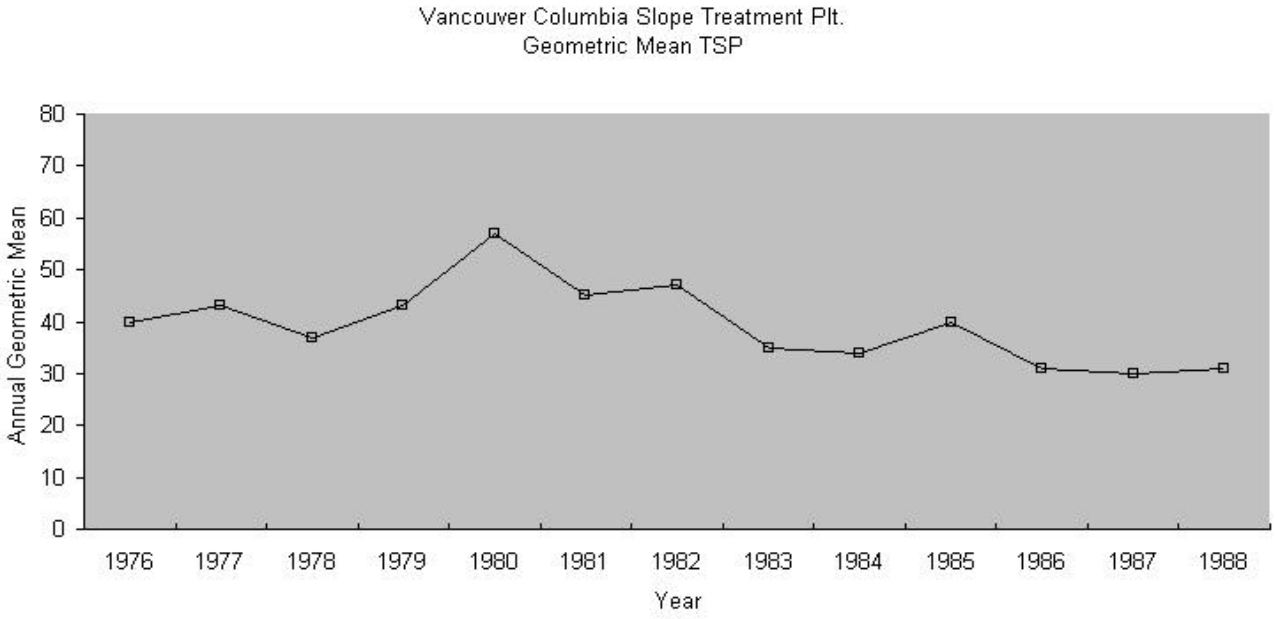
AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	Federal Standard	State Standard
PM_{10}	Annual Arithmetic Mean	50 ug/m	50 ug/m
	24 hours	150 ug/m	150 ug/m
Ozone	1 hour	0.12 ppm	0.12 ppm
Carbon Monoxide	8 hours	9 ppm	9 ppm
	1 hour	35 ppm	35 ppm
Sulfur Dioxide	Annual Arithmetic Mean	0.03 ppm	0.02 ppm
	24 hours	0.14 ppm	0.10 ppm
	3 hours	0.5 ppm	0.5 ppm
Nitrogen Dioxide	Annual Arithmetic Mean	0.053 ppm	0.053 ppm
Lead	Calendar Quarter	1.5 ug/m	1.5 ug/m

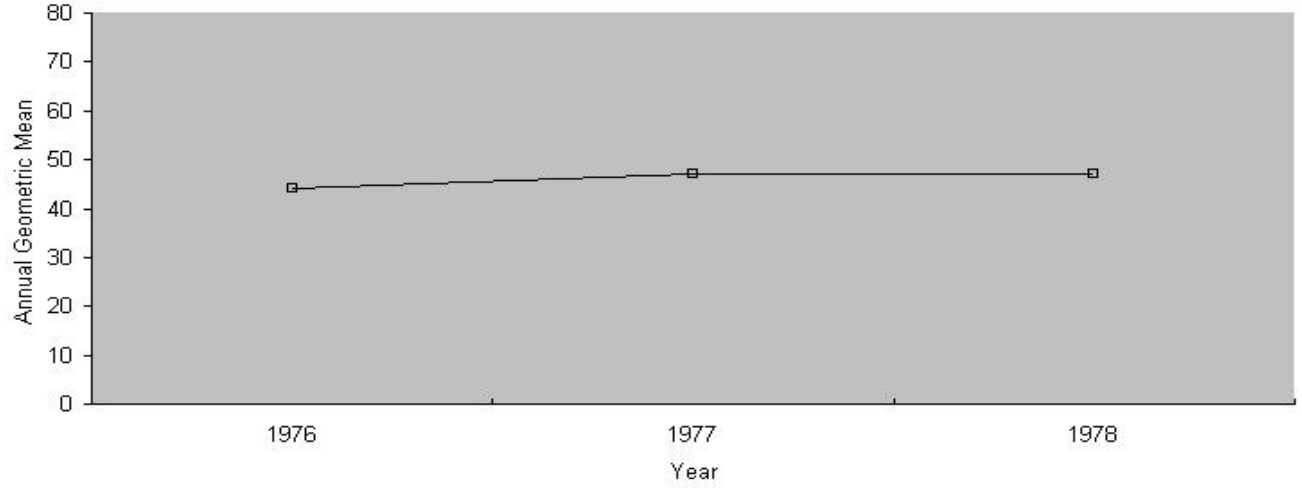
B. TOTAL SUSPENDED PARTICULATE MATTER (TSP)

Any matter that exists in a finely divided filterable form, whether liquid or solid, is defined as particulate matter when airborne. In years past, emphasis was placed on the total combined weight of all suspended particles with little consideration given to whether they were within the respiratory size or not. This philosophy was changed in 1987 to base the U.S. EPA health standard on respirable sized particulate (i.e., PM_{10}). Therefore, SWAPCA no longer samples for TSP. The following TSP sampling data is still useful however. This data can be used to show historical trends in the region.

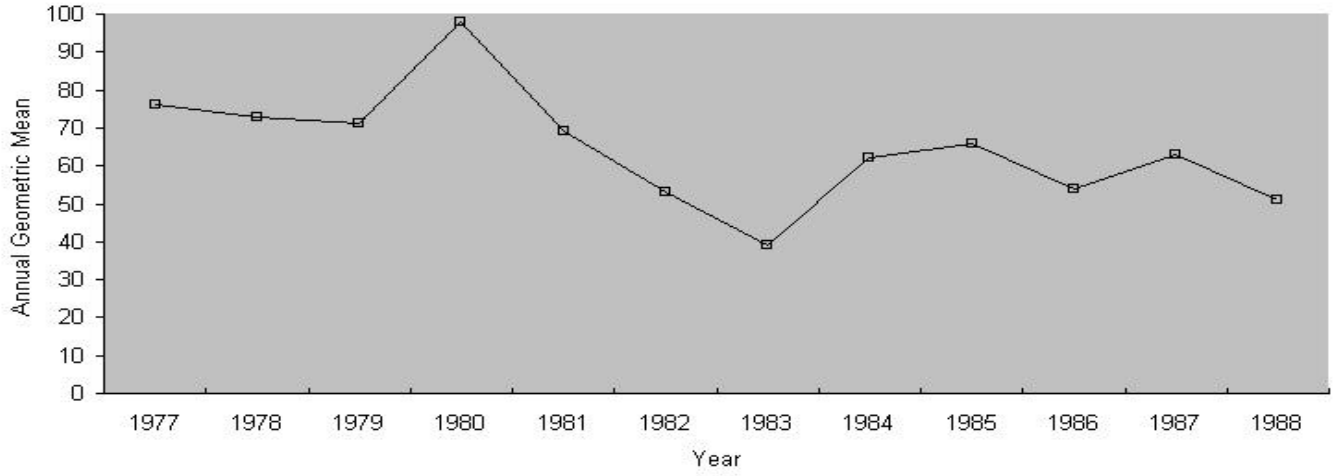




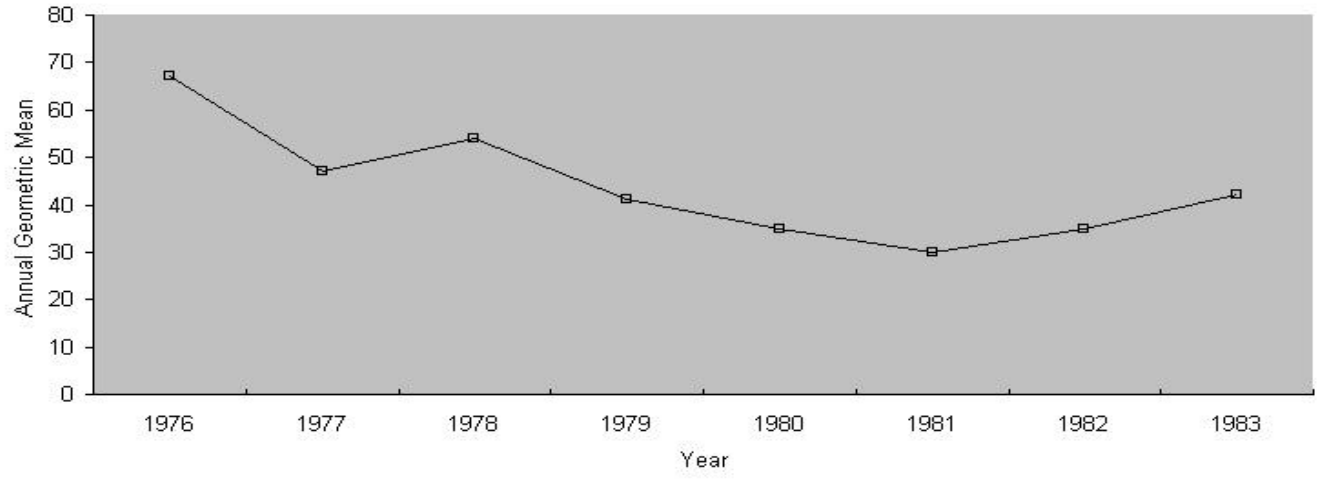
Port of Vancouver Terminal #2
Geometric Mean TSP

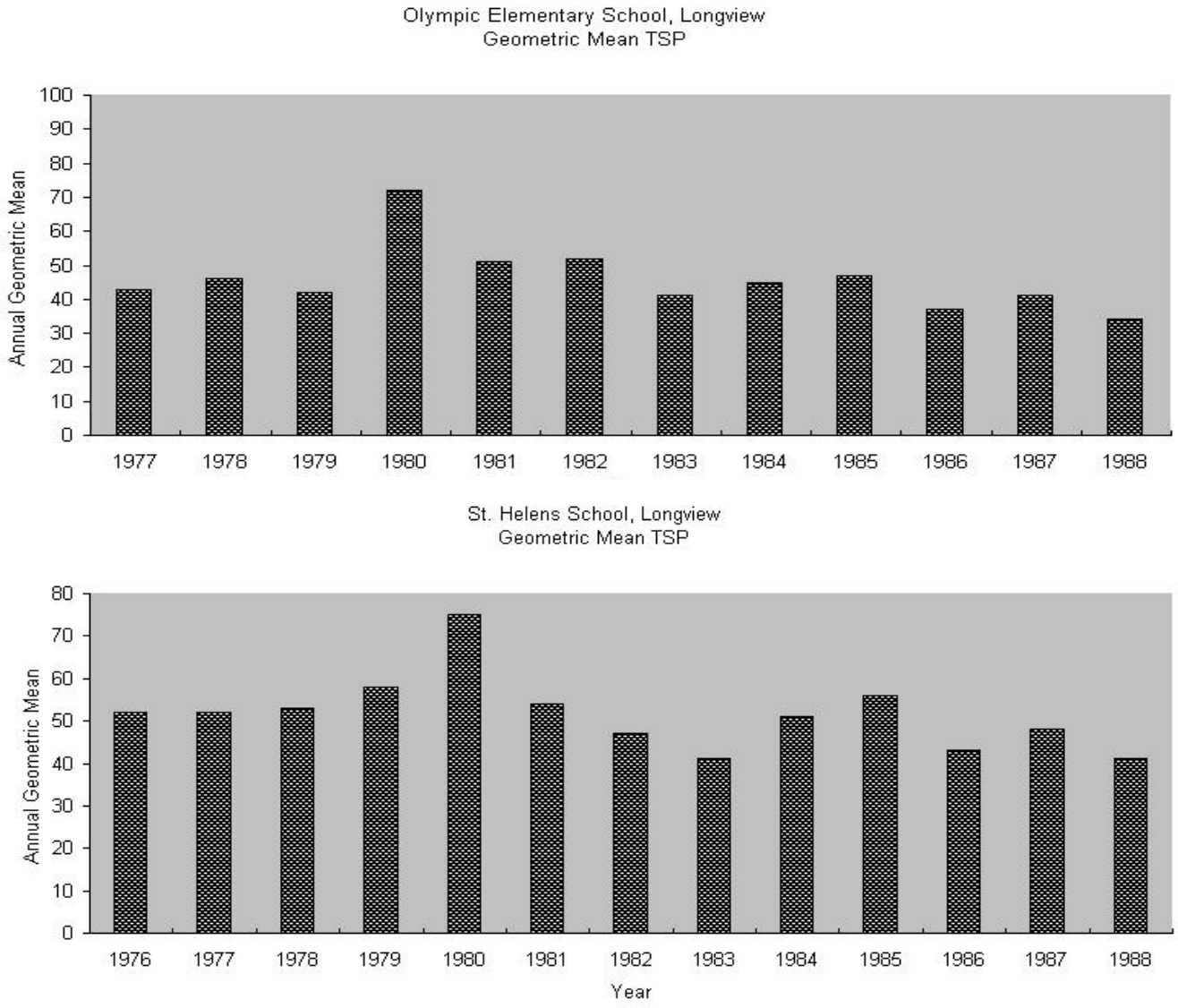


Longview City Shop
Geometric Mean TSP



Columbia River High School
Geometric Mean TSP





C. FINE PARTICULATE (PM_{10})

Particulate matter is emitted from both natural and anthropogenic sources. Nature provides particulate matter in a variety of forms such as spores, pollen, volcanic ash, salt, soil and meteoric dust. To this natural background, man adds fly ash, smoke, iron oxide, cement and countless other materials. Usually these pollutants are produced by a variety of sources such as traffic, industry, combustion and other man made activities.

Particulates range in diameter from .005 to 250 microns. Particles of this size range may remain in the air anywhere from a few seconds to several months. Gravitational settling comprises the main mechanism by which particles are removed from the air. Rain also removes particles from the air, but it is virtually ineffective when the particle size diameter is less than 2 microns.

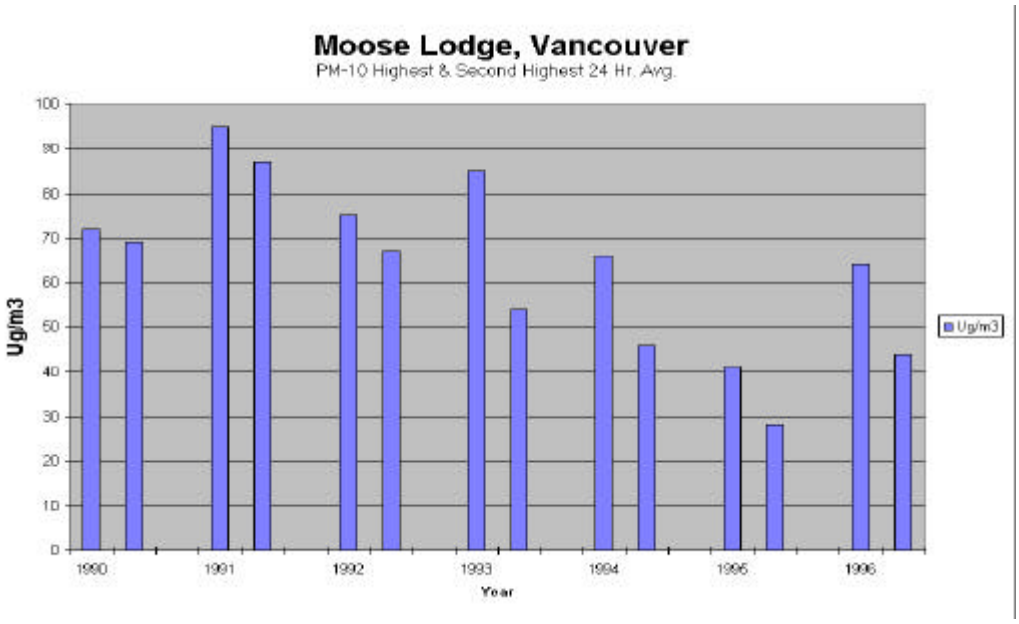
Fine particulate air pollution consists of solid particles or liquid droplets that are less than 10 microns in diameter. Particles in this size range are of greatest concern because they can be inhaled deeply into the lungs where they can remain for years. The health effects of particulate matter vary with the size,

concentration, and chemical composition of the particles. In general, particulate matter causes three kinds of health problems:

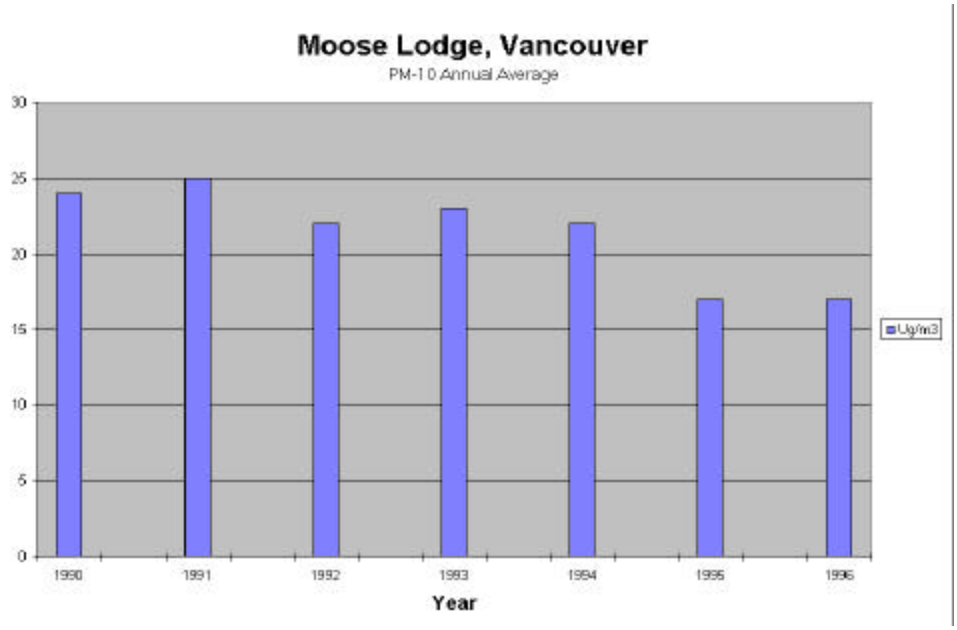
1. The particles may be inherently toxic because of their chemistry.
2. The particles may mechanically damage the respiratory system.
3. The particles may be carriers for absorbed toxic substances.

Relationships have been shown between exposure to high concentrations of particulate matter and increased hospital admissions for respiratory infections, heart disease, bronchitis, asthma, emphysema, and similar diseases. In addition, there may be several potential carcinogens present in particulate matter. Of particular concern are the condensed organic compounds released from low temperature combustion processes (wood stoves, for example).

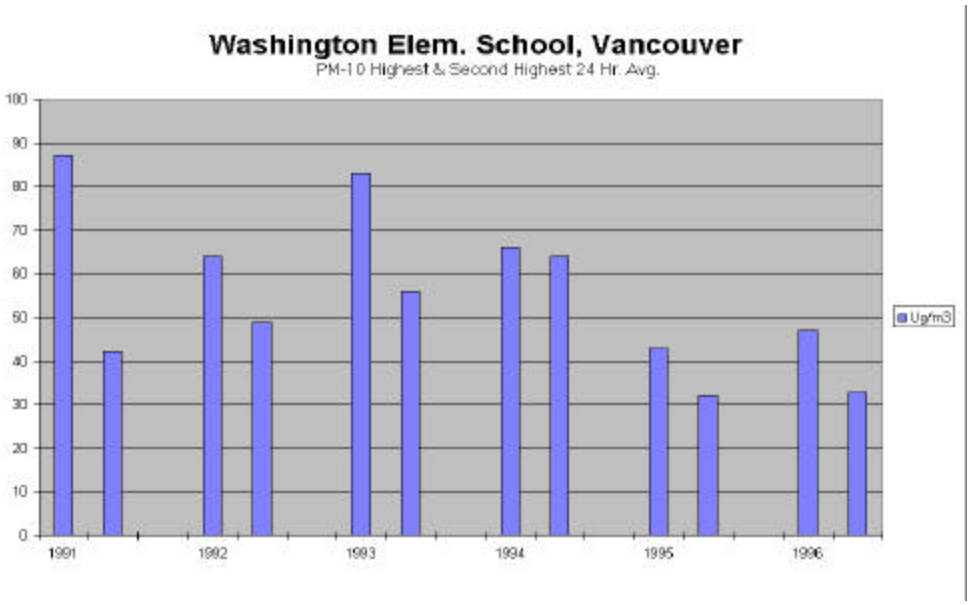
Among the most obvious effects of fine particles are reductions in insulation and visibility due to absorption and scattering of light by suspended particles. Almost all smoke particles from residential wood stoves and fireplaces, industrial boilers, field burning, and other combustion processes can be characterized as fine particulate (i.e., PM_{10}).

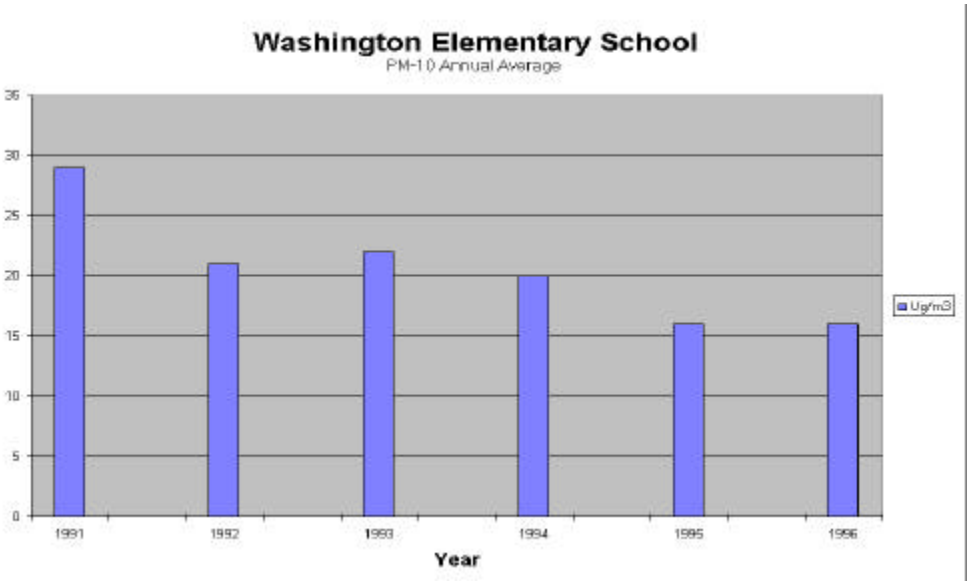


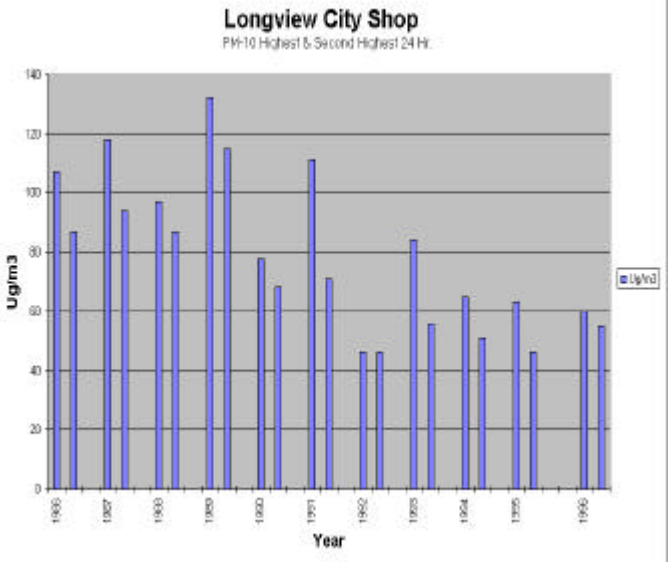
Particulates constitute a large fraction of the pollutants in the air and often are the most hazardous to human health and welfare. Effects of total suspended particulates on animals, materials and vegetation are related to the chemical composition and physical state of the particulate. The effects on human health are primarily associated with injuries to the respiratory system. Particles less than 10 microns can easily penetrate the bronchial passage, while those with diameters less than 1 micron penetrate farther into the lung. Particulates are also associated with burning and irritated eyes, soiling, decreased visibility and degradation of materials. The current trend in air pollution control of particulate matter seems to be toward the capture of even smaller particles.

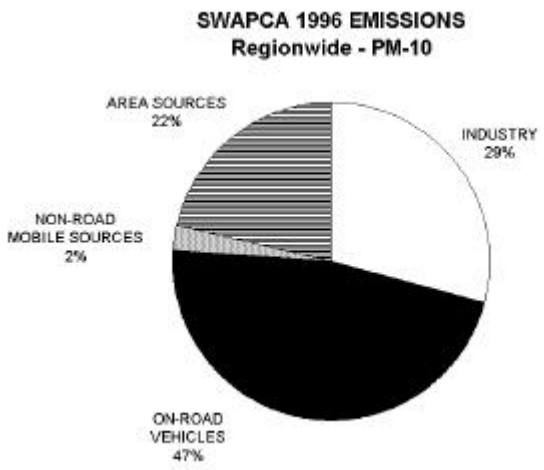


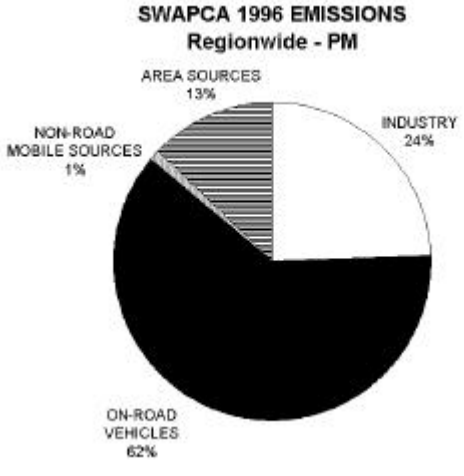
The U.S. EPA proposed a new fine particulate matter standard on December 13, 1996. The new standard would set limits on $PM_{2.5}$ (meaning fine particulate matter 2.5 microns or smaller). The Clean Air Act requires that EPA reviews and, as necessary, revises the air quality standards every five years to ensure that the public health is protected. A comprehensive review of recent health studies of fine particulate matter led the EPA to conclude that the current PM_{10} standard is not sufficient to protect the public health. The new standard will ensure added protection for all, and particularly for children, the elderly, asthmatics, and those with respiratory or heart problems. The EPA's proposed schedule calls for a final rule by mid-1997 followed by a phased implementation period and attainment determinations in 2002-2005.







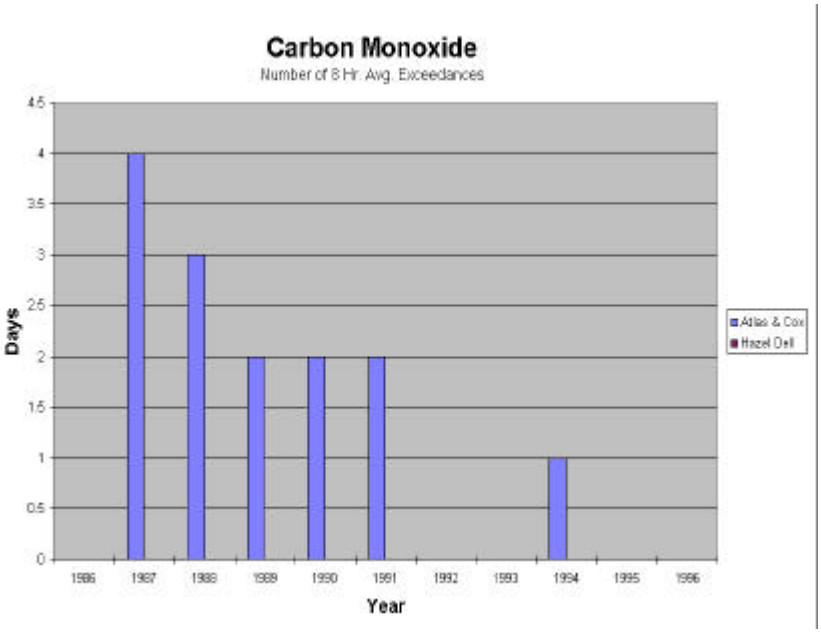


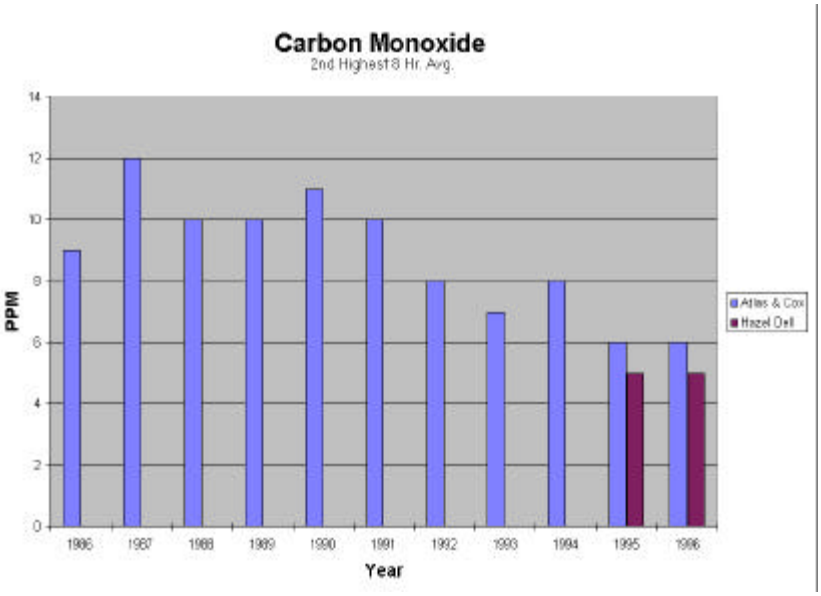


D. CARBON MONOXIDE (CO)

Carbon monoxide (CO) is a colorless, odorless, poisonous gas. In the body, CO binds tightly to hemoglobin (the red pigment in blood that moves oxygen from the lungs to the rest of the body). Once hemoglobin is bound to CO, it can no longer carry oxygen. In this way, CO reduces the oxygen-carrying capacity of the blood and can result in adverse health effects.

High concentrations of CO strongly impair the functions of oxygen-dependent tissues, including the brain, heart, and muscles. Prolonged exposure to low levels of CO aggravates existing conditions in people with heart disease or circulatory disorders. There is a correlation between CO exposure and increased hospitalization and death among such patients. Even in otherwise healthy adults, carbon monoxide has been linked to increased heart disease, decreased athletic performance, and diminished mental capacity. Carbon monoxide also affects newborn and unborn children. High CO levels have been associated with low birth weights and increased infant mortality. Even healthy individuals can be affected at relatively low carbon monoxide concentrations, temporarily resulting in impaired mental functions, visual acuity and alertness.





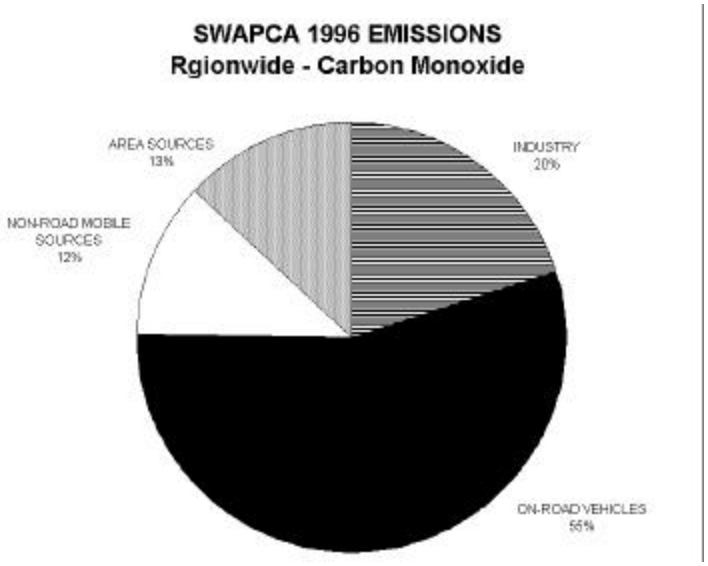
Another potential danger of carbon monoxide is its association with cigarette smoke. This habit can inactivate a smoker's hemoglobin even further, causing a greater exposure to carbon monoxide when combined with external air pollution. Because of its unique mode of action, carbon monoxide is not known to have adverse effects on vegetation, visibility or material objects.

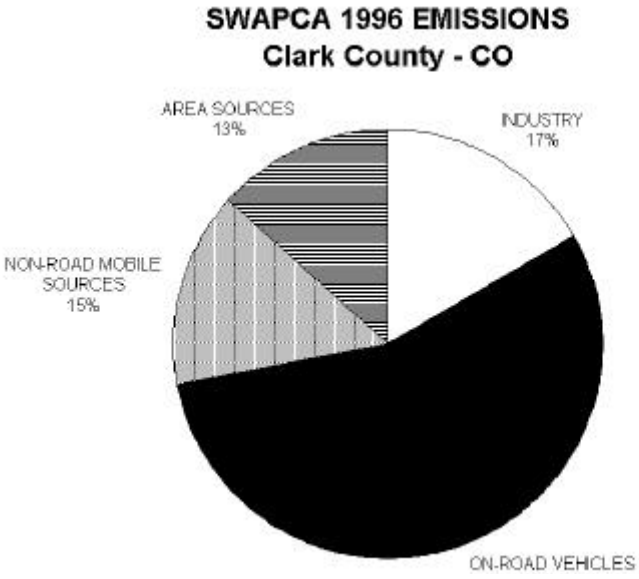
A major natural source of CO is spontaneous oxidation of naturally occurring methane (swamp gas). The major human caused source is incomplete combustion of carbon-based fuels. This is primarily from gasoline-powered motor vehicles. Other important sources are wood stoves, open burning and fuel combustion in industrial and utility boilers.

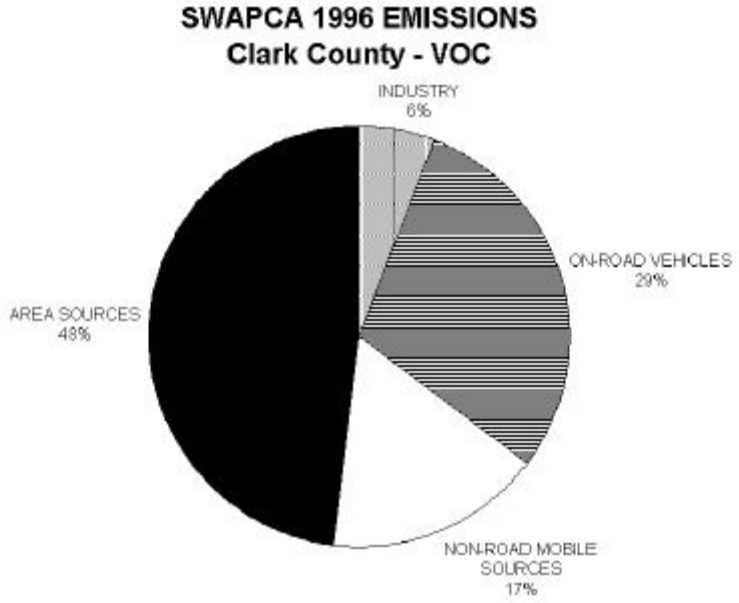
Carbon monoxide emissions from motor vehicles are highest during cold starts. This is one reason why it is best to have alternative transportation modes available that never requires that the vehicle be started in the first place. How a motor vehicle is operated also has an effect on the amount of CO emitted. In stop-and-go driving conditions, CO emissions are also increased when the outside temperature is low. Southwest Washington's most serious CO problems occur during the winter in urban areas, when CO emitted by slow-moving traffic is trapped near the ground.

E. OZONE (O_3)

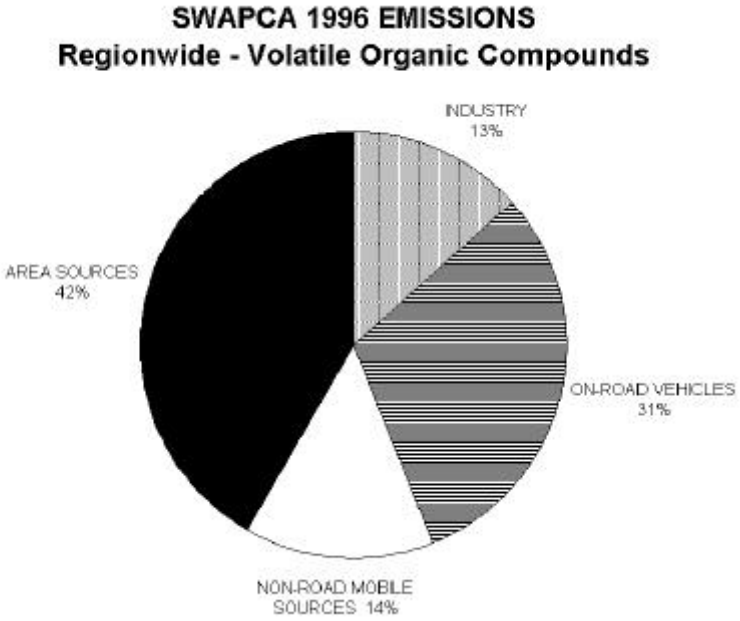
Ozone is a pungent, toxic, highly reactive form of oxygen. It causes irritation of the nose, throat, and lungs. Exposure to ozone can cause increased airway resistance and decreased efficiency of the respiratory system. In individuals involved in strenuous physical activity and in people with pre-existing respiratory disease, ozone can cause sore throat, chest pain, cough, and







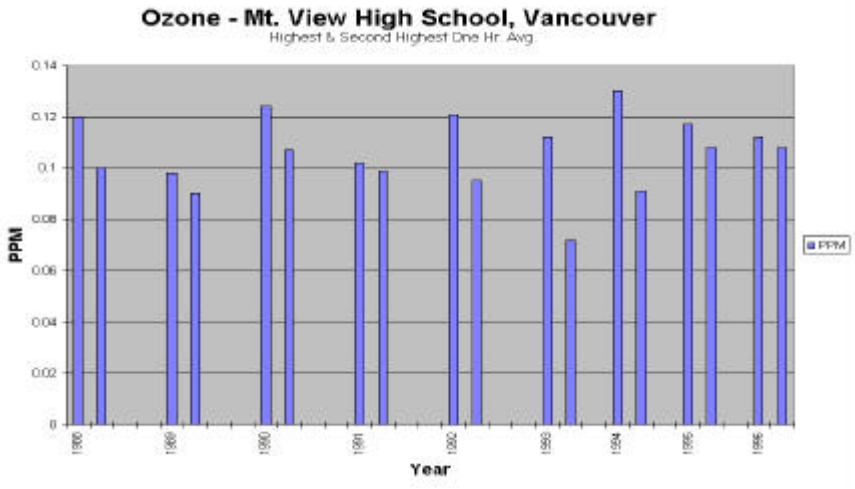
headaches. Plants can also be affected, as reductions in growth and crop yield have been attributed to ozone.



Ozone can affect a variety of materials, resulting in fading of paint and fiber, and accelerated aging and cracking of synthetic rubbers and similar materials. It is also a major contributor to photochemical smog.

Ozone is not emitted directly into the air. It is formed through a series of photochemical (sunlight-requiring) reactions between other pollutants and oxygen (O_2). Most important of these are nitrogen oxides (NO_x) and volatile organic compounds (VOC). To control ozone pollution, it is most common to control both NO_x and VOC. Detailed monitoring and modeling studies are required to justify focusing on only one or the other of these two pollutants. Such a special study was initiated by SWAPCA and the Washington State Department of Ecology (WDOE) in the spring of 1996.

The "ozone layer" in the stratosphere should not be confused with the ozone in the air we breathe. Stratospheric ozone is formed by the ionization of the upper levels of the atmosphere and provides protection from the sun's harmful ultraviolet radiation.



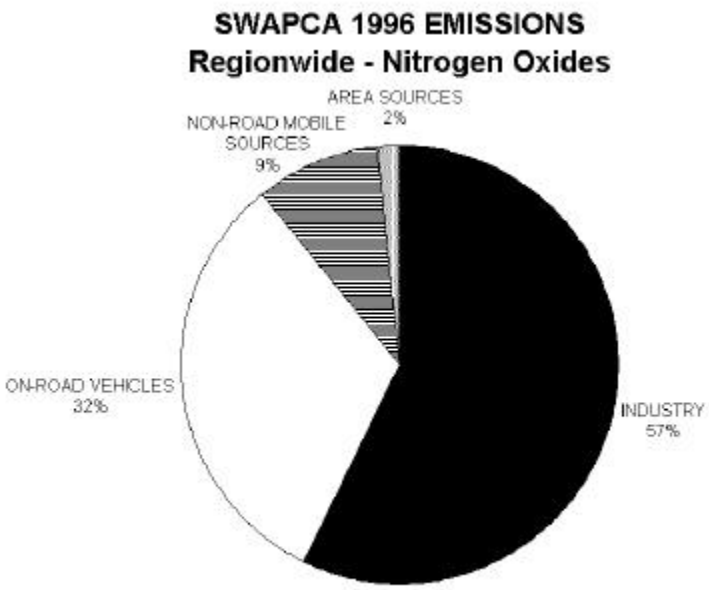
In humans, ozone acts as a mucous membrane irritant resulting in impaired respiratory functions. Symptoms may include sore throat, chest pain, coughing and headaches. Particularly susceptible to the effects of ozone are young children, the elderly, persons with respiratory ailments and individuals who exercise vigorously.

Ozone reacts chemically with alphenic, amino and sulfhydryl groups to damage the mucosal lining of the respiratory tract. The mucosal lining, in secreting mucous, traps particulates and other foreign bodies which are then removed from the lungs by the flagellating action of cilia. Damage to the mucosal lining destroys the ability of the lungs to remove harmful particulates, and the accumulation of mucous and particulates impedes the absorption of oxygen in the lungs. With increased ozone exposure, the lungs become susceptible to bacterial infection, tissue scarring and ultimately lung damage.

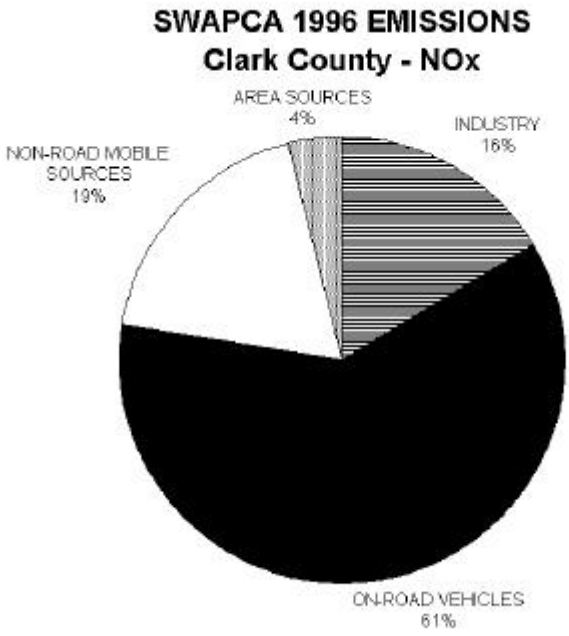
High concentrations of ozone also affect vegetation, resulting in leaf damage and/or reductions in crop growth and yield. Ozone also degrades synthetic rubbers, textiles, and paint colors, and may be a major cause in fabrics fading.

F. NITROGEN DIOXIDE (NO_2)

Nitrogen dioxide is a reddish-brown gas that is toxic in high concentrations. It is a lung irritant and may be related to chronic pulmonary fibrosis. It is also important in the photochemical reactions leading to the formation of ozone. It can cause indirect damage to materials when it combines with moisture in the air to form nitric acid. The nitric acid can then cause corrosion of metal surfaces and can also contribute to acid rain. In addition, NO_2 absorbs visible light and causes reduced visibility. It has also been linked to suppressed growth rates in some plants. Air is composed approximately of 78% nitrogen and 21% oxygen. Together, these predominant gases constitute up to 99% of our atmosphere by volume. When combustion occurs at high temperatures such as in automobile engines and in power plants, nitrogen may combine with oxygen to form several different gaseous compounds collectively known as oxides of nitrogen (No_x). Of these, nitrogen dioxide (NO_2) and nitric oxide (NO) are the most important from an air pollution standpoint.



Both NO_2 and nitric oxide (NO) are potential health hazards. NO is not considered a direct health threat because of the low concentrations found in our atmosphere. The threat NO poses is its ability to react in the atmosphere to form the more toxic compound NO_2.



Nitrogen dioxide is a pulmonary irritant affecting primarily the upper respiratory tract. Although four times more toxic than nitric oxide, NO_2 rarely produces even the mildest of effects. The principal harm most people experience is not from nitrogen oxides directly, but rather from a reaction NO_x has with hydrocarbons in sunlight to produce the photochemical oxidants, ozone and smog.

Nitrogen dioxide also reacts with moisture in the atmosphere to form nitric acid, a contributor to acid rain, which even in small concentrations can corrode metal surfaces. It has adverse effects on atmospheric

visibility and vegetation, although these effects are more commonly found in the northeastern U.S. than in southwest Washington. In addition, nitrogen oxides and their reaction products have been linked to stress corrosion failures of nickel-brass alloys, and to the damaging of fabrics and dyes.

The major human-caused source of NO_2 is fuel combustion in motor vehicles, and utility and industrial boilers. Nitric oxide (NO) is the major nitrogen oxide produced during the combustion process, but once in the atmosphere, NO is rapidly oxidized to NO_2 in the presence of ozone.

G. HYDROCARBONS (Non-Methane)

Non-methane hydrocarbons are a large family of compounds made up of hydrogen and carbon. These compounds are instrumental in the complex series of reactions leading to the formation of ozone and photochemical smog.

These compounds come primarily from motor vehicles, fuel evaporation, industrial coatings and combustion processes. The U.S. Environmental Protection Agency has repealed its health standard for non-methane hydrocarbons and SWAPCA has taken similar action.

H. LEAD (Pb)

Lead is a toxic heavy metal, abundant in the earth's crust. Airborne lead particles are small in size (less than 0.7 microns). For this reason, they can penetrate deep within the lungs and ultimately be absorbed into the human bloodstream.

High concentrations of lead in the blood can cause severe and permanent brain damage, especially in children. Lower levels have vague, non-specific symptoms, including headaches, malaise, stomach pain, irritability, and pallor. Damage can be caused to the heart, kidney, liver, and nerve and blood tissues.

Exposure to lead can occur through multiple pathways, including inhalation of air, ingestion of lead in food, water, soil or dust. Because airborne lead particles are small in size (generally less than 1 micron), a large amount may be inhaled and deposited in the lungs throughout a lifetime. Three systems in the body appear to be sensitive to lead interference: the blood forming system, the nervous system and the renal (kidneys) system. Excessive lead exposure can cause seizures, mental retardation and/or behavior disorders. Fetuses, infants and children are especially susceptible because adverse effects usually occur at lower lead levels than found in the average adult resulting in central nervous system damage. In addition, children are at a greater risk through everyday contact with dust and soil. Streets, playgrounds and the normal hand-to-mouth activities of a child can ultimately lead to high lead exposures. Recent studies have also shown that lead may be a factor in high blood pressure and subsequent heart disease in middle-aged white males.

The major source of lead in the air was the combustion of leaded gasoline in automobiles. This one source accounted for close to 90 percent of the total emissions in the U.S. annually. The U.S. ban on leaded gasoline, effective December 31, 1995, sharply reduced lead contamination in our airshed.

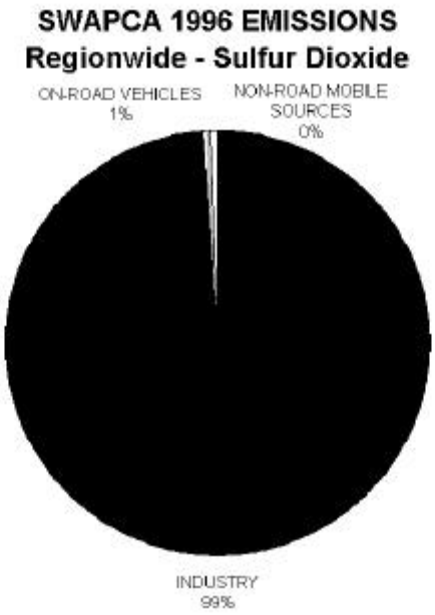
I. SULFUR DIOXIDE (SO_2)

Sulfur dioxide (SO_2) is a colorless, pungent, nonflammable gas. In the body it acts as a lung and eye irritant. When SO_2 is inhaled it causes bronchial constriction, which results in breathing difficulty and an increase in pulse and respiratory rate. People with respiratory diseases like asthma, bronchitis, or emphysema are particularly susceptible to the effects of SO_2.

When conditions promoting oxidation of SO_2 to sulfuric acid are present, the irritant response of SO_2

increases in magnitude by two to three times. When sulfuric acid is inhaled, mucous production increases. This reduces the respiratory system's ability to remove particulate matter, and can lead to more severe respiratory infections, such as pneumonia. Chronic exposure to SO_2 can lead to coughs, shortness of breath, fatigue, and bronchitis.

SO_2 can also damage plants and building materials. The leaves of some vegetables (spinach and lettuce, for example) are damaged by exposure to high levels of SO_2. Sulfur oxides accelerate corrosion of metals and other building materials (limestone, marble, mortar) by forming sulfuric acid on the surface of the material or in the atmosphere, with subsequent deposition on the material. In addition, sulfuric acid and sulfate particles formed in the atmosphere from SO_2 can cause scattering of visible light, thus contributing to haze. These same processes can contribute to acid rain and lead to acidification of lakes and soils.



SO_2 is emitted into the atmosphere through the combustion of sulfur-laden fossil fuels. At concentrations above 3 parts per million (ppm), it can be distinguished by its pungent and irritating odor. In the United States, more than half of the SO_2 pollution originates from power-generating plants. When SO_2 leaves a stack, it may oxidize in the plume to form sulfur trioxide, an exceedingly reactive colorless gas, which combines rapidly with water vapor to form sulfuric acid. This sulfuric acid may further react to form sulfates that, if carried by the wind, may fall miles from the source as acid rain.

Coal is the primary fuel of electricity producing power plants. Because coal contains 0.2% to 7.0% sulfur, its removal presents a serious air pollution need. Early removal of sulfur occurs from some fossil fuels, such as natural gas and petroleum, while still in a gaseous or liquid state. This technology is not easily transferred to sulfur-containing solids. The technology used by industry today involves "coal washing," a method by which the sulfur content in coal is partially removed before combustion. In addition to this practice, SO_2 emissions can be controlled by other means. These include scrubbing of stack gases, flue gas desulfurization, and the burning of low sulfur coal and oil.

The effects of SO_2 on human health usually result in irritation to the upper respiratory tract. Healthy individuals may experience abnormal breathing due to airway resistance. Studies indicate hourly SO_2 concentrations of 250 parts per billion (ppb) have been known to cause bronchial-constriction in asthmatics and sensitive individuals. Other cases show sulfuric acid formation in the lower respiratory tract as a direct result of SO_2 absorption of inhalable particulates.

Nationwide, the major emission of SO_2 is the result of the combustion of coal. Washington has one coal fired power plant and it is located within the jurisdiction of SWAPCA. Diesel fuel and heating oil are other sources of SO_2.

J. INDOOR AIR QUALITY

Indoors was traditionally thought to be a haven from air pollution. But more recently, indications are that air in the work place and home may be as polluted or worse than the outdoors. Why is this? There are three general reasons. In modern times, the use of synthetic building materials and fabrics has become commonplace. After World War II, traditional building materials such as wood were replaced with cheaper alternative materials that could be produced and processed on a large scale. New products such as plastics and pressed-wood products were introduced as materials for building construction and furnishings.

An explosion also occurred in the development of personal care products, pesticides, and household cleaners. Relatively simple and less toxic household cleaners such as baking soda, vinegar, soap, and lye solutions were replaced by more sophisticated chemical formulations. These consumer products were increasingly packaged in convenient aerosol cans, which released their contents directly into the indoor air.

During the energy crisis of 1974, our focus was on conserving energy in homes and other buildings. The desire to reduce heating and cooling costs led to changes in construction techniques in both residential and commercial buildings which reduced building ventilation rates. These changes included tighter building envelopes; inoperable windows; decreased use of operable windows in older construction; use of sealant foams and vapor barriers; reductions in the amount of outdoor air used for ventilation; improperly sized and designed heating, ventilating, and air conditioning (HVAC) systems, the renovation of existing buildings (without corresponding changes to the HVAC systems); and inadequate building maintenance. All of these developments have had two basic effects: an increase in the number and type of contaminants released into the indoor environment, and a decrease in the amount of fresh outdoor air that is introduced into structures to dilute contaminants and satisfy the health and comfort needs of occupants. Increased insulation in buildings and changes in acceptable operating temperatures increased energy efficiency, but also resulted in tight buildings which retained moisture and other contaminants and provided a more favorable environment for microbial growth.

Currently, SWAPCA's enforcement authority is limited to outdoor air pollution except in cases where hazards like asbestos are involved. Since indoor air is a significant concern, we continue to train our staff, accrue data, gear up for possible program development and provide indoor air help when requested.

Common indoor air pollutants include:

- Combustion products such as particulates (ash), CO and NO_2 from tobacco smoking and improper operation of gas appliances, fireplaces, wood stoves, and space heaters.

- Formaldehyde from new home materials like carpet, upholstery, and wood products.

- Vapors from paints, solvents, and aerosols.

- Pesticide and herbicide residues.

- Asbestos, found in older home products like ceiling tiles, flooring, dry wall and insulation.

- Biological contaminants like bacteria, mold, mildew, and pollen.

- Radon, a radioactive gas caused by the natural breakdown of uranium. Radon can be found in high concentration in soils and rocks containing uranium, granite, shale phosphates, and pitchblende.

- Particulates from humidifiers using tap water.

IV. SOUTHWEST WASHINGTON'S AIR QUALITY IN 1996

A. SUMMARY

Air pollution trends over the early 1990s have shown gradual, steady reduction, with some leveling through 1995-1996. In 1996, air pollution levels in southwest Washington were generally satisfactory. In 1994, for the first time, two readings over the ozone 1-hour standard were recorded in Vancouver. These two readings are considered to be only one exceedance of the NAAQS because they occurred on the same day. One exceedance of the carbon monoxide standard also occurred in 1994. There have since been no exceedances of any air quality standards recorded in SWAPCA jurisdiction.

The majority of SWAPCA's air quality sampling sites indicated that both the long term (annual average) and the short term (daily or shorter averages) air pollution levels were slightly improved over the previous years. Some minor variation is always to be expected and consequently, this trend should be viewed with cautious optimism. In many cases, minor variations from year to year in meteorological conditions can be responsible for fluctuations in air pollution levels. These up and down short-term trends can be misleading if not viewed in the proper prospective. In order to obtain a true picture of the air quality improvement, or degradation, a period of several years should be reviewed and analyzed. The reader will be able to do this by referring to the data contained on the graphs, tables and summaries within this report.

B. FACTORS AFFECTING AIR QUALITY

Air pollution levels vary from one part of southwest Washington to another, from day to day, and from year to year. Short-term changes are primarily related to variations in the weather and the amount of pollution emitted into the air, while long-term changes are normally associated with changes in population, pollution sources, trends and economics. Differences in geography and general meteorology from one area to another also have a significant impact on air quality.

Air pollution levels are reflective of seasonal patterns. Increased emissions from automobiles and wood stoves during colder weather, combined with stable air masses that prevent dilution, contribute to higher levels of carbon monoxide and particulate pollution in the winter. Elevated levels of ozone only occur during the summer because ozone formation is dependent upon photochemical reactions occurring at high temperatures and under sunlight. Particulate matter in SWAPCA's region is generally higher during the winter months due to increases in space heating. In some other areas, like eastern Washington, the levels of PM_{10} concentration are higher in the summer and fall months. This is because of the effects of wind blown dust and large scale field burning.

It is always difficult to make generalizations about air quality trends over short time spans. In addition, trends in air quality attributable to control strategies are equally difficult to estimate.

C. EXCEEDANCES OF STANDARDS

The following table indicates the number of days in each of the past nineteen years that southwest Washington experienced pollution concentrations above the NAAQS levels. An exceedance day occurs if any monitoring site records one or more values above these standards during the midnight-to-midnight period. Instances of more or fewer exceedance days from one year to the next may be the result of more intensive monitoring efforts and do not necessarily indicate deteriorating or improving air quality.

NUMBER OF EXCEEDANCE DAYS

City	1978	1979	1980	1981	1982	1983	1984	1985	1986
Fine Particulate (PM_{10})									
Longview	na	na	na	na	na	na	na	na	0
Carbon Monoxide (CO)									
Vancouver	15	2	2	0	0	1	1	0	0
Ozone (O_3)									
Vancouver	na	na	na	0	1	0	0	0	0
Sulfur Dioxide (SO_2)									
Longview	na	na	na	0	0	0	0	0	0

City	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Fine Particulate (PM_{10})										
Vancouver	na	na	na	0	0	0	0	0	0	0
Longview	0	0	0	0	0	0	0	0	0	0
Carbon Monoxide (CO)										
Vancouver	4	3	2	2	2	0	0	1	0	0
Ozone (O_3)										
Vancouver	0	0	0	0	0	0	0	1	0	0
Sulfur Dioxide (SO_2)										
Camas	na	na	na	0	0	na	na	na	na	na
Longview	na	na	na	0	0	na	na	na	na	na

(na = data not available)

D. PM_{10}

With the advent of the new PM_{10} particulate standards in 1987, monitoring efforts in southwest Washington shifted from measuring Total Suspended Particulate (TSP) to monitoring for inhalable particulate with a diameter of 10 microns or smaller (PM_{10}). Since much of the particulate collected as TSP is too large to be inhaled into the lungs (because of the natural capture mechanisms of the upper respiratory tract), scientists believe that PM_{10} is more crucial when dealing with human health. For reference, a 10-micron particle is roughly one-fiftieth the diameter of the period at the end of this sentence. It is important to note that in most cases high levels of TSP also have correspondingly high concentrations of PM_{10} and $PM_{2.5}$. For this reason, even though there is no longer a TSP standard, this data is still useful when looking at trends.

Currently, none of the communities within SWAPCA's jurisdiction are designated as being out of compliance with the PM_{10} standards. Values presented in the following table are the second highest reading of data from any monitors operating in each area of southwest Washington. Because the standard allows for one exceedance per site per year, the second highest reading is the value used to evaluate compliance status.

Wood stoves and open burning are considered primary contributors to PM_{10}. Mandatory wood stove curtailment programs that limit the use of wood for home heating and curtailment of open burning during times of poor atmospheric ventilation help to insure compliance with the ambient standards.

E. OZONE

In the presence of sunlight, ozone is formed near ground level by chemical reactions between organic compounds and nitrogen oxides. When enough volatile organic compounds (VOCs) and nitrogen oxides (NOx) are present, these reactions can produce considerable amounts of ozone when temperatures are above 95 degrees F. Normally, elevated ozone levels occur in Vancouver only during the months of June through August. In 1994 ozone levels rose above the standard twice on one day in mid-July, but it is considered to be only one exceedance for determining compliance with the NAAQS. In 1995 and 1996, no ozone exceedances were recorded in Vancouver, but in 1996 three were recorded in the greater Portland area.

It is important to understand that the areas of Vancouver, Washington and Portland, Oregon share the same airshed. This area is commonly referred to as the "Portland-Vancouver Interstate Air Quality Maintenance Area." In this situation, the consequences of a violation of the federal ambient air quality standards in either state are shared equally by both. Because it takes several hours to produce peak levels of ozone through the chemical reactions with VOCs, NO_x and sunlight, a recorded exceedance of ozone may be a significant distance from the sources that produced the VOC and NO_x (precursor) emissions.

The federal and state standards for ozone allow no more than 1 day per year at a given site to be above the standard when averaged over the most recent three years. Vancouver had no exceedances in 1989, 1990, 1991, 1992, 1993, 1995 or 1996, but one exceedance occurred in 1994. Portland had no days above the standard in 1989, four in 1990, one in 1991, one in 1992, none in 1993, 1994 or 1995, and three in 1996. Only two of the 1996 exceedances occurred at the same site so a violation was not experienced. However, these exceedances precipitated a review process by the Technical Advisory Committee (TAC), as required by the Ozone Maintenance Plan, which began in December of 1996. The TAC findings and recommendations have since been submitted to EPA and redesignation to attainment status granted.

In 1996 SWAPCA received grants to install a second ozone monitor in an area north of the non- attainment area. This same site was also expanded to include other pollutants, such as NO_x, VOC and meteorological data. Data from this and other sites established in cooperation with the Department of Ecology and the U.S. Forest Service will be used to study the ozone formation and transport mechanisms in southwest Washington. A better understanding of these mechanisms is necessary to design effective control strategies

for continued compliance as the area grows.

Because ambient ozone concentrations are related to the release of VOCs from motor vehicles and commercial and industrial sources, strategies to meet the standard have focused mainly on those source categories. One program that is anticipated to reduce VOCs in the Vancouver area is Stage II Vapor Recovery. This program is discussed further under "Emission of Volatile Organic Compounds". The Agency's proposed ozone maintenance plan, developed by the Agency and its Technical Advisory Committee (TAC), fully addresses control measures to insure continued compliance with the standards.

F. CARBON MONOXIDE

Both the Portland and Vancouver areas recorded no exceedances of the carbon monoxide standard in 1996. The carbon monoxide standard is violated when more than one exceedance of the 9 ppm (parts per million) 8-hour average occurs in a calendar year. There is an hourly CO standard of 35 ppm, but it is extremely unlikely that Portland or Vancouver would ever approach this level.

Because carbon monoxide pollution is strongly influenced by motor vehicle emissions, control strategies have focused on the federal Motor-Vehicle Emission Control Program. Automobile manufacturers responded to this program by equipping most vehicles that were built after 1974 with catalytic converters and other emission control features. EPA began to tighten emission standards in 1981 on automobiles and with the adoption of the federal Clean Air Act of 1990 the acceptable emission levels were further reduced.

For carbon monoxide non-attainment areas, EPA has also developed a list of Reasonable Available Control Measures (RACM) that can be employed for transportation sources. These additional measures are weighted for cost-effectiveness and feasibility of implementation before they are recommended for a specific area. The measures include motor vehicle inspection and maintenance, public transportation improvements, park-and-ride lots, parking management, and traffic flow improvements.

SWAPCA conducted a carbon monoxide saturation study in 1993 and 1994. This study was a crucial part of SWAPCA's plan to request redesignation to attainment status from EPA. After careful evaluation, based on traffic counts and an understanding of the local traffic congestion problems, ten different locations were selected for sampling. Generally sampling was conducted on a 3 days per week basis.

As a result of the carbon monoxide saturation study of 1993/1994, a second carbon monoxide monitor was installed in the Hazel Dell area of Vancouver in mid 1995. That site is located at Highway 99 and 78th Street. In addition, the Washington Department of Ecology (WDOE) established a meteorological monitoring station in Vancouver during 1996. This meteorological station is providing valuable information for managing our airshed. This station will continue to provide data useful to both SWAPCA and WDOE for planning and modeling purposes.

Vancouver's carbon monoxide control strategy includes an Inspection and Maintenance (I&M) Program operated under the auspices of the Washington Department of Ecology. This program began in June of 1993 and requires automobiles registered within the carbon monoxide non-attainment area to be inspected bi-annually prior to license renewal. A second emissions testing station opened in May of 1995 in the Cascade Park area of Vancouver. As provided by the Agency's Ozone Maintenance Plan the I&M testing will be expanded into the Ridgefield, Battle Ground, Brush Prairie and LaCenter areas.

G. LEAD

The last exceedance of the lead standard was reported in Portland during the second quarter of 1984 at a site near the Interstate 5 freeway and Going Street. Most recent monitoring data indicate levels at that site less

than 10% of the standard. The dramatic decrease in ambient lead levels is due to phasing out lead in gasoline. Now that leaded gasoline can no longer be legally sold in the U.S. this should further reduce the lead levels in the atmosphere. Lead has not been monitored in Vancouver.

H. SULFUR DIOXIDE

No exceedances of the sulfur dioxide (SO_2) standard have been recorded in either Portland or southwest Washington since 1977. This is due primarily to the discontinuation of high sulfur-containing fuels in the state. Sulfur dioxide is currently monitored in Portland and, during a 1991 study, was conducted by SWAPCA in the Camas, Washington area. The Camas study revealed no exceedances of the standard. Prior to the 1991 Camas study, SO_2 was monitored in the Longview, Washington area, but also indicated no exceedances.

I. NITROGEN DIOXIDE

No exceedances of the nitrogen dioxide standard have ever been recorded in either Portland or southwest Washington. Nitrogen dioxide (NO_2) is currently being monitored in the Vancouver area as a component of the special ozone study discussed above. There is a single monitoring site for nitrogen dioxide in Oregon located generally downwind of downtown Portland. Monitoring data from this site is only collected during the summer months (ozone season).

J. METEOROLOGY

Natural weather processes usually cleanse the air of most pollution. Pollutants normally disperse and are removed by chemical reactions, deposition, condensation, or the scrubbing action of rain.

SWAPCA installed a meteorological station in the Vancouver area in 1996. Atmospheric stability is one of the more important aspects of the weather's effect on air quality. The stability of an air mass controls the amount of vertical mixing that can occur to disperse pollutants. If conditions are such that there is no mixing caused by winds and temperature changes, pollutants will remain trapped at ground level. Prolonged periods with little vertical mixing usually result in a condition commonly called "air stagnation" or "inversion" that may result in increased pollutant concentrations.

The National Weather Service issues an Air Stagnation Advisory (ASA) when stagnation persists over a large area for an extended period. When air pollution problems develop, SWAPCA in coordination with the Washington Department of Ecology (WDOE) uses the ASA, along with weather forecasts and information on current air quality conditions, to determine what actions should be taken to protect public health.

The seasons also have an important impact on meteorology. Both weather and pollutant emissions vary with the time of year. These factors combine to cause seasonal patterns in air quality.

Between storms in late fall and winter, much of southwest Washington is often blanketed with a relatively stable air mass that inhibits the dispersion effects of atmospheric mixing. During the winter automobiles tend to produce more carbon monoxide and home heating produces both carbon monoxide and particulate, especially when wood is used as a fuel. These factors combine to produce the higher pollution levels for these pollutants during the winter. On the other hand, atmospheric ventilation is generally better during spring and summer, when less carbon monoxide and particulate are produced. Consequently, these pollutants are generally not a summertime problem in southwest Washington.

Periods of relatively poor ventilation do occur even in the summer, however. Ozone concentrations reach peak levels when sunshine and temperatures above 95 degrees Fahrenheit accompany periods of stagnation,

and poor ventilation. Although ozone is not released directly into the atmosphere, it is produced during periods of sunlight and elevated temperatures by chemical reactions involving VOCs and NO_x. The meteorological factors favorable to significant ozone formation occur only during the summer.

APPENDIX A

AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	Federal Standard	State Standard
PM10	Annual Arithmetic Mean	50 ug/m	50 ug/m
	24 hours	150 ug/m	150 ug/m
Ozone	1 hour	0.12 ppm	0.12 ppm
Carbon Monoxide	8 hours	9 ppm	9 ppm
	1 hour	35 ppm	35 ppm
Sulfur Dioxide	Annual Arithmetic Mean	0.03 ppm	0.02 ppm
	24 hours	0.14 ppm	0.10 ppm
	3 hours	0.5 ppm	0.5ppm
Nitrogen Dioxide	Annual Arithmetic Mean	0.053 ppm	0.053 ppm
Lead	Calendar Quarter	1.5 ug/m	1.5 ug/m

Notes: The federal total suspended particulate standard (TSP) was dropped in 1987.
ug/m = micrograms of pollutant per cubic meter of air.
ppm = parts per million.

APPENDIX B

Criteria Pollutants			
Pollutants	**Description**	**Sources**	**Health Effects**
Particulate (PM_{10})	Particles less than 10 microns in size.	Wood stove, industry, dust construction, street sand application, open burning agricultural activities.	Aggravates ailments such as bronchitis and emphysema, especially bad for those with chronic heart and lung disease, as well as the very young and old and pregnant women.
Carbon Monoxide (CO)	An odorless, tasteless, colorless gas which is emitted primarily from any form of combustion	Mobile sources (autos, trucks, buses), wood stoves, open burning, industrial combustion sources.	Deprives the body of oxygen by reducing the blood'' capacity to carry oxygen: causes headaches, dizziness, nausea, and listlesness and in high doses may cause death.
Ozone (O_3)	Formed when nitrogen oxides and volatile organic compounds react with one another in the presence of sunlight and warm temperatures. A component of smog.	Mobile sources, industry, power plants, gasoline storage and transfer, paint, solvent usage.	Irritates eyes, nose, throat and respiratory system; especially bad for those with chronic heart and lung disease, as well as the very young and old, and pregnant women.
Nitrogen Dioxide (NO_2)	A poisonous gas produced when nitrogen oxide becomes a byproduct of sufficiently high-burning temperatures.	Fossil fuel power, mobile sources, industry, explosives manufacturing, fertilizer manufacturing.	Harmful to lungs, irritates bronchial and respiratory systems; increases symptoms in asthmatic patients.
Sulfur Dioxide (SO_2)	A gas or liquid resulting from the burning of sulfur-containing fuel.	Fossil fuel power plants, non-ferrous smelters, kraft pulp production.	Increases symptoms in asthmatic patients; irritates respiratory system.
Lead (Pb)	A widely used metal, which may accumulate in the body.	Leaded gasoline, smelting, battery manufacturing, and recycling.	.Affects motor function and reflexes and learning; causes damage to the central nervous system, kidneys and brain. Children affected more than adults

APPENDIX C

GLOSSARY

Air impairment: Unhealthy levels of air pollutants necessitating open burning bans. SWAPCA may declare air impairments based on monitored levels of pollution and weather forecasts.

Ambient air: The surrounding air (excluding indoor air).

Area source: A pollution source not confined to one point, but spread out in a large geographical area. Area sources include automobiles, wood stoves, small businesses (i.e. dry cleaners), etc.

BACT: Best Available Control Technology, or the most effective way that is technically and economically feasible to limit the amount of air pollutants emitted.

Carbon monoxide (CO): A colorless, poisonous gas formed when carbon-containing fuel is not burned completely. Sources include vehicle emissions, industry and wood burning. Related to respiratory and heart diseases.

Class I area: All international parks, national wilderness areas and memorial parks which exceed 5,000 acres, and all national parks which exceed 6,000 acres in size.

Criteria pollutants: A category of pollutants identified by EPA for which standards for protecting human health have been set. Includes carbon monoxide, nitrogen dioxide, sulfur dioxide, ozone, particulate matter and lead.

Emission inventory: A data bank of air pollution statistics, identifying the type, size and location of various pollution sources. Categories include point sources and area sources.

Environment 2010: A strategic plan to identify and ultimately solve the environmental problems faced by Washington State both now and in the future.

EPA: Environmental Protection Agency, a federal agency responsible for environmental concerns.

Federal Clean Air Act: The first major legislation to target air pollution. First passed in 1963, with subsequent revisions in 1970, 1977, and 1990.

Lead (Pb): A heavy gray metal found in gasoline, paints, and plumbing. Exposure can adversely affect the nervous system.

National Ambient Air Quality Standards (NAAQS): Primary and secondary standards set at a national level for criteria pollutants. The purpose of these standards is to protect human health.

Nephelometer: A device that measures particulate pollution in the air.

Nitrogen dioxide (NO_2): A brownish gas and strong oxidizing agent that is one of the major components of acid rain and smog.

Non-attainment area: An area designated by EPA in which National Ambient Air Quality Standards are exceeded.

Offset: A policy requiring reductions in emissions before a permit will be granted.

Ozone (O_3): A poisonous, bluish gas form of oxygen, which is the result of chemical reactions between volatile organic compounds and nitrogen oxides. Destroys crops and impairs breathing.

Particulate matter (PM_{10}): Airborne particles resulting from wood stove burning, outdoor burning, road dust and industry, which can get in lungs and impair the respiratory system.

Point sources: Identifiable pollution sources such as large industries that emit significant levels of air pollutants in a particular geographic location.

PSD: Prevention of Significant Deterioration. A permit issued before construction can begin on new or expanded facilities that emit air pollutants. The purpose of the permit is to ensure that the air pollution in the area does not reach unhealthy levels in areas currently meeting federal standards, and that the facility is using BACT.

SPMS: Special Purpose Monitoring Site. Used by SWAPCA mainly for short-term studies of air pollution or non-criteria pollutant monitoring.

SLAMS: State and Local Air Monitoring Site. Site for air monitoring and data collection.

SIP: State Implementation Plan. A plan the state adopts to ensure that state air quality objectives are met.

Sulfur dioxide (SO_2): A gas or liquid resulting from the burning of sulfur-containing fuel. May cause breathing problems.

Telemetry: A method of collecting data from monitoring sites. Data is electronically sent over telephone lines to a central computer at SWAPCA.

Toxic air pollutants: Compounds that may cause cancer and/or other health problems at extremely low concentrations.

Volatile organic compounds (VOCs): Unstable or carbon-based compounds that, when combine with nitrogen oxides, will produce ozone.

APPENDIX D

FACTS YOU SHOULD KNOW

about

YOUR AIR POLLUTION CONTROL AGENCY

and

HOW YOU CAN HELP

SOUTHWEST AIR POLLUTION CONTROL AUTHORITY

Serving Clark, Cowlitz, Lewis, Skamania and Wahkiakum Counties

WHO IS SWAPCA?

The Southwest Air Pollution Control Authority (SWAPCA) was formed after passage of the 1967 Clean Air Act of Washington (RCW 70.94). That Act required the more populated counties within the State of Washington to activate local air pollution control authorities. Altogether, there are seven such agencies within the State. Many people think that SWAPCA is part of either the City, County, State or Federal government, but in actuality, we are a separate government entity classified as a municipal corporation. Our jurisdiction includes the five counties of Clark, Cowlitz, Lewis, Skamania and Wahkiakum. It covers a total of 6,127 square miles and serves a population of approximately 475,000.

MISSION:

The mission of SWAPCA is to preserve, enhance and protect the quality of our region's air resource, by sound management practices and public education, for the benefit of current and future generations.

PURPOSE:

SWAPCA administers the laws and regulations regarding air pollution control. The basis for these laws and regulations can be either state, federal, our own air pollution control regulations, the State Environmental Policy Act, or State Implementation Plan requirements. There are also agreements with other governmental agencies, such as the State Department of Ecology and the State Department of Natural Resources regarding funding, program commitments, and open burning control.

HISTORY:

In December of 1968, the Agency's Board of Directors adopted Regulation 1, which together with the Washington Clean Air Act, became the primary air pollution control law for SWAPCA. In October 1969, the Board of Directors adopted Regulation 2 to establish additional controls for industrial pollution sources. Regulation 1 and 2 have been amended numerous times to meet state and federal requirements and to

establish programs necessary for control of air pollution.

RESPONSIBILITIES:

In achieving the purposes of the Clean Air Act, SWAPCA is to hold hearings, control emissions of air contaminants through the adoption of regulations, measure emissions of air contaminants from sources, review new sources, maintain proper records of operations, contract with individuals for studies and reports, and inspect and monitor air pollution sources and levels. SWAPCA issues citations, initiates court suits or uses other legal means to enforce the provisions of this regulation.

FUNDING:

The State Clean Air Act empowers local air pollution control boards to apply to the state and federal governments for grants-in-aid, to charge fees for certain services, and to assess cities and counties within SWAPCA's boundaries for "supplemental income" in proportion to their population. SWAPCA has financed its program through state and federal grants, permit fees from industry, assessments of cities and counties within its five county jurisdiction according to population, and through penalties collected for infractions.

BOARD OF DIRECTORS:

The governing Board of SWAPCA consists of eleven members. This includes a County Commissioner from each of the five counties, one City Council representative from the largest city within each of the five counties, and one member-at-large.

The Board of Directors holds public meetings on the third Tuesday of each month at 3:00 p.m. Most meetings are held at SWAPCA's office, located at 1308 N.E. 134th Street, Vancouver, WA. However, an effort is made to meet about once per year in Cowlitz, Lewis, Wahkiakum, and Skamania Counties as well.

STAFF AND RESPONSIBILITIES:

SWAPCA employs a professional staff to provide technical, engineering, enforcement, and administrative and clerical support.

The Executive Director is appointed by the Board of Directors to serve in a professional capacity as its technical advisor and administrative officer.

The engineering staff reviews new source applications, provides information on regulations to interested parties, maintains the emission inventory, assists in source testing activities, and gives technical assistance to inspectors. They review environmental impact statements, SEPA actions, coordinate with city and county departments, and assist in regulation review. They also assist in developing control plans to meet and maintain air quality standards and conduct or review special studies.

The operations staff conducts source inspections, responds to citizen complaints, does routine surveillance to maintain compliance of point sources and enforces air pollution regulations. They maintain the air-monitoring network and perform data analysis and quality assurance. They provide computer service assistance to other agency staff and assist in the planning and development of plans to meet and maintain air quality standards. All staff members participate in special projects, routine information requests, enforcement and public education programs.

The clerical staff provides a variety of specialized secretarial/clerical assistance, performs work in

accounting, financial records, preparation of periodic reports, fiscal status reports, payroll, personnel records, library filing, and other assistance as needed by the Agency staff.

ADVISORY BOARD:

An Advisory Board advises the Executive Director and Board of Directors on air pollution matters. Two must represent industry and all should be skilled and experienced in the field of air pollution control. They are appointed by the Executive Director.

AIR SAMPLING:

An air pollution monitoring network is operated within SWAPCA's jurisdiction. Pollutants sampled are small size particulate (PM-10), carbon monoxide, and ozone. Meteorological parameters are also monitored, including temperature, wind speed, wind direction, and related statistical indicators. Special studies also occur for monitoring other compounds as needed.

VIOLATIONS:

As a means of enforcing the regulations, SWAPCA has the responsibility to issue civil penalties and initiate actions in court. Additional means of enforcement include injunctions, restraining orders, assurances of discontinuance, and other administrative means.

PUBLIC EDUCATION AND INFORMATION:

SWAPCA maintains a library of information on environmental issues, which is open to the public for research purposes. Informational brochures, leaflets, and fact sheets are available upon request. Staff members are available for presentations to civic, educational and other interested groups. Telephone message lines provide information on air pollution levels and seasonal topics like woodstoves and open burning. Information on specific air pollution problems, current control requirements and general regulations is also available.

HOW CAN I GET MORE INFORMATION

SWAPCA Office (360) 574-3058

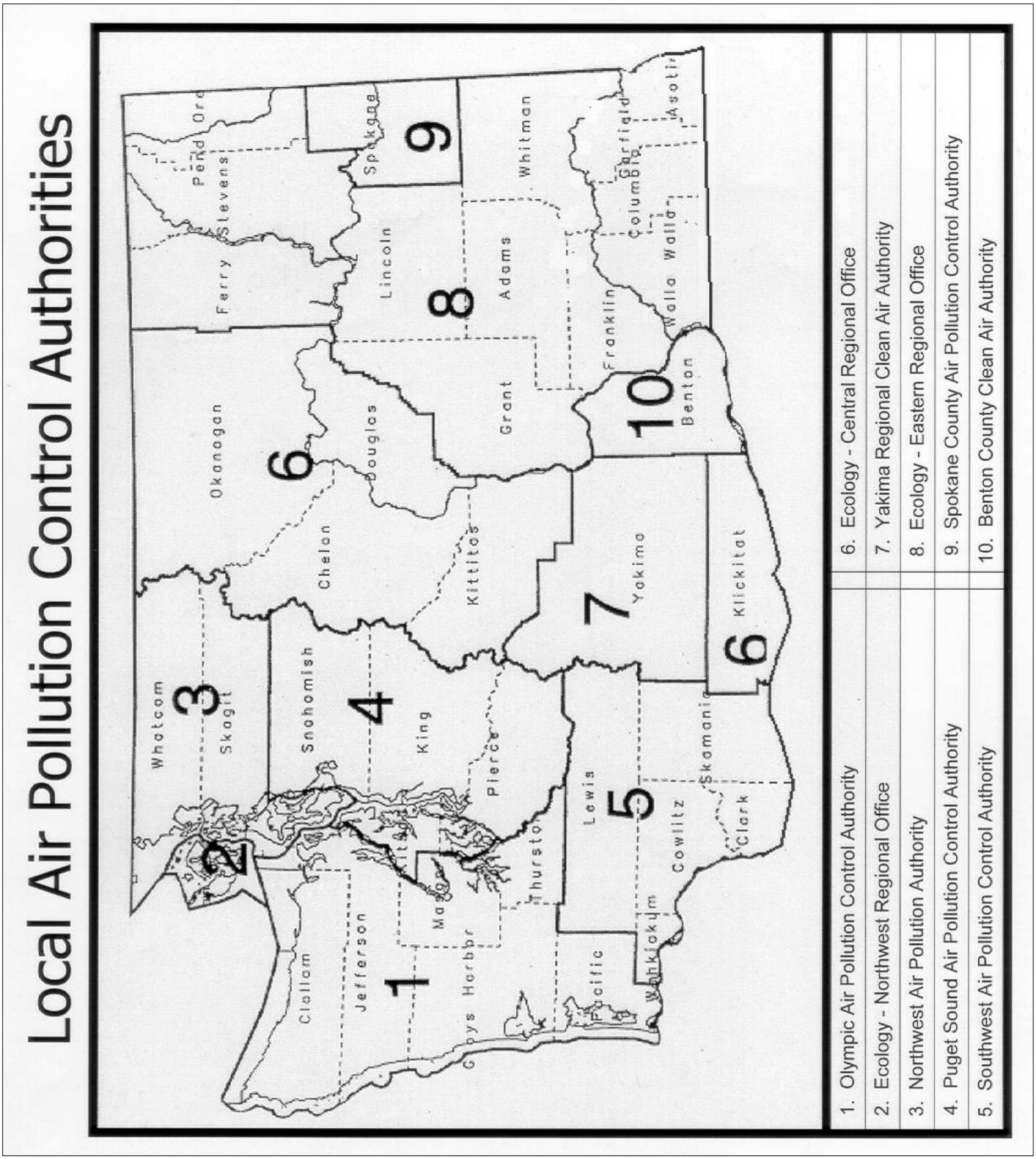
Burning and Wood Stove Information (360) 574-0057

IF EVERYONE DOES SOMETHING

WE CAN CLEAR THE AIR IN VANCOUVER!

1. Avoid using your wood stove or fireplace when air quality is poor.
2. Burn only dry, seasoned wood.
3. Keep your car tuned for fuel efficiency.
4. Combine your errands into just one trip.
5. Walk or ride your bike on short trips.
6. Take the bus or car pool at least one day a week.
7. Use the phone to cut down on “looking and travel” time.

APPENDIX E


Local Air Pollution Control Authorities
Whatcom
Skagit
Snohomish
King
Pierce
Thurston
Lewis
Skamania
Clark
Cowlitz
Wahkiakum
Pacific
Grays Harbor
Mason
Kitsap
Jefferson
Clallam
Chelan
Okanogan
Douglas
Grant
Yakima
Klickitat
Benton
Franklin
Walla Walla
Columbia
Garfield
Asotin
Whitman
Adams
Lincoln
Spokane
Ferry
Stevens
Pend Oreille
1. Olympic Air Pollution Control Authority
2. Ecology - Northwest Regional Office
3. Northwest Air Pollution Authority
4. Puget Sound Air Pollution Control Authority
5. Southwest Air Pollution Control Authority
6. Ecology - Central Regional Office
7. Yakima Regional Clean Air Authority
8. Ecology - Eastern Regional Office
9. Spokane County Air Pollution Control Authority
10. Benton County Clean Air Authority

APPENDIX F

TOTAL SWAPCA REGIONAL EMISSIONS

1996 Annual Emission Inventory

	Tons per Year					
	CO	**SO2**	**VOC**	**NOx**	**PM**	**PM-10**
INDUSTRY	50,250	82,991	3,912	26,316	9,299	6,273
ON-ROAD VEHICLES	139,789	578	9,044	14,826	23,411	10,056
NON-ROAD MOBILE SOURCES	29,779	380	4,247	4,162	506	505
AREA SOURCES	32,776	62	12,352	770	4,816	4,617
TOTAL	252,594	84,011	29,556	46,074	38,032	21,452
INDUSTRY						
Large Industries	50,172	82,968	3,683	26,209	9,000	6,198
small industries	78	23	229	107	299	75
ON-ROAD VEHICLES						
Vehicles	139,789	578	9,044	14,826	964	964
Road Dust Paved	0	0	0	0	21,142	11,371
Road Dust Unpaved	0	0	0	0	1,305	522
	139,789	578	9,044	14,826	23,411	12,856
NON-ROAD MOBILE SOURCES						
Aircraft	995	1	32	5	0	0
Vessels/ships	124	34	66	392	12	12
Railroads	33	15	16	205	5	5
Lawn & Garden Equipment	13,584	8	1,736	26	29	29
Recreational Vehicles	687	0	240	2	3	3
Recreational Marine Vehicles	2,999	41	1,002	98	0	0
Light Commercial Equipment	4,871	6	277	42	7	7
Industrial Equipment	1,316	9	92	196	11	11
Construction Equipment	2,516	211	394	2,428	248	248
Agricultural Equipment	375	30	82	380	56	56
Logging Equipment	2,280	26	310	388	135	134
	29,779	380	4,247	4,162	506	505
AREA SOURCES						
Solvent Utilization	0	0	6,840	0	0	0
Gasoline Storage and Transport	0	0	814	0	0	0
Stationary Source Fuel Combustion	131	13	59	371	38	38
Woodstoves/Fireplaces	24,067	44	3,939	299	3,377	3,377
Residential Trash & Yard Burning	980	4	236	48	167	293
Slash Burning	7,394	0	433	47	1,173	848
Structure and Wildfires	204	0	31	5	61	61
	32,776	62	12,352	770	4,816	4,617

CLARK COUNTY EMISSIONS

1996 Annual Emission Inventory

	Tons per Year					
	CO	**SO2**	**VOC**	**NOx**	**PM**	**PM-10**
INDUSTRY	20,315	2,353	893	2,010	1,740	1,104
ON-ROAD VEHICLES	66,830	295	4,464	7,484	11,944	6,559
NON-ROAD MOBILE SOURCES	17,788	217	2,511	2,297	225	225
AREA SOURCES	16,234	37	7,319	471	2,380	2,348
	121,167	2,903	15,187	12,263	16,288	10,236
INDUSTRY						
Large Industries	20,302	2,343	793	1,960	1,559	1,089
small industries	13	10	100	50	181	15
ON-ROAD VEHICLES						
Vehicles	66,830	295	4,464	7,484	492	492
Road Dust Paved					10,786	5,801
Road Dust Unpaved					666	266
	66,830	295	4,464	7,484	11,944	6,559
NON-ROAD MOBILE SOURCES						
Aircraft	640	1	20	3	0	0
Vessels/ships	80	22	42	252	8	8
Railroads	21	9	10	132	3	3
Lawn & Garden Equipment	8,741	5	1,099	17	19	19
Recreational Vehicles	442	0	154	1	2	2
Recreational Marine Vehicles	1,930	27	645	63	0	0
Light Commercial Equipment	3,135	4	176	27	4	4
Industrial Equipment	847	5	59	126	7	7
Construction Equipment	1,326	111	208	1,277	131	131
Agricultural Equipment	151	12	33	153	23	23
Logging Equipment	475	21	65	245	28	28
	17,788	217	2,511	2,297	225	225
AREA SOURCES						
Solvent Utilization	0	0	4,344	0	0	0
Gasoline Storage and Transport	0	0	407	0	0	0
Stationary Source Fuel Combustion	85	8	38	238	25	25
Woodstoves/Fireplaces	14,219	26	2,305	177	2,001	2,001
Residential Trash & Yard Burning	261	3	113	23	72	107
Slash Burning	1,542	0	91	30	244	177
Structure and Wildfires	127	0	20	3	38	38
	16,234	37	7,319	471	2,380	2,348

COWLITZ COUNTY
EMISSIONS
1996 Annual Emission Inventory

	Tons per Year					
	CO	**SO2**	**VOC**	**NOx**	**PM**	**PM-10**
INDUSTRY	27,556	2,338	2,616	5,363	2,753	1,430
ON-ROAD VEHICLES	36,058	140	2,263	3,629	5,668	3,112
NON-ROAD MOBILE SOURCES	6,152	81	871	910	131	130
AREA SOURCES	8,705	13	2,701	161	1,243	1,170
	78,471	2,572	8,451	10,063	9,795	5,842
INDUSTRY						
Large Industries	27,545	2,332	2,548	5,342	2,676	1,405
small industries	11	6	68	21	77	25
ON-ROAD VEHICLES						
Vehicles	36,058	140	2,263	3,629	233	233
Road Dust Paved	0	0	0	0	5,118	2,753
Road Dust Unpaved	0	0	0	0	316	126
	36,058	140	2,263	3,629	5,668	3,112
NON-ROAD MOBILE SOURCES						
Aircraft	189	0	6	1	0	0
Vessels/ships	23	6	12	74	2	2
Railroads	6	3	3	39	1	1
Lawn & Garden Equipment	2,575	2	339	5	5	5
Recreational Vehicles	130	0	46	0	1	1
Recreational Marine Vehicles	569	8	190	18	0	0
Light Commercial Equipment	923	1	54	8	1	1
Industrial Equipment	249	2	18	37	2	2
Construction Equipment	532	45	83	515	52	52
Agricultural Equipment	135	11	29	137	20	20
Logging Equipment	821	4	90	76	45	45
	6,152	81	871	910	131	130
AREA SOURCES						
Solvent Utilization	0	0	1,327	0	0	0
Gasoline Storage and Transport	0	0	222	0	0	0
Stationary Source Fuel Combustion	25	3	11	70	7	7
Woodstoves/Fireplaces	5,674	10	956	70	788	788
Residential Trash & Yard Burning	305	1	52	11	40	79
Slash Burning	2,662	0	126	9	396	284
Structure and Wildfires	39	0	6	1	12	12
	8,705	13	2,701	161	1,243	1,170

LEWIS COUNTY EMISSIONS

1996 Annual Emission Inventory

	Tons per Year					
	CO	**SO2**	**VOC**	**NOx**	**PM**	**PM-10**
INDUSTRY	2,367	78,300	401	18,938	4,805	3,739
ON-ROAD VEHICLES	32,438	126	2,036	3,264	5,099	0
NON-ROAD MOBILE SOURCES	4,837	72	717	854	126	126
AREA SOURCES	6,219	9	1,934	114	943	876
	45,862	78,507	5,088	23,170	10,973	4,741
INDUSTRY						
Large Industries	2,325	78,293	342	18,903	4,765	3,704
small industries	42	7	59	35	40	35
ON-ROAD VEHICLES						
Vehicles	32,438	126	2,036	3,264	210	210
Road Dust Paved	0	0	0	0	4,605	2,476
Road Dust Unpaved	0	0	0	0	284	114
	32,438	126	2,036	3,264	5,099	2,800
NON-ROAD MOBILE SOURCES						
Aircraft	138	0	4	1	0	0
Vessels/ships	17	5	9	54	2	2
Railroads	5	2	2	28	1	1
Lawn & Garden Equipment	1,887	1	248	3	4	4
Recreational Vehicles	95	0	34	0	0	0
Recreational Marine Vehicles	417	6	139	14	0	0
Light Commercial Equipment	677	1	40	6	1	1
Industrial Equipment	183	1	13	27	2	2
Construction Equipment	600	50	94	580	59	59
Agricultural Equipment	80	6	17	81	12	12
Logging Equipment	741	0	116	59	46	46
	4,837	72	717	854	126	126
AREA SOURCES						
Solvent Utilization	0	0	972	0	0	0
Gasoline Storage and Transport	0	0	173	0	0	0
Stationary Source Fuel Combustion	18	2	8	51	5	5
Woodstoves/Fireplaces	3,428	6	556	43	483	483
Residential Trash & Yard Burning	340	1	58	12	45	88
Slash Burning	2,402	0	162	7	401	291
Structure and Wildfires	31	0	5	1	9	9
	6,219	9	1,934	114	943	876

SKAMANIA COUNTY
EMISSIONS
1996 Annual Emission Inventory

	Tons per Year					
	CO	**SO2**	**VOC**	**NOx**	**PM**	**PM-10**
INDUSTRY	12	0	1	5	1	0
ON-ROAD VEHICLES	3,000	12	188	302	472	259
NON-ROAD MOBILE SOURCES	697	7	104	78	16	16
AREA SOURCES	1,086	1	281	17	166	151
	4,795	20	574	402	655	426
INDUSTRY						
Large Industries	0	0	0	4	0	0
small industries	12	0	1	1	1	0
ON-ROAD VEHICLES						
Vehicles	3,000	12	188	302	19	19
Road Dust Paved	0	0	0	0	426	229
Road Dust Unpaved	0	0	0	0	26	11
	3,000	12	188	302	472	259
NON-ROAD MOBILE SOURCES						
Aircraft	20	0	1	0	0	0
Vessels/ships	3	1	1	8	0	0
Railroads	1	0	0	4	0	0
Lawn & Garden Equipment	275	0	36	0	1	1
Recreational Vehicles	14	0	5	0	0	0
Recreational Marine Vehicles	61	1	20	2	0	0
Light Commercial Equipment	99	0	6	1	0	0
Industrial Equipment	27	0	2	4	0	0
Construction Equipment	42	4	7	40	4	4
Agricultural Equipment	9	1	2	9	1	1
Logging Equipment	148	1	24	8	9	9
	697	7	104	78	16	16
AREA SOURCES						
Solvent Utilization	0	0	142	0	0	0
Gasoline Storage and Transport	0	0	7	0	0	0
Stationary Source Fuel Combustion	3	0	1	8	1	1
Woodstoves/Fireplaces	545	1	88	7	77	77
Residential Trash & Yard Burning	54	0	9	2	7	14
Slash Burning	479	0	33	1	80	58
Structure and Wildfires	5	0	1	0	1	1
	1,086	1	281	17	166	151

WAHKIAKUM COUNTY
EMISSIONS
1996 Annual Emission Inventory

	Tons per Year					
	CO	**SO2**	**VOC**	**NOx**	**PM**	**PM-10**
INDUSTRY	0	0	1	0	0	0
ON-ROAD VEHICLES	1,462	6	92	147	230	126
NON-ROAD MOBILE SOURCES	304	2	45	23	8	8
AREA SOURCES	533	1	118	6	84	72
	2,299	8	256	177	322	207
INDUSTRY						
Large Industries	0	0	0	0	0	0
small industries	0	0	1	0	0	0
ON-ROAD VEHICLES						
Vehicles	1,462	6	92	147	9	9
Road Dust Paved	0	0	0	0	208	112
Road Dust Unpaved	0	0	0	0	13	5
	1,462	6	92	147	230	126
NON-ROAD MOBILE SOURCES						
Aircraft	8	0	0	0	0	0
Vessels/ships	1	0	1	3	0	0
Railroads	0	0	0	2	0	0
Lawn & Garden Equipment	107	0	14	0	0	0
Recreational Vehicles	5	0	2	0	0	0
Recreational Marine Vehicles	24	0	8	1	0	0
Light Commercial Equipment	38	0	2	0	0	0
Industrial Equipment	10	0	1	2	0	0
Construction Equipment	16	1	3	16	2	2
Agricultural Equipment	0	0	0	0	0	0
Logging Equipment	95	0	15	0	6	6
	304	2	45	23	8	8
AREA SOURCES						
Solvent Utilization	0	0	55	0	0	0
Gasoline Storage and Transport	0	0	5	0	0	0
Stationary Source Fuel Combustion	1	0	0	3	0	0
Woodstoves/Fireplaces	201	0	33	2	28	28
Residential Trash & Yard Burning	20	0	3	1	3	5
Slash Burning	309	0	21	0	52	38
Structure and Wildfires	2	0	0	0	1	1
	533	1	118	6	84	72