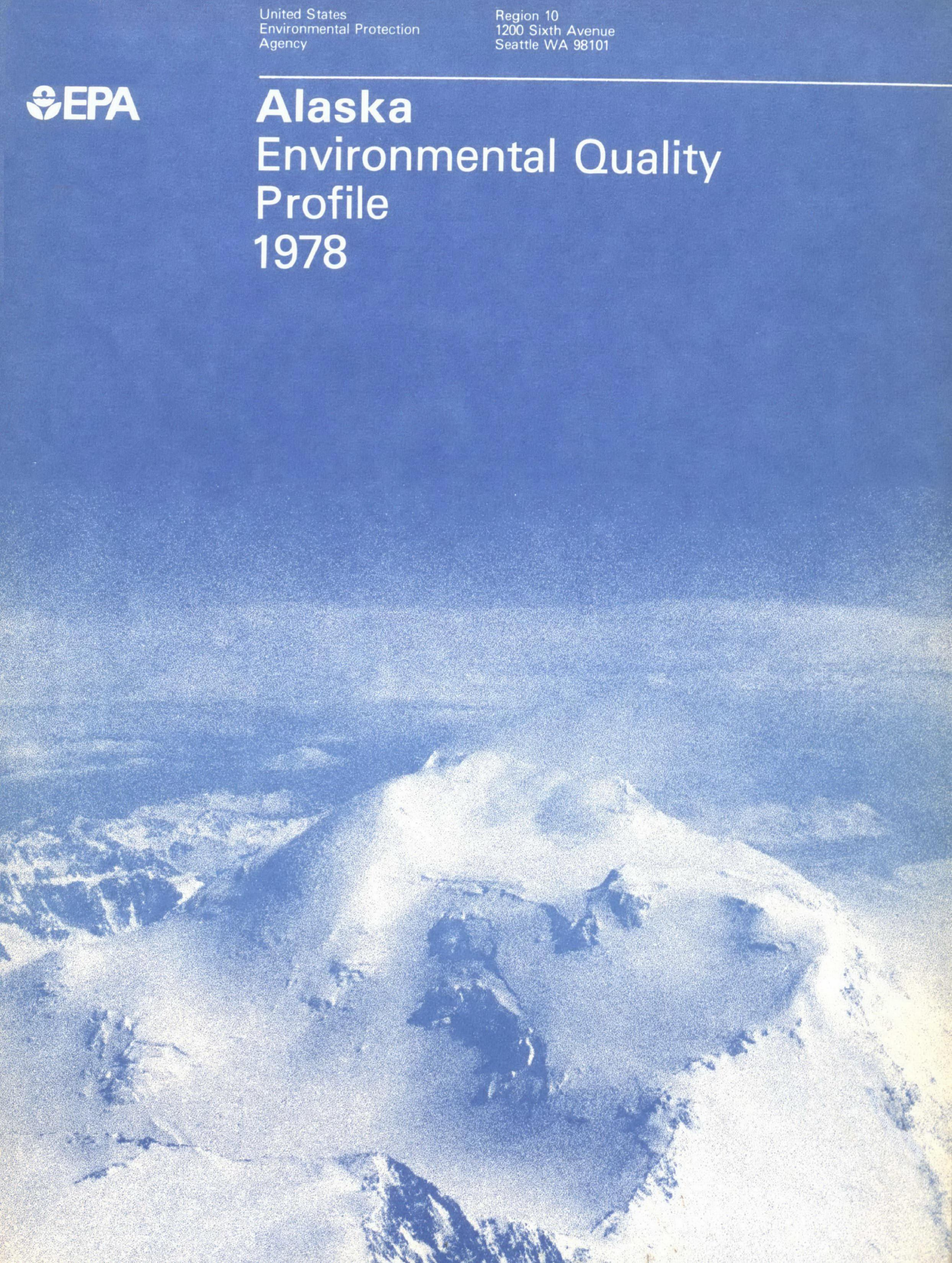
United States
Environmental Protection
Agency

Region 10
1200 Sixth Avenue
Seattle WA 98101

EPA

Alaska Environmental Quality Profile 1978



PREFACE

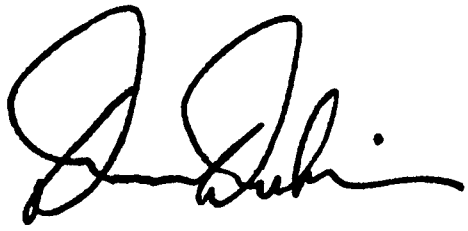
This is a report for the people of the State of Alaska. It provides environmental information gathered from a variety of sources—State environmental agencies, local government, and the U.S. Environmental Protection Agency and other Federal agencies. The purpose of the report is to describe the State of Alaska's progress in restoring and safeguarding an environment that is the envy of the Nation.

As the report shows, much has been accomplished in recent years but much remains to be done. As the larger sources of pollution are cleaned up, a greater proportion of the remaining problems are attributable to the way we manage our resources, to our practices in agriculture and forestry, to future urban and suburban water planning, and to the use of automobiles.

New Federal environmental laws reaffirm the primary responsibilities of the states for solving these problems in ways which are in consonance with local needs. In addition, to keep the faith with the businesses, industries and municipalities that have already voluntarily met their environmental responsibilities, a continuing vigorous enforcement effort must be maintained against those polluters that profit unfairly by avoiding their responsibilities.

Looking ahead, it is clear that the Northwest must accommodate a growing population and that this must be accomplished while maintaining a reasonable balance between economic benefits and the need for healthful air, clean water, and the other unique qualities of life that characterize the Northwest.

The technical data behind this report is available from the Region 10 office of the U.S. Environmental Protection Agency. This data is available to all persons who may wish to investigate a particular topic in greater depth or who may need greater detail for planning or management purposes. The Region 10 office of EPA intends to issue future reports with improvements and expansions in the information as appropriate. Comments and suggestions are welcome.



Donald P. Dubois
Regional Administrator, Region 10
U.S. Environmental Protection Agency
Seattle, Washington

December, 1978

ALASKA ENVIRONMENTAL QUALITY PROFILE
CONTENTS

AIR QUALITY

Improving air quality in the Northwest has been a cooperative effort among Federal, State and local environmental agencies, industry, and a concerned and informed public. Since the 1970 Clean Air Act Amendments, there has been a considerable expenditure of time and money to find solutions to the most pressing air pollution problems.

National air quality standards have been established to ensure that the goal of a clean and healthful environment is attained. The States, with Federal assistance, have developed a variety of regulatory, enforcement, and administrative programs in an attempt to reduce pollutants to such a level that these air quality standards would be attained and maintained. State efforts have been augmented by Federal regulation of pollutants from stationary sources such as power plants and factories and by the Federal program to reduce air pollution emissions from motor vehicles.

Throughout the Northwest, State, Federal and local environmental quality control agencies maintain monitoring networks to scientifically measure air quality. The Seattle Regional Office of the Environmental Protection Agency annually evaluates data submitted by these air pollution control agencies. This analysis allows an assessment of the degree to which the air quality of the Northwest has been changing and the degree to which air quality standards are being achieved.

Overall, air quality in Alaska, as well as the other states in Region 10, has improved during the past five years.

Air Quality Standards

The Clean Air Act of 1970 directed EPA to establish ambient air quality standards for the principal and most widespread classes of air pollutants as shown in Table 1. The standards are divided into two categories: **primary standards** which are set at levels required to protect the public health; and more stringent **secondary standards** which are set at levels which would reduce other undesirable effects of air pollution. The primary standards were established by evaluating medical data and are designed to reduce adverse health effects from particulate matter, sulfur oxides, hydrocarbons, carbon monoxide, photochemical oxidants, and nitrogen oxides. The health effects of hydrocarbons are not listed in Table 1 because hydrocarbons, in themselves, do not pose a direct health problem. Rather, they react in sunlight to form oxidants. For this reason, the standards for hydrocarbons serve as a way of controlling oxidants and for attaining the oxidant standard.

Some pollutants exhibit both chronic and acute effects depending on the duration of exposure and the concentration of the pollutant. For this reason, the standards for some pollutants require the concentration of the pollutant in the air to be averaged over various lengths of time.

TABLE 1

HEALTH EFFECTS OF AIR QUALITY STANDARDS VIOLATIONS

Pollutant	Health Effect at Concentrations above the Primary Standard
Total Suspended Particulates (TSP)	Aggravation of asthma and chronic lung diseases, increased cough, chest discomfort, restricted activity, aggravation of heart and lung disease symptoms in the elderly, increased death rate;
Sulfur Dioxide (SO_2)	Aggravation of asthma, aggravation of heart and lung disease symptoms in the elderly, increased lung illness, increased death rate;
Carbon Monoxide (CO)	Interference with mental and physical activity, reduced capacity in persons suffering from heart and other circulatory disorders;
Photochemical Oxidants (O_3)	Aggravation of asthma and chronic lung disease, irritation of the eye and of the respiratory tract, decreased vision, reduced heart and lung capacity;
Oxides of Nitrogen (NO_x)	Increased chronic bronchitis.

Measuring Air Quality

The average number of days per year in which the primary air quality standards were exceeded in the period 1974 to 1976 has been used in this report to characterize air quality. A three-year running average is used to project trends because it minimizes year-to-year deviations due to weather and climate.

For various reasons, including sampling frequency requirements and the cost of collecting air quality samples, data is not collected for all days of the year, at all monitoring stations, and for all pollutants. However, there is sufficient data to make reliable estimates of the total days of standards violations for most types of pollutants.

Monitoring stations selected in each Election District for the three-year average are those showing the greatest number of days exceeding the standard. Accordingly, the figures are not representative of the entire Election District in which the station is located. Attainment of the secondary standards were not addressed in this report since the major emphasis in most areas of the Northwest is still on attainment of the primary health standards.

ALASKA AIR QUALITY

Figures 1, 2, and 3 on the next pages show various aspects of Alaska air quality.

In Figure 1, all the Election Districts of the State have been color coded according to the degree to which standards are being violated in at least one monitoring site within the Election District. Election Districts shaded yellow are exceeding one or more of the primary standards, while the Election Districts shaded blue are attaining all standards.

Figure 2 shows in more detail where, and how often, the primary standards were exceeded in monitored Election Districts. During the three-year period ending in 1976, eight of Alaska's 28 Election Districts recorded concentrations of pollutants that exceeded primary air quality standards. Particulate matter (TSP) was the most widespread cause of an exceeded standard. Concentrations above the primary particulate standard occurred in every Election District in which the standards were not met. The carbon monoxide (CO) standard was exceeded in Fairbanks approximately one day in every four, and in Anchorage one day in 14.

Figure 3 shows the severity of violations for these same Election Districts. The degree of risk from exposure to pollution varies according to both the concentration and the length of exposure time. As the concentration increases above the primary standard, it eventually reaches what is called the "alert" level, at which there is a significantly higher health risk.

Figure 3 indicates that approximately one-third of all instances in which health standards were exceeded in Alaska involved concentrations at or above the alert level. Almost half of those more serious conditions occurred in the more populated or industrialized Election Districts of Anchorage, Fairbanks, and Juneau.

FIGURE 1

AIR QUALITY STATUS MAP — BY ELECTION DISTRICT

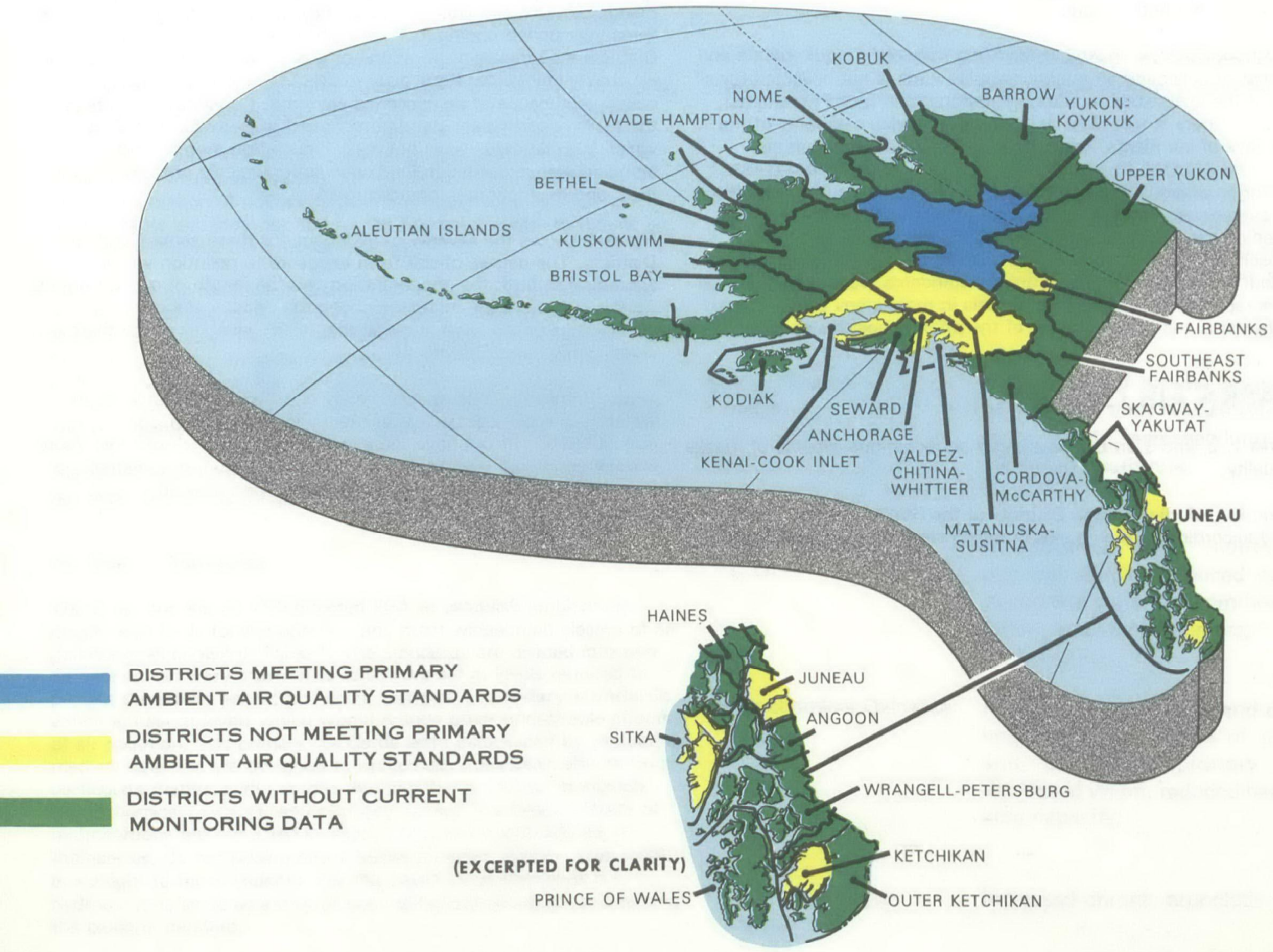


FIGURE 2

ANNUAL AVERAGE NUMBER OF DAYS HEALTH STANDARD EXCEEDED — BY POLLUTANT

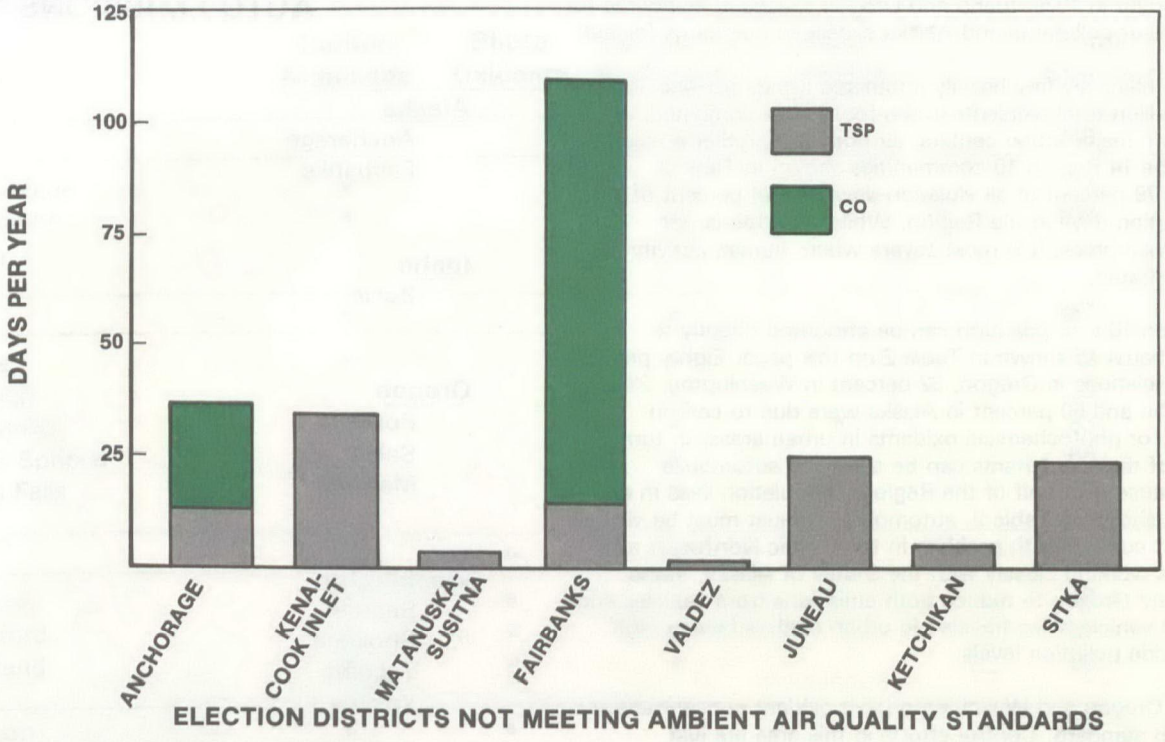
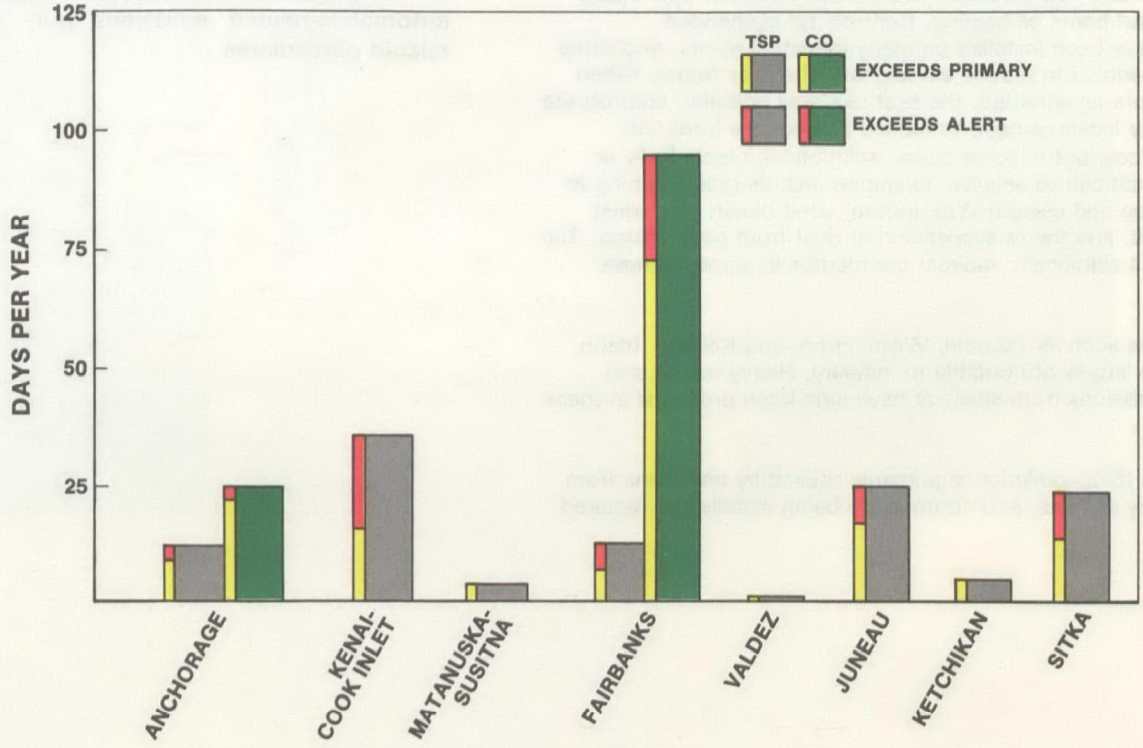


FIGURE 3

ANNUAL AVERAGE NUMBER OF DAYS HEALTH STANDARD EXCEEDED — BY SEVERITY



A REGIONAL OVERVIEW

As shown in Table 3 on the facing page, air quality violations occur in every State in Region 10. Standards for four of the major pollutants were exceeded in the State of Washington for the three-year period ending in 1976. Idaho and Oregon exceeded standards for three of the major pollutants and Alaska exceeded standards for two.

Region 10 has relatively few heavily populated urban centers. There are only 6.5 million total residents in the four states combined. Where there are major urban centers, air pollution problems exist. Violations in the 14 Region 10 communities shown in Table 3 accounted for 79 percent of all violation-days and 74 percent of all alert level violation-days in the Region. While pollution is not confined to urban areas, it is most severe where human activity is heavily concentrated.

Much of Region 10's air pollution can be attributed directly to automobile exhaust as shown in Table 2 on this page. Eighty percent of standards violations in Oregon, 62 percent in Washington, 23 percent in Idaho and 50 percent in Alaska were due to carbon monoxide and/or photochemical oxidants in urban areas. In turn, 80% to 90% of these pollutants can be traced to automobile exhausts. Because over half of the Region's population lives in or near the cities shown in Table 2, automobile exhaust must be viewed as a signficiant public health problem in the Pacific Northwest and Alaska. EPA is working closely with the States of Alaska, Idaho, Washington and Oregon to reduce both emissions from vehicles and the number of vehicle miles traveled in urban centers having high carbon monoxide pollution levels.

Both western Oregon and Washington have oxidant concentrations over the health standard. Control efforts in this area are just beginning, because the creation of oxidants is an extremely complex phenomena, involving reactions of hydrocarbons and other chemicals to sunlight.

The suspended particulate problem is widespread and results from both industrial and non-industrial sources such as dust from roads and streets, and home oil heating. Controls for suspended particulates have been installed on many industrial plants, and some plants are scheduled to reduce emissions in the near future. When new facilities are constructed, the best available pollution controls are required. Many localities need to reduce particulates from non-industrial sources, but in some cases, solutions are technically or economically difficult to achieve. Examples include grass burning in western Oregon and eastern Washington, wind-blown dust, dust from dirt roads, and the re-suspension of dust from paved roads. The automobile is a significant, indirect contributor to some of these problems.

In communities such as Tacoma, Washington, and Kellogg, Idaho, air pollution is largely attributable to industry. Heavy metals and particulate emissions from smelters have long been problems in these areas.

Sulfur dioxide (SO_2) pollution is primarily caused by emissions from large stationary sources, and controls are being installed as required by law.

TABLE 2

PERCENT OF TOTAL AIR QUALITY VIOLATION DAYS ATTRIBUTABLE TO AUTO EMISSIONS *

Alaska	**50%**
Anchorage	68%
Fairbanks	88%
Idaho	**23%**
Boise	96%
Oregon	**80%**
Portland	96%
Salem	100%
Medford	77%
Washington	**65%**
Seattle	99%
Spokane	80%
Tacoma	55%
Yakima	75%
Region 10	**54%**

*assumes all CO and O_X violation days result from automobile-related emissions but excludes auto related particulates

TABLE 3

AIR QUALITY STATUS IN SELECTED URBAN AREAS

Urban Areas	Pollutants Exceeding Standards				Total Violation Days	
	Carbon Monoxide	Photo Oxidants	Suspended Particulates	Sulfur Dioxide	Primary Standard	Alert Level
Alaska	•		•		**240**	**69**
Anchorage	•		•		37	6
Fairbanks	•		•		108	28
Sitka			•		24	10
Idaho	•		•	•	**467**	**143**
Boise	•		•		112	23
Kellogg			•		133	17
Pocatello			•	•	83	50
Soda Springs			•		65	32
Twin Falls			•		29	7
Oregon	•	•	•		**169**	**43**
Eugene	•	•	•		18	3
Medford	•	•	•		57	26
Portland	•	•	•		55	8
Washington	•	•	•	•	**355**	**62**
Seattle	•	•	•		98	8
Spokane	•		•		131	19
Tacoma	•	•	•	•	22	2

AIR QUALITY TRENDS IN ALASKA

The trend in air quality is an important indication of whether the air pollution control activities have been effective in curbing adverse health effects. Figure 4 shows trends in each Election District based on the air monitoring records for the period 1974 through 1976. Because many of the areas either lack ambient data or lack sufficient historical data, the trend in only a few areas can be shown. An upward arrow indicates that measured concentrations of the specified pollutant appear to be increasing. A downward arrow indicates that concentrations appear to be decreasing. A horizontal arrow depicts an apparent unchanging level in the ambient concentration.

Overall, Alaska's air quality improved between 1974 and 1976. Of those Election Districts exhibiting a trend, all but one is either improving or remaining the same.

Figure 4 also shows the status of air quality in all the Election Districts in the State. Blue boxes indicate that there is no evidence that the specified air quality standard has been exceeded. Yellow boxes indicate that a standard has been exceeded without concentrations reaching the alert level; and red boxes flag areas exceeding the alert levels. Where circles occur within the box, there is a presumed compliance with standards derived from a knowledge of pollutant sources, rather than actual measurements.

This does not add any more Election Districts to those eight already shown in a non-attainment status due to recorded values, but it does cause one more pollutant to be listed as exceeding the standard. This addition is SO_2 in Valdez and is based on modeling work done by Alaska on the SO_2 emissions which will come from the oil tankers while they are in port.

FIGURE 4

AIR QUALITY STATUS AND TRENDS

ELECTION DISTRICT	PARTICULATE	CARBON MONOXIDE	PHOTO OXIDANTS	SULFUR DIOXIDE	NITROGEN DIOXIDE
ANCHORAGE	⇨	⇨	○		○
KENAI-COOK INLET		○	○	○	○
SEWARD	○	○	○	○	○
MATANUSKA-SUSITNA		○	○	○	○
BARROW	○	○	○	○	○
FAIRBANKS	⇨	⇨	○	⇨	
KOBUK	○	○	○	○	○
NOME	○	○	○	○	○
SOUTHEAST FAIRBANKS	○	○	○	○	○
UPPER YUKON	○	○	○	○	○
YUKON-KOYUKUK		○	○	○	○
ALEUTIAN ISLANDS	○	○	○	○	○
BETHEL	○	○	○	○	○
BRISTOL BAY BOROUGH	○	○	○	○	○
BRISTOL BAY	○	○	○	○	○

LEGEND

- NO EVIDENCE PRIMARY STANDARD EXCEEDED
- EXCEEDS PRIMARY LEVEL
- EXCEEDS ALERT LEVEL
- ○ DESIGNATION BASED ON JUDGMENT
- ⇩ DECREASING STANDARDS VIOLATIONS
- ⇨ LEVEL OR NO APPARENT TREND
- ⇧ INCREASING STANDARDS VIOLATIONS
- INSUFFICIENT DATA TO DETERMINE TRENDS

ELECTION DISTRICT	PARTICULATE	CARBON MONOXIDE	PHOTO OXIDANTS	SULFUR DIOXIDE	NITROGEN DIOXIDE
CORDOVA-MC CARTHY	○	○	○	○	○
KODIAK	○	○	○	○	○
KUSKOKWIM	○	○	○	○	○
VALDEZ-CHITINA-WHITTIER		○	○		○
WADE HAMPTOM	○	○	○	○	○
ANGOON	○	○	○	○	○
HAINES	○	○	○	○	○
JUNEAU	⇩	○	○	○	○
KETCHIKAN	⇨	○	○	⇩	○
OUTER KETCHIKAN	○	○	○	○	○
PRINCE OF WALES	○	○	○	○	○
SITKA	⇧	○	○		○
SKAGWAY-YAKUTAT	○	○	○	○	○
WRANGELL-PETERSBURG	○	○	○	○	○

SOURCES OF AIR POLLUTION IN ALASKA

The previous charts have expressed air quality in terms of the days of standards violations. Another way of describing the problem is in terms of the amount of pollution being put into the air and from where it is coming.

Figures 5 and 6 show emissions in those Alaska Election Districts which exceed standards. The emission totals are based on the latest emission inventory information including 1976 data where available. In preparing these charts, emissions from some sources had to be estimated and some of the smaller sources have not been included. Also, emissions attributed to a particular Election District may affect air quality in an adjoining Election District because the source is located close to the Election District boundary. Overall, however, the charts provide good perspective as to the extent, location, and sources of air pollution.

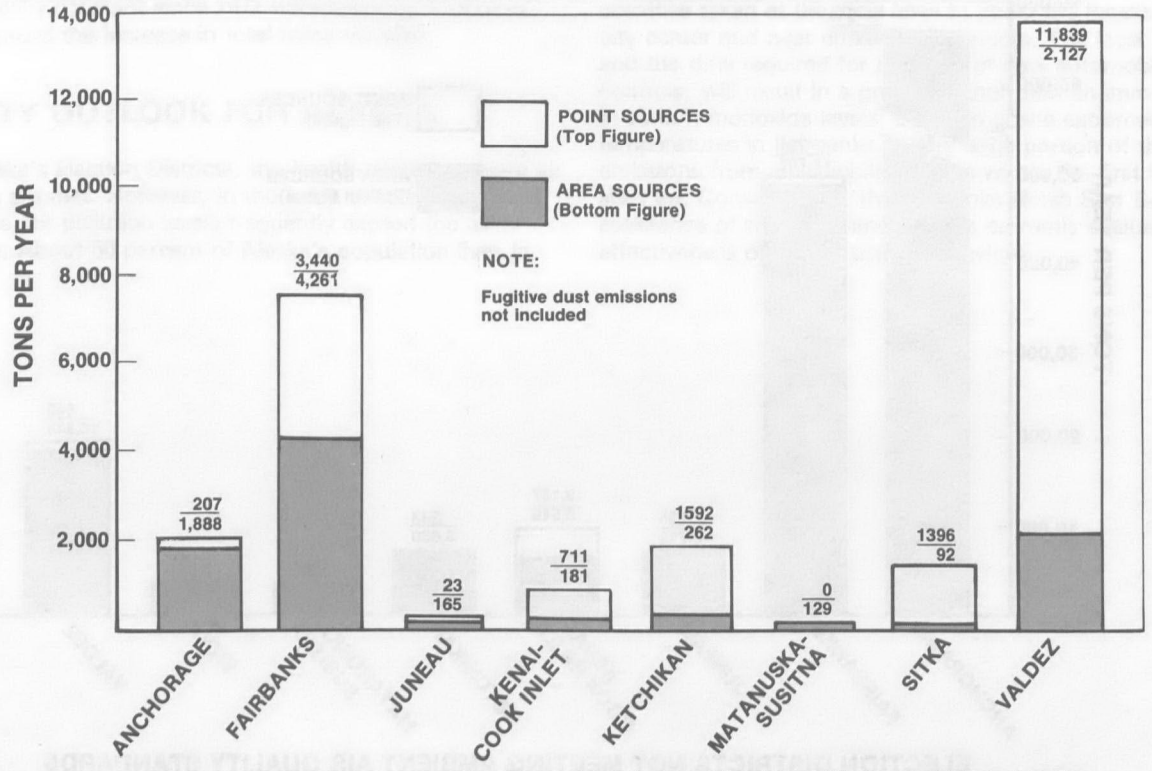
Suspended Particulates

Sources of particulate emissions can be grouped into two major categories: **point sources,** which are large stationary sources such as factories and power plants; and **area sources,** such as from the heating of homes and buildings, from transportation, and from wind-blown dust. To date, particulate emissions have been addressed mainly by installing control equipment on industrial plants, reducing the burning of the higher ash-content fuels and paving roads to reduce exceptional dust problems.

Figure 5 indicates the estimated distribution of particulate matter emissions by source category in those Election Districts in which a primary air quality standard was exceeded. Point sources accounted for about 19,000 tons of the more than 28,000 tons of particulate matter produced.

FIGURE 5

POINT AND AREA SOURCES — PARTICULATE EMISSIONS



ELECTION DISTRICTS NOT MEETING AMBIENT AIR QUALITY STANDARDS

Area sources were responsible for less than 9,000 tons of particulate matter. A large portion of the particulate emissions to the atmosphere stems from a group of area sources referred to as "fugitive dust sources." Fugitive dust includes such things as wind-blown dust, dust from dirt roads and re-suspended dirt from paved roads. The Alaska Department of Environmental Conservation believes that many of the violation days in Alaska are a result of wind-blown or natural fugitive dust. Future profiles will be better able to put these emissions into perspective in relation to the rest of the sources.

Sulfur Dioxide

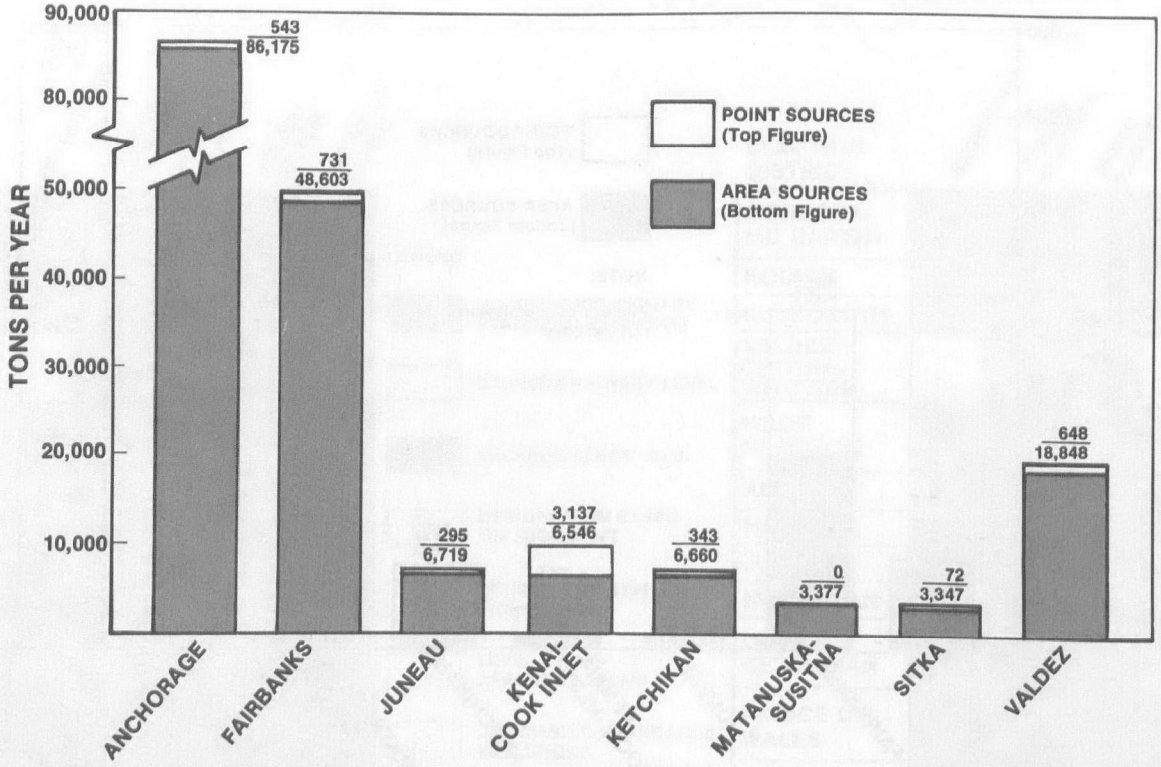
Sulfur dioxide emissions are not a significant problem in Alaska. Nationally, the principal sources of sulfur dioxide emissions are from the combustion of sulfur-containing fuel and large industrial sources such as pulp mills. Sulfur dioxide emissions have declined nationally due to the substitution of lower sulfur fuels and the installation of control equipment on industrial sources.

Photochemical Oxidants and Hydrocarbons

Major sources of hydrocarbon emissions are escaping gasoline and cleaning solvent vapors. Nationally, hydrocarbon emissions have gone down only slightly. Significant reductions have been obtained from highway vehicles as a result of the Federal emission standards. These reductions have been partially offset by increases in industrial process emissions and losses of gasoline and other hydrocarbon vapors from evaporation at filling stations and other points in the marketing chain, and from the use of various solvents. The increases reflect a general increase in the consumption of these products.

FIGURE 6

POINT AND AREA SOURCES — CARBON MONOXIDE EMISSIONS



ELECTION DISTRICTS NOT MEETING AMBIENT AIR QUALITY STANDARDS

Carbon Monoxide

Nationally, some three-fourths of the carbon monoxide emissions come from transportation sources, but as in many other urban areas, transportation is responsible for almost all of the emissions in Anchorage and Fairbanks. Carbon monoxide emissions have decreased mostly because of the Federal emission standards on motor vehicles and because of less burning of solid waste. Some industrial emissions also have been reduced because of decreases in production, and the phasing-out of some obsolete processes.

Figure 6 shows the carbon monoxide emission inventory. Over 98% of the CO emissions in Fairbanks and Anchorage stem from area sources, and the vast majority of these are automobiles.

Nitrogen Oxides

Nationally, nitrogen oxides emissions have increased mainly because of increased emissions from electric utility plants and increased industrial power generation. Emissions from electric utilities and industrial sources have risen because of increased power demands and little equipment has been installed on these sources specifically to control nitrogen oxides. Emissions of nitrogen oxides from vehicles have been essentially constant since 1972 because control devices have counterbalanced the increase in total miles traveled.

AIR QUALITY OUTLOOK FOR ALASKA

For many of Alaska's Election Districts, the health-related ambient air quality standards are met. However, in the more densely populated areas of the State, air pollution levels frequently exceed the air quality standards. About 60 percent of Alaska's population lives in Anchorage and Fairbanks where not only the primary standards but also the more severe alert air quality levels are exceeded. Although eight Election Districts have recorded concentrations in excess of the health standard, the trend is favorable.

The outlook for control of pollutants in areas exceeding the ambient air standards is as follows:

Particulates. Point sources of particulates may be controlled with reliable, relatively inexpensive technology. However, fugitive dust is responsible for a large share of Alaska's particulate air pollution. Thus, even though control of point sources may reduce the frequency or severity of excursions above the standards, violations will occur until area and fugitive dust sources are also controlled.

Sulfur Dioxide. Application of currently available control technology for sulfur dioxide could result in additional reductions in the volume of pollutant emissions. The best available control technology on new sources, especially those associated with energy production and the production and transportation of the North Slope energy resources, will ensure that the SO_2 standard is met.

Carbon Monoxide. Control will rely on both the Federal Motor Vehicle Control Program to reduce auto emissions and upon those activities taken at the local level to abate the localized problem in the city center and near commuter corridors. The local actions needed, and the time required for phase-in of new automobiles with better controls, will result in a gradual rather than an immediate reduction in carbon monoxide levels. Because of the extremely cold winter temperatures in Fairbanks, a very large portion of the total CO emissions from automobiles occurs within the first few minutes after start up. Consequently, the Fairbanks North Star Borough, with the assistance of the State and EPA, is currently evaluating the effectiveness of engine pre-heat devices.

RIVER WATER QUALITY

In 1972, the United States Congress enacted amendments to the "Federal Water Pollution Control Act" which stimulated new cooperative Federal, State and local water quality improvement programs. Since 1972, various regulatory, enforcement, grant, and administrative programs have been developed to reduce pollutants entering the Nation's waters. This section of the report provides information on the current status and trends in water quality in the State of Alaska.

Ways of Measuring River Water Quality

Under the Federal Water Pollution Control Act, the states established water quality standards to protect the public water supply and the quality of water for wildlife, recreation, navigation, agriculture, industry, and the propagation of fish and shellfish. The Alaska Water Quality Standards, like those of the other states in Region 10, specify levels of parameters such as temperature, dissolved oxygen, bacteria and turbidity in river water.

In order to provide a means for reliably measuring and comparing water quality in the Northwest, a standardized set of parameters and associated criteria has been selected. These criteria, termed "Federal water quality goals" in the following discussion, are a synthesis of the state standards, national criteria, information in the technical literature, and professional judgment. The eleven parameters used to measure river water quality in this report are listed and explained in Table 4 below.

While water quality can be discussed in terms of the degree to which each of these eleven parameters deviate from the selected criteria, it is helpful to be able to express the quality of a stream or river by means of a single, overall measure. In order to accomplish this, a "water quality index" (WQI) has also been formulated. This index is simply a weighted aggregation of the eleven parameters shown in Table 4 and provides index numbers ranging from 0 to 110. The way the WQI is calculated is described in the insert on page 14. An index number from 0 to 4 means the river water essentially meets Federal water quality goals. A number between 4 and 11 means the river provisionally meets goals, while a number above 11 means the water fails to meet goals. In the graphs shown in this section of the report, these index number ranges are colored blue, yellow and red respectively.

TABLE 4

CRITERIA/PARAMETER GROUPS[1] FOR THE WATER QUALITY INDEX

Criteria/ Parameter Group	Explanation
Temperature	Temperature of water influences both the nature of life forms and the rate of chemical reactions. Excessively high temperature is detrimental to cold water fish.
Dissolved Oxygen	Oxygen dissolved in water is essential to the life of aquatic organisms including fish. Low levels of oxygen can be detrimental to these organisms.
pH	Measure of acidity or alkalinity of water. Extreme levels of either can imperil fish life and speed corrosion.
Bacteria	Bacteria indicate probable presence of disease-related organisms and viruses not natural to water.
Trophic	Indication of the level of algal activity in water. Excessive activity is characterized by very murky, turbid water and nuisance-levels of algae which impair recreational uses of water. Algal decomposition process can adversely affect dissolved oxygen levels in water bodies.
Aesthetics	Refers to detectable oil, grease and turbidity which is visually unpleasant.
Solids	Dissolved and suspended material in water. Excess dissolved solids adversely affect water taste, industrial and domestic use. Excess suspended solids adversely affect fish feeding and spawning habits.
Total Dissolved Gas	Measure of concentration of gases in water. Can affect the metabolism of aquatic life forms.
Radioactivity	May be in water resulting from radioactive waste discharges or fallout. Excess levels could result in a direct threat to aquatic and other life forms.
Organic Toxicity	Includes pesticides and other poisons that have the same effects and persistence as pesticides.
Inorganic Toxicity	Heavy metals and other elements. Excess concentrations are poisonous to aquatic and other life forms.

[1]A total of 80 criteria/parameters were evaluated and condensed to the eleven shown here. More detailed information will be provided as requested.

THE QUALITY OF ALASKA'S PRINCIPAL RIVERS

The following report on Alaska's water quality status is incomplete due to the scarcity of data. Future reports should contain more complete and specific status information.

The majority of rivers within Alaska are relatively unpolluted. The Susitna, Kuskokwim, Chena, and Sagavanirktok Rivers are shown to be unpolluted by the Water Quality Index (Figure 9). However, the lower portion of the Chena River is in an unknown status, even though in the past it has had water quality problems from its confluence with the Little Chena River to its mouth. This river flows through the metropolitan area of Fairbanks and has been impacted by inadequately treated domestic sewage and urban runoff.

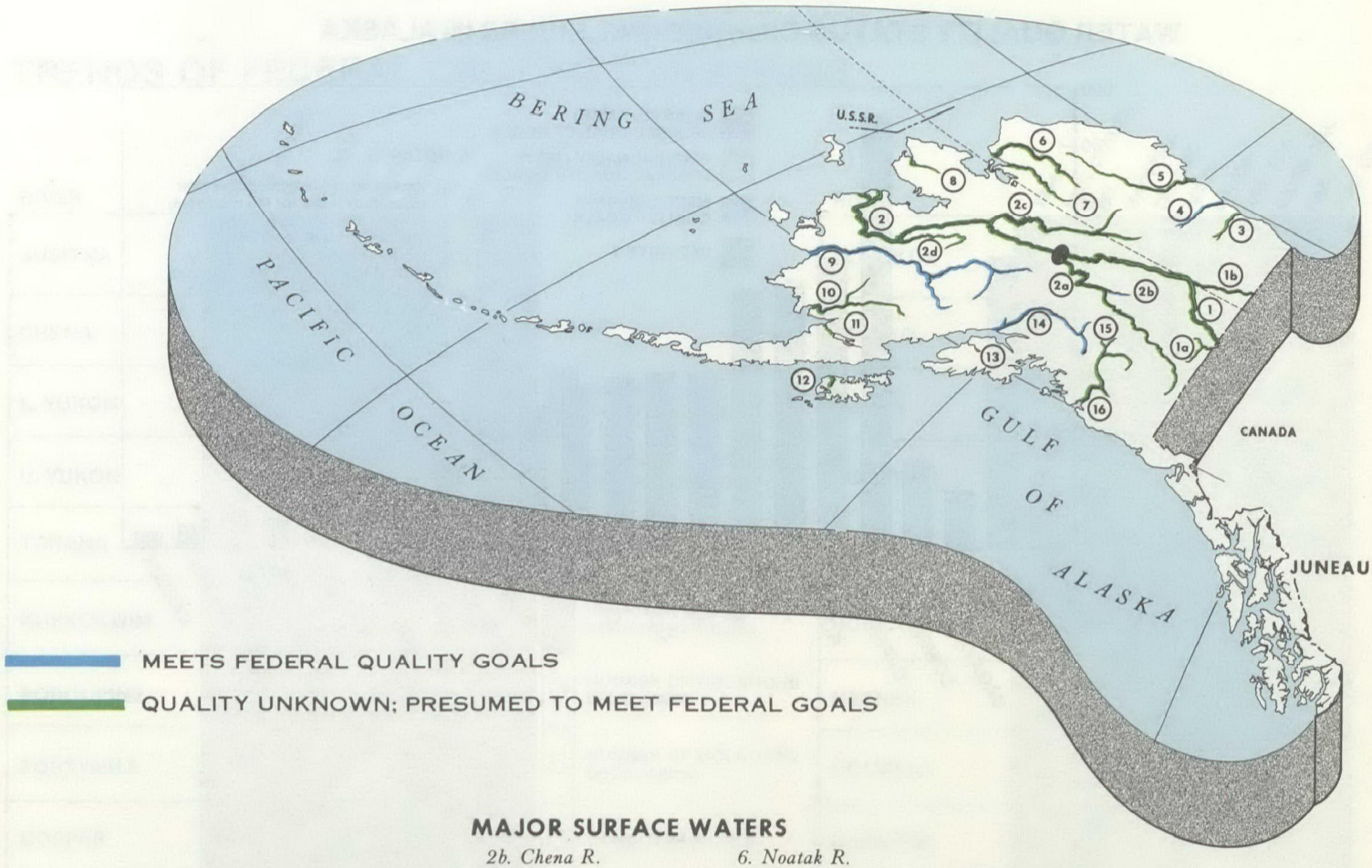
Most of the remaining rivers can be assumed to meet Federal goals because they are located in remote, sparsely populated areas of the state. Possible exceptions are in the lower reach of the Tanana River which is affected by more urban activities, and some segments in the Fortymile and Porcupine Rivers that may be adversely affected by placer mining operations. In the next few years, additional data on these rivers should help clarify the water quality picture.

RIVER WATER QUALITY TRENDS

Figure 10 provides details for eleven broad parameter classes described in Table 4. The blue color indicates that measurements for the indicated parameter produced no evidence of a violation of Federal criteria for water suitable for fish, wildlife, and recreation. Yellow and red indicate minor and major violations of the criteria. The green indicates that there was inadequate information for making a judgment. An upward-pointing arrow within a box indicates that the concentrations of the contaminant are rising, or that the frequency of violations is increasing. A downward-pointing arrow indicates declining problems and a horizontal arrow indicates that no significant change has occurred over the five-year period. The trends represent the average condition of the river evaluated.

FIGURE 7

WATER QUALITY STATUS OF PRINCIPAL RIVERS IN ALASKA



MEETS FEDERAL QUALITY GOALS

QUALITY UNKNOWN; PRESUMED TO MEET FEDERAL GOALS

MAJOR SURFACE WATERS

1. UPPER YUKON RIVER
1a. Fortymile Cr.
1b. Porcupine R.
2. LOWER YUKON RIVER
2a. Tanana R.
2b. Chena R.
2c. Koyukuk R.
2d. Innoko R.
3. Canning R.
4. Sagavanirktok R.
5. Colville R.
6. Noatak R.
7. Kobuk R.
8. Kuzitrin R.
9. Kuskokwim R.
10. Nushagak R.
11. Naknek R.
12. Karluk R.
13. Kenai R.
14. Susitna R.
15. Gulkana R.
16. Copper R.

● SELECTED STREAM REACH LIMITS

The Water Quality Index (WQI)

The WQI compares measured water quality during the last five years with the recommended Federal criteria. The data used to make this comparison come from various Federal, State, and local agencies and are stored in EPA's computer systems. A number is calculated for every water quality sampling station with sufficient data. Seventy-nine Alaska stations were used in this evaluation. Seasonal and other temporal data biases are significantly reduced by time-weighting the WQI calculation for each station. The final index number for each station is a summation of standard violations for each criteria/parameter group which are also weighted by the severity of the violation. The station WQI number spans a scale that may run from 0.0 (no measured evidence of pollution) to a theoretical maximum level of 110.0 (severe pollution in all eleven criteria/parameter groups at all times). Individual reaches of most Northwest rivers fall below a WQI of 30, and the average WQI for entire rivers is still lower.

Based on professional judgment as to the significance of the values and the known water quality status of regional streams, the entire scale of 0 to 110 is divided into several ranges. An index number greater than 11.0 (shown as red in the Figures) is considered to be characteristic of streams that do not meet the goals of the Federal Water Pollution Control Act. An index number less than 4.0 (blue) is considered to be equivalent to natural or minimally impaired conditions (meets goals of the Act). An index number between 4.0 and 11.0 (yellow) is indicative of streams which provisionally meet the goals of the Act. The color green is used in the charts when the water quality status is unknown due to an inadequate data base.

FIGURE 8

WATER QUALITY STATUS OF PRINCIPAL RIVERS IN ALASKA

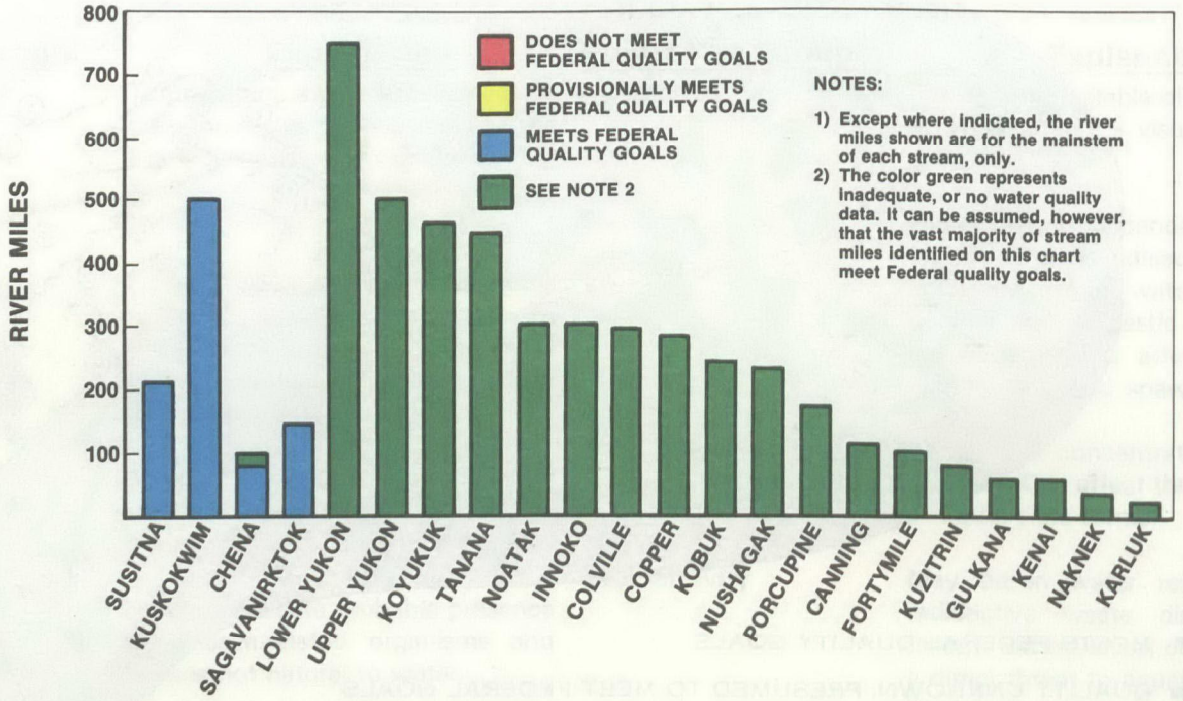


FIGURE 9

PRINCIPAL RIVERS IN ALASKA – AVERAGE WATER QUALITY INDEX

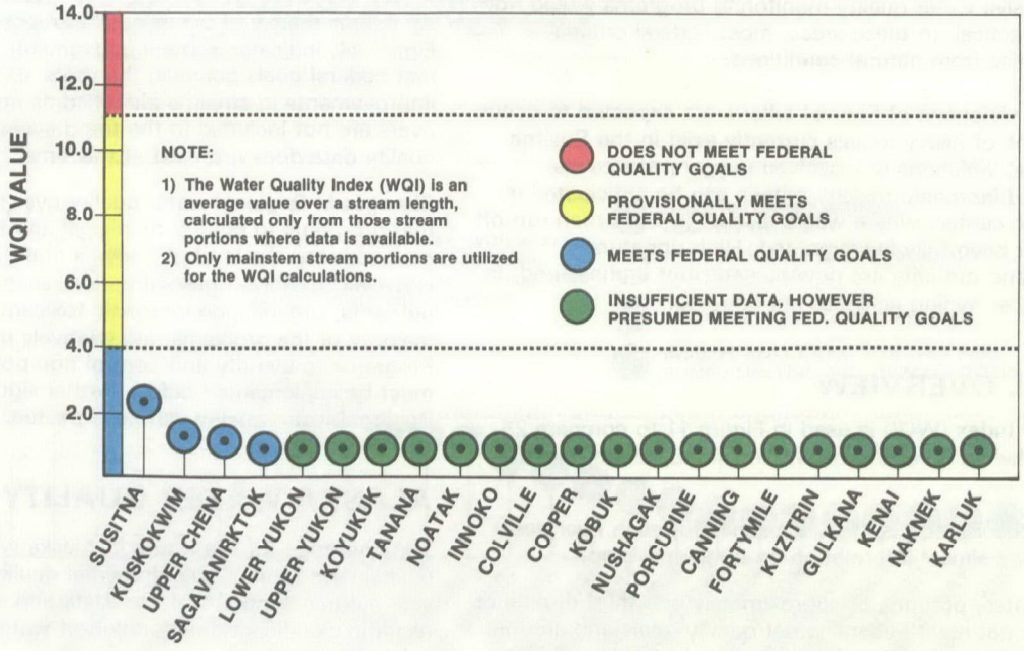
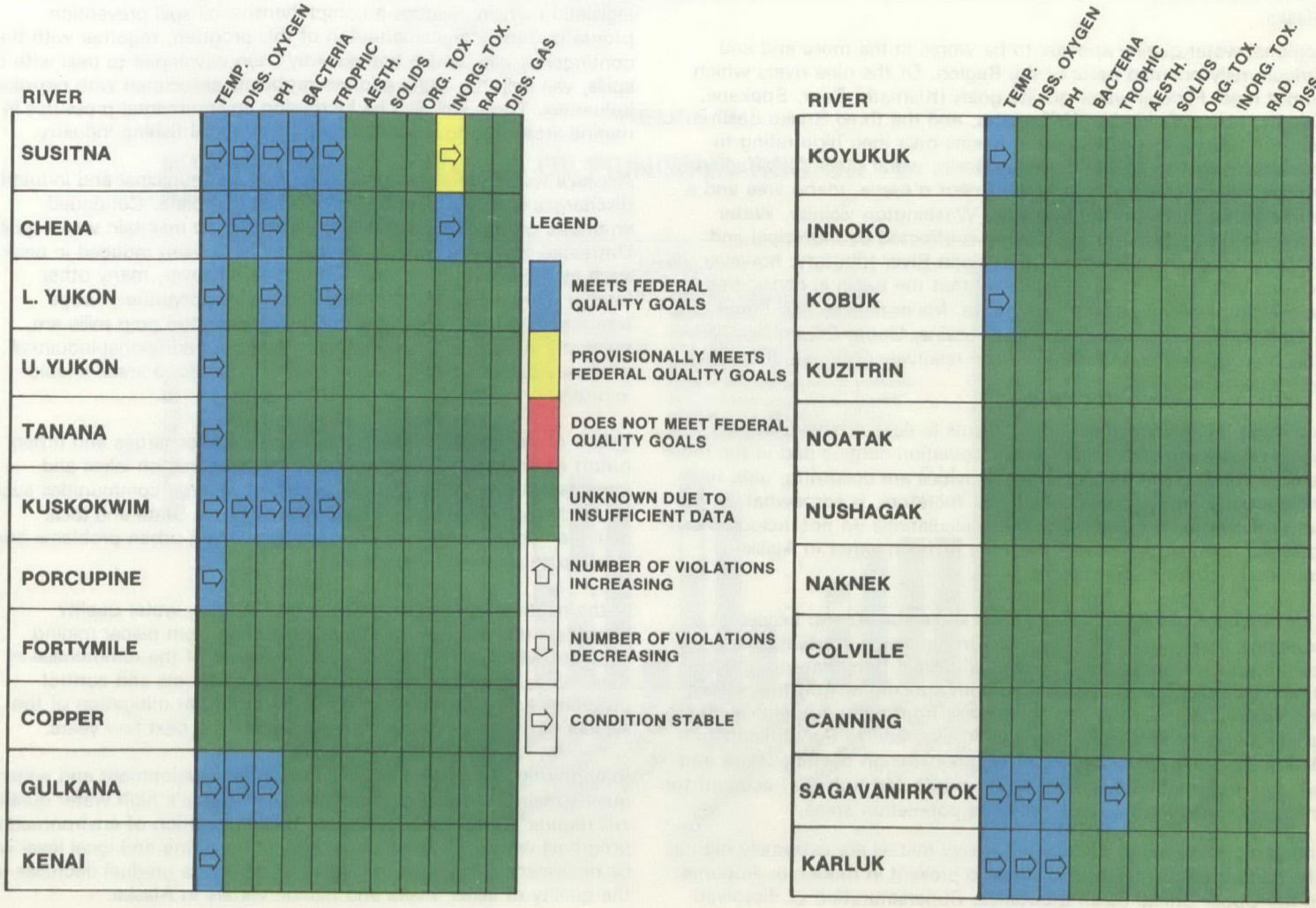


FIGURE 10

TRENDS OF FEDERAL CRITERIA VIOLATIONS



RIVER WATER QUALITY

Of the 22 rivers reviewed, water quality data has been collected on only 13. The lack of water quality data is not as alarming as it may appear because the majority of these rivers are in remote areas of the State where extensive water quality monitoring programs would not be necessary or practical. In these areas, most Federal criteria violations would arise from natural conditions.

Some non-natural violations of Federal criteria are expected to occur. High concentrations of heavy metals currently exist in the Susitna River. In the future, violations of dissolved oxygen, aesthetics, organic toxicity and inorganic toxicity criteria can be anticipated in streams near urban centers where waste discharge and urban run-off programs have not been fully implemented. High unnatural suspended solids and turbidity are now present, but unmeasured, in streams where placer mining activities are ongoing.

A REGIONAL OVERVIEW

The Water Quality Index (WQI) is used in Figure 11 to compare 25 major Pacific Northwest River Basins within Alaska, Idaho, Oregon, and Washington.

Figure 12 depicts the water quality by river mile for each river basin and Figure 13 shows similar information on a regional map.

As Figure 12 indicates, portions of approximately one-third or nine of the river basins do not meet Federal water quality goals and another four only provisionally meet them. Most streams in Alaska fall into the unknown category. However, many of these waterways are located in remote areas unaffected by man. Future reports will show the results of water quality monitoring programs now in progress in Alaska.

Regional water quality appears to be worse in the more arid and agriculturally oriented parts of the Region. Of the nine rivers which do not meet Federal water quality goals (Klamath, Bear, Spokane, Yakima, Lower Columbia, Willamette, and the three Snake Basins) only the Spokane and Willamette Basins owe their high rating to industrial activities. In the Spokane Basin, water quality is affected by intense mining and smelting in the Coeur d'Alene, Idaho area and a municipal discharge in the Spokane, Washington vicinity. Water quality in the Willamette River Basin is affected by municipal and industrial discharges in the small Tualatin River tributary; however, its average WQI rating is so close to 4.0 that the Basin is considered to be meeting Federal water quality goals. Major coastal and Puget Sound rivers and the northeast river basins, Upper Columbia, Clark Fork/Pend Oreille, and Kootenai have relatively good water quality, with a few exceptions.

Although it is known that some streams in Alaska have localized water quality problems near major population centers and in the more remote areas where placer mining activities are occurring, data for most areas is non-existent. The WQI, therefore, is somewhat conservative for the State since the calculations do not include these localized pollutants. The vast majority of fresh water in Alaska is considered to be of good quality.

The most prevalent criteria violations in Region 10 are: excessive concentrations of phosphorus and nitrogen, high nutrient levels resulting in eutrophication; suspended solids; temperature; and low dissolved oxygen levels associated with agricultural activities within the Region. High suspended solid levels from natural origins such as glaciers, mostly in Washington and Alaska, add to the difficulty in determining the actual causes of violations. High bacteria levels and pollutants that affect aesthetics (oil, grease and turbidity) account for most violations in the vicinity of large population areas.

Inorganic toxicants in the form of heavy metals are extremely high in the Spokane River Basin and are also present in moderate amounts in the Upper Snake Basin tributaries. Supersaturation of dissolved gas periodically occurs in the Lower Snake and Columbia Rivers from high river flows passing over dams. Because of reduced river flow, this problem has been less severe in the last few years.

An overall review of water quality trends in Region 10, shown in Figure 14, indicates some improvements in streams that provisionally met Federal goals between the years 1972 and 1976, and minimal improvements in streams identified as not meeting the goals. Alaska rivers are not included in the trend evaluation since adequate water quality data does not exist at this time.

Changes in Regional water quality over the last five years indicate that programs to control municipal and industrial waste discharges have reduced the level of bacteria and oxygen degrading materials. However, dissolved gas saturation, suspended solids, temperature, nutrients, organic and inorganic toxicants which make up the majority of the problems, are relatively unaffected by these programs. Programs to identify and control non-point sources within the Region must be implemented before further significant improvements in Regional water quality can be expected.

ALASKA WATER QUALITY OUTLOOK

The challenge for the future in Alaska will be to preserve the present overall high level of environmental quality. Greater utilization of the vast natural resources of the State and increased population could result in significant deterioration of water quality.

The most serious threat will be to the marine waters. Oil terminal facilities, tanker traffic, and off-shore petroleum production generate potentials for large oil spills. In 1976, the State Legislature enacted legislation which includes a comprehensive oil spill prevention program. Timely implementation of this program, together with the contingency plan which has recently been developed to deal with oil spills, will help the State address problems associated with petroleum industries. There will also be increasing environmental pressures in marine areas due to the expanding commercial fishing industry.

Alaska's waste water treatment program for municipal and industrial discharges is well advanced, but not yet complete. Continued emphasis on this program will be necessary to maintain water quality. Untreated domestic sewage discharges have been reduced in areas such as the Chena River near Fairbanks; however, many other interior and coastal communities still have inadequate sewage treatment facilities. Most seafood processors and pulp mills are presently increasing their treatment levels. As additional industrial treatment needs are met, water quality in localized areas should improve.

Urban center growth, resulting in increased discharges and urban runoff as well as increased recreational pressures on lakes and streams, will continue to cause problems in large communities such as Anchorage, Fairbanks and Juneau. Various State and local management agencies are presently identifying urban problems and developing prevention programs.

In the relatively unpopulated interior of Alaska, water quality degradation in clear water streams resulting from placer mining activities will be difficult to control. Because of the remoteness of these areas, technical evaluation of mining effects and control programs have not advanced. It is doubtful that mitigation of the effects of placer mining will be possible in the next few years.

Recognizing the conflict between resource development and water quality maintenance, the preservation of Alaska's high water quality will require considerable attention. Implementation of environmental programs which are being developed at the State and local level will be necessary in the next few years to prevent a gradual decrease in the quality of lakes, rivers and marine waters in Alaska.

FIGURE 11

PRINCIPAL REGION 10 RIVER BASINS – AVERAGE WATER QUALITY PER RIVER MILE

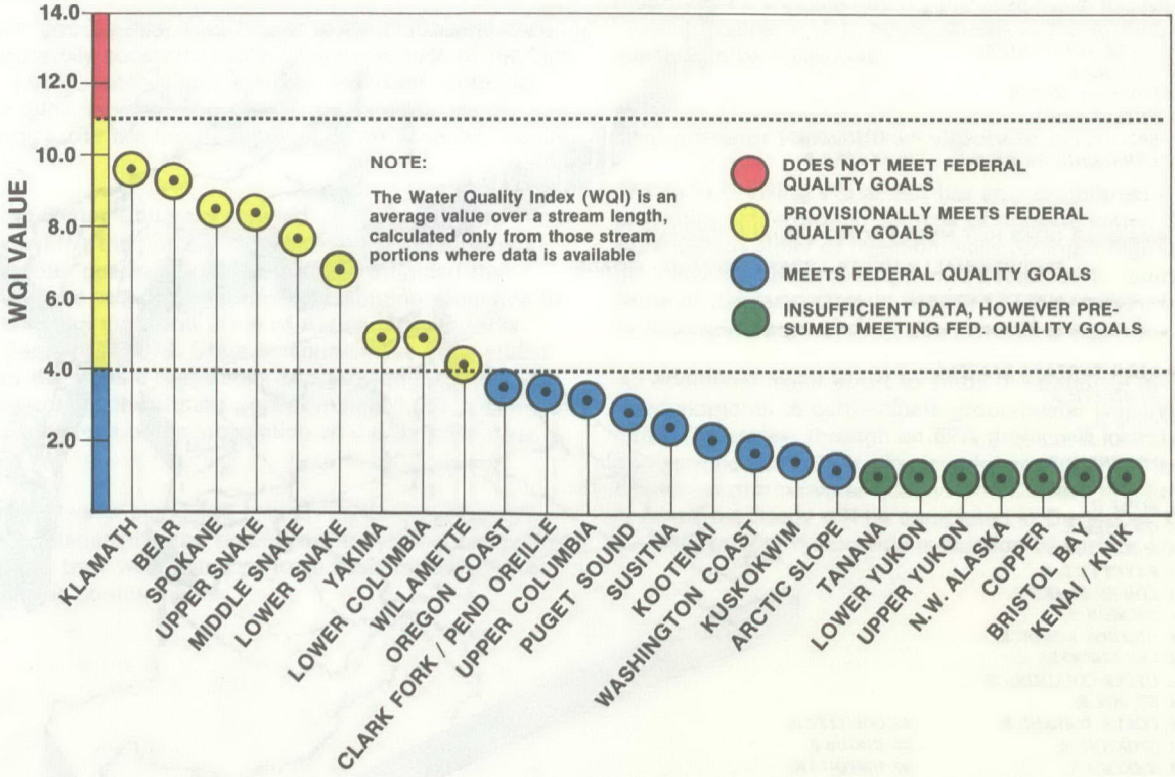


FIGURE 12

WATER QUALITY STATUS OF PRINCIPAL REGION 10 RIVER BASINS

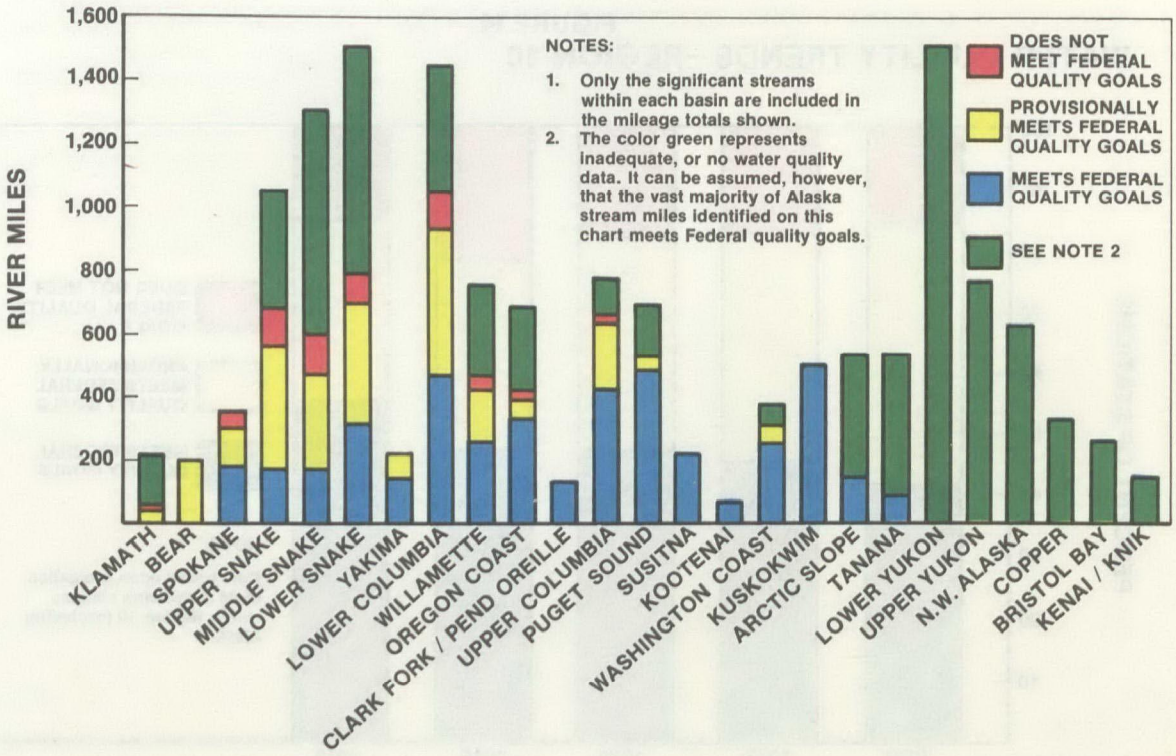


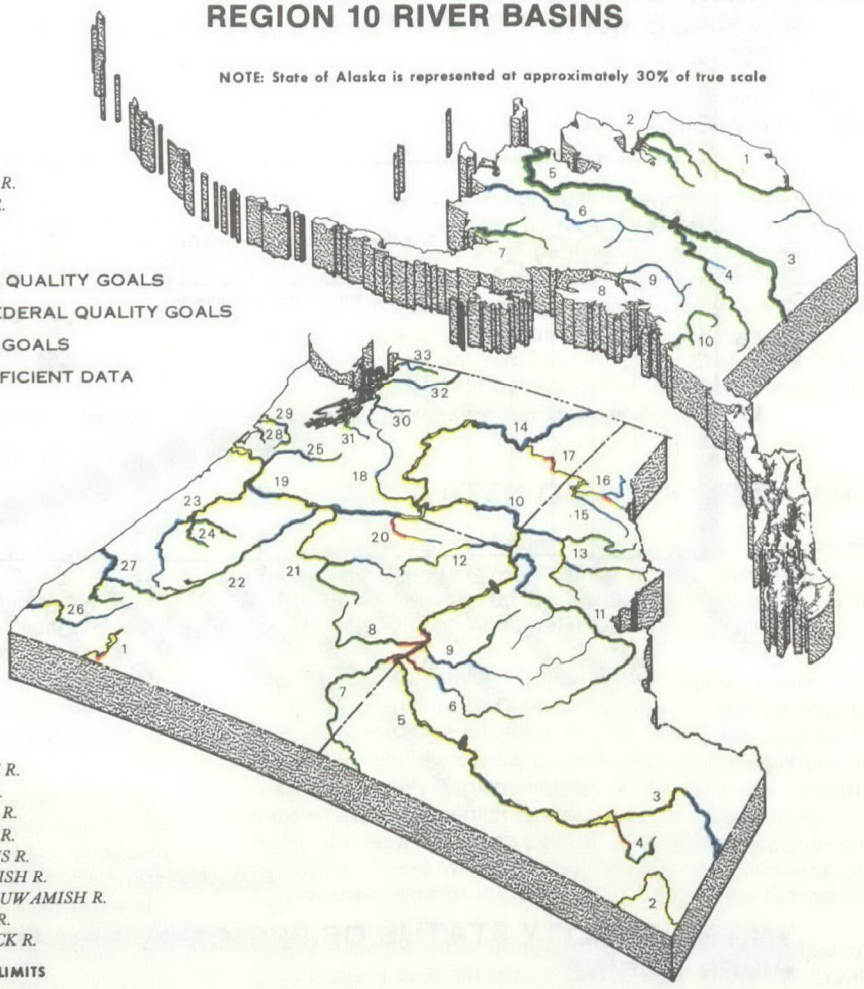
FIGURE 13

WATER QUALITY STATUS OF PRINCIPAL REGION 10 RIVER BASINS

MAJOR SURFACE WATERS AND DRAINAGE AREAS

1. *ARCTIC SLOPE DRAINAGE*
2. *NORTHWEST ALASKA DRAINAGE*
3. *UPPER YUKON RIVER*
4. *TANANA R.*
5. *LOWER YUKON R.*
6. *KUSKOKWIM R.*
7. *BRISTOL BAY DRAINAGE*
8. *KENAI-KNIK DRAINAGE*
9. *SUSITNA R.*
10. *COPPER R.*

NOTE: State of Alaska is represented at approximately 30% of true scale



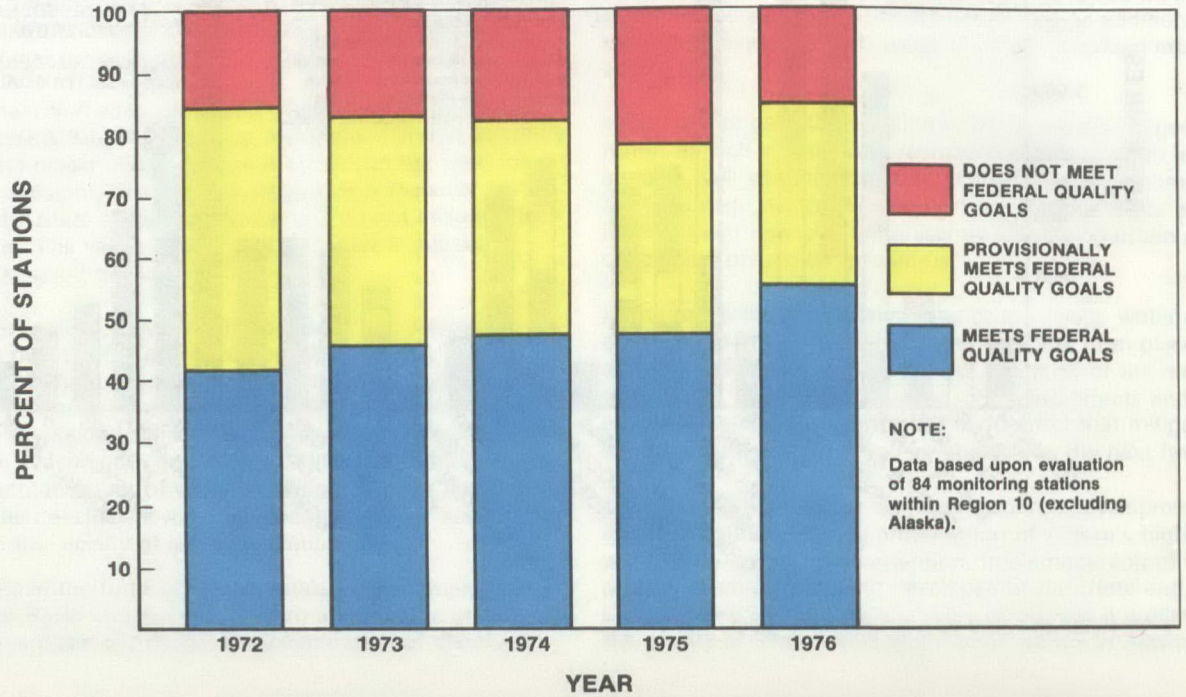
MAJOR SURFACE WATERS

1. *KLAMATH R.*
2. *BEAR R.*
3. *UPPER SNAKE R.*
4. *PORTNEUF R.*
5. *MIDDLE SNAKE R.*
6. *BOISE R.*
7. *OWYHEE R.*
8. *MALHEUR R.*
9. *PAYETTE R.*
10. *LOWER SNAKE R.*
11. *SALMON R.*
12. *GRANDE RONDE R.*
13. *CLEARWATER R.*
14. *UPPER COLUMBIA R.*
15. *ST. JOE R.*
16. *COEUR D'ALENE R.*
17. *SPOKANE R.*
18. *YAKIMA R.*
19. *LOWER COLUMBIA R.*
20. *UMATILLA R.*
21. *JOHN DAY R.*
22. *DESCHUTES R.*
23. *WILLAMETTE R.*
24. *SANTIAM R.*
25. *COWLITZ R.*
26. *ROGUE R.*
27. *UMPQUA R.*
28. *WILLIPA R.*
29. *CHEHALIS R.*
30. *SNOHOMISH R.*
31. *GREEN/DUWAMISH R.*
32. *SKAGIT R.*
33. *NOOKSACK R.*

● SELECTED STREAM REACH LIMITS

FIGURE 14

WATER QUALITY TRENDS – REGION 10



DRINKING WATER

Public Water System Program

The drinking water coming into most homes in the Northwest and Alaska today is generally considered safe, mainly because of the high standards set by public water supply systems. However, potential contamination of drinking water supplies by the careless use of chemical compounds and the unsafe disposal of toxic wastes requires vigilance.

In 1974, the United States Congress enacted the Safe Drinking Water Act. This Act gives EPA the primary responsibility for establishing national drinking water quality standards, but it is intended that individual states assume responsibility for implementing programs to ensure the standards are met. The State of Alaska assumed this responsibility in September 1978. State personnel have been added to help implement the State's regulations and provide technical assistance to operators of the State's approximately 1,200 public water systems which come under jurisdiction of the Safe Drinking Water Act.

The national drinking water standards contain maximum allowable levels for various contaminants and require water systems to monitor (sample and analyze) their water on a periodic basis for determining compliance with these contaminants.

Alaska State drinking water regulations consistent with the national regulations first went into effect in April 1978; therefore, complete data to evaluate the ability of the State's public water systems to meet national standards is not yet available. The State's first annual report will be compiled by January 1979 and this report will become a baseline against which improvements in the State's drinking water quality can be measured.

Groundwater Protection Program

The Safe Drinking Water Act has also established a program for protecting underground sources of drinking water. States with a significant number of injection wells having a high potential for groundwater contamination will be required to regulate such wells. None of the four states in Region 10 have, as yet, been designated to run an underground injection control program.

An additional major effort to study the potential of surface impoundments to contaminate groundwater was initiated in March 1978. The states, through an EPA grant, will locate surface impoundments such as pits, ponds, and lagoons, and assess their impact on groundwater quality. The Surface Impoundment Assessment Study will be completed in December 1979, and will provide the first nationwide evaluation of surface impoundments.

FIGURE 15

TROPHIC STATUS OF MAJOR RECREATIONAL LAKES

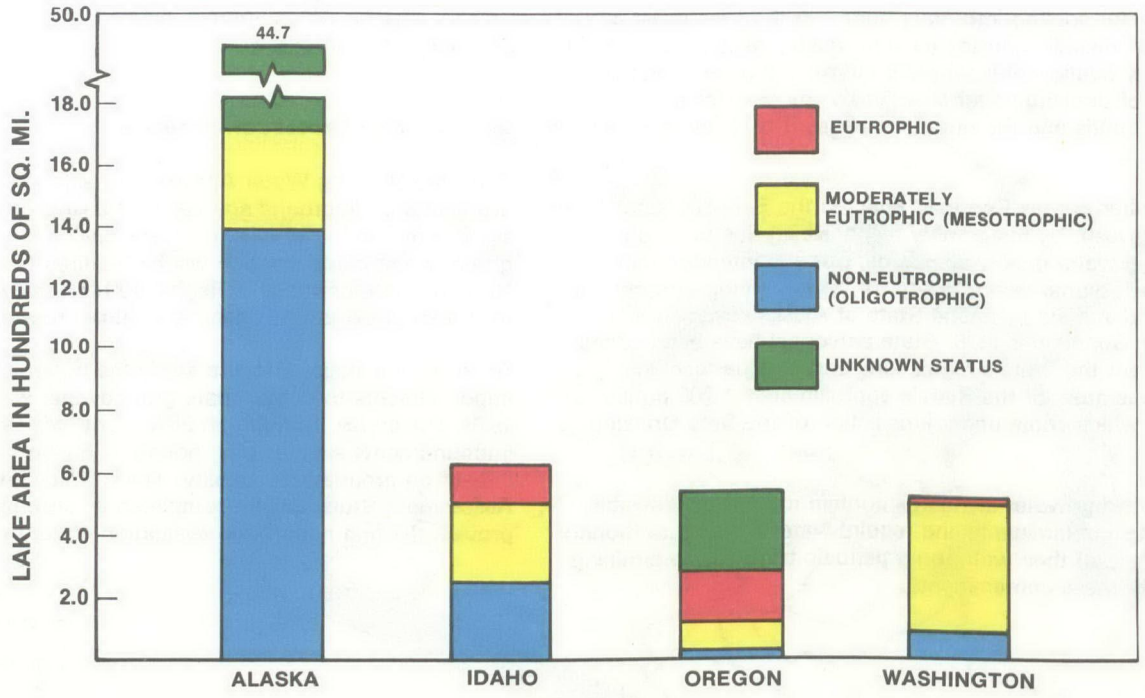
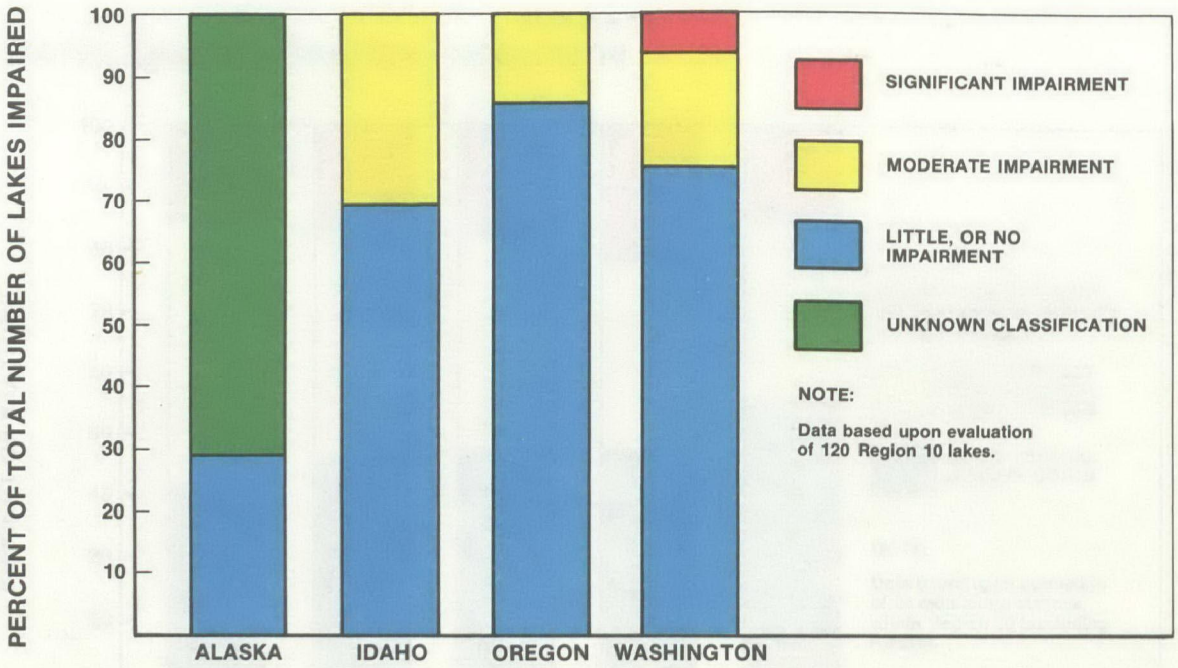


FIGURE 16

IMPAIRMENT STATUS OF RECREATIONAL LAKES



LAKE WATER QUALITY

Lakes in Alaska will undoubtedly play a major role in the State's water quality picture in the future due to increased development and associated population growth. Lake uses for fishing, boating, and water supply will increase with this growth.

Measuring Lake Water Quality

Although a numerical "water quality index" has not been developed for lakes as for rivers, lake quality can be characterized in two ways: trophic status and the degree of impairment of beneficial use.

While eutrophication, the process of aging, occurs naturally in lakes and impoundments, man's activities may accelerate this process, resulting in "cultural eutrophication". Highly eutrophic bodies of water are characterized by dense algal blooms, floating mats of vegetation, and a murky appearance. Algae are naturally found in every body of water; however, when stimulated by abundant nutrients, sunlight, and warm temperatures, they multiply rapidly to become a nuisance to recreational users and seriously affect water quality for other uses.

Plant nuisances may directly curtail or eliminate water recreation activities such as swimming, boating, and fishing; impart tastes and odors to water supplies; and hamper industrial and municipal water treatment. These nuisance growths can also cause toxic conditions which adversely affect other aquatic life in the lakes. Possibly the greatest effect of eutrophication on water quality is the consumption of dissolved oxygen when algae die, sink to the bottom of the lake and are decomposed by bacteria. This process reduces dissolved oxygen levels and can adversely affect fish and other aquatic inhabitants.

Water bodies with very little algae are said to be oligotrophic (often called pristine). Lakes are said to be mesotrophic if they have moderate algae productivity and meso-eutrophic if they are approaching fully eutrophic conditions.

In the case of use impairment, swimming, fishing, boating and aesthetics may be considered. An evaluation system which yields an impairment score is shown in Table 5.

In this report, lake water quality has been assessed by totaling the individual use ratings shown in Table 5. The rating for each factor for minimum or no impairment is one, and the most severe impairment is rated three. Final ratings range from a low of four (minimum or no impairment), to a high of twelve (significant impairment). Professional judgment was used to determine the degree of impairment where data were not available.

TABLE 5

CRITERIA FOR EVALUATING IMPAIRMENT OF LAKES

Recreational Use	Degree of Impairment: None — Criteria	Score	Moderate — Criteria	Score	Significant — Criteria	Score
Swimming	Very low bacteria levels (Fecal coliforms geometric mean less than 50 per 100 ml)	1	Moderate bacteria levels (Fecal coliforms 50 to 200 per 100 ml)	2	Unhealthy bacteria levels (Fecal coliforms greater than 200 per 100 ml)	3
Fishing	No adverse conditions. Healthy fish population.	1	Slightly adverse conditions. Slight reduction in fish population.	2	Adverse conditions. Significant reduction in fish population.	3
Boating	Less than 10% of surface area affected by aquatic weeds	1	10% to 30% affected	2	More than 30% affected	3
Aesthetics	Objects visible in water to depth of 10 feet or more and low phosphorus (Secchi Disc at 10 feet; total phosphorus of less than 10 ug/l)	1	Objects visible from 1.5 to 10 feet and moderate phosphorus level (Secchi Disc at 1.5 to 10 feet; total phosphorus 10 to 20 ug/l)	2	Objects not visible beyond 1.5 feet or high phosphorus level (Secchi Disc at less than 1.5 feet; total phosphorus greater than 20 ug/l)	3
SCORE	**4** (No uses impaired)		**5-8** (All uses moderately impaired)		**9-12** (All uses significantly impaired)	

TABLE 6

TROPHIC STATUS OF NATURAL FRESHWATER LAKES IN ALASKA (AT LEAST 10 SQUARE MILES IN AREA)

Lake	Surface Area in Square Miles	Latitude	Longitude	Trophic Status[1] Eutrophic	Meso-trophic	Oligo-trophic	Unknown
Iliamna	1000	59°35	155°00			•	
Becharof	458	57°50	156°25				•
Teshekpuk	315	70°35	153°30				•
Naknek	242	58°35	156°00		•		
Tustumena	117	60°25	150°20			•	
Clark	110	60°10	154°00			•	
Dall	100	60°15	163°45				•
Inland*	95	66°30	159°50				•
Imuruk Basin*	80	65°05	165°40				•
Upper Ugashik	75	57°50	156°25				•
Kukaklek	72	59°35	155°00				•
Lower Ugashik	72	57°30	156°55				•
Nerka	69	59°20	158°45				•
Nuyakuk	64	59°50	158°50				•
Aropuk	57	61°10	163°45				•
Tazlina	57	61°50	146°30			•	
Nunavakpak	53	60°45	162°40				•
Kaghasuk*	52	60°55	163°40				•
Skilak	38	60°25	150°20			•	
Chauekuktuli	34	60°05	158°50				•
Chikuminuk	34	60°15	158°55				•
Beverley	33	59°40	158°45				•
Whitefish	33	61°20	160°00				•
Aleknagik	31	59°20	158°45				•
Brooks	31	58°30	155°55				•
Kgun	31	61°35	163°50				•
Nanwhyenuk or Nonvianuk	31	59°00	155°30				•
Takslesluk	31	61°05	162°55				•
George	29	61°15	148°35			•	
Nunavak Anukslak	29	61°05	162°30				•
Unnamed	28	60°55	164°00				•
Mother Goose	12	57°10	157°20				•
Unnamed	12	60°25	164°10				•
Unnamed	12	59°50	163°25				•
Unnamed	12	62°15	162°20				•
Unnamed	12	70°50	153°30				•
Colville	11	58°45	155°40				•
Harlequin	11	59°25	138°55				•
Unnamed	11	60°25	164°10				•
Unnamed	11	60°25	162°20				•
Bear	10	56°00	160°15				•
Chignik	10	56°15	158°50				•
Ewan	10	62°25	145°50				•
Kontrashibuna	10	60°10	154°00				•
Kukaklik	10	61°40	160°30				•
Kulik	10	58°55	155°00				•
Kulik	10	61°45	160°40				•
Miles	10	60°40	144°45				•
Susitna	10	62°25	146°40				•
Unnamed	10	60°20	162°00				•
Unnamed	10	60°25	162°00				•
Unnamed	10	60°55	162°10				•
Unnamed	10	59°55	163°15				•
Unnamed	10	62°00	162°00				•

1 Source of Data:
Alaska Department of Environmental Conservation, Environmental Protection Agency Alaska Operations Office

* May be saltwater

TROPHIC CONDITIONS AND USE IMPAIRMENT

Of the 97 lakes in Alaska which have at least 10 square miles of surface area (6,400 acres) none are eutrophic, only five lakes are classified as mesotrophic (moderate algal productivity), and nine are oligotrophic (relatively pristine). Trophic status for the majority of Alaska's lakes (83) is unknown but is expected to be either oligotrophic or mesotrophic. Since there is relatively little effect by man upon most lakes in the State, these lakes represent the natural trophic status. Table 6 shows the trophic status of some of the natural freshwater lakes in Alaska.

In addition to excessive algae, other forms of pollutants such as bacteria, turbidity, and oil also impair the beneficial uses of lakes and reservoirs. Table 7 depicts the degree of impairment of recreation lakes in Alaska. Of the 18 most-used Alaska recreation lakes, only enough information is available to classify seven (by measurements or professional judgment). None of these seven have any significant degree of impairment.

Even though there is no apparent impairment of recreational values in Alaska lakes at this time, continued development and residential growth in the vicinity of many of these lakes is to be expected. Therefore, care must be taken in future planning and development so that these bodies of water will retain their high water quality.

A REGIONAL OVERVIEW

There are 145 lakes and reservoirs within Region 10 that equal or exceed 10 square miles in surface area and thousands of other smaller lakes and reservoirs. Each plays an important role in the ecosystem of the Pacific Northwest and Alaska.

Many Regional lakes and reservoirs are at or approaching a level of eutrophication unsuitable for their intended uses. Exceptions are the Alaska lakes, most of which are in remote areas.

Figure 15 presents a summary of trophic status of the Regional lakes by state.

Alaska, the least populated state, has the largest percentage of non-eutrophic (oligotrophic) lakes and even the moderately eutrophic lakes are probably the result of natural causes. About one-third of Idaho's lakes and reservoirs are still non-eutrophic; however, the remaining lakes are either moderately eutrophic or eutrophic because of intense land and water use in the more populated and agriculturally oriented portions of the state. Oregon and Washington, the most populated states in Region 10, have the lowest percentage of the non-eutrophic lakes and reservoirs. Even though the eutrophic condition of some of these bodies of water may result from natural causes; intense recreational use, residential development, and agricultural use east of the Cascade Mountains, has accelerated the eutrophication process.

A review of the 120 lakes within Region 10 that have the highest recreational use in each state, indicates that most have only limited recreational impairment. Figure 16 shows the impairment breakdown by state. The water quality of only two lakes in the State of Washington is considered to be significantly impaired with seventy-five percent showing little or no impairment.

In Idaho 30 percent, and in Oregon 12 percent of the lakes show moderate impairment of the highest beneficial uses. Most of the impaired Oregon lakes and reservoirs are in the semi-arid portion of the State. Those in Idaho are in the southern portion of the State.

In almost every case, moderate or significant impairment is the result of intense recreational use of lakes which are near populated areas. The more pristine lakes and reservoirs are situated away from these areas, many times in the higher elevations. The challenge for the future will be to maintain the existing good quality lakes while upgrading the poorer quality ones.

TABLE 7
PRINCIPAL ALASKA LAKES
Impairment of Highest Beneficial Use

Name	Surface Area (Acres)	Recreational Use Impaired[1]				Final Rating
		Swimming	Fishing	Boating	Aesthetics	
Harding		1	1	1	1	4
Fielding		1	1	1	1	4
Summit		1	1	1	1	4
Paron		1	1	1	1	4
Big		1	1	1	1	4
Kenai	19	1	1	1	1	4
Skilak	38	1	1	1	1	4
Fire				Status Unknown		
Nancy				Status Unknown		
Galbraith				Status Unknown		
Clark	110			Status Unknown		
Iliamna	1000			Status Unknown		
Minchumina	23			Status Unknown		
Louise	23			Status Unknown		
Schader				Status Unknown		
Tustumena	117			Status Unknown		
Ward				Status Unknown		
Blue				Status Unknown		

1 Numbers in columns represent the degree of recreational impairment for each lake—minimum impairment per category is 1 and highest is 3; therefore, final rating ranges from 4 for little or no impairment to 12 for maximum impairment of all recreation categories.

MARINE WATER QUALITY

Alaska has more coastal and estuarine water than any other state in the United States and relies upon these waters for the majority of its economic life. Coastal areas support importing, exporting, transportation, shellfish production, commercial fishing, and recreation. They are also used for oil production and transportation, seafood processing, logging and pulp and paper activities. The majority of the State's urban centers and associated industrial development are in or near marine water areas. It is therefore important that the health of these waters be maintained at a high quality to support all of the uses.

Measuring Marine Water Quality

Marine water quality determinations are based upon specific microbiological, chemical and toxicological criteria established by the U.S. Food and Drug Administration for the National Shellfish Sanitation Program. Waters free of fecal contamination, industrial waste, radionuclides, and biotoxins are considered safe for edible shellfish production, and are classified as "Approved for Commercial Shellfish Harvesting." Waters which generally meet the criteria but are subject to occasional closure resulting from seasonal increases in population, freshwater runoff, or temporary malfunctioning of waste treatment facilities are classified as "Conditionally Approved." Waters found to be contaminated, or suspected of being contaminated, which would produce shellfish unsafe for human consumption are classified as "Closed to Commercial Shellfish Harvesting."

Assessing water quality in marine water is a difficult, time-consuming and expensive task due to the complexities of tidal variations, fluctuating currents and unpredictable mixing patterns. However, the condition of shellfish such as oysters, clams, and mussels can be used to assess marine water quality. Shellfish concentrate disease-causing bacteria and viruses as well as toxic chemicals, radionuclides, and biotoxins from the waters in which they live. Since shellfish reflect concentrations of domestic, industrial, and agricultural wastes, they can be used as practical long-term indicators of water quality and the effectiveness of pollution control efforts at specific locations.

ALASKA'S MARINE WATERS

Approximately 92,400 acres of commercial shellfish growing waters (for razor clams only) have been classified by the Alaska Department of Health and Social Services (Figure 17). Most of the "Approved for Commercial Shellfish Harvesting" waters are in the vicinity of Cordova with smaller acreages located near Swikshak on the Alaska Peninsula and Polly Creek on Cook Inlet. The balance of Alaska's extensive, but uncharted, shellfish growing waters are technically classified as closed. This classification is required, not because of known pollution problems, but because these waters have not been subjected to sanitary surveys or monitored for the presence of paralytic shellfish poison (PSP). Funds for such studies are severely limited so that most areas in the State have never been classified.

Paralytic shellfish poison is a naturally occurring biotoxin produced on the West Coast by the microscopic marine alga, **Gonyaulax catenella**, and taken up by filter-feeding molluscs such as clams. A number of illnesses, including some fatalities, have occurred in Alaska and other coastal regions as a result of people unknowingly eating shellfish containing high levels of PSP. The prevention of paralytic shellfish poisoning in humans depends heavily on the identification of toxic shellfish by laboratory testing.

Some improvement in the quality of marine water has occurred over the last five years. Pulp mills in Silver Bay and Ward Cove have upgraded their treatment levels and as a result the water quality degradation has been reduced. Further treatment will improve water quality even more in the future. Similar improvements can be expected in the Kodiak area as the result of a reduction in seafood waste discharges.

It is inevitable that the demand for Alaska clams will grow as shellfish reserves dwindle elsewhere. In the past, man's activities have had only a limited impact on the classification of Alaska's shellfish growing areas. However, consideration of the human health effects of pollutants near populated areas will undoubtedly play a greater role in the classification process as the demand for approved shellfish growing waters increases.

THE REGIONAL OVERVIEW

A total of 349,300 acres of commercial shellfish growing area (Figure 18) has been classified by agencies in Oregon, Washington, and Alaska. This represents approximately two percent of the classified growing waters in the nation. Seventy-three percent of the regional growing area (254,100 acres) is classified as approved; nine percent (32,900 acres) conditionally approved; and 18 percent (62,300 acres) closed.

Most of the closed growing areas are due to fecal contamination or the great potential for such contamination resulting from nearness to municipal sewage treatment facilities serving populated areas. The conditionally approved areas are primarily characterized by excessive fecal contamination occurring as a result of seasonal increases in freshwater runoff from agricultural and logging activities, as well as the occasional malfunctioning or bypassing of sewage treatment plants.

Population growth and associated sewage wastes appear to pose the greatest threat to approved shellfish growing areas in Region 10. Because of the small size of Oregon's shellfish industry and the generally undeveloped nature of Alaska's clam resources, changes in Washington State's shellfish growing area classification would probably have the greatest regional economic impact. The effect of reductions in the size of Washington's approved growing area may be mitigated by the industry's ability to maintain current production levels on somewhat less acreage. Nevertheless, the closure of key growing areas in southern Puget Sound or Willapa Bay would have an immediate adverse impact.

FIGURE 17

MARINE WATERS OF ALASKA
STATUS OF CLASSIFIED SHELLFISH GROWING AREAS

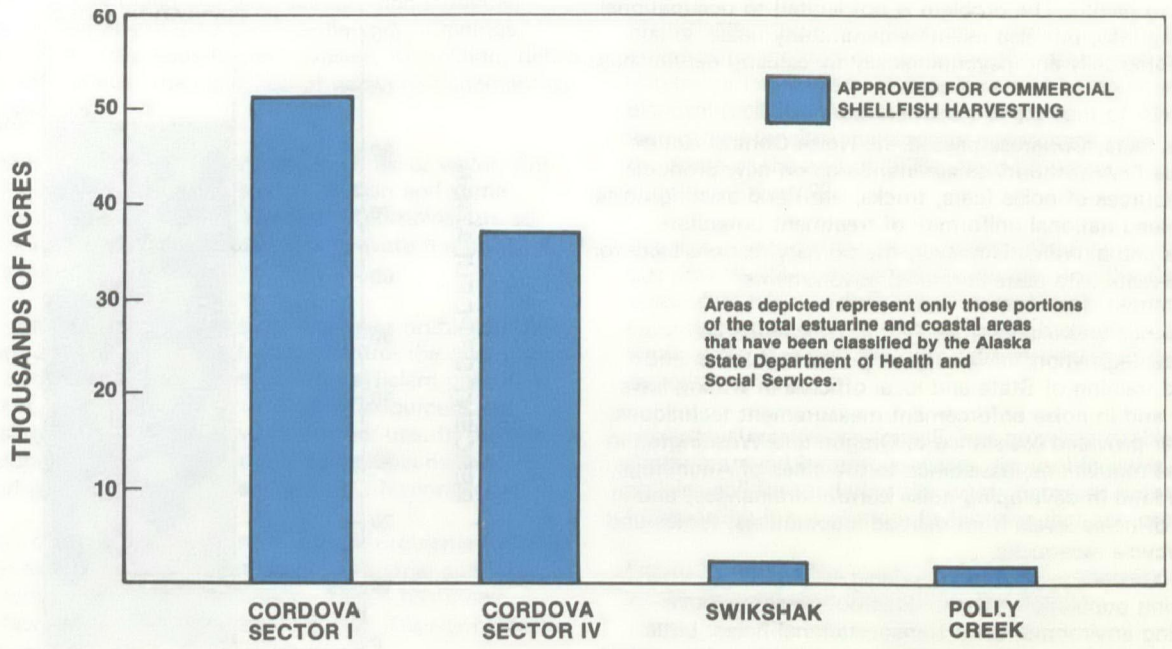
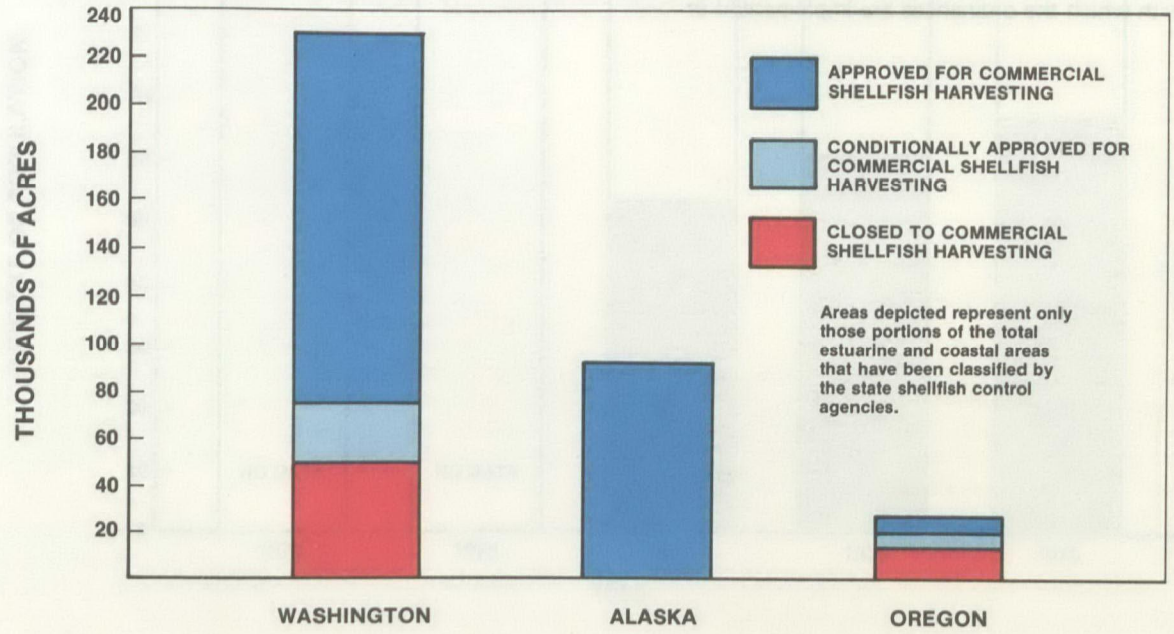


FIGURE 18

MARINE WATERS OF REGION 10
STATUS OF CLASSIFIED SHELLFISH GROWING AREAS



NOISE

Sound, so vital a part of our existence, is growing to such disagreeable proportions within our environment today that it is a very real threat to health. The problem is not limited to occupational noise and hearing loss, but also includes community noise, which affects us physiologically and psychologically by causing nervousness and tension.

In view of these facts, Congress passed the Noise Control Act of 1972 which gives EPA authority to set standards on new products that are major sources of noise (cars, trucks, etc.) and existing noise sources which need national uniformity of treatment (interstate railroads, trucks and aircraft). However, the primary responsibility for control of noise rests with state and local governments.

Technical assistance is available from EPA in areas such as: developing model legislation; reviewing proposed legislation and regulations; and training of State and local officials in writing laws and ordinances and in noise enforcement measurement techniques. EPA has thus far provided assistance to Oregon and Washington in developing noise regulations, assistance to the cities of Anchorage, Seattle and Portland in developing noise control ordinances, and in the monitoring of noise levels from railroad locomotives, ferries and auto and motorcycle racetracks.

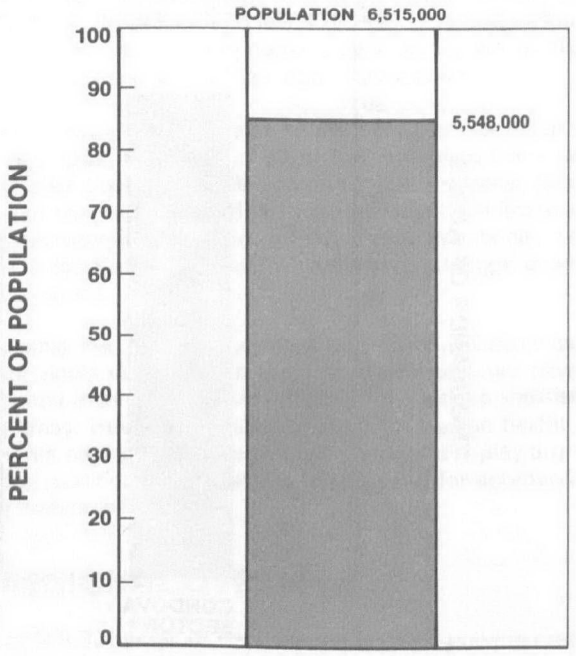
Despite a growing population, Alaska does not presently have legislation limiting environmental or transportational noise. Little progress has been made to date to initiate a statewide noise control program.

Of the major cities in Alaska, Anchorage has enacted an ordinance prescribing noise levels for land use, motor vehicles and recreational vehicles. Other noise sources controlled by the Anchorage ordinances include: motorboats, aircraft, home power tools, horns, alarms, refuse collection vehicles, snow removal vehicles and construction activities.

Figure 19 indicates the percent of the population in Region 10 covered by noise ordinances. This exhibit does not reflect the effectiveness with which the ordinances are implemented or enforced.

FIGURE 19

REGION 10 POPULATION COVERED BY NOISE ORDINANCES



SOLID WASTE

Waste management deals with problems ranging from health and environmental hazards to the efficiency of collection operations. The diverse nature of wastes (dead animals, mercury-rich industrial sludges, dredge spoils, abandoned cars, septic tank pumpings, residential solid waste, infectious hospital wastes, demolition, debris, feedlot wastes, etc.) makes the challenge of waste management as complex as its sources.

Improper disposal methods can pollute the land, air or water. For example, burning dumps contribute to air pollution and some disposal sites, especially west of the Cascade Mountains, are so situated that leachate and drainage waters aggravate the pollution of rivers and streams.

The long-term solution to solid waste management problems lies in the development of systems that will wisely control the quantity and characteristics of wastes. This can be done by efficient collection, creative recycling, recovering energy and other resources, and properly disposing of wastes that have no further use. In the near term, the development of environmentally acceptable methods of disposal on land is stipulated by Federal law as a National goal.

Alaska has most of the solid waste management problems found in the other states except no large quantities of industrial and farm wastes are currently generated. In addition, Alaska has many problems that few other states have experienced. They are climatic, geologic and demographic in nature; and include problems such as permafrost, Arctic deserts, coastal rain forests, vast regions of unsuitable soils, mountainous terrain, lack of surface transportation systems, and hundreds of isolated villages.

The relative status of solid waste management in Alaska is difficult to define. One method of measuring the status and progress is to determine the number of people served by approved, State-permitted disposal facilities. Approximately 67 percent of Alaska's population was served by sites managed in accordance with permits issued by the State at the end of 1976, about 24 percent more than in 1974, as shown in Figure 20.

Resource recovery has been contemplated by several communities, but only the Municipality of Anchorage and the City and Borough of Sitka have taken serious steps toward implementation. Resource recovery will be limited for some time because of small quantities of waste generated and the high cost of transportation to recovered material markets.

Hazardous wastes are a small, but growing, problem in Alaska. No State-approved hazardous waste disposal facilities exist. Present policies call for rendering the waste harmless before disposal or transporting it out-of-state to facilities that can properly process it.

Figure 21 shows the location of resource recovery and hazardous waste disposal sites throughout the Region.

FIGURE 20

PERCENT OF POPULATION SERVED BY STATE-APPROVED SOLID WASTE DISPOSAL FACILITIES

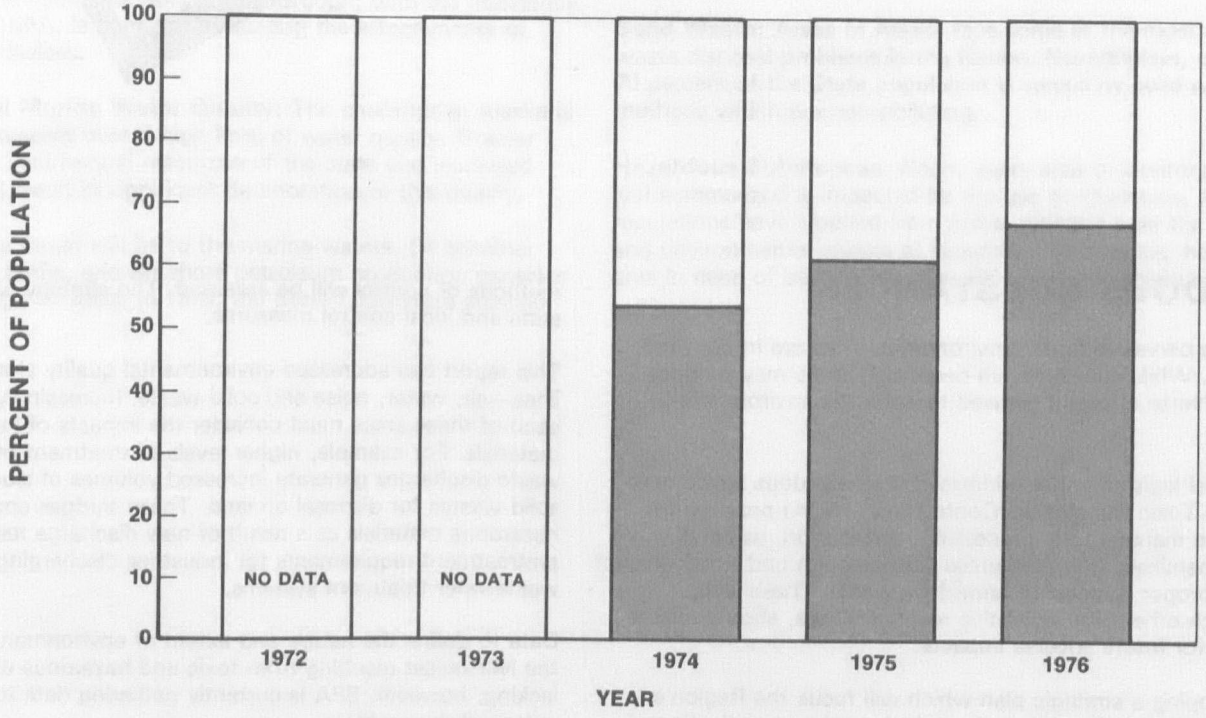
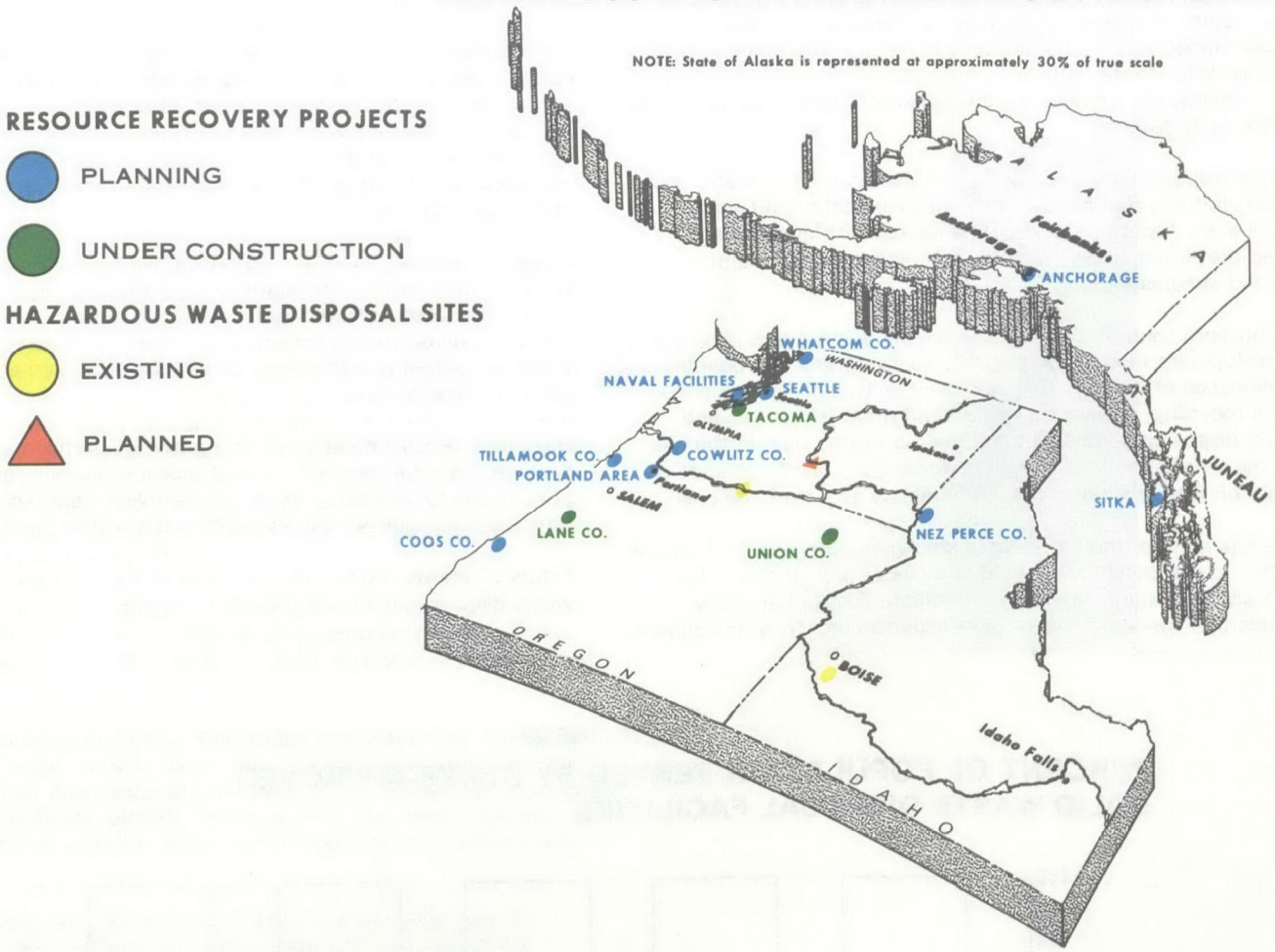


FIGURE 21

STATUS OF RESOURCE RECOVERY PROJECTS AND HAZARDOUS WASTE DISPOSAL SITES IN REGION 10



HAZARDOUS SUBSTANCES

Chemicals are pervasive in our environment. They are in our food, water and air. While chemicals are beneficial, some may produce long term, adverse effects if allowed to enter the environment improperly.

Recent Federal legislation has addressed the hazardous substances problem. The Toxic Substances Control Act (TSCA) provides for controlling the manufacture, processing, distribution, use and disposal of chemicals. The Resources Conservation and Recovery Act provides for proper disposal of hazardous waste. These laws, combined with other EPA legislative responsibilities, should reduce the potential for future adverse impacts.

EPA is developing a strategic plan which will focus the Region's attention on high priority chemicals. Following the identification of chemicals manufactured and used in the Region, impacts and methods of control will be assessed. The strategy will utilize Federal, state and local control measures.

This report has addressed environmental quality along media lines—air, water, noise and solid waste. Increasingly, actions taken in each of these areas must consider the impacts of hazardous materials. For example, higher levels of treatment of air and water waste discharges generate increased volumes of sludges and other solid wastes for disposal on land. These sludges contain toxic and hazardous materials as a result of new discharge restrictions and pretreatment requirements for industries discharging to municipal wastewater treatment systems.

Data to define the nature and extent of environmental problems in the Northwest resulting from toxic and hazardous chemicals are lacking; however, EPA is currently gathering data to depict the extent of the problem.

SUMMARY

Air Quality: For many of Alaska's Election Districts, health-related air quality standards are met. However, in the more densely populated areas of the State, air pollution levels frequently exceed the standards. About 60 percent of Alaska's population lives in Anchorage and Fairbanks where not only the primary standards but also the more severe alert air quality levels are exceeded. Nevertheless, the long-term trend is favorable.

The outlook for controlling the main air quality pollutants in Alaska is as follows:

Industrial sources of **particulates** may be controlled with reliable, relatively inexpensive technology. However, fugitive dust is responsible for a large share of Alaska's particulate air pollution. Thus, even through control of point sources may reduce the frequency or severity of violations, problems will still occur until area and fugitive dust sources are also controlled.

Application of currently available control technology for **sulfur dioxide** could result in additional reductions in the volume of pollutant emissions. The best available control technology on new sources, especially those associated with energy production and the production and transportation of the North Slope energy resources will ensure that the SO_2 standard is met.

For **carbon monoxide**, control will rely on both the Federal Motor Vehicle Control Program to reduce auto emissions and upon those activities taken at the local level to abate problems in the city center and near commuter corridors. The local actions needed, and the time required for phase-in of new automobiles with better controls, will result in a gradual rather than an immediate reduction in carbon monoxide levels. Because of the extremely cold winter temperatures in Fairbanks, a very large portion of the total CO emissions from automobiles occurs within the first few minutes after start up. Consequently, the Fairbanks North Star Borough, with the assistance of the State and EPA, is currently evaluating the effectiveness of engine pre-heat devices.

River, Lake and Marine Water Quality: The challenge in Alaska is to preserve the present overall high level of water quality. Greater utilization of the vast natural resources of the state and increased population could result in significant deterioration of this quality.

The most serious threat will be to the marine waters. Oil terminal facilities, tanker traffic, and off-shore petroleum production generate potentials for large oil spills. In 1976, the State Legislature enacted legislation which includes a comprehensive oil spill prevention program. Timely implementation of this program, together with the contingency plan which has recently been developed to deal with oil spills is important.

Alaska's waste water treatment program for municipal and industrial discharges is well advanced, but not yet complete. Emphasis on this program will be necessary to maintain water quality. Untreated domestic sewage discharges have been reduced in areas such as the Chena River near Fairbanks; however, other interior and coastal communities still have inadequate sewage treatment facilities. Most seafood processors and pulp mills are presently improving their treatment levels.

In the relatively unpopulated interior of Alaska, water quality degradation in clear water streams resulting from placer mining activities will be difficult to control. It is doubtful that mitigation of the impacts of placer mining will be possible in the next few years.

Recognizing the conflict between resource development and water quality maintenance, the preservation of Alaska's high water quality will require considerable attention. Implementation of environmental programs which are being developed at the State and local level will be necessary in the next few years to prevent a gradual decrease in the quality of lakes, rivers and marine waters in Alaska.

Drinking Water Quality: In September 1978 Alaska assumed the responsibility for implementing the Safe Drinking Water Act. In accordance with this Act the State is requiring water systems to thoroughly monitor the quality of water they serve. Because regulations became effective only recently, complete information to evaluate the quality of Alaska's drinking water is not yet available.

Noise: Approximately 45 percent of Alaska's population is covered by noise regulation ordinances which are based on objective standards of sound intensity.

Solid Waste: Areas of Alaska face some of the most difficult solid waste disposal problems in the Nation. Nevertheless, currently about 70 percent of the State population is served by solid waste disposal methods which are non-polluting.

Hazardous Substances: Nearly every area of environmental quality just summarized is impacted by the use of chemicals. New laws and regulations have resulted from public concern over the adverse health and environmental effects of hazardous substances; however, it is an area in need of better data, research and integrated control efforts.