United States
Environmental Protection
Agency

Region 10
1200 Sixth Avenue
Seattle WA 98101

December 1980

EPA

Pacific Northwest Region

Environmental Quality Profile

Preface

This is the fourth annual report to the people of the Pacific Northwest on the status of our environment. The information presented in this report has been compiled by the Environmental Protection Agency (EPA) in cooperation with the States of Alaska, Idaho, Oregon, and Washington. Valuable contributions have also been made by numerous individuals as well as other institutions.

While the Northwest United States is viewed as being relatively environmentally "clean" in comparison with other parts of the Nation, there are many problems to be solved. Most importantly, however, the Northwest is growing--more industry attracts more people--and the results of that growth are not always environmentally beneficial. The people of the Northwest consequently face a challenge: accommodating increased growth while retaining one of our greatest resources, a healthful and beautiful environment.

During May and June 1980, when Mount St. Helens erupted, this report was nearing completion. With the exception of the presentation on Mount St. Helens, environmental data used in the report consist of data collected in 1979 and do not reflect the impact of the volcanic eruption.

Space precludes a complete discussion of the many complex technical and economic issues associated with environmental protection. Therefore, the interested reader is invited to contact the Region 10 Office of EPA in Seattle for other publications and additional information. Also, we encourage suggestions on how future issues of this publication can be made more useful.

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December, 1980

Contents/Summary

1 Mount St. Helens

The 1980 series of Mount St. Helens eruptions created troubling uncertainties for environmental and public health officials in the Pacific Northwest. The surge of mud, fallen timber and other debris, plus the heavy fallout of volcanic ash into many areas of the region, raised questions about the quality of drinking water, the ability of sewage treatment plants to withstand the ash flushed into sewer systems, and the possible health effects on people from inhaling potentially dangerous quantities of volcanic dust. Many fears about serious environmental consequences were quickly dispelled, but no immediate answers are available for questions about long-term health effects.

5 Solid Waste and Hazardous Substances

Problems with traditional methods of solid waste disposal and the need to conserve natural resources and energy have prompted the use of new approaches in Region 10 solid waste management. In particular, communities are recycling more recoverable materials and considering energy recovery from municipal waste.

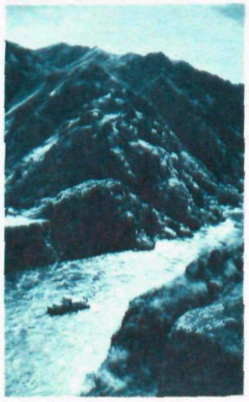
Production, use, and disposal of hazardous substances is a major concern in Region 10. However, stringent regulatory programs, including new hazardous waste regulations, are being implemented to better manage these materials. EPA requires monitoring of radioactive materials and pesticides, although the states have primary enforcement duties for controlling these substances.

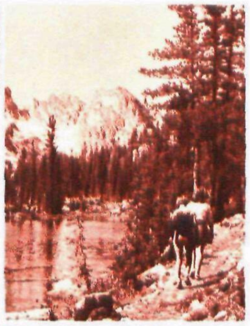
9 Air Quality

In 1979, most areas in Region 10 met air quality standards. Standards for total suspended particulates were exceeded in 16 areas as well as a number of others where fugitive dust is a problem. Sulfur dioxide standards are being exceeded in three areas of Idaho and one area of Washington. Carbon monoxide levels in all four states are expected to be controlled by various transportation management strategies. Ozone standards were exceeded in both the Portland and Seattle areas. To attain standards, controls on point sources and area sources either have been implemented or are planned.

18 River Water

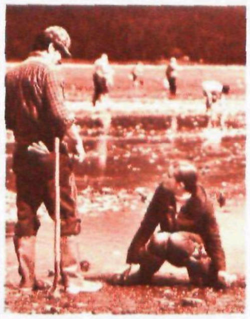
Portions of many of the Region's major rivers have marginal water quality with respect to the Federal water quality goals, and the overall 7-year trend has shown little improvement. Much of the existing degradation is due to a variety of non-point sources which should eventually be controlled by area-wide wastewater management programs. Some is contributed by point sources, such as industries, which are controlled through state and Federal pollution permits. Natural occurrences are also responsible for some of the problems. The water quality criteria most often exceeded are those for temperature, bacteria, nutrient levels, turbidity, solids, and heavy metals.





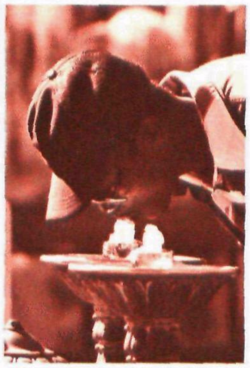
Lakes 33

Many of the Region's major recreational lakes have water quality and other problems which impair their recreational use—principally algae and aquatic weed growths and excessive sedimentation. Primary sources of these problems are stormwater runoff from urban and agricultural lands, sewage and septic discharges from residential areas and recreational facilities, and irrigation return flows. A variety of measures have been taken to restore the water quality in some of the lakes.



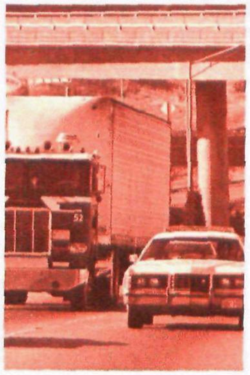
Marine Water 40

About one-third of the Region's classified commercial shellfish growing areas are closed during at least part of the year. These closures are primarily due to fecal bacteria contamination caused by inadequate sewage treatment. Others may be due to seasonal runoff from agricultural and forestry activities, and industrial point sources, such as pulp mills. Naturally occurring outbreaks of "red tide" also necessitate the closure of some areas on a seasonal basis.



Drinking Water 44

Drinking water in the Northwest and Alaska is generally considered to be safe, but five waterborne disease outbreaks have occurred within the past year, and others are suspected but unconfirmed. Water system compliance with the bacteriological standards has remained fairly constant from Fiscal Year 78 to Fiscal Year 79; however, improvements have been made in achieving compliance with the bacteriological monitoring requirements. Improvements in compliance with both bacteriological monitoring and standards are expected to occur in Fiscal Year 80.



Noise 46

The Federal Noise Control Act of 1972 gives EPA authority to set standards for cars, trucks, interstate railroads, aircraft, etc. However, the primary responsibility for noise control rests with state and local governments. With technical assistance from EPA as required, each community develops the programs that meet their unique requirements.

Summary of Environmental Indicators

		OREGON		WASHINGTON		IDAHO		ALASKA	
MEDIA	INDICATOR	CURRENT STATUS	TREND	CURRENT STATUS	TREND	CURRENT STATUS	TREND	CURRENT STATUS	TREND
Air Quality	Number of areas exceeding standards	6	Little change	8	Little change	5	Little change	2	Little change
River Water Quality	Percentage of monitoring stations meeting water quality goals (based on worst 3 months)	30%	Little change	50%	Little change	30%	Slight decrease	10%	Insufficent data
Lake Water Quality	Percentage of major recreational lakes with little or no use impairment	58%	Little change	50%	Little change	57%	Little change	87%	Little change
Marine Water Quality	Percentage of classified shellfish harvesting waters open	50%	Little change	68%	Little change			100%	
Drinking Water Quality	Percentage of population served by water supplies in compliance with regulations for bacterial contamination	72%	Improving	69%	Improving	64%	Improving	43%	Improving
	Percentage of community water supplies in compliance with regulations for bacterial contamination	58%	Improving	17%	Improving	63%	Improving	18%	Improving
Noise	Percentage of population covered by enforcement of state/local noise regulations	50%	Improving	50%	Improving	5%	Little change	35%	Improving
Solid Waste Disposal	Number of recycling centers in operation	300+	Improving	300+	Improving	20	Improving	2	Improving
	Number of hazardous waste handling facilities in operation	3	Improving	4	Improving	2	Little change	0	

Mount St. Helens

The eruption of Mount St. Helens occurred last spring just as this report neared completion. Consequently, the fallout from the volcano suddenly threw into question many of EPA's conclusions regarding the condition of the environment in the Pacific Northwest.

Data EPA had collected on levels of turbidity and solids in the surface waters of southwestern Washington were made obsolete by the movement of tons of mud, fallen timber, and other debris into rivers and lakes in the immediate vicinity of Mount St. Helens (see Figure 1). Over a wider area, the turbidity created in dozens of drinking water supplies in Washington, Idaho, and Oregon cast doubt on EPA's assessments of the drinking water quality in those systems most affected by mudflows and ash fallout. For a few days, it was uncertain whether the turbidity would interfere with the disinfection needed to assure safe drinking water.

Emissions of ash and various gases produced what will undoubtedly be long-standing problems related to attainment of national ambient air quality standards for particulate matter throughout the Region. In addition, serious questions were raised about the volcano's contributing significantly to acid rain formation well beyond the borders of the Pacific Northwest.

The potential for far-reaching effects became apparent by early July when an English scientist claimed that ash from Mount St. Helens was responsible for the unseasonably cold summer temperatures in Great Britain and for the rains that drenched the Wimbledon tennis tournament.

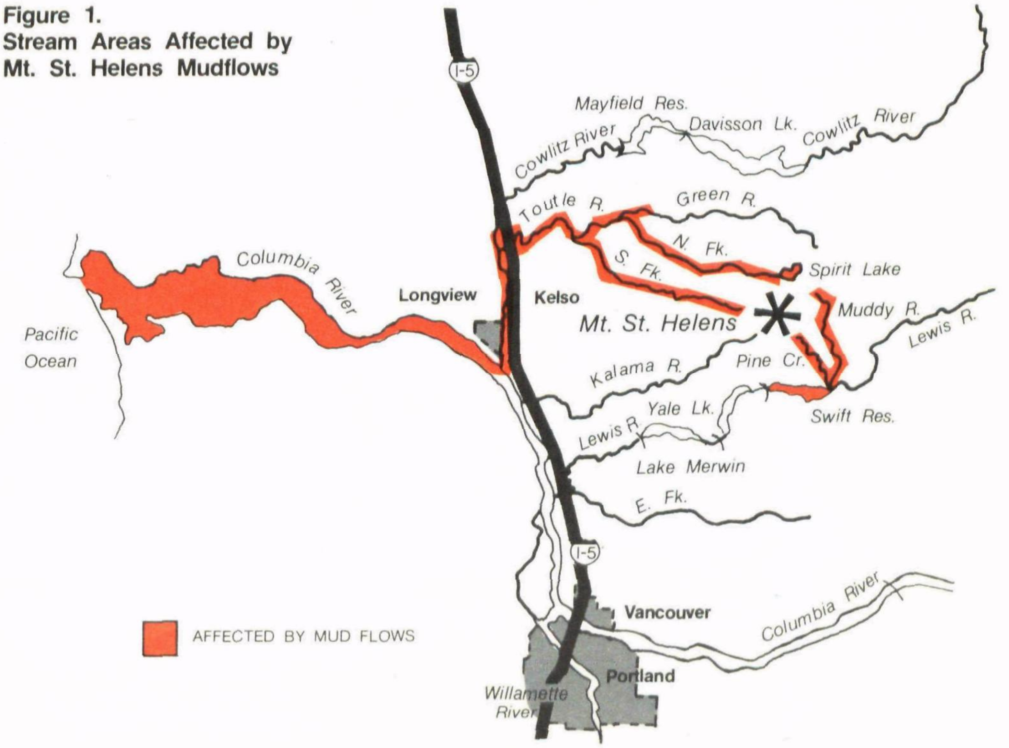
The concerns of the English scientist seem frivolous when compared with those of people living in Washington, Idaho, and Oregon in the aftermath of Mount St. Helens' May, June, and July eruptions. For people who had to dig their way out of mudflows or heavy ash fallout, it was a matter of personal health, and some very important questions arose. Was it safe to handle the ash? Was their water fit to drink? Was the air safe to breathe?

These were the three chief questions facing EPA and state environmental and health agencies in the wake of the volcano's eruptions—in particular the one of May 18. Within hours of this explosion that blasted more than 1,000 feet off the top of the mountain, EPA sent a specially equipped aircraft over areas of central Washington downwind from the volcano to measure radioactivity. No radioactivity above normal background levels was discovered in the aerial measurements, which was confirmed through analyses of ground ash samples taken the same day.

It was also promptly determined that the ash was highly conductive. Upon contact with moisture, deposits of ash on transformers and other electrical equipment could cause power outages. Utility operators took the precaution of using emergency crews to blow ash from substation transformers before rainfall could produce interruptions in electrical service.

Rumors that ground-level ash fallout was highly acidic were rapidly dispelled. U-2 flights discovered high acid content of particles in the atmosphere, but fears that the ash might etch painted surfaces of cars or, worse yet, produce acids under face masks being used for protection, were alleviated when tests of ground ash showed almost no acidity. Also, there were no toxic properties in the ash. This was established by EPA personnel who, in the scramble to obtain all available information about ash characteristics, acted as a clearinghouse for analyses quickly performed by state, Federal,

Figure 1.
Stream Areas Affected by Mt. St. Helens Mudflows



and private laboratories throughout the Northwest. The ash did consist of minute fractions of cobalt and other inert heavy metals, but in quantities so small that by May 21 EPA was able to determine that they presented no danger to people inhaling airborne ash or drinking water containing ash particles.

Of greater concern was the threat to drinking water posed by the high levels of turbidity in surface streams and reservoirs receiving heavy deposits of ash or mud (see Figure 2). (In the first few days after the May 18 eruption, some drinking water supplies in southwestern Washington had so much mud they were facetiously described as "too wet to plow and too thick to run.") Fortunately, in those cases where mud clogged drinking water intakes, system operators were able to draw water from alternate sources; operators at other systems with high turbidity levels adjusted the amount of chemicals used in flocculation and, by keeping a close watch on filtration equipment, managed to provide water that was safe to drink.

Many systems came dangerously close to running out of water because of the heavy use of domestic supplies to flush away the accumulations of ash that paralyzed their communities. Several systems rationed water usage, but no community anywhere in the Northwest ever completely ran out.

The accumulations of ash that were sluiced into storm drains and sanitary sewers created problems for the operators of municipal sewage treatment plants. At one point in Spokane, a city hit hard by the May 18 fallout, it was reported that no less than 30 percent of the influent entering the city's sewer system consisted of solids. Mechanical equipment was threatened by the load, making it necessary to temporarily bypass treatment facilities. Spokane, like other cities, reduced treatment levels from secondary to primary to avoid expensive damage to their equipment. Managers of local sewerage authorities correctly preferred to tolerate increased discharges of oxygen-demanding materials from their outfall lines for a few days rather than risk permanent damage to their systems that might leave downstream waterways without any treatment at all for what could have been months to come.

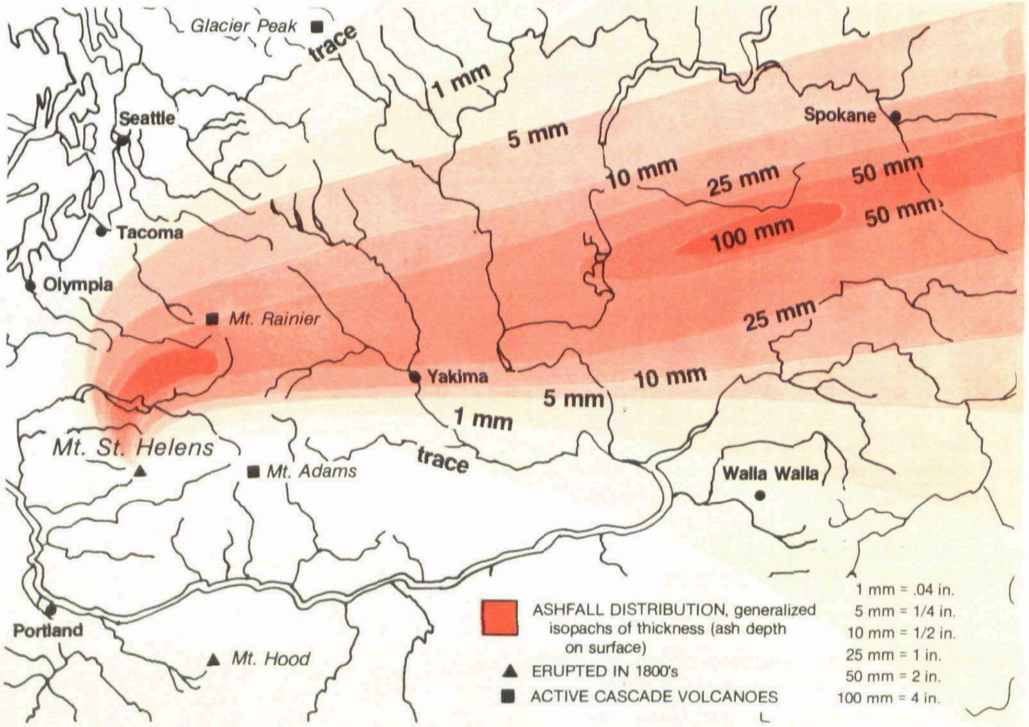
Water quality standards were undoubtedly violated in a few areas of the Pacific Northwest, but EPA and state and local health officials were more worried about the effects of violations of national ambient air quality standards for total suspended particulates (TSP).

Local air pollution control agencies throughout the Pacific Northwest recorded TSP levels far in excess of the standard set to protect human health. Figure 2 shows the dispersion pattern from the May 18 eruption and Figure 3 shows the highest 24-hour concentrations of particulates observed after the Mount St. Helens eruptions of last May and June. Monitors in Yakima, for example, recorded levels of particulates reaching 30,000 micrograms per cubic meter of air. Historically, the Pacific Northwest has rarely experienced air pollution episodes in which TSP levels even remotely approached the 1000-microgram level, and Figure 3 shows the normal average 24-hour levels of TSP during 1979.

The standard set by EPA to protect human health is 260 micrograms per cubic meter of air over a 24-hour period. When that standard is exceeded and weather forecasts indicate conditions are likely to get worse, air pollution control agencies begin to consider preventive actions to protect public health. If TSP levels reach 375 micrograms for a 24-hour period, air pollution control agencies issue alerts to advise susceptible people about dangers to their health. At 625 micrograms of TSP, warnings are issued that advise stronger precautions. At 900 micrograms, the "emergency" stage is reached and local governments are empowered to impose restrictions on personal and commercial activities that would send TSP concentrations above 1000 micrograms, at which level there is significant harm to human health.

At this writing, it is still too early to tell just how long people living in heavy fallout areas can expect exposure to TSP concentrations dramatically above levels that prevailed before the eruption. Even though local efforts to

Figure 2.
Ash Deposits Following Mt. St. Helens Eruption

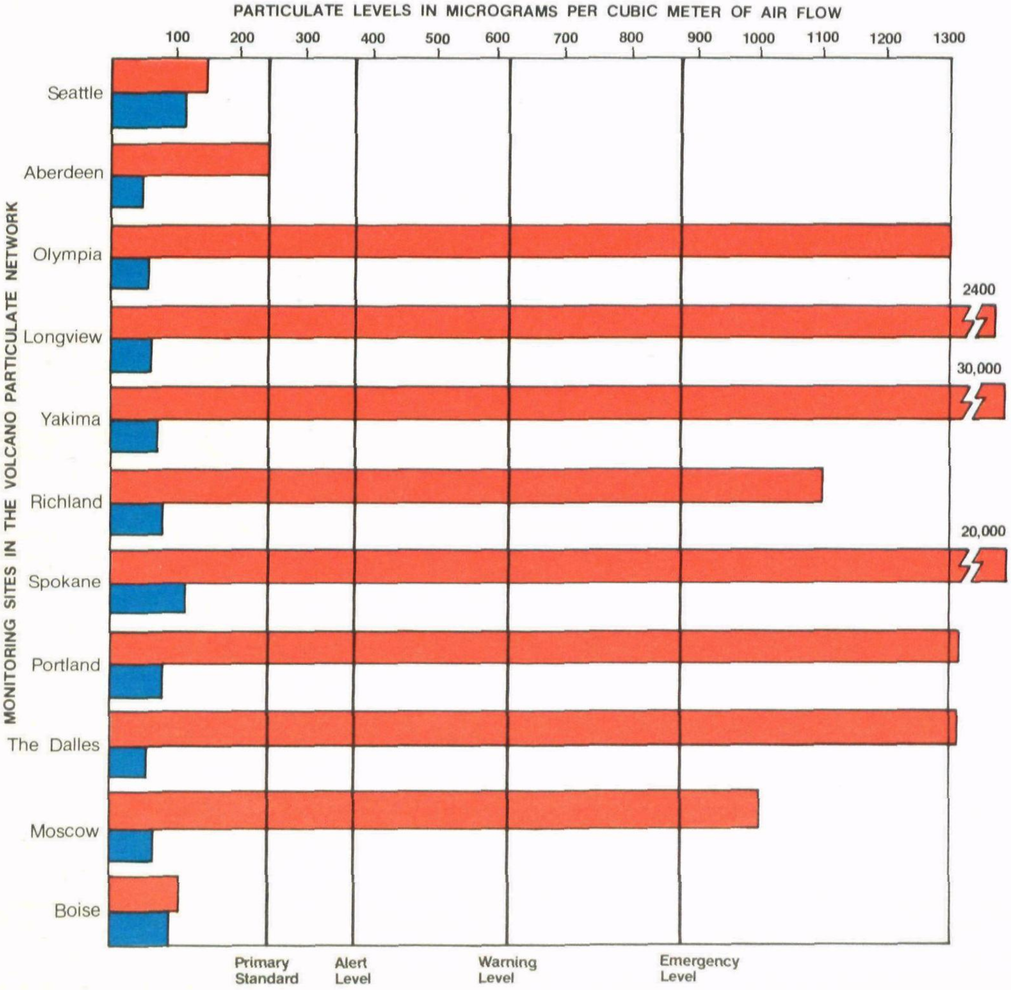


remove ground ash in many communities bordered on the heroic, enough ash remained for several weeks after the initial cleanup to send TSP concentrations soaring above 1000 micrograms. As one example, Spokane—despite a successful cleanup of the ash from the May 18 fallout—experienced winds on June 1 (a full 2 weeks later) that caused monitoring equipment to record TSP in concentrations of more than 2300 micrograms during one 8-hour period.

So much volcanic dust lay on the ground in many fallout areas that it was subject to redistribution every time a stiff wind came up. This worried public health officials who were trying to accurately assess the risk to public health. Their job was made difficult by their inability to predict how long people could expect to encounter heavy, prolonged exposure to ash already on the ground. In addition, they had no way to measure exposure from the volcano's unpredictable future eruptions.

Early reports from the Center for Disease Control (CDC), based on information collected by epidemiologists about hospital emergency room visits and hospital admissions in fallout areas, were not conclusive about the seriousness of short-term health effects. While the preliminary results of CDC's investigations suggested significant increases in hospital admissions for a variety of respiratory ailments, CDC had not—as this article was being prepared—performed the follow-up studies that would precisely determine the short- or long-term risks to human health.

Figure 3.
Total Suspended Particulate Levels Since the Eruption



🟥 MAXIMUM 24-HOUR AMBIENT TOTAL SUSPENDED PARTICULATE LEVELS SINCE THE ERUPTION

🟦 NORMAL AVERAGE 1979, 24-HOUR AMBIENT TOTAL SUSPENDED PARTICULATE LEVELS

— AMBIENT AIR QUALITY LEVELS REQUIRING ACTION

Of special concern to CDC was the potential for people in fallout areas to develop silicosis, an emphysema-like illness produced by heavy exposure to crystalline silica, a known component of volcanic ash. Occupational standards designed to protect workers from crystalline silica exist for the workplace, but none have been devised for ambient air. Direct correlations have been established between the development of silicosis and the exposure of workers engaged for several years in hazardous occupations, but no such correlation exists for exposure of the general population. CDC, in trying to establish that relationship (if, in fact, any such relationship exists) was relying on ambient monitoring data furnished by sampling stations operated by state environmental agencies and local air pollution authorities in cooperation with EPA.

The state and local agencies had long maintained monitoring stations to collect information about total suspended particulates and other air pollutants. With the eruptions of Mount St. Helens, added monitoring capability was needed to measure ambient levels of TSP. State and local agencies promptly responded to the challenge. New sampling sites were set up, new equipment was deployed, and the frequency of monitoring was increased in Washington, Oregon, and Idaho. The monitoring stations used to collect the TSP data are shown in Figure 4.

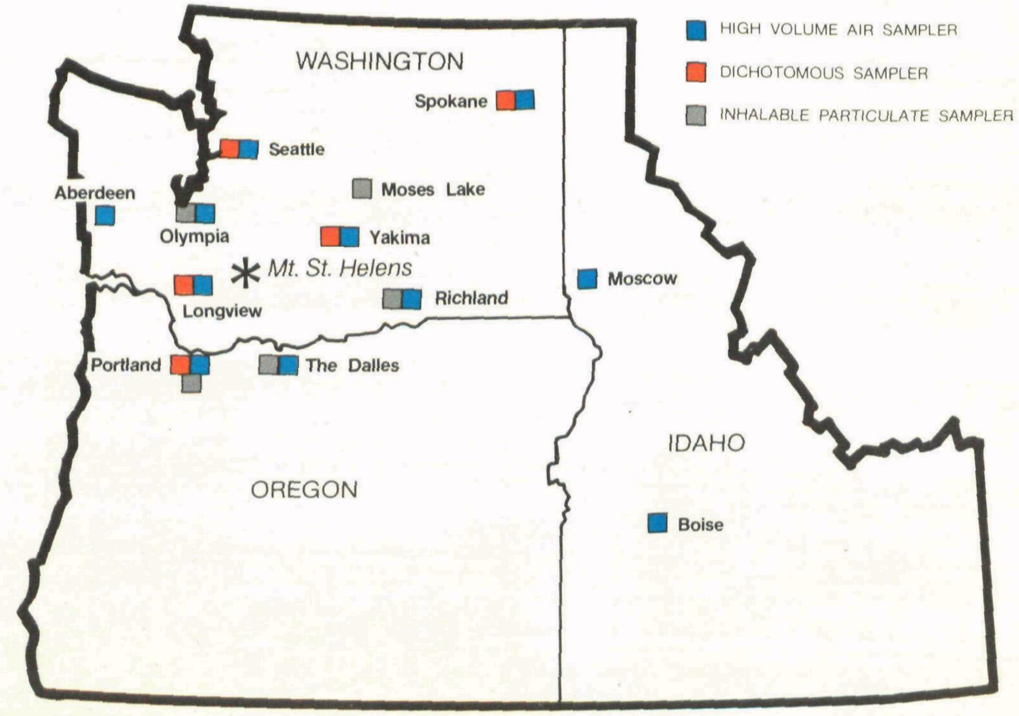
At as many sites as possible, equipment was installed that enabled state and local agencies to make two kinds of measurements. Not only would "Hi Vol" samplers be used to measure TSP, but other equipment ["Dichot" (Dichotomous) and "IP" (Inhalable Particulates)] was added to measure that fraction of total particulates so small as to be inhalable. Relatively coarse particules (i.e., larger than 15 microns) cannot be inhaled; they usually are trapped in the nose or throat and can easily be expelled. Particles smaller than 15 microns, on the other hand, can be inhaled. And those smaller than 2-1/2 microns are considered respirable, so tiny they can be drawn deep into the lungs. Respirable particles tend to remain lodged in the lungs for long periods of time and possibly can alter the body's physiological defense systems.

Data from the monitoring network is immediately relayed, as soon as available, to epidemiologists at CDC. This monitoring data will be used by CDC to make correlations between ambient exposures and data collected by CDC's own in-depth investigations of persons exposed to potentially dangerous levels of volcanic ash.

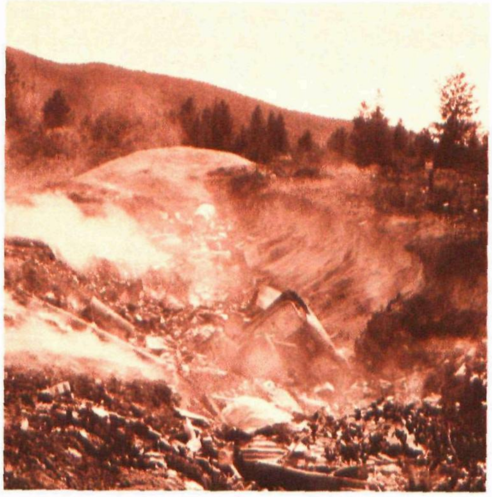
Other monitoring data being collected will help gauge whether emissions from Mount St. Helens will contribute significantly to the formation of acid rain, which is a product of sulfur and nitrogen oxides reacting with water vapor in the upper atmosphere to cause drops of sulfuric acid and nitric acid to return to earth. Although it is well-established that sulfur oxides can be carried by prevailing winds for hundreds of miles, not much is known about the exact process by which acid rain is formed or precisely how it is transported in the atmosphere. Mount St. Helens' emission of hundreds to thousands of tons of sulfur dioxide per day was cause for concern by EPA researchers who had already been trying to determine the environmental effects of acid rain.

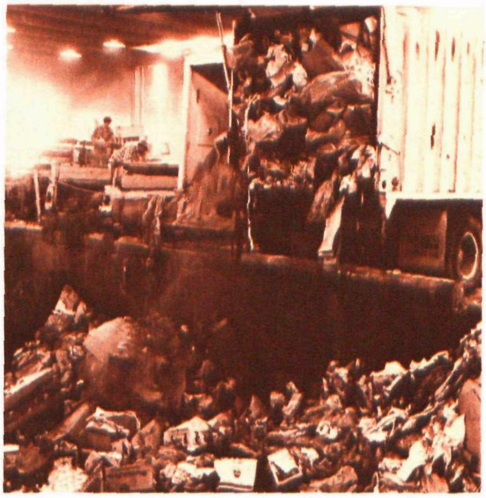
While there are still many unanswered questions about the long-term effects of the Mount St. Helens eruptions on people and the environment, one fact has clearly been affirmed: man and his environment can all too easily become the victims of changes that upset the fragile balance of our global ecology. Mankind is vulnerable to innumerable environmental stresses, some of which are the result of natural, uncontrollable events.

Figure 4.
Region 10 Volcano Particulate Network



Solid Waste and Hazardous Substances





In general, Region 10 has escaped the environmental problems found in other parts of the U.S. No major scale problems from improper disposal of hazardous substances have been discovered as yet. The problems that have surfaced are being dealt with and remedies are being developed. Open burning of wastes has been virtually eliminated from Region 10, but many environmental problems related to improper disposal of municipal waste remain, with water pollution being a major concern. Scarcity of land for solid waste disposal, concern about limited resources, and serious health hazards arising from improper disposal of hazardous wastes prompted Congress to pass the Resource Conservation and Recovery Act (RCRA) in 1976. In addition, other forms of hazardous substances are regulated by EPA under authorities of TSCA (Toxic Substances Control Act) and FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act). In this increasingly complex area, Region 10 feels they are moving in a positive direction toward protecting human health. The following section summarizes the solid waste and hazardous substances problems addressed in the Pacific Northwest, as well as hazards dealt with by other means.

Solid Waste Disposal

The Resource Conservation and Recovery Act requires that Federal criteria be established for evaluating land disposal operations nationwide. In the past, municipal landfills could often be described as open dumps. These criteria have now been developed and the states in Region 10 have started an inventory to classify disposal sites. Those sites failing the criteria will be designated as open dumps and placed on a state-established compliance schedule for upgrading or closure.

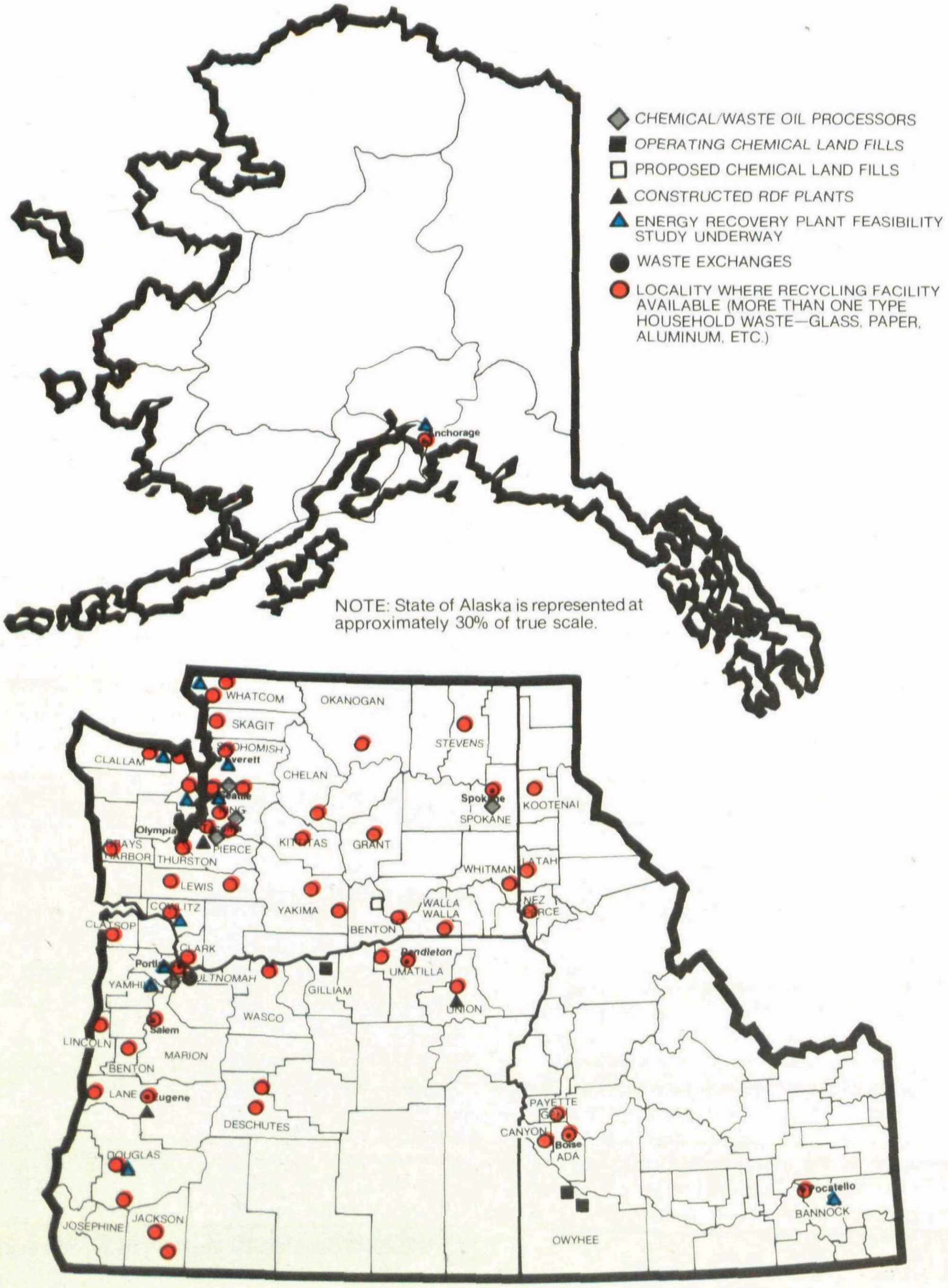
Rainwater draining over the surface of a fill, and filtering into the ground through the wastes, can dissolve (leach) such undesirable substances as chemicals and bacteria into streams and groundwater. Because of the higher rainfall and greater population west of the Cascade Mountains, leachate problems there have been more numerous and serious than in more arid parts of Region 10. Landfills such as those constructed in Lane County, Oregon and Snohomish County, Washington have been engineered for leachate collection and treatment. Older landfills which had serious leachate problems, such as the Cedar Hills landfill in King County, Washington, have installed collection systems that pump leachate into the sewage treatment system. Other landfills may have to close altogether if they cannot be effectively upgraded.

There are other problems related to waste disposal. For example, when garbage decomposes, methane gas is produced as a by-product. Methane is toxic to vegetation and is explosive in certain concentrations. Decomposition can also produce odors. Household wastes, in particular, may attract disease-carrying rodents and insects. Proper disposal with daily cover and proper compaction will reduce many of these problems. Sewage sludge disposal is an increasing problem as water pollution regulations become more strict and landfill space becomes scarce. Alternatives, such as incineration and the use of sludge on farm and forest lands, are being tried. In addition, certain areas have special disposal problems, such as in Alaska where severe cold makes disposal difficult.

Resource Recovery

RCRA provides financial assistance to state solid waste management authorities to develop and implement comprehensive solid waste plans, including environmentally sound disposal methods and recovery and conservation programs. In addition, the President's Urban Grant program has provided funding to Seattle and Portland for development of recycling and energy recovery systems. Some municipal wastes, such as glass, metal, and newspaper, can be recycled, and much of the rest can be converted to "refuse-derived fuel" (RDF) or burned to

Figure 5.
Location of Hazardous Waste and Resource Recovery Facilities in Region 10



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

create steam or electricity. Lane County, Oregon and Tacoma, Washington are testing RDF plants. Portland and Roseburg, Oregon and Cowlitz County, Snohomish County, and King County, Washington and Boise, Idaho are also studying the feasibility of converting waste to energy (Figure 5). The economics of recycled materials are typically very good in the Portland and Puget Sound areas, but recycling programs in Idaho and Alaska suffer from higher transportation costs and smaller volumes.

Other wastes with a potential for recovery include tires, lubricating oil, and wood waste, which simultaneously present serious disposal problems. Discarded tires gradually work to the surface in a landfill, where they trap water, become a breeding place for mosquitoes, and pose a fire hazard. Recently, however, shredded tires were used as a fuel in boilers at the Georgia-Pacific plywood mill in Toledo, Oregon. Waste lubricating oil is used on roads as a dust suppressant, but can contaminate air and water, plus lead in the oil makes indiscriminate burning or disposal undesirable. Oregon has passed a Used Oil Collection Act that provides for designated collection centers, which will encourage re-refining of waste oil. Wood waste, which can pollute water resources and consume significant space in landfills, is presently being used to produce steam in several Northwest timber mills and utilities, and may also be used in combination with refuse-derived fuel.

Hazardous Substances

The Resource Conservation and Recovery Act mandates government control of hazardous waste from its generation to ultimate disposal, including a manifest tracking system for transporting and a permit system for treatment, storage, and disposal facilities. In May of 1980 regulations were promulgated which will implement the Act. Compared to other parts of the country, there are fewer industrial sources of hazardous waste in Region 10. Most of it is created by manufacturers of chemicals, pesticides, and metals, petroleum refineries, and electroplating operations. These sources are concentrated around Puget Sound and in the Willamette Valley.

For RCRA to be effective, acceptable hazardous waste disposal sites must be made available. Presently, there are two state-licensed chemical landfills in Region 10—one at Arlington, Oregon, and the other at Grand View, Idaho, and a third has been proposed on the U.S. Department of Energy's Hanford Reservation in Washington. The availability of such landfills, coupled with the active involvement of Region 10 states in hazardous waste management, has helped prevent serious incidents involving hazardous wastes in the Region. Nevertheless, there has been opposition to using these landfills to dispose of wastes from out-of-state. In addition, RCRA does not address the problem of abandoned facilities which have posed serious health hazards elsewhere in the country. A national trust fund for cleanup of abandoned sites has been proposed, and an inventory of such sites is being conducted.

Besides landfills, several other approaches to hazardous waste management in the Northwest have been taken. Waste exchanges in Portland and Seattle assist parties throughout the Northwest wishing to dispose of a hazardous by-product in locating a second party that can use or recycle the material, thereby eliminating a need for disposal. The second party may be a chemical processor that uses the waste as feedstock for another product. Regulations determine how some substances are used; for instance, labeling and disposal procedures have been established for the more than 800 facilities in Region 10 using or storing polychlorinated biphenyl (PCB), a toxic substance used in electrical transformers and capacitors. Some efforts have also been made to rectify past uses of hazardous substances. Each state in Region 10 will participate in a voluntary national program to reduce the exposure of school children to asbestos fiber found in some school buildings. In addition to long-term management plans, emergency response plans have been developed. Units within several fire departments, including Seattle and Tukwila, Washington, have been trained to deal with incidents involving hazardous materials.

Uncontrolled Hazardous Waste Sites

Unsafe hazardous waste disposal practices become uncontrolled hazardous waste sites, and release of chemicals from these sites can threaten public health or environmental values. (The Love Canal Chemical Dump in New York is a prime example. A school and scores of homes were built close to the dump and, beginning in 1978, a number of startling disclosures about birth defects and serious illness were attributed to the buried chemicals.)

Past hazardous waste disposal practices in the Northwest have been surveyed, and Figure 6 presents the results. Northwest states generate only 1 percent of the hazardous waste nationally, and since 1940, all but approximately 5 percent of these wastes have been accounted for. Over 250 hazardous waste generators and disposal sites have been investigated, and no major problems on the scale of Love Canal have been discovered.

These findings are attributed to the following: hazardous waste generation is minimal; population densities in the Northwest are low; industry is young compared to other areas of the country; and adequate (according to state requirements) hazardous waste disposal sites have been available for several years.

Figure 6.
Hazardous Waste Disposal

Radiation

As Figure 7 shows, every person is exposed to radiation from naturally occurring, inescapable sources such as cosmic rays and soil. Normally, less than half a person's radiation exposure is man-made. The data in Figure 7 are based on national statistics, but are representative for Region 10 as well.

Because the genetic and cancer-causing effects of radiation are thought to be additive or cumulative, the radiation dose to individuals must be kept to the lowest practicable level. EPA limits the radiation dose to individuals and to the total population by monitoring radiation and by setting and enforcing regulations on radioactivity in the air, drinking water, surface water, and waste materials, and from nuclear power plants.

Pesticides

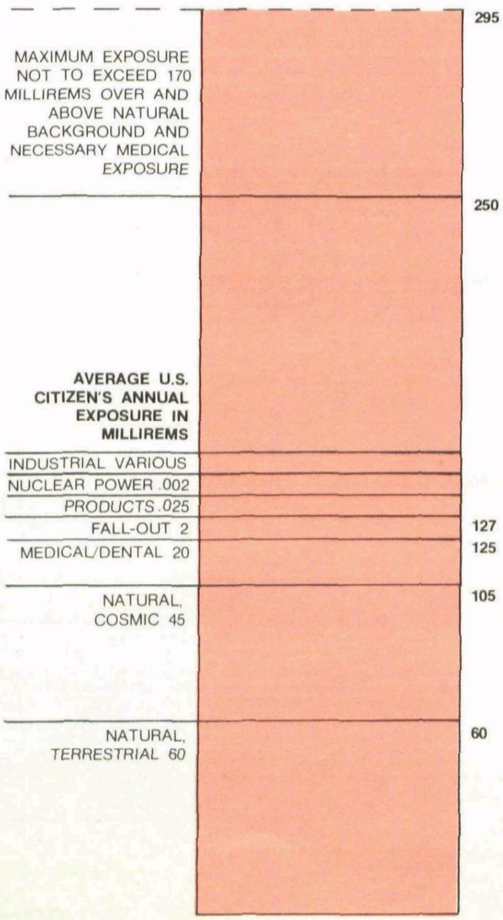
Pesticides are substances used to prevent, destroy, repel, or mitigate any pest, such as insects, rodents, weeds, and fungi, as well as substances used as plant regulators and defoliants. Improperly used, they can harm other organisms besides their target, causing illness or death. The regulation of pesticides poses some complex policy and technical issues. Conventional chemical pesticides, by their very nature, are hazardous; but they are widely viewed as necessary to maintain agricultural productivity. In addition, the hazards of pesticides, especially the long-term effects, are difficult to assess.

The law giving EPA authority to regulate pesticides is the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). It requires that all pesticide producers and all pesticides to be sold in the U.S. (including imported products) be registered with EPA. The pesticide producers must provide scientific studies to support the registered use patterns, and must provide proper container labeling for their products. In addition, they must maintain detailed records of their production and distribution.

The EPA and state agencies work together to regulate the manufacture and use of pesticides. As of this year, EPA has established funded cooperative enforcement agreements with the Idaho, Oregon, and Washington State Departments of Agriculture, and a non-funded cooperative enforcement agreement with the Alaska Department of Environmental Conservation. This means that primary enforcement responsibilities covering pesticide use rests with the states, but EPA can take further action if warranted.

The major thrust of the FIFRA program is directed toward pesticide users. Since 1976, EPA has worked with the states in developing training and certification programs. Applicators of restricted use pesticides (pesticides with greater potential for causing adverse effects) must be certified to ensure that they are competent in the use of those pesticides. EPA and the states combine efforts to see that pesticides are being used according to label directions.

Figure 7.
Average Amount of Exposure to Radiation Per Person Per Year



After pesticides are used, the Food and Drug Administration is responsible for verifying that pesticide residues on raw agricultural commodities are within required limits.

Environmental monitoring for pesticides is conducted by certain state health departments through EPA grants. Region 10 has two epidemiological study groups, one in Wenatchee, Washington and the other in Boise, Idaho.

Pesticide registration and resulting use can be discontinued at any time EPA determines that unreasonable adverse effects on the environment outweigh the benefit from continued use of the pesticide. If further restricting use of the pesticide cannot correct the problems, ultimately the product can be cancelled or suspended. For example, EPA took emergency action to suspend products containing 2,4,5-T and Silvex. Cancellation hearings are in progress and a final determination will be made regarding the future of these pesticides.

Air Quality

Air quality in the Northwest is relatively clean as most areas of the Region comply with the National Ambient Air Quality Standards. However, air quality problems do exist in the more densely populated areas of the four states; but pollution abatement controls on point and area sources should alleviate these problems in the future. Implementation of these controls continues to be a cooperative effort among Federal, state, and local environmental agencies, industry, and a concerned, informed public. However, much remains to be done, and this section gives some insight into the types of air quality problems faced by the citizens of Region 10.

Air Quality Standards — History and Definition

The Clean Air Act of 1970 directed EPA to establish National Ambient Air Quality Standards ("ambient" refers to outside or environmental conditions, rather than indoor quality), and in 1977, amendments to the Act required that all standards be met as soon as possible and practical. In the case of primary (health-related) standards, the new deadline is December 31, 1982. Under certain conditions an extension to December 31, 1987 can be granted for carbon monoxide and ozone.

The more highly concentrated a pollutant, the worse its effect on humans and their environment. Because some pollutants have both chronic and acute effects on health, standards are based on their average concentration over various lengths of time with a margin of safety included. Pollutants that exceed secondary standards have detrimental impacts on the public welfare and result in deterioration of many consumer products. Exceeding primary standards poses a threat to public health. If the pollutant concentration reaches the alert level, individuals, industry, and government should take immediate action to protect human health by curtailing outdoor activities, use of automobiles, and certain industrial operations.

Federal standards have been set for six major pollutants. Table 1 lists the effects on health and property that are the normal result of exceeding those standards.

Table 1.
Effects of Major Air Pollutants on Health and Property

POLLUTANT	HEALTH EFFECTS	PROPERTY EFFECTS
Total Suspended Particulates	Correlated with increased bronchial and respiratory disease, especially in young and elderly.	Corrodes metals and concrete; discolors surfaces; soils exposed materials; decreases visibility.
Sulfur Dioxide	Upper respiratory irritation at low concentrations; more difficult breathing at moderate concentrations (3000 ug/m^3), correlated with increased cardio-respiratory disease; acute lung damage at high concentrations.	Corrodes and deteriorates steel, marble, copper, nickel, aluminum, and building materials; causes brittleness in paper and loss of strength in leather; deteriorates natural and synthetic fibers; "burns" sensitive crops.
Carbon Monoxide	Physiological stress in heart patients; impairment of psycho-motor functions; dizziness and headaches at lower concentrations; death when exposed to 1000 ppm for several hours.	Corrodes limestone and concrete structures.
Ozone	Irritates eyes, nose, throat; deactivates respiratory defense mechanisms; damages lungs.	Deteriorates rubber and fabrics; corrodes metals; damages vegetation.
Nitrogen Dioxide	Combines with hydrocarbons in the presence of sunlight to form photo-chemical smog; irritates eyes, nose, throat; damages lungs.	Corrodes metal surfaces; deteriorates rubber, fabrics, and dyes.
Lead	Primary concern with young children. Most pronounced effects on nervous system (damage may occur at low levels), kidney system, and blood forming system (high levels may have severe and sometimes fatal consequences such as brain disease, palsy, and anemia). Blood levels $>$30mg/deciliter are associated with an impairment in cell function.	Injures plants through absorption of soil. Affects nervous system of grazing animals.

How Air Quality is Measured

Air quality data are collected at monitoring stations located throughout each of the four states, primarily in concentrated population or industrial centers—the most likely sources of air pollution. Monitoring sites are designated in this report as commercial/industrial, residential, or rural. However, air pollution can originate away from the monitoring site. High pollutant levels in a residential area, for example, do not necessarily indicate the source is located in that area. Not all pollutants are monitored continuously at all stations, and monitors are not located in all counties, primarily because of the high cost of installation and operation, but monitors are located in large metropolitan areas. EPA has estimated the percentage of days during which concentrations of the various pollutants exceeded the standards throughout Region 10 during 1979.

Geographical areas within Region 10 where source emissions, in combination with influencing weather conditions, cause air quality standards to be exceeded have been designated as *non-attainment*. Currently, 22 areas in Region 10 fall in this category. All other areas are classified as *attainment*. The original determination of non-attainment was based on data for 1975 through 1977; therefore, areas that are presently classified as attainment may have exceeded the standards during calendar year 1979 and are illustrated in this report.

The Regional Air Quality Outlook

Region 10 has relatively few heavily populated urban centers; in the four states there are only 6.5 million residents. While air pollution is not confined to urban areas, it is most severe where human activity, especially vehicular activity, is heavily concentrated. Some violations of National Ambient Air Quality Standards occur in every state of Region 10.

During 1979, four of the major pollutants exceeded standards in Washington, while three standards were exceeded in both Idaho and Oregon. Only carbon monoxide standards were exceeded in Alaska.

Total Suspended Particulates

Suspended particulates are solid or liquid particles of different sizes having health effects that vary with particle size and composition. Particulates can aggravate asthma and chronic lung diseases; they increase coughing and chest discomfort. Some particulates can be toxic or cancer-causing (lead or asbestos particles, for example). Particulate pollution may interfere with visibility, injure vegetation, and increase cleaning and maintenance costs in numerous sectors of the economy.

Suspended particulate matter is a widespread problem throughout the Northwest. Some particulate emissions come from so-called *point sources*, which are easily identified stationary industrial sources of emissions, such as smokestacks. The rest, which cannot be pinpointed to a specific source, are termed *area sources*, such as space heating (resident and commercial heating units) and fugitive dust. Fugitive dust can be created by certain industrial and agricultural operations, and by vehicles on paved as well as unpaved roads. In areas with little major industrial development and low population density, fugitive dust is composed mostly of natural soil particles and is believed to be less harmful to the health. For this reason, many areas are considered to be attaining air quality standards even though particulate standards are exceeded.

Also included under area sources are motor vehicle tailpipe emissions which we have classified separately as mobile sources (see Figure 16, page 17). Figure 8 shows the three states that exceeded suspended particulate standards; i.e., at least one monitoring site in the county exceeded one or more of the standards for total suspended particulates (TSP) in 1979. Aside from areas where rural fugitive dust accounts for exceeding TSP standards, most violations are focused in 16 areas. Data from these areas are charted on Figure 9, showing the percentage of samples that exceeded standards based upon number of days monitored. (Note that particulate samples are routinely collected once every 6 days.)

In Idaho, the Pocatello and Conda-Soda Springs areas' major point sources of total suspended particulates are fertilizer and industrial chemical processors. In the latter area, fugitive dust from roads and fields also contributes to TSP levels in excess of the standards. In Lewiston, the wood products industry and a kraft pulp mill are the chief point sources, while in the Kellogg area, the Bunker Hill Company's smelting operation is a major source of TSP.

In Oregon's Portland area, motor vehicles directly or indirectly account for approximately half the area's suspended particulates; natural sources, vegetative burning, and industrial sources contribute the rest. Wood products, rock products, and metallurgical industries are the major point sources, but all have applied reasonable controls on their emissions. The wood products industry is also the major point source in the Medford-Ashland area. Although the Grants Pass area exceeded TSP standards, more data will be needed to assess potential problems there. In the Eugene-Springfield and Lebanon areas, burning of slash, field stubble, and other vegetation, and airborne dust from roads and fields contribute to particulate levels. Emissions from the wood products, paper, and rock products industries also contribute to the Eugene-Springfield particulate problem.

In Washington's Seattle, Tacoma, and Spokane areas, fugitive dust from paved and unpaved roads and construction sites, and point source industrial emissions caused TSP standards to be exceeded. The main source of particulates in the Vancouver area has been traced to the Carborundum Company, a processor of inorganic minerals. In the Port Angeles and Longview areas, suspended particulate levels are largely due to fugitive dust from log yards and emissions from the forest products industry. The Clarkston area's major source of pollution is pulp mill operations in Lewiston, Idaho.

Particulate control devices such as baghouses, electrostatic precipitators, and scrubbers have been installed on many industrial sources, and some plants are scheduled to further reduce emissions in the future. As existing plants are modified and new facilities are constructed, the best technology available to control suspended particulates will be required. Control of fugitive dust is more difficult to achieve. Paving roads and parking areas can help, as well as improved "housekeeping" in industrial areas (such as covering hoppers or conveyor belts or other equipment transporting raw materials). Construction sites can be wetted down to reduce dust. However, it is expected that reduction of fugitive dust will be very gradual due to the high cost of control.

Figure 8.
Air Quality Status —
Total Suspended Particulates

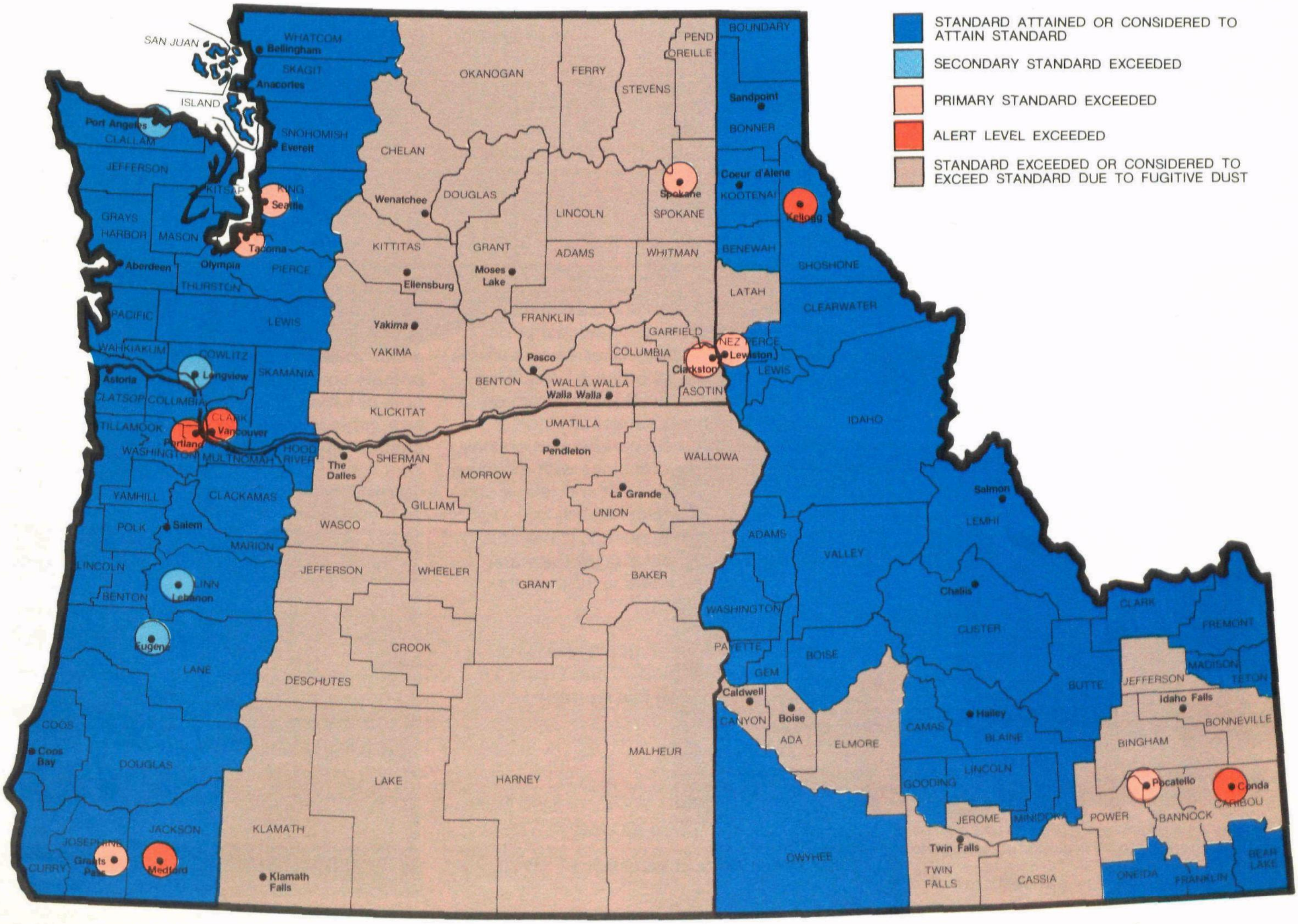
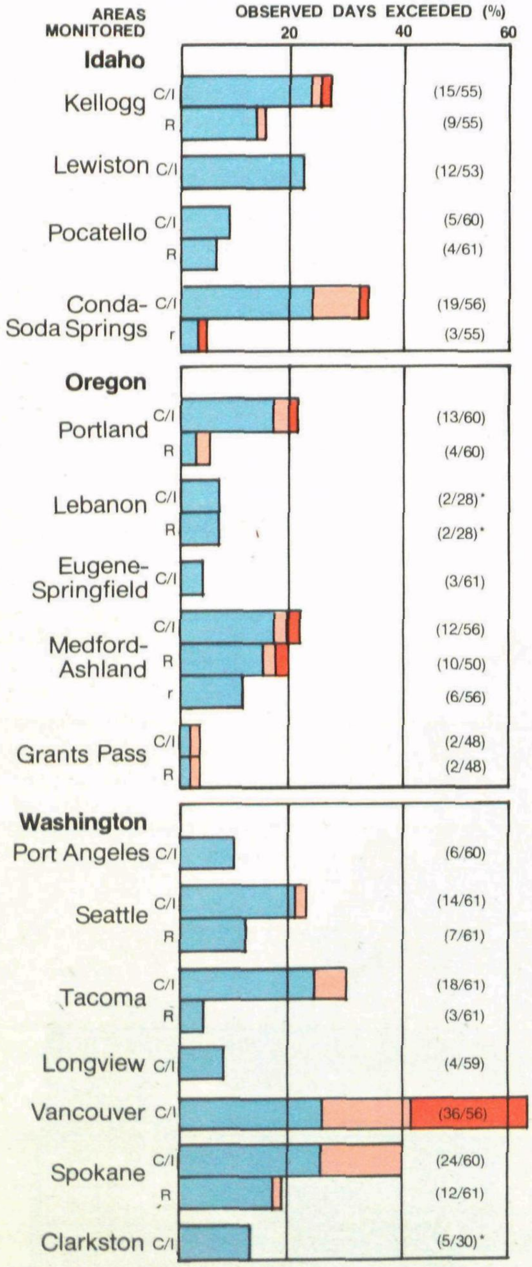


Figure 9.
Percent of Observed Days Total Suspended Particulates Exceeded Standards



NOTE: Number in parentheses represents total number of days exceeding standards per number of observation days.

*May not be representative of total problem. Less than 75% of observation days reported.

C/I: COMMERCIAL INDUSTRIAL
R: RESIDENTIAL
r: RURAL

🟦 SECONDARY STANDARD EXCEEDED
🟧 PRIMARY STANDARD EXCEEDED
🟥 ALERT LEVEL EXCEEDED

Alaska is not illustrated in Figures 8 and 9 since violations in the state are attributed to fugitive dust. However, the Fairbanks, Alaska area has a unique pollution problem called "ice fog" which forms spontaneously at -40° F when supersaturated water vapor cools and can no longer hold moisture, forming ice crystals. At warmer temperatures, -20° F, ice fog can form around condensation nuclei such as particulate matter. Deeper layers of ice fog have been forming more frequently at warmer temperatures as the population has increased, with heavy ice fog occurring approximately 15 days per year. There is no Federal air quality standard pertaining to ice fog even though it severely decreases visibility. Economical control techniques are presently being researched and evaluated to help reduce this problem.

To date, the concern in Region 10 has been to reduce emissions from point sources. Although most of the industries that produce significant amounts of particulates have installed the required control devices, particulate problems, especially those resulting from area sources, still remain in the urban areas.

Sulfur Dioxide

Sulfur dioxide is formed when coal or oil containing sulfur is burned, or when sulfur is burned in an industrial process. Breathing air containing sulfur dioxide can produce adverse health effects similar to those described above for suspended particulates. When sulfur dioxide combines with moisture in the air to form acidic mist and rain, it can pose an increased health hazard. In addition, it corrodes buildings, is harmful to vegetation, and can deteriorate the water quality of lakes and streams far from the source of the pollutant.

Figure 10 shows the air quality status of sulfur dioxide in Region 10 and Figure 11 compares those areas that exceeded standards. In Idaho, the principal cause of sulfur dioxide pollution is the smelting of nonferrous ores (lead and zinc) and the manufacture of phosphate fertilizer.

In Kellogg, where the Bunker Hill Company smelts and refines lead and zinc, the rugged terrain of the Silver Valley inhibits adequate dispersion of sulfur dioxide, although the plant's two 700-foot stacks have improved the situation. However, during frequent thermal inversions, the plant must follow a set of procedures to reduce or discontinue production to keep sulfur dioxide levels within the standards. The Bunker Hill Company will conduct further studies to determine where maximum sulfur dioxide concentrations occur. The results of these studies will provide the information necessary to improve Bunker Hill's dispersion program to meet ambient standards until additional controls are installed.

The major source of sulfur dioxide in the Pocatello area is J.R. Simplot, which produces fertilizers and industrial chemicals. The company is installing additional controls that should further reduce their emissions by 25 percent. The Beker Industries phosphate fertilizer plant near Soda Springs is the major source of sulfur dioxide in that area; primary sources are two sulfuric acid plants, both of which operate in compliance with applicable emission regulations when their control equipment is functioning properly.

Over 80 percent of Washington's sulfur dioxide pollution comes from industrial sources and power plants. About half the emissions in the state are from ASARCO's Tacoma smelting and refining operations; however, violations of standards have not occurred in Tacoma since December 1976. ASARCO relies on dispersion techniques to meet national ambient air quality standards by reducing operations when weather conditions (such as thermal inversions) prevent adequate mixing. As in the case of the Bunker Hill smelter, this may only be a temporary solution until the need for better, constant control has been established and equipment installed.

The major sulfur dioxide sources in the Port Angeles area are ITT Rayonier and Crown Zellerbach. Based on meteorological conditions, emission rates, and the geography of the area, ITT appears to have the dominant effect on ambient sulfur dioxide levels.

The pulp mills in southeastern Alaska, major point sources of sulfur dioxide, comply with the state's SO_2 air quality regulations. In 1979, the sulfur dioxide standards were not exceeded. Additional data are needed to assess potential future sulfur dioxide problems that could arise from operation of the pipeline terminal and proposed construction of a petrochemical plant in Valdez.

Oregon complies with the National Ambient Air Quality Standards for sulfur dioxide and there are no known potential problems in that state.

Figure 10.
Air Quality Status — Sulfur Dioxide

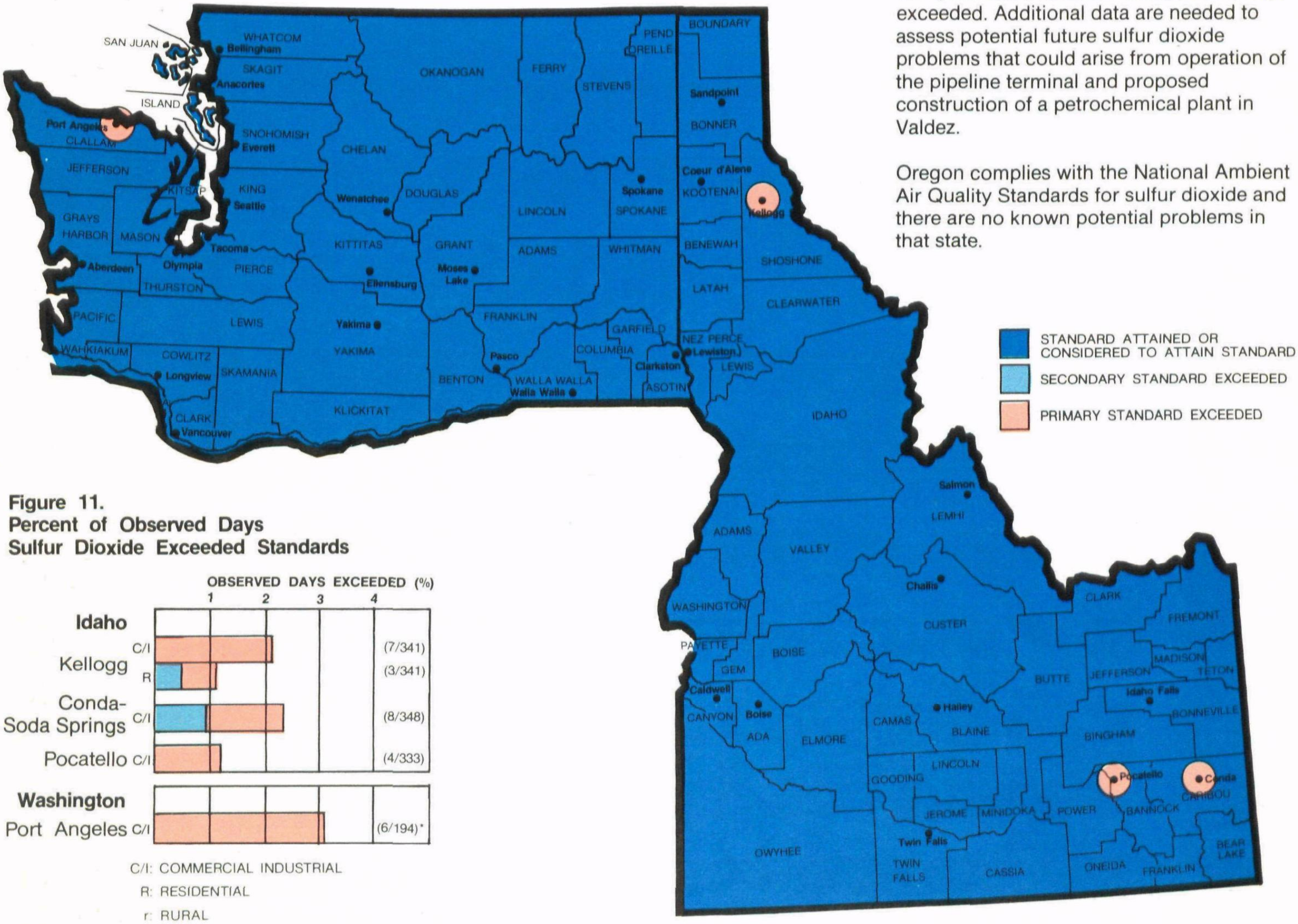


Figure 11.
Percent of Observed Days Sulfur Dioxide Exceeded Standards

OBSERVED DAYS EXCEEDED (%) 1 2 3 4

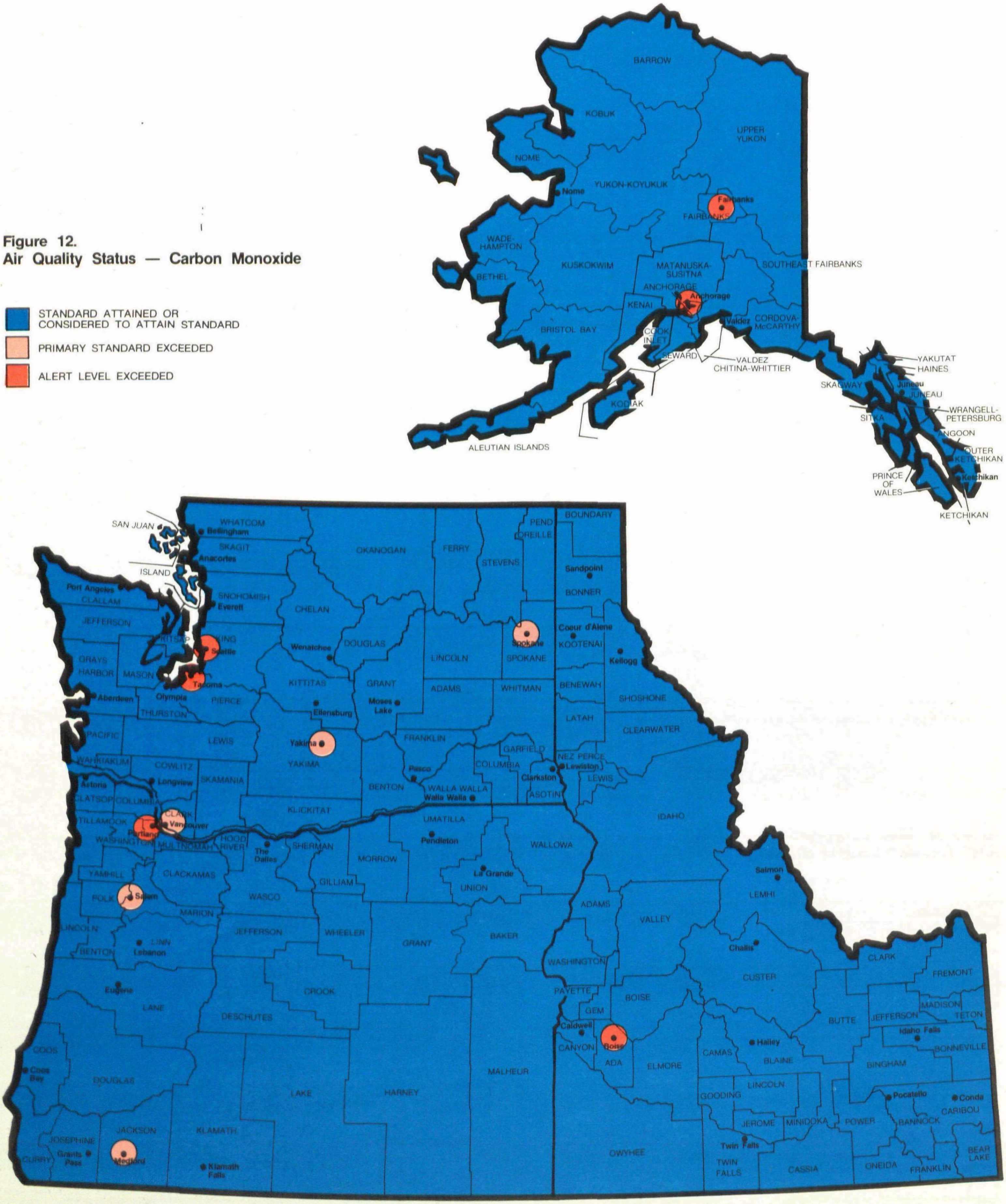
Idaho		
Kellogg	C/I	(7/341)
	R	(3/341)
Conda-Soda Springs	C/I	(8/348)
Pocatello	C/I	(4/333)
Washington		
Port Angeles	C/I	(6/194)*

C/I: COMMERCIAL INDUSTRIAL
R: RESIDENTIAL
r: RURAL

NOTE: Number in parentheses represents total number of days exceeding standards per number of observation days.

*May not be representative of total problem. Less than 75% of observation days reported.

Figure 12.
Air Quality Status — Carbon Monoxide



🟦 STANDARD ATTAINED OR CONSIDERED TO ATTAIN STANDARD

▨ PRIMARY STANDARD EXCEEDED

🟥 ALERT LEVEL EXCEEDED

Carbon Monoxide

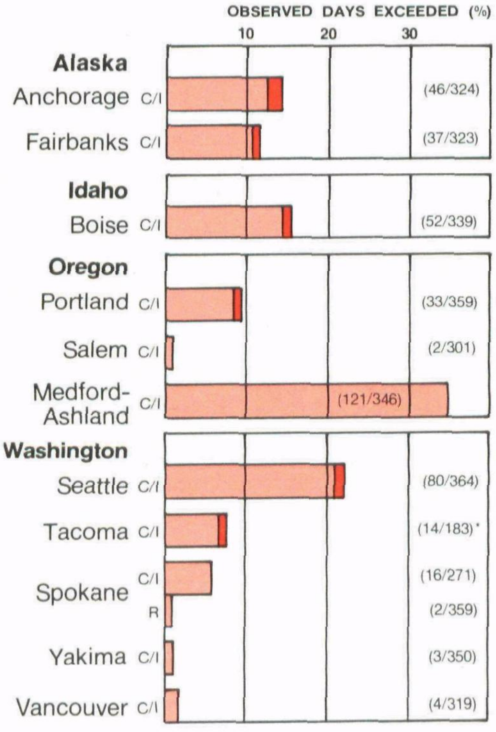
Carbon monoxide is a colorless, odorless gas—high concentrations can cause unconsciousness or even death. At concentrations above the primary standard, this pollutant can interfere with mental alertness and physical activity, especially for persons with heart or lung disorders. Carbon monoxide is a by-product of fossil fuels combustion. Its major source is motor vehicles, and the most severe violations of standards are recorded where automobiles are concentrated—in urban areas. Figure 12 illustrates the extent of the carbon monoxide problem in Region 10, and Figure 13 compares the areas not meeting the carbon monoxide standard.

Motor vehicles are responsible for about 90 percent of carbon monoxide emissions; therefore, plans for reducing such emissions center on improvements to individual automobiles and to the transportation system as a whole. As older cars are replaced by models with up-to-date pollution control equipment, carbon monoxide levels should decline. In addition, regular vehicle inspection and maintenance will ensure that emission control devices are functioning effectively. Other measures for mitigating the carbon monoxide problem are based upon reducing vehicle miles traveled and include traffic flow improvements, transit improvements, carpooling, bike lanes, and parking management.

The majority of the carbon monoxide problems in Region 10 are compounded by adverse climate conditions. During the winter months, extreme stable inversions develop in many parts of the Region which severely inhibit the dispersion characteristics of pollutants resulting in high pollutant concentrations. Also, it is difficult to maintain efficient combustion processes in cold weather. For example, automobiles in Alaska take longer to warm up and emit substantially more air pollutants than at warmer ambient temperatures; carbon monoxide emissions during engine warm-up may account for up to 65 percent of the total vehicle emissions produced, depending upon the size of the engine. Therefore, maintaining a warm engine or reducing average engine size may be effective in reducing cold-start emissions. These emissions are currently uncontrolled, and the proposed low-temperature emission standard for automobiles should be effective in helping to achieve the 90% reduction mandated by the Clean Air Act through the Federal Motor Vehicle Control Program.

Through transportation controls previously identified, EPA is working closely with the Region 10 states to control emissions from vehicles and to reduce the number of vehicle miles traveled in urban centers with high carbon monoxide levels.

Figure 13.
Percent of Observed Days
Carbon Monoxide Exceeded Standards



NOTE: Number in parentheses represents total number of days exceeding standards per number of observation days.

*May not be representative of total problem. Less than 75% of observation days reported.

🟥 ALERT LEVEL EXCEEDED

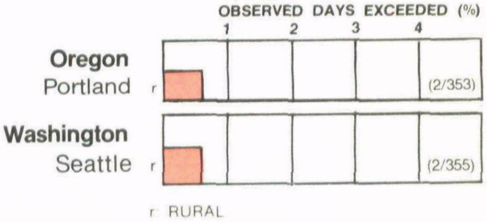
▨ PRIMARY STANDARD EXCEEDED

Ozone

Unlike other air pollutants discussed in this report, photochemical oxidants are not emitted by industries or automobiles; rather, they are the product of a chemical reaction that occurs in the atmosphere when two other pollutants are present—oxides of nitrogen (which are discussed below) and hydrocarbons. The chief sources of hydrocarbons include automobile exhaust and volatile organic compounds (VOC) such as solvents and gasoline. Besides oxides of nitrogen and hydrocarbons, sunlight is necessary for the reaction. When all three are present, a class of chemicals known as photochemical oxidants is produced, the most common of which is the gas, ozone. Air quality standards refer to ozone, and only ozone is measured by monitoring instrumentation.

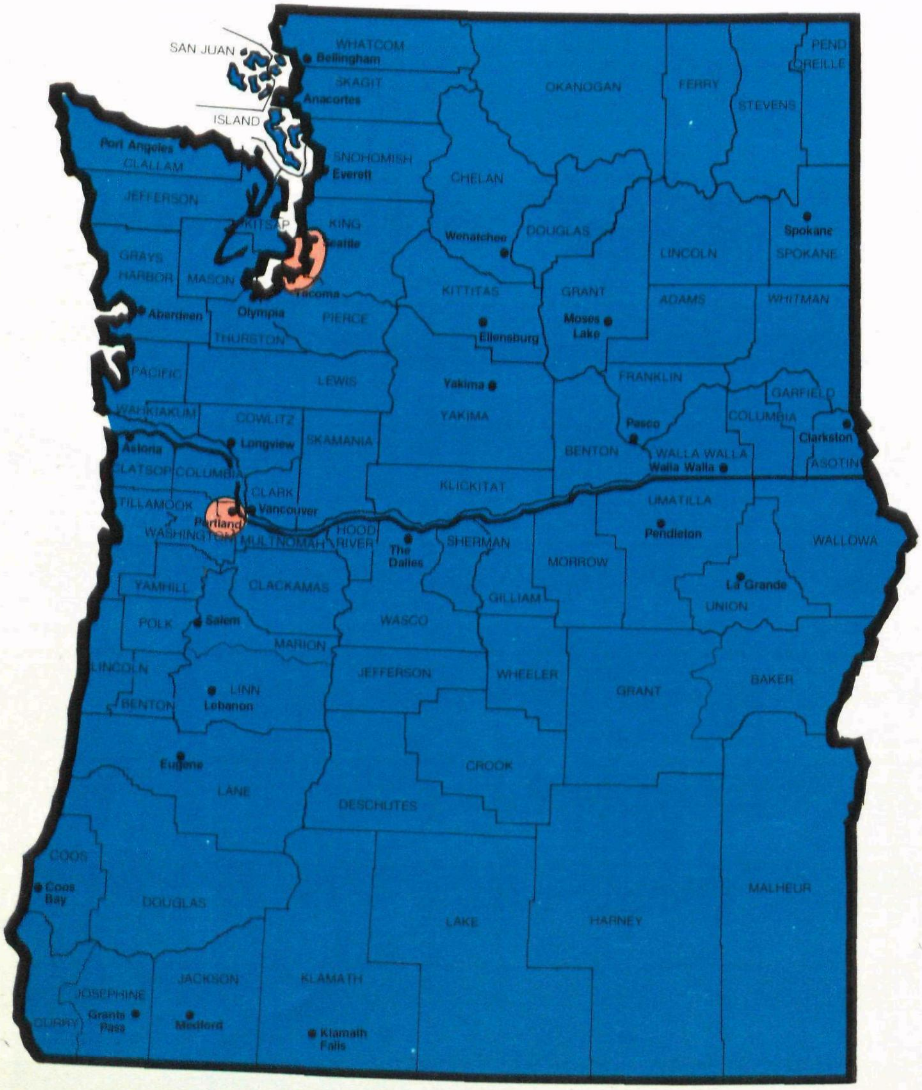
Ozone irritates the eyes and respiratory system, aggravates asthma and chronic lung diseases, and reduces lung and heart capacity. It also probably causes more damage to plants in the United States than any other pollutant. Ozone concentrations greater than the health standard have occurred in the Portland, Oregon, and Seattle, Washington, areas, (see Figures 14 and 15) and future monitoring may identify other areas. Because significant quantities of the substances that give rise to ozone come from automobiles, measures taken to reduce other automobile emissions, such as carbon monoxide, are also effective in controlling ozone. Also, measures that control VOC indirectly lower ozone levels. (An example is the floating roof for oil storage tanks that reduces evaporative losses.)

Figure 14.
Percent of Observed Days
Ozone Exceeded Standards



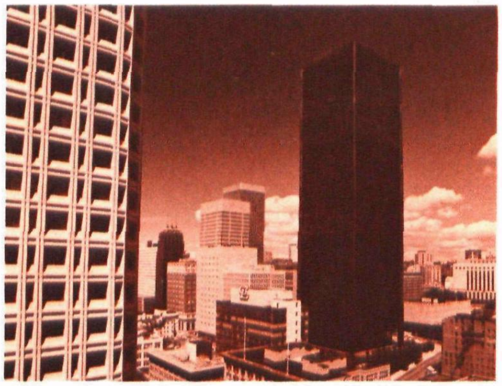
NOTE: Number in parentheses represents total number of days exceeding standards per number of observation days.

Figure 15.
Air Quality Status — Ozone



🟦 STANDARD ATTAINED OR CONSIDERED TO ATTAIN STANDARD

🟥 PRIMARY STANDARD EXCEEDED



Nitrogen Dioxide

Oxides of nitrogen are gases formed mainly by combustion. Sources include automobiles and power plants. Besides irritating the eyes and respiratory tract and damaging metal, rubber, fabric, and dyes, oxides of nitrogen contribute to photochemical oxidants, as described above.

During 1979, the nitrogen dioxide standard was not exceeded in any of the Region 10 states.

Lead

In 1978, EPA established an air quality standard for lead, which is to be achieved by November, 1982. At this time, the states, in cooperation with EPA, are gathering data to identify areas where the standard is being exceeded. Violations of the lead standard have occurred in the Kellogg, Idaho, area where the major sources are the Bunker Hill Company's lead smelter and general areawide contamination resulting from 60 years of milling and smelting operations. Lead violations have also been found in the Seattle, Washington, area—Harbor Island due to RSR/Quemetco and along Interstate 5 from Northgate to Spokane Street. The Puget Sound Air Pollution Control Agency is developing a plan to clean up the Seattle area.

Other Hazardous Materials

In addition to the six major air pollutants discussed above, other hazardous materials emitted to the air include asbestos, beryllium, and mercury. EPA is analyzing other potentially hazardous pollutants, and standards for these will be developed in the future, if necessary.

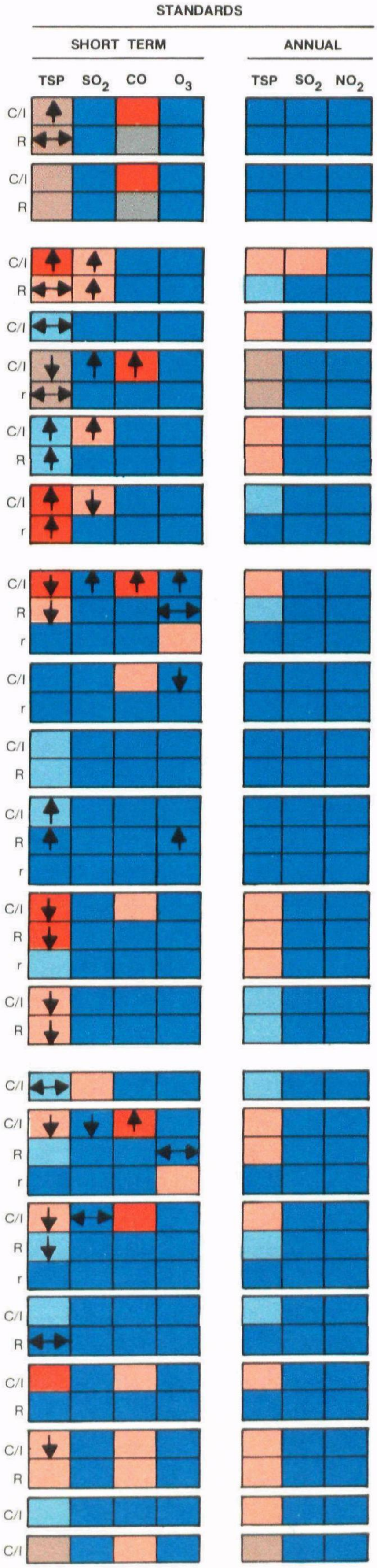
Trends in Air Quality

Trends in air quality indicate whether air pollution control activities have been effective. Figure 16 shows the urban areas in Region 10 in which air quality standards were exceeded in 1979. A trend was established for designated monitoring sites obtaining data for the 6-year period from 1974 through 1979. Air quality has improved in some Region 10 areas over the past few years; however, those improvements may not be shown in Figure 16 because long-term trend data is lacking. Also, new sites have been added within the last year to state networks, and trends for these areas will be available in the future.

C/I: COMMERCIAL INDUSTRIAL
R: RESIDENTIAL
r: RURAL

🟦	STANDARD ATTAINED OR CONSIDERED TO ATTAIN STANDARD
▢	SECONDARY STANDARD EXCEEDED
🟧	PRIMARY STANDARD EXCEEDED
🟥	ALERT LEVEL EXCEEDED
🟫	STANDARD EXCEEDED OR CONSIDERED TO EXCEED STANDARD DUE TO FUGITIVE DUST
▩	INSUFFICIENT DATA BUT CONSIDERED TO EXCEED STANDARD
↑	IMPROVING TREND
↓	DETERIORATING TREND
↔	NO SIGNIFICANT CHANGE

Figure 16.
Air Quality Trends



AREAS MONITORED		STANDARDS							CAUSE OF PROBLEM
		SHORT TERM				ANNUAL			
		TSP	SO_2	CO	O_3	TSP	SO_2	NO_2	
Alaska									
Anchorage	C/I	🟫↑	🟦	🟥	🟦	🟦	🟦	🟦	Mobile & Area Sources
	R	🟫↔	🟦	▩	🟦	🟦	🟦	🟦	Mobile & Area Sources
Fairbanks	C/I	🟫	🟦	🟥	🟦	🟦	🟦	🟦	Mobile & Area Sources
	R	🟫	🟦	▩	🟦	🟦	🟦	🟦	Mobile & Area Sources
Idaho									
Kellogg	C/I	🟥↑	🟧↑	🟦	🟦	🟧	🟧	🟦	Point Sources
	R	🟧↔	🟧↑	🟦	🟦	▢	🟦	🟦	Point Sources
Lewiston	C/I	▢↔	🟦	🟦	🟦	🟧	🟦	🟦	Point & Area Sources
Boise	C/I	🟫↓	🟦↑	🟥↑	🟦	🟫	🟦	🟦	Mobile & Area Sources
	r	🟫↔	🟦	🟦	🟦	🟫	🟦	🟦	
Pocatello	C/I	▢↑	🟧↑	🟦	🟦	🟧	🟦	🟦	Point & Area Sources
	R	▢↑	🟦	🟦	🟦	🟧	🟦	🟦	Point & Area Sources
Conda-Soda Springs	C/I	🟥↑	🟧↓	🟦	🟦	▢	🟦	🟦	Point & Area Sources
	r	🟥↑	🟦	🟦	🟦	🟦	🟦	🟦	Point & Area Sources
Oregon									
Portland	C/I	🟥↓	🟦↑	🟥↑	🟦↑	🟧	🟦	🟦	Mobile, Area & Point Source
	R	🟧↓	🟦	🟦	🟦↔	▢	🟦	🟦	Mobile & Area Sources
	r	🟦	🟦	🟦	🟧	🟦	🟦	🟦	Mobile Sources
Salem	C/I	🟦	🟦	🟧	🟦↓	🟦	🟦	🟦	Mobile Sources
	r	🟦	🟦	🟦	🟦	🟦	🟦	🟦	
Lebanon	C/I	▢	🟦	🟦	🟦	🟦	🟦	🟦	Area Sources
	R	▢	🟦	🟦	🟦	🟦	🟦	🟦	Area Sources
Eugene-Springfield	C/I	▢↑	🟦	🟦	🟦	🟦	🟦	🟦	Mobile, Area & Point Sources
	R	🟦↑	🟦	🟦	🟦↑	🟦	🟦	🟦	
	r	🟦	🟦	🟦	🟦	🟦	🟦	🟦	
Medford-Ashland	C/I	🟥↓	🟦	🟧	🟦	🟧	🟦	🟦	Mobile & Point Sources
	R	🟥↓	🟦	🟦	🟦	🟧	🟦	🟦	Mobile & Point Sources
	r	▢	🟦	🟦	🟦	🟧	🟦	🟦	Area Sources
Grants Pass	C/I	🟧↓	🟦	🟦	🟦	▢	🟦	🟦	Area Sources
	R	🟧↓	🟦	🟦	🟦	▢	🟦	🟦	Area Sources
Washington									
Port Angeles	C/I	▢↔	🟧	🟦	🟦	▢	🟦	🟦	Point & Area Sources
Seattle	C/I	🟧↓	🟦↓	🟥↑	🟦	🟧	🟦	🟦	Mobile, Area & Point Sources
	R	▢	🟦	🟦	🟦↔	🟧	🟦	🟦	Mobile & Area Sources
	r	🟦	🟦	🟦	🟧	🟦	🟦	🟦	Mobile Sources
Tacoma	C/I	🟧↓	🟦↔	🟥	🟦	🟧	🟦	🟦	Mobile, Area & Point Sources
	R	▢↓	🟦	🟦	🟦	▢	🟦	🟦	Mobile & Area Sources
	r	🟦	🟦	🟦	🟦	🟦	🟦	🟦	
Longview	C/I	▢	🟦	🟦	🟦	▢	🟦	🟦	Point & Area Sources
	R	🟦↔	🟦	🟦	🟦	🟦	🟦	🟦	
Vancouver	C/I	🟥	🟦	🟧	🟦	🟧	🟦	🟦	Mobile & Point Sources
	R	🟦	🟦	🟦	🟦	🟦	🟦	🟦	
Spokane	C/I	🟧↓	🟦	🟧	🟦	🟧	🟦	🟦	Mobile, Area & Point Sources
	R	🟧	🟦	🟧	🟦	🟧	🟦	🟦	Mobile & Area Sources
Clarkston	C/I	▢	🟦	🟦	🟦	🟧	🟦	🟦	Area & Point Sources
Yakima	C/I	🟫	🟦	🟧	🟦	🟫	🟦	🟦	Mobile Sources

River Water Quality

Water quality in Pacific Northwest and Alaskan rivers is generally good; however, portions of many Region 10 major rivers have marginal quality with respect to Federal water quality goals. This degradation is the result of both point and non-point sources of pollution with some problems attributed to natural causes. Criteria most often exceeded are those for temperature, bacteria, nutrient levels, and heavy metals. To attain the water quality goals, wastewater treatment programs for point sources and best management practices for non-point sources either have been implemented or are planned.

How River Water Quality is Determined

When Congress enacted amendments to the Federal Water Pollution Control Act in 1972, a national goal was set—"fishable, swimmable" waters by 1983 and the states in Region 10 have adopted that goal. The purpose of the Act is to protect the quality of our Nation's waters for a variety of uses, including public water supply, wildlife, fish and shellfish, recreation, navigation, agriculture, and industry. Each water use depends on certain characteristics, such as temperature, concentration of dissolved oxygen, or absence of bacteria, which can be measured and used to evaluate water quality. They vary with the chemistry of the stream being measured, the season, and other factors.

Region 10 states have specified a limited number of criteria for water quality parameters and incorporated them into water quality standards. In addition, to reliably compare water quality on a regional scale, EPA Region 10 developed a standardized set of parameters and associated criteria and segregated them into ten related groups (Table 2). These criteria are a synthesis of state water quality standards, National EPA water quality criteria, information in technical literature, and professional judgment. Like the state water quality standards, this more comprehensive set of criteria is intended to define water quality levels necessary to protect human and aquatic life and the desired recreational uses of river and stream waters, and thus represent EPA Region 10 water quality goals. More than one criteria value based on water use may be associated with certain parameters. For example, most of the Region's streams are managed to support cold water game fish species such as trout and salmon; however, some are managed as warm water fisheries, supporting bass, bullhead, etc., which require less stringent criteria. The water

Table 2.
Criteria Categories for the Water Quality Index

CRITERIA CATEGORY	EXPLANATION
Temperature	Water temperature influences the type of fish and other aquatic life that can survive in a river. Excessively high temperatures are detrimental to aquatic life.
Dissolved Oxygen	To survive, fish and aquatic life must have certain levels of oxygen in the water. Low oxygen levels can be detrimental to these organisms.
pH	pH is the measure of acidity or alkalinity of water. Extreme levels of either can imperil fish and aquatic life.
Aesthetics	Refers to oil, grease, and turbidity which are visually unpleasant. For the Index, this group is mostly represented by the turbidity parameter, which is a measure of the clarity of the water, because it is much more widely measured than any of the others within the group.
Solids	Dissolved mineral and suspended material such as mud or silt. Excess dissolved minerals (hard water) interfere with agricultural, industrial, and domestic use. Excess suspended solids adversely affect fish feeding and spawning.
Radioactivity	May be in water as a result of radioactive waste discharges or fallout. Excess levels can harm aquatic and other life forms.
Bacteria	Bacteria indicate probable presence of disease-related organisms and viruses not natural to water (i.e. from human sewage or animal waste).
Trophic (Nutrient Enrichment)	Indicates the extent of algae or nutrients in water. Nutrients promote algae growth. When algae (one-celled water plants) flourish they make the water murky, and the growths make swimming and fishing unpleasant. Decomposition of dead algae can decrease dissolved oxygen concentrations to levels harmful to fish.
Organic Toxicity	Includes pesticides and other organic poisons having same effects and persistence as pesticides.
Inorganic Toxicity	Heavy metals and other elements; excess concentrations are poisonous to aquatic and other life forms. Also includes percent saturations of dissolved gases in water which can affect the metabolism of aquatic life.

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[1] Approximately 80 parameters were evaluated and condensed to the 10 categories shown here. More detailed information is available on request.

quality of an individual stream or stream portion may be determined at a monitoring station by measuring each parameter and comparing it to the criteria. But to compare one stream to another, or to compare segments within a particular stream, a single inclusive number is useful. Consequently, a Water Quality Index (WQI) has been formulated by EPA Region 10 based upon the aforementioned criteria.

Sources and Control of Water Pollution

Pollutants that reach the Region's streams have two general origins: *point source* pollution, such as wastewater from industries, sewage treatment plants, and the like, that enters streams at an easily identified location; and less easily identified *non-point source* pollution, that consists of stormwater from urban areas, irrigation water, and runoff from farm, forest, and mining lands.

Industries that discharge waste effluent to streams must have a permit issued by EPA under the National Pollution Discharge Elimination System (NPDES) or by states that have assumed this responsibility. Through this means, EPA can require that point source pollutants be removed before wastewater reaches the river. Since non-point sources cannot be so easily treated, "best management practices" are required. For example, agricultural best management practices might include waste storage areas to keep organic wastes from reaching nearby streams, or contour plowing to prevent erosion of soil into rivers.

The responsibility for developing methods to control non-point source pollution has been given to local and state agencies assigned to develop water quality management plans as provided by the Federal Water Pollution Control Act.

Water Quality Index

In this report, the Water Quality Index compares water quality data measured, primarily, from October 1977 through September 1979 with the recommended Federal criteria. (Water management agencies usually operate on a "water year," i.e., October-September, rather than on a calendar year basis.) This data is collected by various Federal, state, and local agencies and stored in EPA's computer systems. The final Index number for each station takes into account the 10 water quality criteria categories shown in Table 2, adjusted to reflect the severity by which the criteria are exceeded. Two types of Index numbers are generated: one represents the average annual water quality, the other shows the worst 3 consecutive months status, which provides a better indication of the severity of those water quality problems occurring on a seasonal basis. The Index numbers span a scale from 0 (no measured evidence of pollution) to 100 (severe pollution at all times). In this report, the scale is divided into three color ranges:

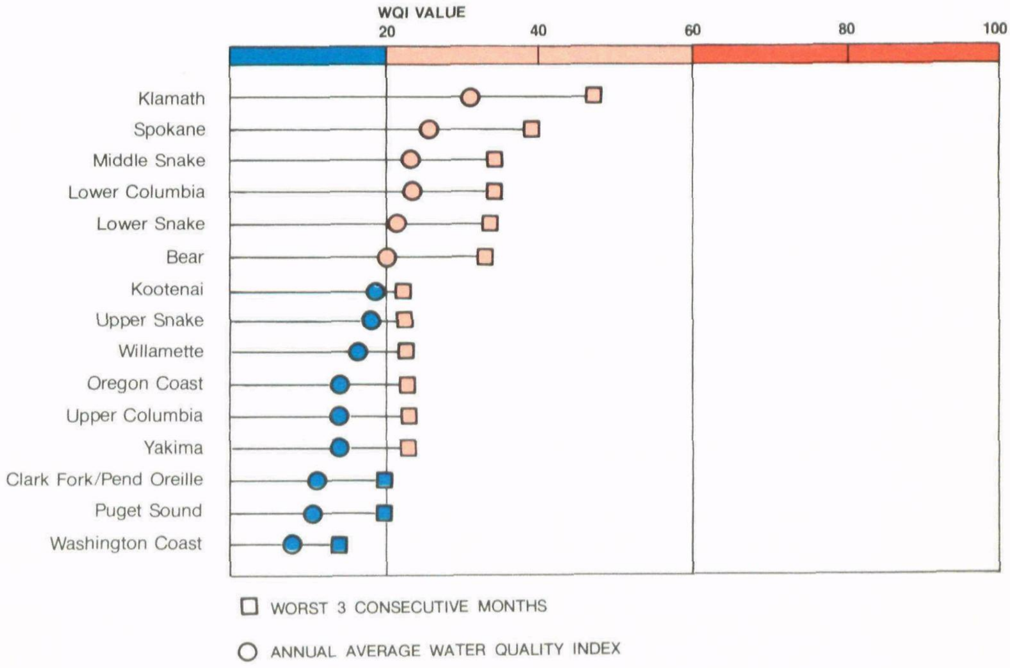
Blue represents streams with Index numbers between 0 and 20. These streams either have no pollution or are minimally polluted and therefore meet the goals of the Federal Water Pollution Control Act.

Light brown represents streams with Index numbers between 20 and 60. Such streams are intermittently and/or moderately polluted and are considered marginal with respect to meeting the goals of the Act.

Dark brown represents streams with an Index number greater than 60. These streams are severely polluted and do not meet the goals of the Act.

The color gray is used in the graphs when the water quality status is unknown because of inadequate data.

Figure 17.
Water Quality Index Values for Principal Region 10 River Basins



🟥 UNACCEPTABLE — SEVERE POLLUTION

🟧 MARGINAL — INTERMITTENT, OR MODERATE POLLUTION

🟦 ACCEPTABLE — MINIMAL, OR NO POLLUTION

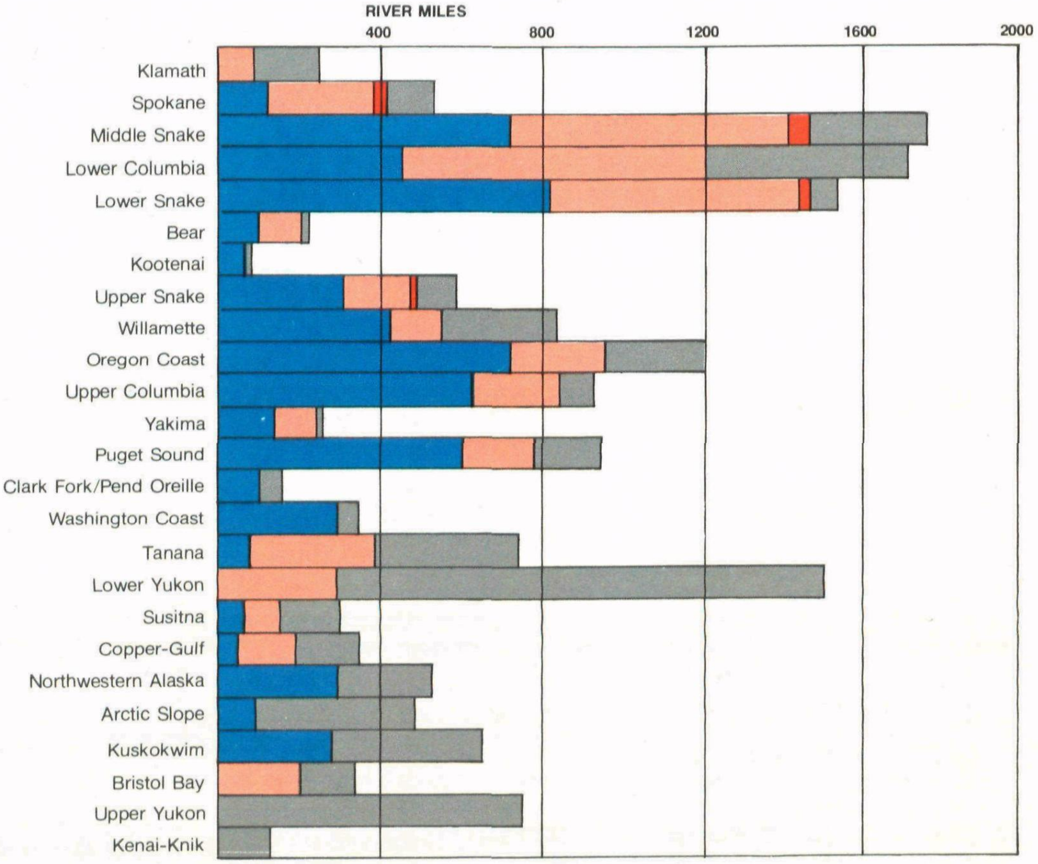
Lack of data precludes calculation of WQI values for Alaska basins.

The Regional Overview

The Water Quality Index is used in Figure 17 to compare the major river basins, which include the principal rivers and tributaries within Idaho, Oregon, and Washington. (Lack of data precludes the calculation of WQI values to represent entire Alaska basins.) Figure 18 depicts the relative extent of water quality degradation within each river basin, and Figure 19 shows similar information on a regional map. Only three major river basins (Figure 17) seem to clearly meet the Federal water quality goals, with both Index numbers less than 20. Another six generally meet the goals, except during certain times of the year. The remaining six basins only marginally meet the Federal goals, and the majority of these drain arid portions of the Region that receive significant non-point source waste contributions from agricultural and livestock activities.

Most of the criteria exceeded are those for temperature, bacteria, trophic, aesthetics, solids, and inorganic toxicants categories. Natural conditions such as hot summer temperatures, low streamflows, and easily erodable soils also contribute, particularly in the more arid portions of the Region. In the Spokane River Basin, high heavy metals contributions from past and present mining activities on the South Fork Coeur d'Alene River drainage in Idaho are primarily responsible for elevated Index values. Elevated heavy metals concentrations of unknown origins also appear in portions of the Lower Columbia and Lower Snake Basins.

Figure 18.
Miles Within Principal Region 10 River Basins Meeting Water Quality Criteria



BASED UPON THE AVERAGE ANNUAL WQI:

🟥 UNACCEPTABLE — SEVERE POLLUTION

🟥 MARGINAL — INTERMITTENT, OR MODERATE POLLUTION

🟦 ACCEPTABLE — MINIMAL, OR NO POLLUTION

⬜ STATUS UNKNOWN

Only the principal river and tributary mileages are shown for each basin.

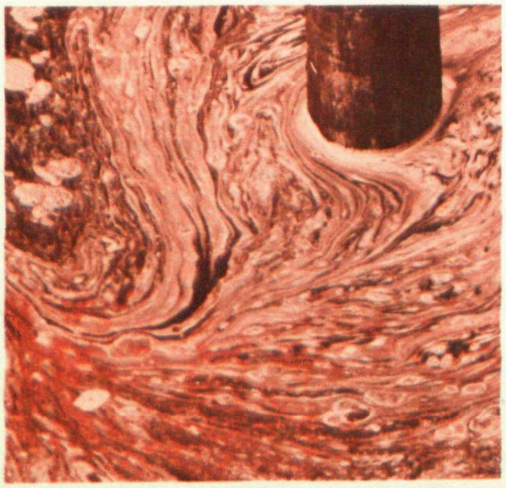
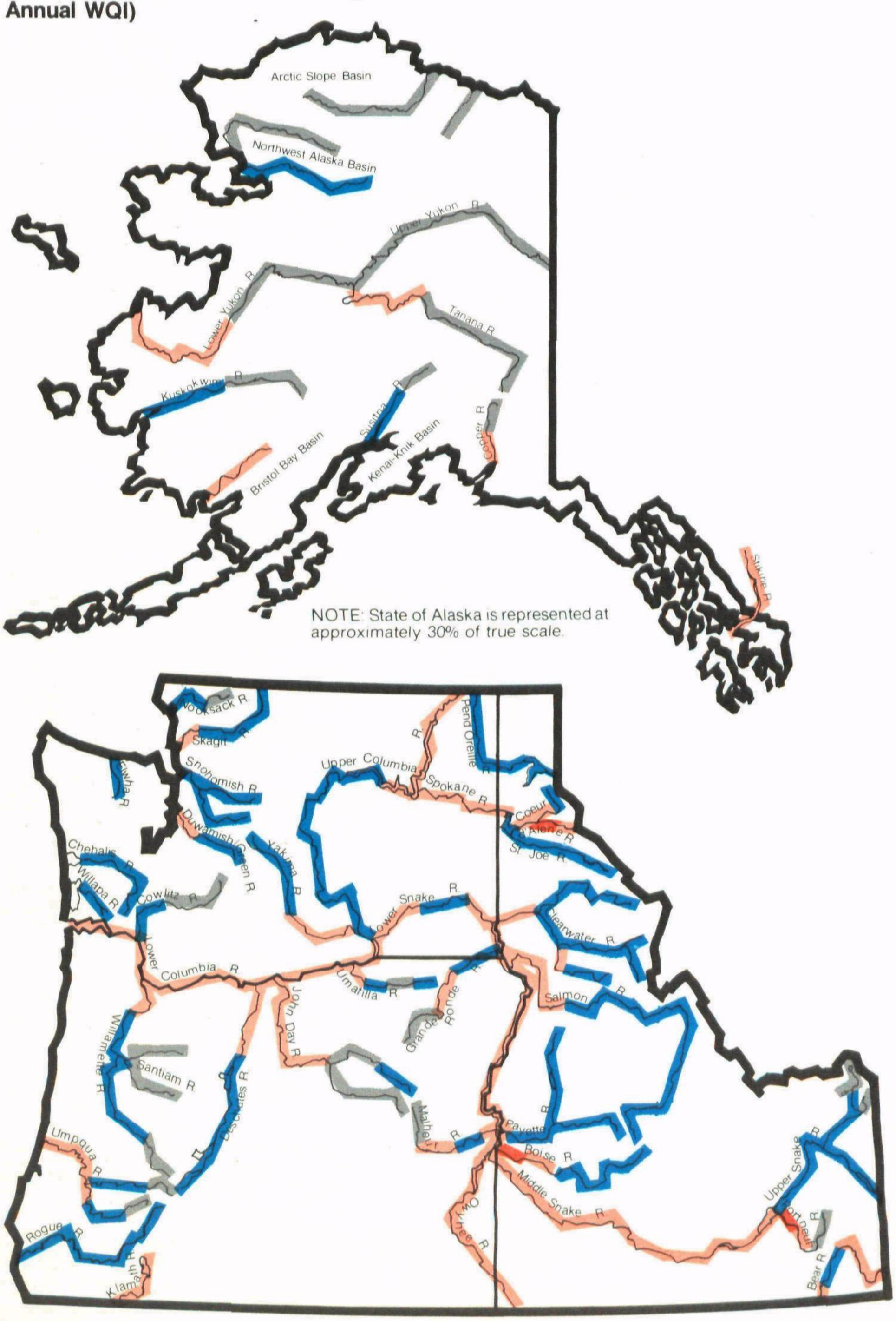
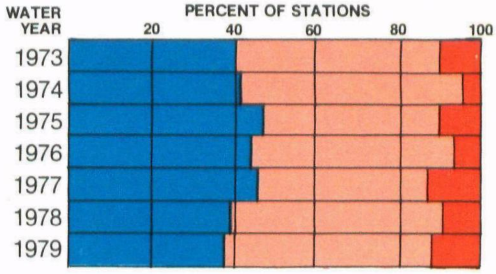


Figure 19.
Water Quality Status of Principal Rivers in Region 10 (Based Upon the Average Annual WQI)



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

Figure 20.
Water Quality Trends in Region 10



Based upon the water quality status during the worst 3 consecutive months per station at 89 monitoring and stations within Region 10. (Alaska stations, organic and inorganic toxicant pollution categories not included.)

🟥 UNACCEPTABLE — SEVERE POLLUTION

▨ MARGINAL — INTERMITTENT, OR MODERATE POLLUTION

🟦 ACCEPTABLE — MINIMAL, OR NO POLLUTION

▩ STATUS UNKNOWN

Data on organic toxicants is lacking for most streams. Programs are underway, however, to better define their extent and to develop realistic criteria for these compounds.

Most of the criteria exceedances indicated in Alaska are due to natural conditions, such as glacial activity and spring runoff. Past and present mining operations may be contributing to the higher solids and metals values in some of these rivers.

Regional water quality trends were analyzed by comparing data from 89 representative monitoring stations over a 7-year period (Figure 20). There has been little significant change at these stations since 1973. Due to inadequate data, Alaska rivers could not be included in the analysis, nor were organic or inorganic toxicants included, since there have been significant changes in analytical techniques and reporting procedures over the time period considered. Although point source controls have made many improvements in Regional water quality, further plans to identify and control non-point sources are needed to improve water quality in those stream segments still not fully meeting water quality goals.

The Quality of Oregon's Principal Rivers

Figures 21 and 22 show that none of Oregon's principal rivers and streams are severely polluted all year. The Snake River above Brownlee Dam (Middle Snake) experiences severe degradation during some months of the year. Portions of the Owyhee and Malheur Rivers are seasonally polluted to almost as great a degree. Half of the principal rivers have only marginal water quality on an annual average basis, and more are similarly affected at least part of the year. Most of the lesser quality streams are located in the eastern and southern parts of the state, and are impacted by non-point source wastes from irrigation, agricultural, and livestock activities.

Figure 23 shows the worst 3-month status of certain Oregon river and stream reaches with respect to each of the 10 WQI categories. Some of the man-caused sources of criteria exceedances are also indicated. Criteria most frequently exceeded are temperature, bacteria, trophics, solids, and inorganic toxicants (basically, heavy metals).

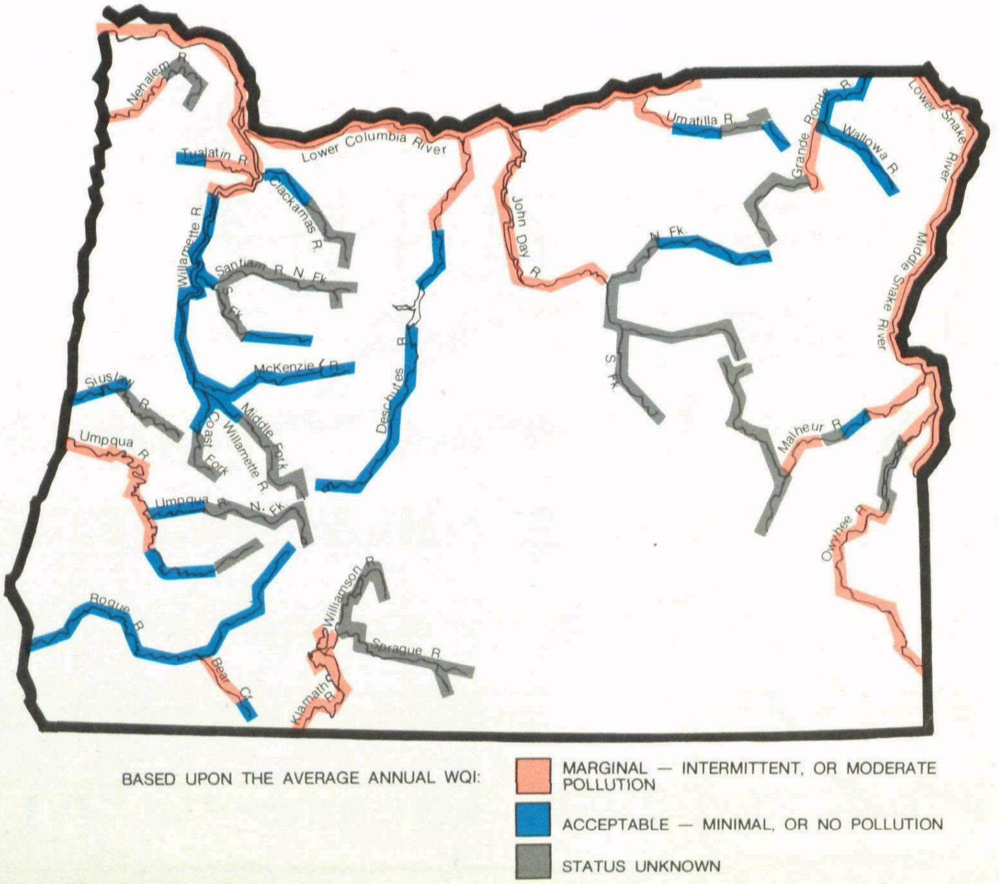
Temperatures exceeding the criteria contribute to the impairment of cold water fish species. This condition is somewhat mitigated by the ability of the fish to migrate to cooler tributary streams during the warmest periods, and to partially adapt to the warmer temperatures. The hot, dry climate in eastern and southern Oregon with attendant low streamflows is mostly responsible for these exceedances. In some streams, however, these climatic conditions may be aggravated by irrigation diversions and return flows, dams, and the destruction of streambank vegetation. The portions of the Malheur, Owyhee, Umatilla, and Klamath that are represented were evaluated against warm water fishery criteria and subsequently do not indicate temperature exceedances.

Dissolved oxygen levels occasionally failed to meet the criteria in the Snake River immediately below Hell's Canyon Dam and in the Klamath River near Keno. This is due to the introduction of nutrients from agricultural, livestock, and natural sources, which stimulate algal and aquatic weed growth during the spring and summer months. The subsequent decay of these growths and other organic debris introduced by irrigation wastewater consumes quantities of dissolved oxygen sufficient to cause the remaining oxygen levels to fall short of the criteria. In the lower South Umpqua, low dissolved oxygen levels appear to be caused by municipal point sources combined with seasonally low streamflows during the summer.

The lower John Day and Middle Snake Rivers show pH values in excess of the criteria. Natural soil conditions may be the primary reason in the former case, and agricultural runoff in the latter.

Over half of the stream segments shown exceed criteria levels for bacteria and nutrients. Much of this degradation may be attributed to runoff from grazing lands,

Figure 21.
Water Quality Status of Oregon's Principal Rivers



croplands, and animal confinement areas. Municipal point sources also contribute to these problems in certain areas.

In Region 10, the aesthetics and solids categories are mostly represented by the turbidity and suspended solids parameters, respectively, and are therefore closely related. High turbidity levels usually indicate similar levels of suspended solids, which are caused by the erosion of soil into the rivers and streams. Both conditions are aesthetically offensive. Most of those Oregon streams exceeding the turbidity criteria are impacted by agricultural runoff during late spring and summer. The other streams are affected to a lesser extent during winter and spring due to rainfall and snowmelt runoff. Again, although many of these conditions are probably natural in origin, man's agricultural, livestock, and forestry activities across the state may be responsible for some of the degradation.

There is a significant lack of data on organic toxicants in Oregon streams, even though pesticides and herbicides are widely used in both agricultural and forestry activities throughout the state. Regular monitoring for a relatively small number of these chemicals has been performed in only a few of Oregon's streams in recent years. Except for the Klamath River, where concentrations of the pesticide Lindane were found in excess of the EPA criteria for aquatic life in 1976, this limited monitoring program has not detected significant levels of organic toxicants to date. More widespread sampling for a much larger number of organic toxicants is being undertaken to better assess the extent of these compounds.

The inorganic toxicants category is primarily represented by the heavy metal parameters except for the South Umpqua, where only ammonia data is available. Seasonally low streamflows combined with sewage treatment plant effluent probably account for the elevated ammonia values. The highest levels of heavy metals occur in the Columbia River from unknown sources.

EPA stream monitoring for radiation in or near Oregon occurs quarterly on the Columbia River near Richland, Washington and Astoria, Oregon. Although there is insufficient criteria data available to calculate Index numbers for this category, observed radiation values at these sites are less than 5 percent of the EPA drinking water standard.

River Water Quality Trends

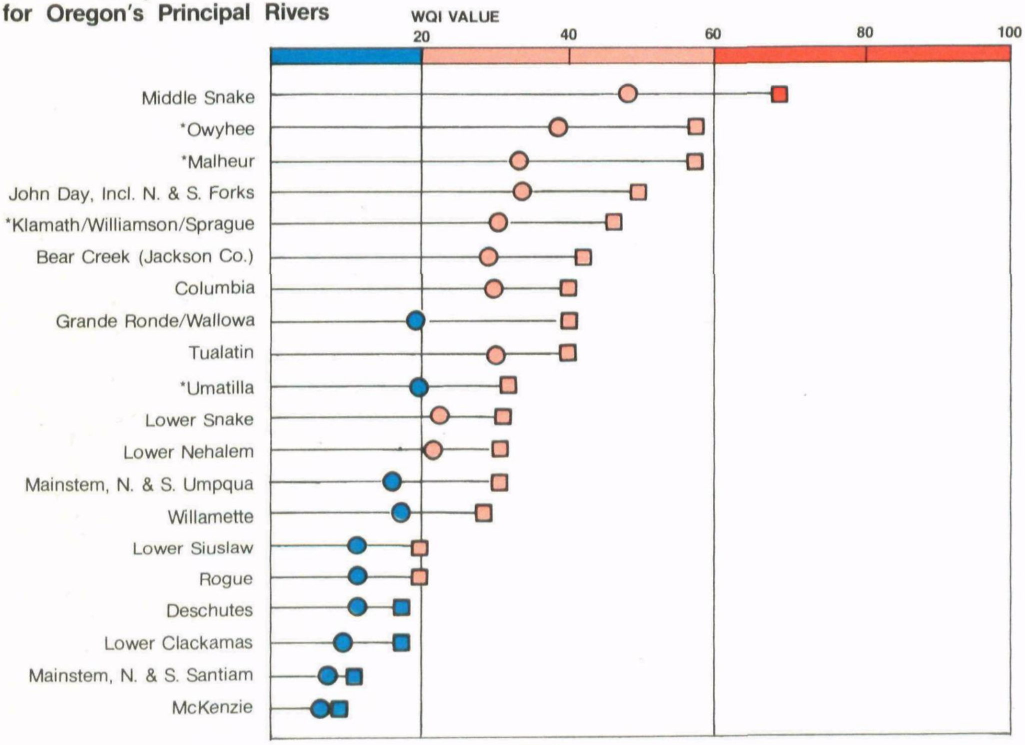
Figure 24 compares the year-to-year water quality at 22 monitoring stations within or bordering upon Oregon over the past 7 years. Although improvements due to point source controls have been documented, no significant improvement trends in statewide water quality are seen because of the influence of continuing natural and man-caused non-point source degradation at these stations.

Looking at the individual water quality categories and stream segments (Figure 24), it appears that conditions are deteriorating somewhat in several of the most degraded segments, while conditions in the Willamette River and its tributaries seem to be improving. The limited amount of data available for analysis makes it difficult to provide a more complete evaluation of Oregon water quality trends at this time.

The Outlook for Oregon

Many existing water quality problems in Oregon are due to non-point sources of pollution, especially agricultural sources. To address this problem, the Oregon Department of Environmental Quality (DEQ) has assessed the state's non-point source pollution and is now developing and beginning to apply best

Figure 22.
Water Quality Index Values for Oregon's Principal Rivers



The WQI values presented are derived from averaging WQI values from those river portions with adequate data. Except where indicated, river portions included are located only on the main river named.

*Portions of these streams were evaluated using criteria designed to protect warm water aquatic species, only.

🟥 UNACCEPTABLE — SEVERE POLLUTION

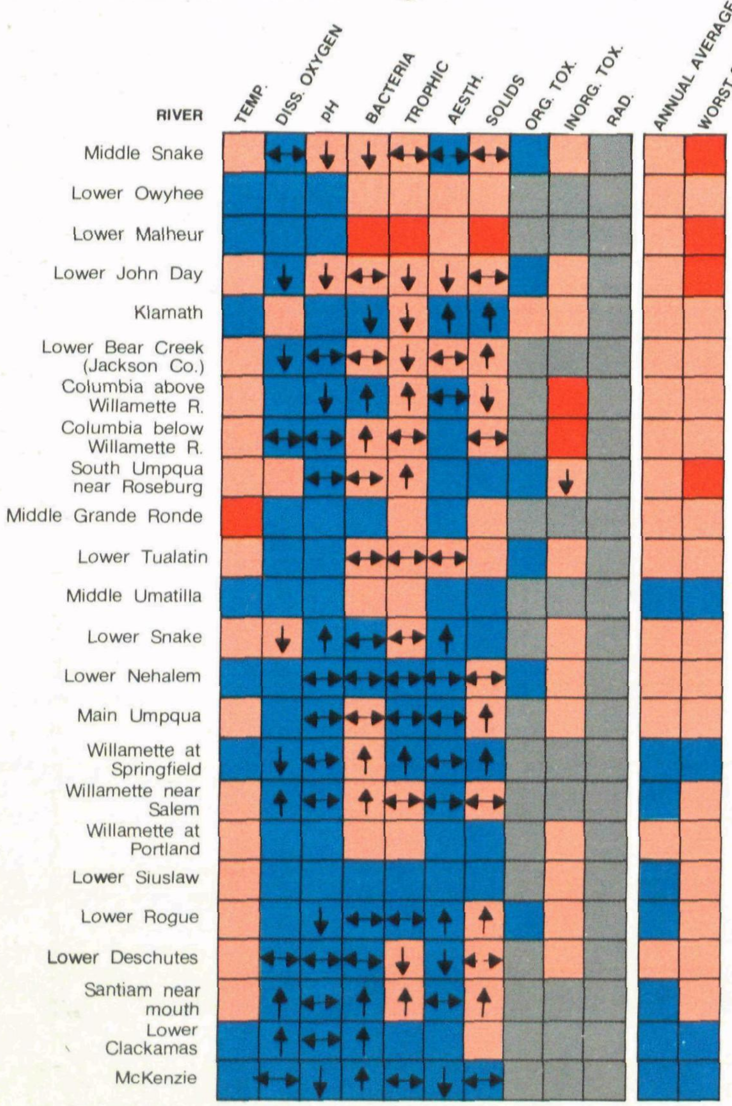
🟥 MARGINAL — INTERMITTENT, OR MODERATE POLLUTION

🟦 ACCEPTABLE — MINIMAL, OR NO POLLUTION

□ WORST 3 CONSECUTIVE MONTHS

○ ANNUAL AVERAGE WATER QUALITY INDEX

Figure 23.
River Water Quality Categories
Current Status and Trends in Oregon



RIVER	TEMP.	DISS. OXYGEN	pH	BACTERIA	TROPHIC	AESTH.	SOLIDS	ORG. TOX.	INORG. TOX.	RAD.	ANNUAL AVERAGE	WORST 3-MONTHS	HUMAN-RELATED CAUSES OF CRITERIA EXCEEDANCES
Middle Snake	🟧	🟦↔	🟧↓	🟧↓	🟧↔	🟦↔	🟧↔	🟦	🟧	▨	🟧	🟥	Agriculture
Lower Owyhee	🟦	🟦	🟦	🟧	🟧	🟧	🟧	▨	▨	▨	🟧	🟧	Agriculture
Lower Malheur	🟦	🟦	🟦	🟥	🟥	🟧	🟥	▨	▨	▨	🟧	🟥	Agriculture
Lower John Day	🟧	🟦↓	🟧↓	🟧↔	🟧↓	🟧↓	🟧↔	🟦	🟧	▨	🟧	🟥	Agriculture
Klamath	🟦	🟧	🟦	🟦↓	🟧↓	🟦↑	🟦↑	🟧	🟧	▨	🟧	🟧	Agriculture
Lower Bear Creek (Jackson Co.)	🟧	🟦↓	🟦↔	🟧↔	🟧↓	🟧↔	🟧↑	▨	▨	▨	🟧	🟧	Agriculture, urban runoff
Columbia above Willamette R.	🟧	🟦	🟦↓	🟦↑	🟧↑	🟦↔	🟧↓	▨	🟥	▨	🟧	🟧	Point & non-point sources
Columbia below Willamette R.	🟧	🟦↔	🟦↔	🟧↑	🟧↔	🟦	🟧↔	▨	🟥	▨	🟧	🟧	Point & non-point sources
South Umpqua near Roseburg	🟧	🟧	🟦↔	🟧↔	🟧↑	🟦	🟦	🟦	🟧↓	▨	🟧	🟥	Point sources
Middle Grande Ronde	🟥	🟦	🟦	🟦	🟧	🟦	🟧	▨	▨	▨	🟧	🟧	Agriculture
Lower Tualatin	🟧	🟦	🟦	🟧↔	🟧↔	🟧↔	🟧	🟦	🟧	▨	🟧	🟧	Municipal point sources, animal wastes
Middle Umatilla	🟦	🟦	🟦	🟧	🟧	🟦	🟦	▨	▨	▨	🟦	🟦	Agriculture
Lower Snake	🟧	🟧↓	🟦↑	🟦↔	🟧↔	🟦↑	🟦	▨	🟧	▨	🟧	🟧	Upstream waste
Lower Nehalem	🟦	🟦	🟦↔	🟦↔	🟦↔	🟦↔	🟧↔	🟦	🟧	▨	🟧	🟧	
Main Umpqua	🟧	🟦	🟦↔	🟧↔	🟦↔	🟦↔	🟧↑	▨	🟧	▨	🟧	🟧	
Willamette at Springfield	🟦	🟦↓	🟦↔	🟧↑	🟦↑	🟦↔	🟦↑	▨	▨	▨	🟦	🟦	
Willamette near Salem	🟧	🟦↑	🟦↔	🟧↑	🟧↔	🟦↔	🟧↔	▨	▨	▨	🟦	🟧	Point sources, animal wastes
Willamette at Portland	🟧	🟦	🟦	🟧	🟧	🟦	🟦	▨	🟧	▨	🟧	🟧	Point sources, animal wastes
Lower Siuslaw	🟧	🟦	🟦	🟦	🟦	🟦	🟦	▨	🟧	▨	🟦	🟧	
Lower Rogue	🟧	🟦	🟦↓	🟦↔	🟦↔	🟦↑	🟧↑	🟦	🟧	▨	🟦	🟧	
Lower Deschutes	🟧	🟦↔	🟦↔	🟦↔	🟧↓	🟦↓	🟧↔	▨	🟧	▨	🟧	🟧	
Santiam near mouth	🟧	🟦↑	🟦↔	🟦↑	🟧↑	🟦↔	🟧↑	▨	▨	▨	🟦	🟧	
Lower Clackamas	🟦	🟦↑	🟦↔	🟦↑	🟦	🟦	🟧	▨	▨	▨	🟦	🟦	
McKenzie	🟦	🟦↔	🟦↓	🟦↑	🟦↔	🟦↓	🟦↔	▨	▨	▨	🟦	🟦	

The colors depict the worst three-month status of each category during the water year 1978/1979 period. The arrows depict category trends as determined by a non-parametric statistical test of water year 1973 through 1979 data.

🟥 UNACCEPTABLE — SEVERE POLLUTION

🟧 MARGINAL — INTERMITTENT, OR MODERATE POLLUTION

🟦 ACCEPTABLE — MINIMAL, OR NO POLLUTION

▨ STATUS UNKNOWN

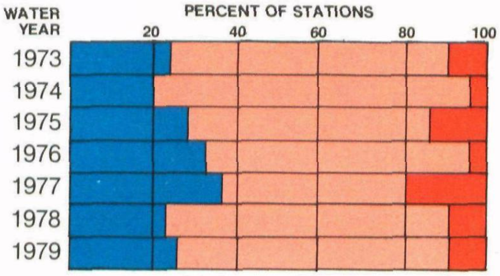
↑ IMPROVING TREND

↓ DETERIORATING TREND

↔ NO SIGNIFICANT CHANGE

☐ INADEQUATE, OR NO DATA AVAILABLE FOR TRENDS ANALYSIS

Figure 24.
Water Quality Trends in Oregon



Based upon the water quality status during the worst 3 months at 22 monitoring stations within and bordering upon Oregon. Organic and inorganic toxicity parameter groups not included.

management practices to farms identified as pollution sources. DEQ works with agricultural agencies to encourage farmers to voluntarily use approved practices. Projects are underway that should reduce pollution levels in Bear Creek (Jackson County), the Owyhee and Malheur Rivers (Malheur County), the Umatilla River (Gilliam, Marion, Sherman, Umatilla, and Wasco Counties), and the Lower Columbia (Wasco County).

Forestry practices, which can also increase sediment and nutrient levels, are controlled in Oregon through the Forest Practices Act, which requires that road construction and logging activities minimize erosion and restricts logging adjacent to streams, thus protecting stream cover. The Act is enforced by officers who cite and fine contractors and private operations who fail to comply.

Control of point sources from industrial and sewage treatment operations through the NPDES permit system should improve water quality along specific stream segments. A regional treatment plant being constructed for the Eugene-Springfield area, for example, should significantly reduce bacterial levels in the Willamette River. Industries discharging to tributaries of the Willamette, such as the Teledyne Wah Chang plant at Albany, are reducing the levels of ammonia in their effluent. This should improve the level of dissolved oxygen in the river and reduce the toxicity and nutrient levels. Installation of secondary treatment facilities at several fruit processing plants has reduced the discharge of pollutants to the Columbia River.

The Quality of Washington's Principal Rivers

Figure 25 shows the location and extent of water quality within Washington's principal rivers and streams, and Figure 26 compares their water quality in WQI terms.

On an average annual basis, the majority of streams generally meet the Federal water quality goals. The South Fork of the Palouse currently appears to be the most degraded Washington stream and does not meet Federal goals. During their worst 3-month conditions, over half of the streams may be considered marginal with respect to the goals.

The marginal rating for the Puyallup/White system and the Upper Nisqually is primarily due to criteria exceeded in the aesthetics and solids categories, caused by glacial meltwater. In the Lower Columbia, this rating is due to elevated heavy metals levels from unknown sources.

Many of the state's water quality problems are found in the lower portions of the Yakima, Crab Creek, Walla Walla/Touchet, and Palouse drainages, where the effects of climatically induced low streamflows and high summer temperatures are aggravated by man's activities. Problems typically encountered include high levels of bacteria, turbidity, suspended solids, and nutrients, as well as elevated summer water temperatures. Most of these problems are attributed to agricultural and livestock-related non-point sources, such as irrigation return flows, erosion from cultivated dryland areas, and runoff from grazing areas and feedlots.

Figure 27 shows the status of various segments of Washington's principal streams with respect to the 10 WQI categories. Summer stream temperatures exceed recommended criteria in the lower portions of many of the eastern Washington streams. As in Oregon, natural causes are probably the major contributors, but human activities compound the problem. Dissolved oxygen levels in the Spokane River immediately below Long Lake Dam fail to meet the minimum criteria during the late summer and fall. This condition is caused by the oxygen-consuming

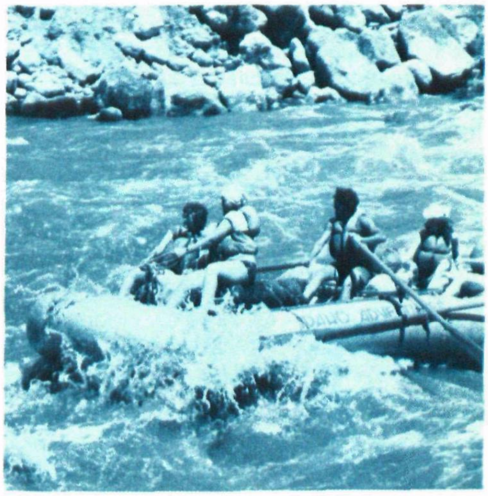
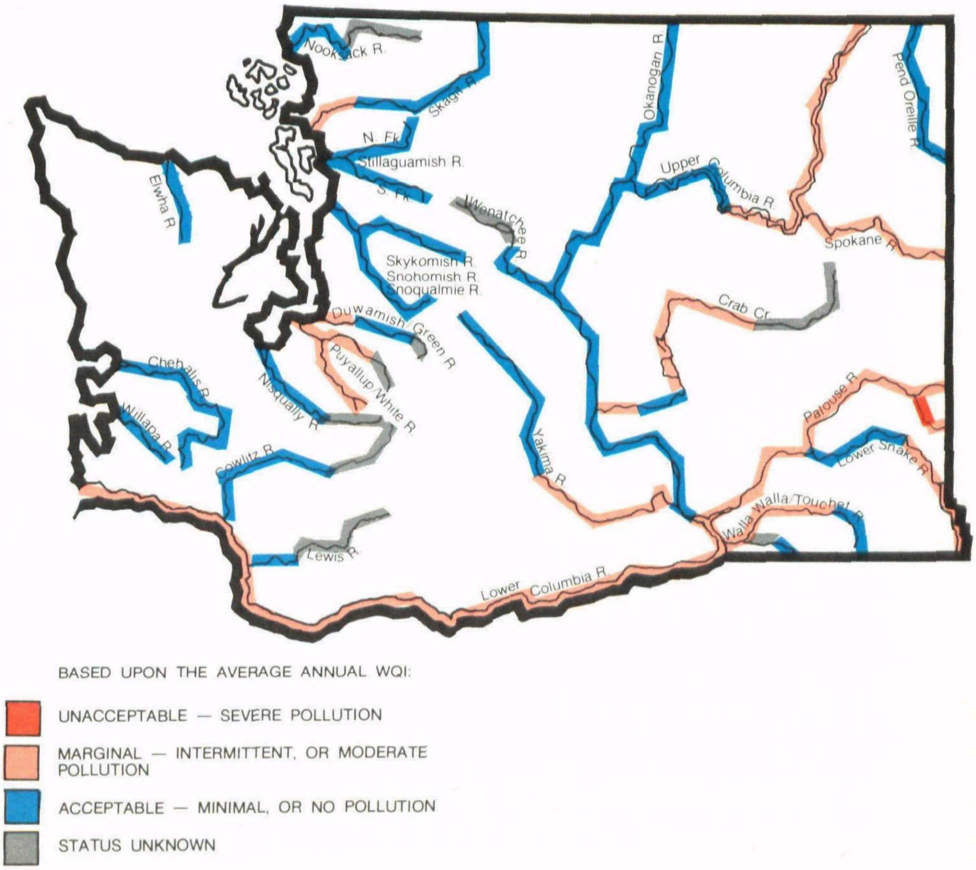


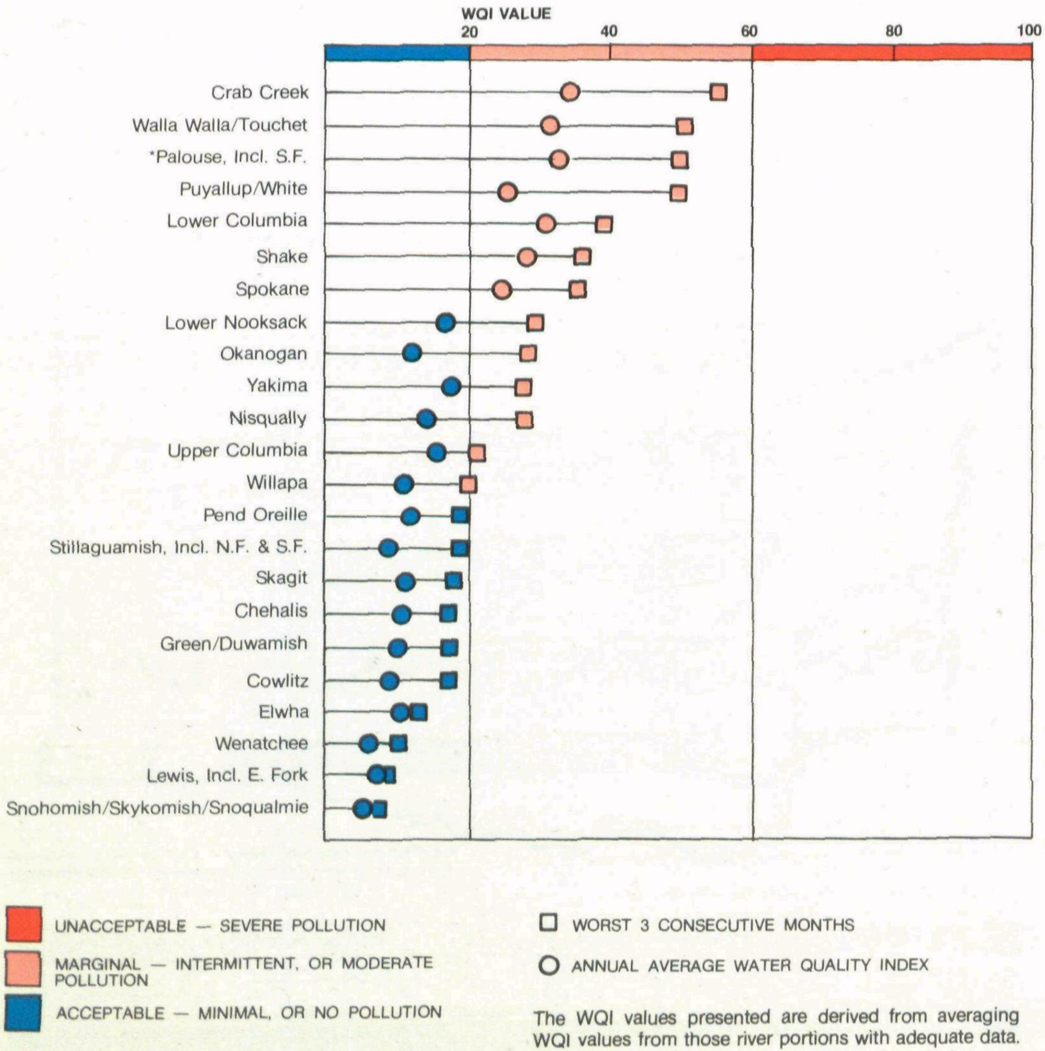
Figure 25.
Water Quality Status of Washington's Principal Rivers



decay of algae and other organic material within Long Lake, which are either contributed to or stimulated by upstream sources. Excessive bacterial levels are mostly found in the lower portions of eastern Washington's streams, with irrigation, precipitation, and snowmelt runoff from grazing and animal confinement areas the probable causes. However, sewage treatment wastes may be primarily responsible for exceedances in the South Fork Palouse and Duwamish Rivers.

The most severe exceedances of the aesthetics and solids criteria generally occur in the more intensely farmed areas of southern and eastern Washington, particularly during periods of rainfall and snowmelt runoff.

Figure 26.
Water Quality Index Values for Washington's Principal Rivers



*Evaluated using criteria designed to protect warm water aquatic species only.

The WQI values presented are derived from averaging WQI values from those river portions with adequate data. Except where indicated, river portions included are located only on the main river named.

Recent monitoring of the lower Spokane, Elwha, and Yakima Rivers for organic toxicants indicates no significant levels of these compounds. More widespread sampling for a much larger number of organic toxicants is being undertaken to better assess their extent in Washington's streams.

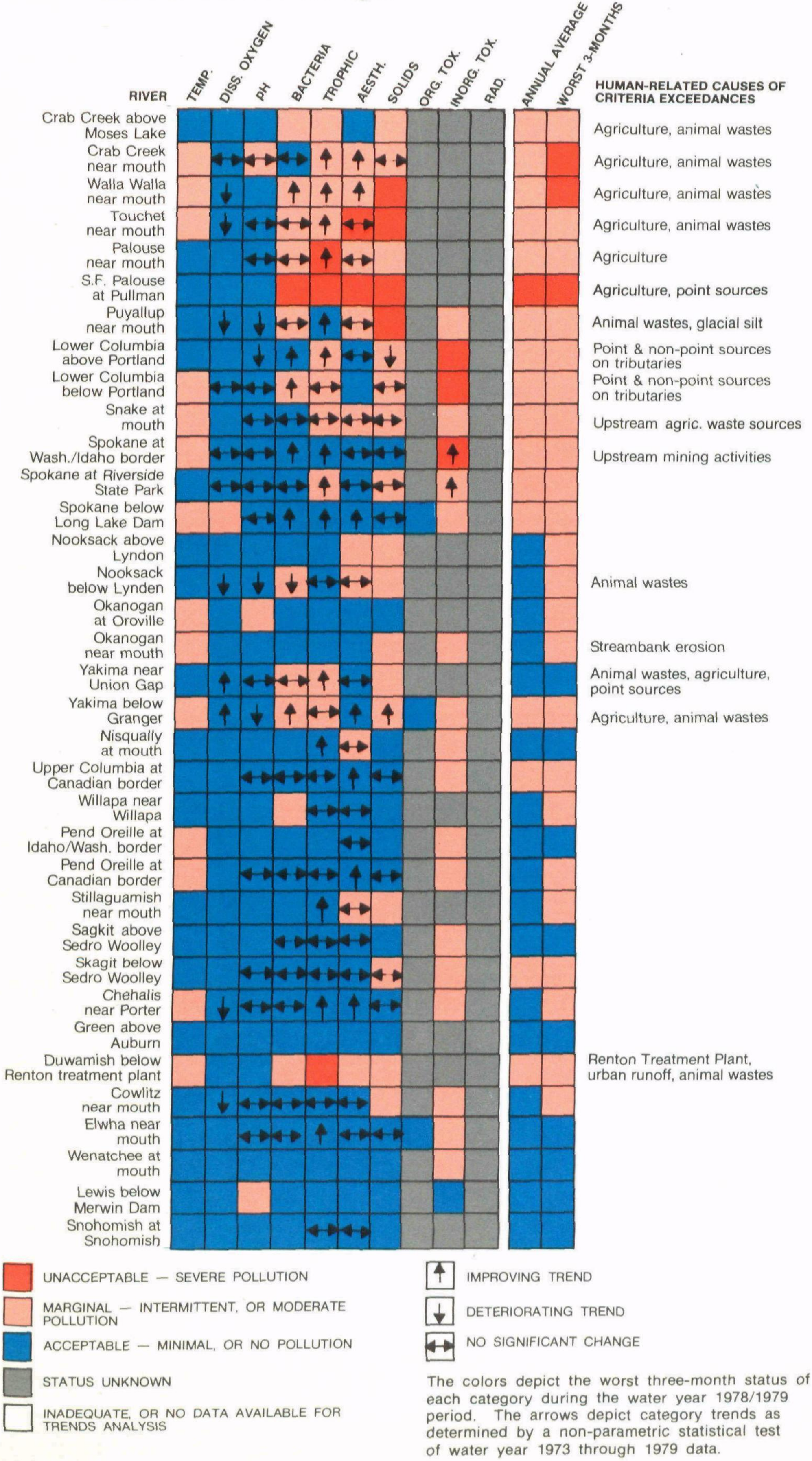
Inorganic toxicants include the heavy metals zinc, lead, and cadmium, which can harm fish and persons who eat contaminated fish. A number of Washington rivers appear not to meet recently refined Federal criteria. However, for most of these streams, it is not clear at this time whether there is a genuine problem with inorganic toxicants or simply a problem with insufficiently sensitive analytical and monitoring techniques. Past and present mining and smelting activities in Idaho's South Fork Coeur d'Alene River drainage are responsible for excessive inorganic toxicant levels in the Spokane River.

EPA stream monitoring for radiation in or near Washington occurs quarterly on the Columbia River near the Canadian border, Richland, and Astoria, Oregon. Although insufficient criteria data is available to calculate Index numbers for this category, observed radiation values at these sites are less than 3 percent of the EPA drinking water standard.

River Water Quality Trends

Figure 28 compares the year-to-year water quality at 39 monitoring stations within, or bordering upon, the state over the past 7 years. As in Oregon, improvements due to point source controls have been documented. No significant improving trends in the overall water quality status are seen, however, due to the influence of continuing natural and human related non-point source degradation at these stations. Incomplete data from some of the monitoring stations and variations in the climate and sampling times combine to add difficulties to the attempt to analyze water quality trends.

Figure 27.
River Water Quality Categories
Current Status and Trends in Washington



RIVER	TEMP.	DISS. OXYGEN	pH	BACTERIA	TROPHIC	AESTH.	SOLIDS	ORG. TOX.	INORG. TOX.	RAD.	ANNUAL AVERAGE	WORST 3-MONTHS	HUMAN-RELATED CAUSES OF CRITERIA EXCEEDANCES
Crab Creek above Moses Lake	🟦	🟦	🟦	🟧	🟧	🟦	🟧	▒	▒	▒	🟧	🟧	Agriculture, animal wastes
Crab Creek near mouth	🟧	🟦 ↔	🟧 ↔	🟦 ↔	🟧 ↑	🟧 ↑	🟧 ↔	▒	▒	▒	🟧	🟥	Agriculture, animal wastes
Walla Walla near mouth	🟧	🟦 ↓	🟦	🟧 ↑	🟧 ↑	🟧 ↑	🟥	▒	▒	▒	🟧	🟥	Agriculture, animal wastes
Touchet near mouth	🟧	🟦 ↓	🟦 ↔	🟧 ↔	🟧 ↑	🟥 ↔	🟥	▒	▒	▒	🟧	🟧	Agriculture, animal wastes
Palouse near mouth	🟦	🟦	🟦 ↔	🟧 ↔	🟥 ↑	🟧 ↔	🟧	▒	▒	▒	🟧	🟧	Agriculture
S.F. Palouse at Pullman	🟦	🟦	🟦	🟥	🟥	🟥	🟥	▒	▒	▒	🟥	🟥	Agriculture, point sources
Puyallup near mouth	🟦	🟦 ↓	🟦 ↓	🟧 ↔	🟦 ↑	🟧 ↔	🟥	▒	🟧	▒	🟧	🟧	Animal wastes, glacial silt
Lower Columbia above Portland	🟦	🟦	🟦 ↓	🟦 ↑	🟧 ↑	🟦 ↔	🟧 ↓	▒	🟥	▒	🟧	🟧	Point & non-point sources on tributaries
Lower Columbia below Portland	🟧	🟦 ↔	🟦 ↔	🟧 ↑	🟧 ↔	🟦	🟧 ↔	▒	🟥	▒	🟧	🟧	Point & non-point sources on tributaries
Snake at mouth	🟧	🟦	🟦 ↔	🟦 ↔	🟧 ↔	🟧 ↔	🟧 ↔	▒	🟧	▒	🟧	🟧	Upstream agric. waste sources
Spokane at Wash./Idaho border	🟧	🟦 ↔	🟦 ↔	🟦 ↑	🟦 ↑	🟦 ↔	🟦 ↔	▒	🟥 ↑	▒	🟧	🟧	Upstream mining activities
Spokane at Riverside State Park	🟦	🟦 ↔	🟦 ↔	🟦 ↔	🟧 ↑	🟦 ↔	🟧 ↔	▒	🟧 ↑	▒	🟧	🟧	
Spokane below Long Lake Dam	🟧	🟧	🟦 ↔	🟦 ↑	🟦 ↑	🟦 ↑	🟦 ↔	🟦	🟧	▒	🟧	🟧	
Nooksack above Lyndon	🟦	🟦	🟦	🟦	🟦	🟧	🟧	▒	▒	▒	🟦	🟧	
Nooksack below Lynden	🟦	🟦 ↓	🟦 ↓	🟧 ↓	🟦 ↔	🟧 ↔	🟧	▒	▒	▒	🟦	🟧	Animal wastes
Okanogan at Oroville	🟧	🟦	🟧	🟦	🟦	🟦	🟦	▒	▒	▒	🟦	🟧	
Okanogan near mouth	🟧	🟦	🟦	🟦	🟦	🟦	🟧	▒	🟧	▒	🟦	🟧	Streambank erosion
Yakima near Union Gap	🟦	🟦 ↑	🟦 ↔	🟧 ↔	🟧 ↑	🟦 ↔	🟧	▒	▒	▒	🟦	🟦	Animal wastes, agriculture, point sources
Yakima below Granger	🟧	🟦 ↑	🟦 ↓	🟧 ↑	🟧 ↔	🟦 ↑	🟧 ↑	🟦	🟧	▒	🟧	🟧	Agriculture, animal wastes
Nisqually at mouth	🟦	🟦	🟦	🟦	🟦 ↑	🟧 ↔	🟦	▒	🟧	▒	🟦	🟦	
Upper Columbia at Canadian border	🟦	🟦	🟦 ↔	🟦 ↔	🟦 ↔	🟦 ↑	🟦 ↔	▒	🟧	▒	🟧	🟧	
Willapa near Willapa	🟦	🟦	🟦	🟧	🟦 ↔	🟦 ↔	🟦	▒	▒	▒	🟦	🟧	
Pend Oreille at Idaho/Wash. border	🟧	🟦	🟦	🟦	🟦	🟦 ↔	🟦	▒	🟧	▒	🟦	🟦	
Pend Oreille at Canadian border	🟧	🟦	🟦 ↔	🟦 ↔	🟦 ↔	🟦 ↑	🟦 ↔	▒	🟧	▒	🟦	🟧	
Stillaguamish near mouth	🟦	🟦	🟦	🟦	🟦 ↑	🟧 ↔	🟧	▒	▒	▒	🟦	🟧	
Sagkit above Sedro Woolley	🟦	🟦	🟦	🟦 ↔	🟦 ↔	🟦 ↔	🟦	▒	🟧	▒	🟦	🟦	
Skagit below Sedro Woolley	🟦	🟦	🟦 ↔	🟦 ↔	🟦 ↔	🟦 ↔	🟧 ↔	▒	🟧	▒	🟧	🟧	
Chehalis near Porter	🟧	🟦 ↓	🟦 ↔	🟦 ↔	🟦 ↑	🟦 ↑	🟦 ↔	▒	🟧	▒	🟦	🟧	
Green above Auburn	🟦	🟦	🟦	🟦	🟦	🟦	🟦	▒	▒	▒	🟦	🟦	
Duwamish below Renton treatment plant	🟧	🟦	🟦	🟧	🟥	🟧	🟧	▒	▒	▒	🟧	🟧	Renton Treatment Plant, urban runoff, animal wastes
Cowlitz near mouth	🟦	🟦 ↓	🟦 ↔	🟦 ↔	🟦 ↔	🟦 ↔	🟧	▒	🟧	▒	🟦	🟧	
Elwha near mouth	🟦	🟦	🟦 ↔	🟦 ↔	🟦 ↑	🟦 ↔	🟦 ↔	🟦	🟧	▒	🟦	🟦	
Wenatchee at mouth	🟦	🟦	🟦	🟦	🟦	🟦	🟦	▒	🟧	▒	🟦	🟦	
Lewis below Merwin Dam	🟦	🟦	🟧	🟦	🟦	🟦	🟦	▒	🟦	▒	🟦	🟦	
Snohomish at Snohomish	🟦	🟦	🟦	🟦	🟦 ↔	🟦 ↔	🟦	▒	▒	▒	🟦	🟦	

🟥 UNACCEPTABLE — SEVERE POLLUTION

🟧 MARGINAL — INTERMITTENT, OR MODERATE POLLUTION

🟦 ACCEPTABLE — MINIMAL, OR NO POLLUTION

▒ STATUS UNKNOWN

⬜ INADEQUATE, OR NO DATA AVAILABLE FOR TRENDS ANALYSIS

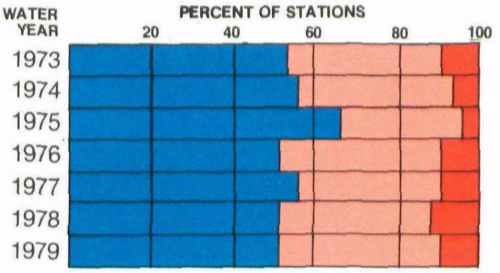
↑ IMPROVING TREND

↓ DETERIORATING TREND

↔ NO SIGNIFICANT CHANGE

The colors depict the worst three-month status of each category during the water year 1978/1979 period. The arrows depict category trends as determined by a non-parametric statistical test of water year 1973 through 1979 data.

Figure 28
Water Quality Trends in Washington



Data based upon the worst 3 consecutive months status of 39 monitoring stations within, and bordering upon, Washington. Organic and inorganic toxicant categories not included.

Figure 27 indicates some improvement in certain categories in the most-degraded stream segments in eastern Washington, particularly with respect to trophic conditions. In fact, where data is available, it appears that nutrient levels are declining in many stream segments across the state. Because limited data is available for trends analysis, it is difficult to more completely evaluate water quality trends within the state at this time.

The Outlook for Washington

The NPDES permit system and implementation of areawide wastewater management plans being developed should correct many of the pollution problems discussed above. New and improved sewage treatment plants, improved operation of existing plants, and best management practices in agricultural and livestock operations should most noticeably improve bacteria, nutrients, and solids levels. The effect of forest practices on erosion and temperature levels is being controlled through the Forest Practices Act.

Programs are underway to determine the extent of organic toxicants. If significant levels are found, they are likely to be in metropolitan areas where the impact of both municipal and industrial waste discharges are the greatest. Elevated levels may also be found in streams that drain agricultural areas with high pesticide usage.

The Quality of Idaho's Principal Rivers

Figure 29 shows the location of the major Idaho streams and the general extent of water quality degradation within their reaches based upon the average annual WQI. Figure 30 compares their average annual and worst 3-month WQI values.

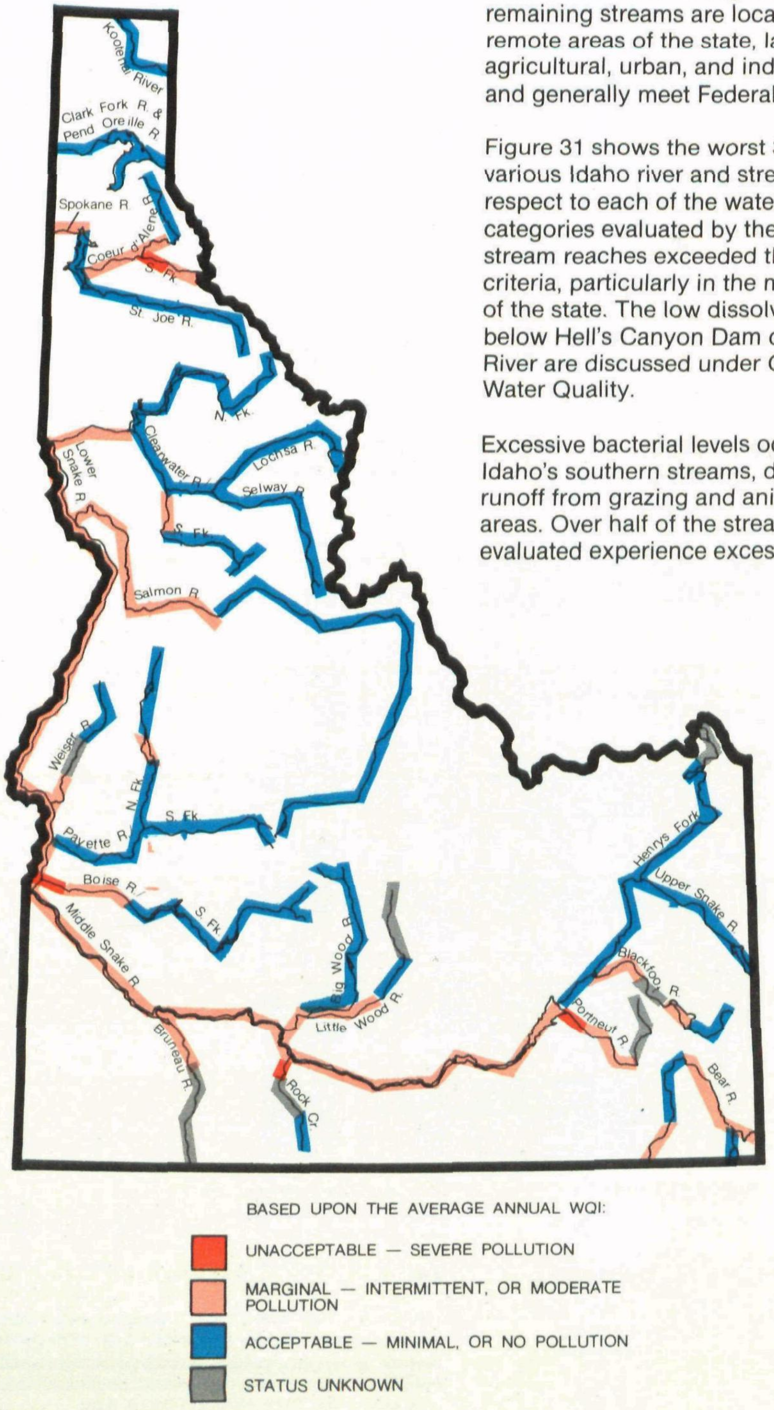
Much of the South Fork Coeur d'Alene River is affected by wastes from past and present mining and ore-producing activities within its basin. Pollution from these activities also causes the Spokane and main Coeur d'Alene Rivers to be rated marginal. The lower Portneuf River has been degraded by a combination of municipal, industrial, agricultural, and natural sources. Since the summer of 1980, however, much of the municipal and industrial wastewater has been diverted from the river. Rock Creek, which flows through Twin Falls, is heavily impacted by irrigation wastewater entering its lower reaches.

Most of the other principal streams monitored in Idaho only marginally meet Federal water quality goals during their worst 3-month periods; many of their problems are attributed to agricultural non-point sources, particularly in Southern Idaho. Some stream reaches are affected by point source discharges from sewage treatment and industrial plants, for example, the Boise River and Milner Reservoir, located on the Snake River. High heavy metals levels from unknown sources are primarily responsible for the Lower Salmon and Clearwater Rivers' marginal ratings. The remaining streams are located in more remote areas of the state, lack significant agricultural, urban, and industrial activities, and generally meet Federal goals.

Figure 31 shows the worst 3-month status of various Idaho river and stream reaches with respect to each of the water quality categories evaluated by the WQI. Many stream reaches exceeded the temperature criteria, particularly in the more arid portions of the state. The low dissolved oxygen levels below Hell's Canyon Dam on the Snake River are discussed under Oregon River Water Quality.

Excessive bacterial levels occur in some of Idaho's southern streams, due primarily to runoff from grazing and animal confinement areas. Over half of the stream segments evaluated experience excessive levels of

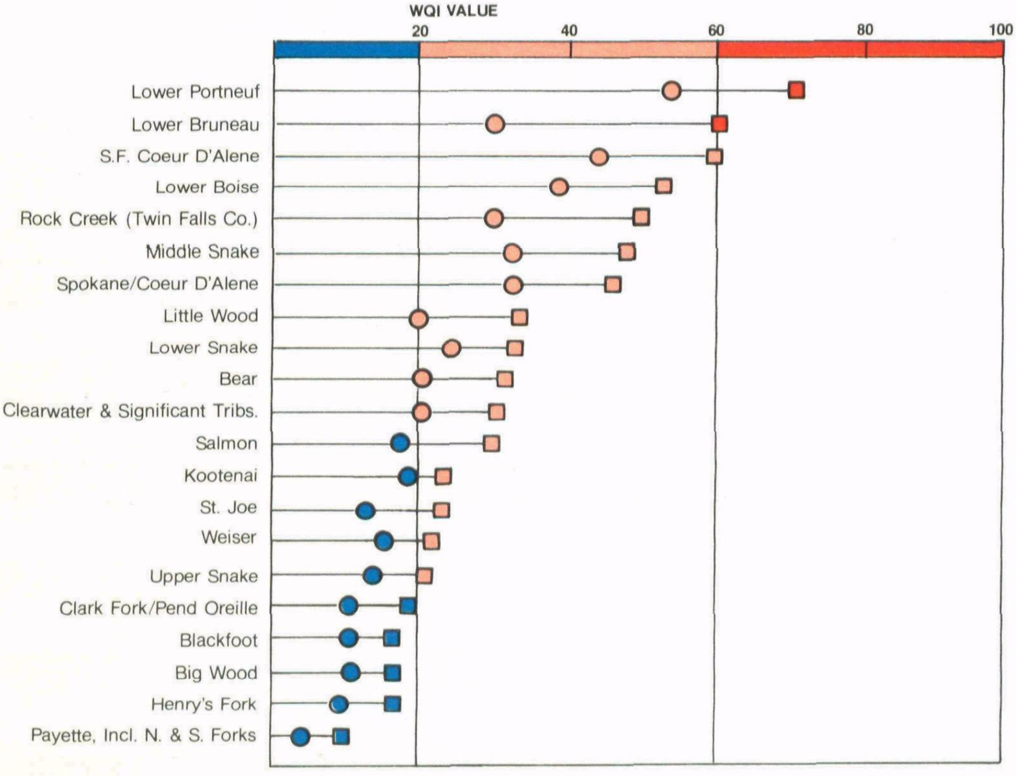
Figure 29.
Water Quality Status of Idaho's Principal Rivers



nutrients (trophic category) during at least part of the year. These are mostly over-enriched by runoff from irrigated and dryland agriculture, although secondary treated sewage may be contributing to these problems in some streams, such as the Boise River.

The highest suspended solids levels observed in the state were found in the lower portions of Rock Creek, Bruneau River, Portneuf River, and in the Bear River near the Wyoming border. Irrigation return flows are mostly responsible for these levels in Rock Creek, while rainfall and snowmelt runoff from dryland agricultural areas account for the high solids levels in the other three streams.

Figure 30.
Water Quality Index Values for Idaho's Principal Rivers



The WQI values presented are derived from averaging WQI values from those river portions with adequate data. Except where indicated, river portions included are located only on the main river named.

☐ WORST 3 CONSECUTIVE MONTHS

○ *ANNUAL AVERAGE WATER QUALITY INDEX*

🟥 UNACCEPTABLE — SEVERE POLLUTION

🟥 MARGINAL — INTERMITTENT, OR MODERATE POLLUTION

🟦 ACCEPTABLE — MINIMAL, OR NO POLLUTION

Limited monitoring for organic toxicants in the water on the Snake, Bear, Kootenai, and Salmon Rivers has not revealed significant levels of contamination in recent years. Fish tissue samples taken at 19 trend stations in Idaho indicated that no criteria levels were exceeded for 22 pesticides and other organics. However, 26 percent and 30 percent of the total DDT and PCB samples, respectively, exceeded recommended concentrations for the protection of fish-eating birds and mammals. Large amounts of PCB's were released to the Upper Snake River following the flooding caused by the failure of the Teton Dam.

High levels of heavy metals from the aforementioned mining and smelting sources are causing criteria exceedances in parts of the Spokane/Coeur d'Alene River system.

Insufficient criteria exist to allow formulation of Index numbers for the radiation category. Compared to the Idaho regulations for public drinking water systems, however, recent data shows that a few stream segments exceeded these criteria. These are believed to be caused by naturally occurring uranium in the soils.

River Water Quality Trends

The general water quality picture in Idaho, as represented by the 28 monitoring stations evaluated in Figure 32, has exhibited little apparent change over the past 7 years for the same reasons explained in the Oregon and Washington discussions.

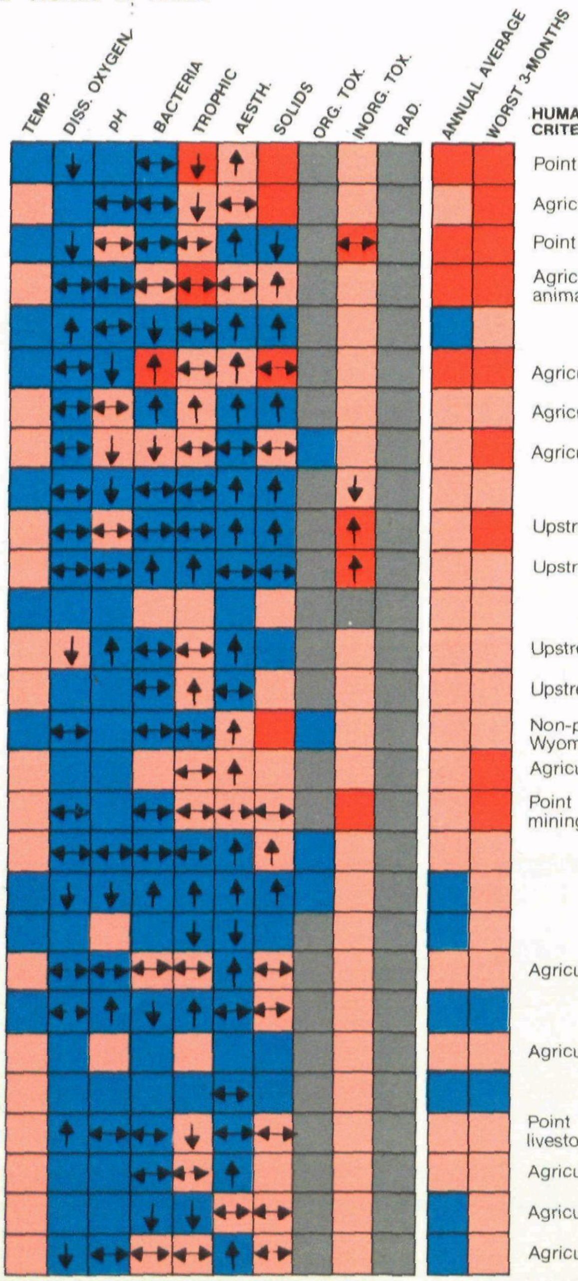
Trends within individual categories (Figure 31) indicate improvement in the aesthetics and solids categories in many of the stream segments. Segments exhibiting improvements in the greatest number of categories are the Kootenai River near the Canadian border and the Snake River near Mountain Home.

The Outlook for Idaho

Reductions in point source pollution in Idaho are being achieved by means of NPDES permits and earlier cooperative state, industry, and municipal efforts. Problems still exist, however, with sewage treatment, including inadequate treatment levels, overloading of facilities from infiltration/inflow, and insufficient dilution of sewage effluent due to low streamflows. Food processing industries and mining and ore processing facilities are other major point sources requiring improvements.

Agriculture continues to be one of the most significant non-point sources of water pollution in Idaho. A Statewide Agricultural

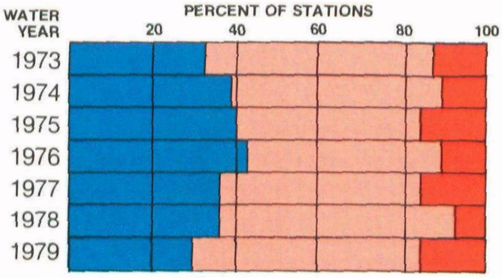
Figure 31.
River Water Quality Categories
Current Status and Trends in Idaho



RIVER	HUMAN-RELATED CAUSES OF CRITERIA EXCEEDANCES
Portneuf at mouth	Point & non-point sources
Bruneau near mouth	Agriculture, animal wastes
South Fork Coeur d' Alene at mouth	Point & non-point sources
Boise near mouth	Agriculture, point sources, animal wastes
Boise at Lucky Peak Dam	
Rock Creek at Twin Falls	Agriculture, animal wastes
Middle Snake near Mountain Home	Agriculture, animal wastes
Middle Snake near Weiser	Agriculture
Coeur d' Alene above the South Fork	
Coeur d' Alene below the South Fork	Upstream mining sources
Spokane at Wash./Idaho border	Upstream mining sources
Little Wood near mouth	
Lower Snake at Hell's Canyon Dam	Upstream waste sources
Lower Snake near Lewiston	Upstream waste sources
Bear at Wyoming border	Non-point sources in Wyoming & Utah
Bear at Utah border	Agriculture, animal wastes
Clearwater near mouth	Point sources, agriculture, mining
Salmon near mouth	
Kootenai near U.S./Canada border	
St. Joe near mouth	
Weiser at mouth	Agriculture, animal wastes
Upper Snake above Idaho Falls	
Upper Snake near Burley	Agriculture
Pend Oreille at Washington border	
Big Wood near mouth	Point sources, agriculture livestock
Blackfoot near mouth	Agriculture
Henry's Fork near mouth	Agriculture
Payette near mouth	Agriculture, animal wastes

The colors depict the worst three-month status of each category during the water year 1978/1979 period. The arrows depict category trends as determined by a non-parametric statistical test of water year 1973 through 1979 data.

Figure 32.
Water Quality Trends in Idaho



Based upon the water quality status during the worst 3 months at 28 monitoring stations within and bordering upon Idaho. Organic and inorganic toxicity parameter groups not included.

- 🟥 UNACCEPTABLE — SEVERE POLLUTION
- 🟥 MARGINAL — INTERMITTENT, OR MODERATE POLLUTION
- 🟦 ACCEPTABLE — MINIMAL, OR NO POLLUTION
- ⬛ STATUS UNKNOWN
- ↑ IMPROVING TREND
- ↓ DETERIORATING TREND
- ↔ NO SIGNIFICANT CHANGE
- ☐ INADEQUATE, OR NO DATA AVAILABLE FOR TRENDS ANALYSIS

Pollution Abatement Plan was completed in 1979. *This voluntary program is being* implemented on a statewide basis, and specifically using 208 projects in four high-priority areas: Rock Creek and Cedar Draw in Twin Falls County, Paradise Creek-South Fork Palouse River in Latah County, and Marsh Creek in Bannock County.

Mining activities are another major non-point source of pollution. Significant improvement in water quality would result if discharges from the Bunker Hill Company in Kellogg were to meet EPA guidelines; however, runoff from abandoned and inactive mining operations, which is difficult and expensive to control, would still create *problems in the South Fork and main Coeur* d'Alene Rivers. State plans to rehabilitate the South Fork have been hampered by lack of funds.

The Quality of Alaska's Principal Rivers

Because most of Alaska is remote and inaccessible, water quality information is scattered, as well as difficult and expensive to obtain; therefore half of the state's *principal streams cannot be evaluated.* Available data from October 1977 through September 1979 were used to indicate the general status of the principal Alaska rivers. Where insufficient data existed for that period, data from October 1972 through September 1979 *were used. Figure 33 shows* the location and water quality status of these streams, and Figure 34 compares the Index values from the single stations that represent each river.

None of the rivers with data appear to be severely degraded. River segments rated marginal are primarily exceeding turbidity (aesthetics), suspended solids, and heavy metals (inorganic toxicants) criteria on an intermittent basis. The high levels of the first *two are primarily due to natural occurrences,* such as ice breakup and runoff from the snowpack and glaciers. Human activities, such as placer mining and construction, may be partially responsible, particularly in some of the smaller tributary streams. Metals *criteria exceedances may be due to a* combination of factors, such as mining activities, natural geological processes, and the criteria/reporting problem discussed earlier.

Figure 33.
Water Quality Status of Alaska's Principal Rivers

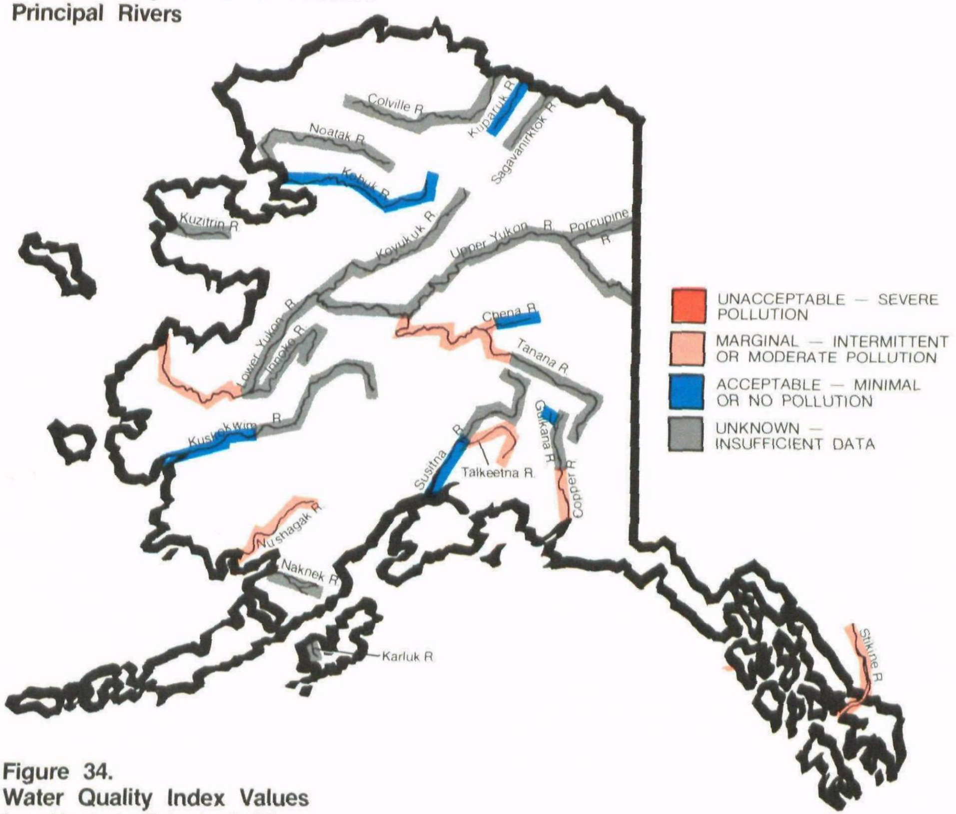
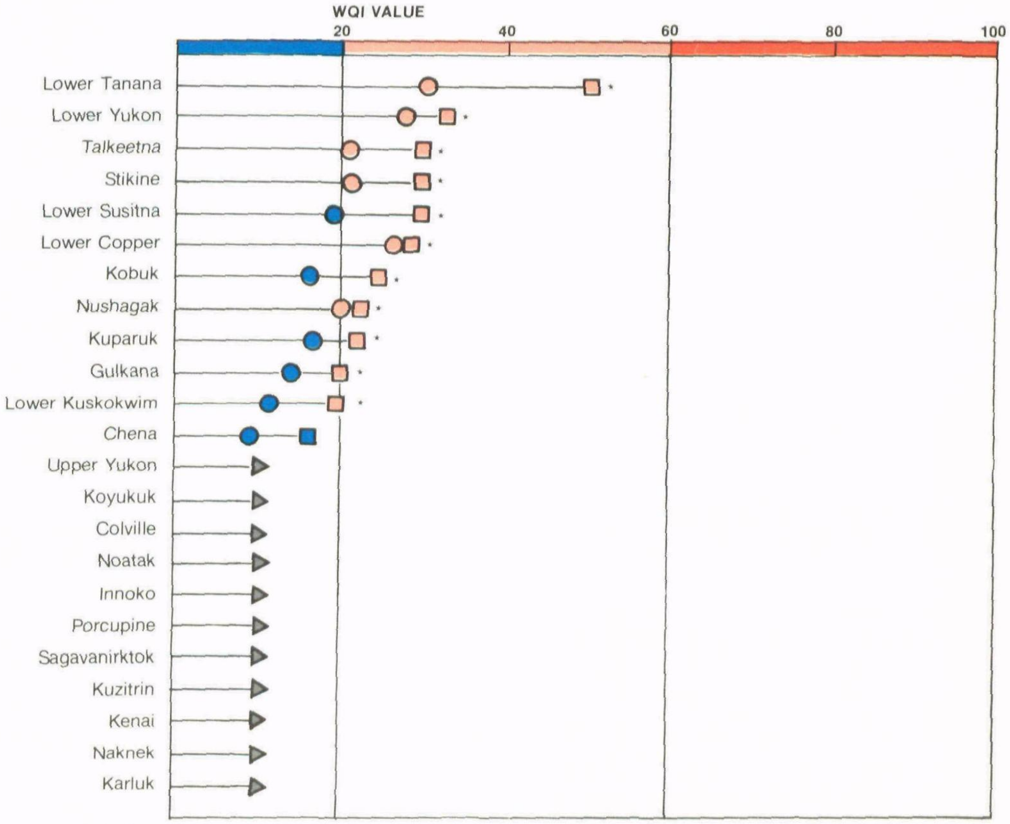


Figure 34.
Water Quality Index Values for Alaska's Principal Rivers



*All marginal rivers exceed sediment criteria which may be due to natural causes, such as glacial flows.

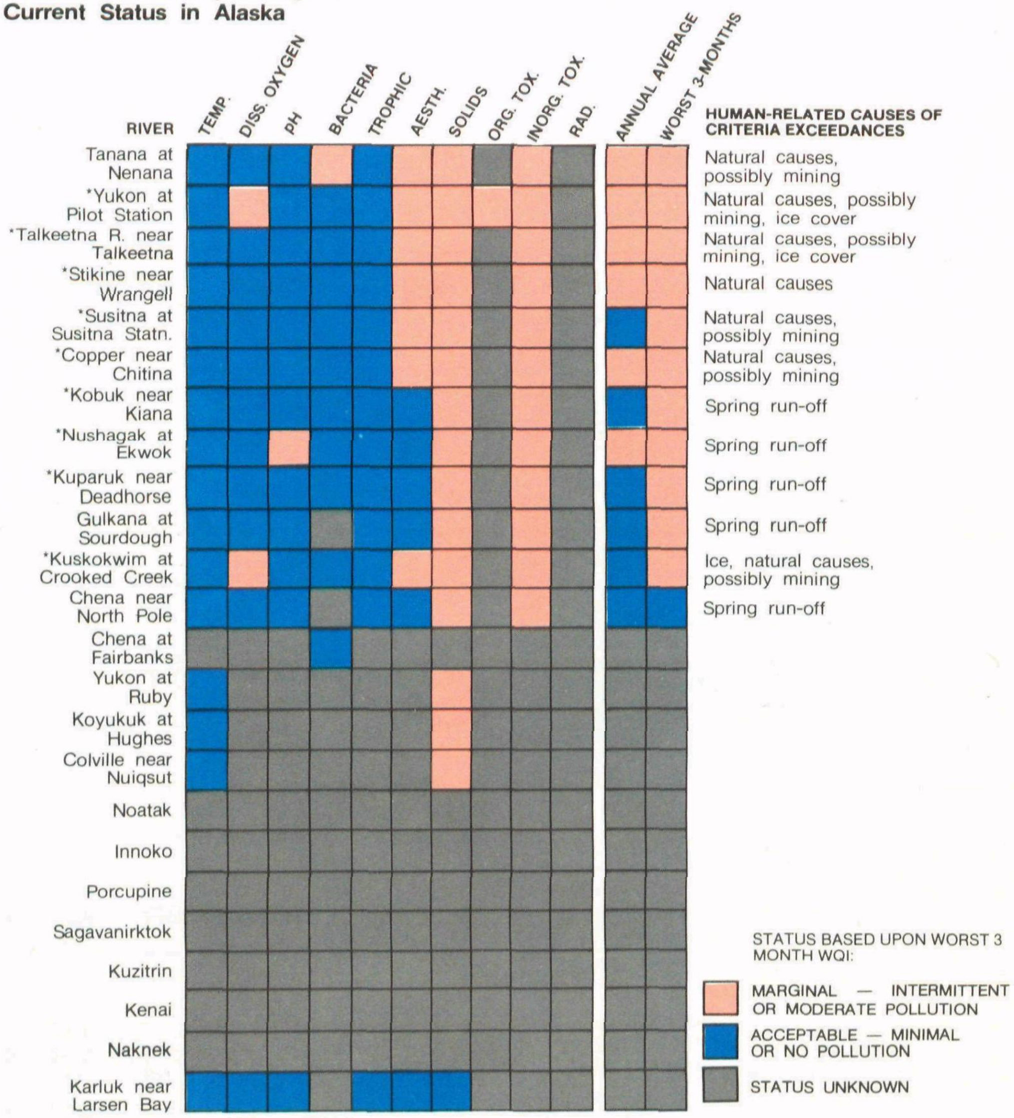
NOTE: Due to insufficient data, Index numbers could not be calculated for some rivers. Those values presented are calculated from only one monitoring station on each river.

☐ WORST 3 CONSECUTIVE MONTHS

○ ANNUAL AVERGE WATER QUALITY INDEX

▷ INSUFFICIENT DATA

Figure 35.
River Water Quality Categories
Current Status in Alaska



RIVER	TEMP.	DISS. OXYGEN	pH	BACTERIA	TROPHIC	AESTH.	SOLIDS	ORG. TOX.	INORG. TOX.	RAD.	ANNUAL AVERAGE	WORST 3-MONTHS	HUMAN-RELATED CAUSES OF CRITERIA EXCEEDANCES
Tanana at Nenana	🟦	🟦	🟦	🟥	🟦	🟥	🟥	▨	🟥	▨	🟥	🟥	Natural causes, possibly mining
*Yukon at Pilot Station	🟦	🟥	🟦	🟦	🟦	🟥	🟥	🟥	🟥	▨	🟥	🟥	Natural causes, possibly mining, ice cover
*Talkeetna R. near Talkeetna	🟦	🟦	🟦	🟦	🟦	🟥	🟥	▨	🟥	▨	🟥	🟥	Natural causes, possibly mining, ice cover
*Stikine near Wrangell	🟦	🟦	🟦	🟦	🟦	🟥	🟥	▨	🟥	▨	🟥	🟥	Natural causes
*Susitna at Susitna Statn.	🟦	🟦	🟦	🟦	🟦	🟥	🟥	▨	🟥	▨	🟦	🟥	Natural causes, possibly mining
*Copper near Chitina	🟦	🟦	🟦	🟦	🟦	🟥	🟥	▨	🟥	▨	🟥	🟥	Natural causes, possibly mining
*Kobuk near Kiana	🟦	🟦	🟦	🟦	🟦	🟦	🟥	▨	🟥	▨	🟦	🟥	Spring run-off
*Nushagak at Ekwok	🟦	🟦	🟥	🟦	🟦	🟦	🟥	▨	🟥	▨	🟥	🟥	Spring run-off
*Kuparuk near Deadhorse	🟦	🟦	🟦	🟦	🟦	🟦	🟥	▨	🟥	▨	🟦	🟥	Spring run-off
Gulkana at Sourdough	🟦	🟦	🟦	▨	🟦	🟦	🟥	▨	🟥	▨	🟦	🟥	Spring run-off
*Kuskokwim at Crooked Creek	🟦	🟥	🟦	🟦	🟦	🟥	🟥	▨	🟥	▨	🟦	🟥	Ice, natural causes, possibly mining
Chena near North Pole	🟦	🟦	🟦	▨	🟦	🟦	🟥	▨	🟥	▨	🟦	🟦	Spring run-off
Chena at Fairbanks	▨	▨	▨	🟦	▨	▨	▨	▨	▨	▨	▨	▨	
Yukon at Ruby	🟦	▨	▨	▨	▨	▨	🟥	▨	▨	▨	▨	▨	
Koyukuk at Hughes	🟦	▨	▨	▨	▨	▨	🟥	▨	▨	▨	▨	▨	
Colville near Nuiqsut	🟦	▨	▨	▨	▨	▨	🟥	▨	▨	▨	▨	▨	
Noatak	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	
Innoko	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	
Porcupine	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	
Sagavanirktok	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	
Kuzitrin	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	
Kenai	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	
Naknek	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	
Karluk near Larsen Bay	🟦	🟦	🟦	▨	🟦	🟦	🟦	▨	▨	▨	▨	▨	

STATUS BASED UPON WORST 3 MONTH WQI:

🟥 MARGINAL — INTERMITTENT OR MODERATE POLLUTION
🟦 ACCEPTABLE — MINIMAL OR NO POLLUTION
▨ STATUS UNKNOWN

*October 1977 - September 1979 data. Evaluations of the *remaining stations based upon data from October 1972* - September 1979. Insufficient data available for category trends analysis.

Figure 35 shows the current status of river water quality categories in Alaska. The bacterial problem indicated in the Tanana River is based upon 1973 and 1974 data and was due to sewage discharges from the Fairbanks area into the Chena River, a tributary to the Tanana. Since late 1976, these wastes have been diverted from the Chena River and treated by a new sewage treatment plant, which discharges to the Tanana River. Recent data indicate that the Chena at Fairbanks, once severely polluted by these discharges, now has acceptable bacterial levels. This will improve water quality in the Tanana, although no post-treatment data are available at this time.

Low dissolved oxygen levels in the Yukon and Kuskokwim River segments occur in the winter months due to the ice cover. Low pH values are occasionally observed in the Nushagak River for unknown reasons. The marginal organic toxicant rating for the Yukon River is due to one 2,4-D sample in excess of the criteria.

The Outlook for Alaska

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

Alaska's wastewater treatment program for municipal and industrial discharges is well-advanced but not yet complete; therefore 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. Pulp mills are presently increasing their treatment levels. As additional industrial treatment needs are met, water quality in localized areas should improve.

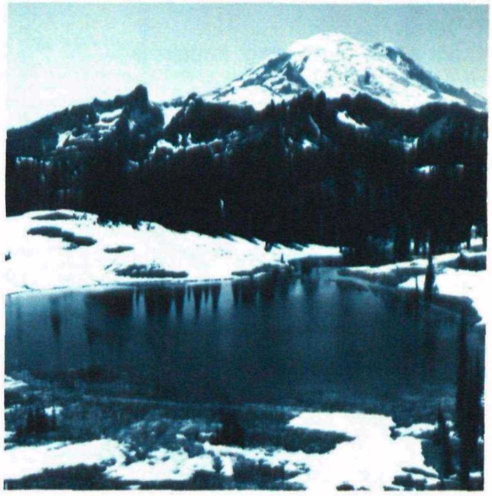
Urban center growth, resulting in increased discharges and urban runoff as well as increased recreational pressures on lakes and streams, will continue to cause problems in large communities such as Anchorage, Fairbanks, and Juneau. Various state and local management agencies are presently identifying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

Water quality degradation 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.

Timber harvesting as a non-point pollution source will become more significant in the future. Logging and the road construction that accompanies it add to the sediment load in a stream through accelerated erosion, particularly if the streambank vegetation is removed in the process. In the past, Alaska's timber industry existed on publicly owned timber land. Timber harvesting practices were rigidly established in lease and contract stipulations, although contract enforcement was frequently deficient. Such Federal controls would not apply to the millions of acres of land being conveyed into state and private ownership as a result of the Statehood Act, Alaska Native Claims Act, and state land disposal programs.

Construction in general, especially for roads, railroads, and pipelines also causes increased erosion and sediment loads. Conditions unique to Alaska, including permafrost, unstable stream channels, extreme temperature ranges, and glacial action accentuate the problem. Many of these situations are still being studied. The state is developing a manual of best management practices for transportation corridors.

Lake Water Quality



Inland lakes and waterways constitute one of the Region's most important recreational and commercial resources. It is generally felt that the lake water quality in the Pacific Northwest is among the best in the Nation. Only a few of the major recreational lakes have significant water quality problems that impair their recreational use.

How Lake Water Quality is Determined

A numerical water quality index has not been developed for lakes, as it has been for rivers. Instead, the water quality of the Region's lakes is evaluated based on ecological conditions (trophic status) and their impact on recreational use of the lakes. For comparison purposes, and to help analyze the extent to which recreational uses are impaired in any given lake, the measurement criteria shown in Table 3 were applied.

Factors Affecting Recreational Uses of Lakes

If a lake is undisturbed by human activities, it undergoes a natural process of aging known as eutrophication. Man's activities, however, may accelerate this process by introducing nutrients to lake waters through improper land use and waste disposal practices. Land use practices on farm land, forests, and construction sites often result in erosion of nutrient-rich soils into streams feeding lakes. Significant quantities of nutrients are also discharged by sewage treatment and certain industrial plants and urban, pasture, and feedlot runoff.

Water quality agencies are concerned with the trophic status of the Region's lakes because their many uses depend on their ecological conditions. Highly eutrophic lakes are characterized by dense algal blooms, floating mats of vegetation, and a murky appearance. Algae are found naturally in every body of water, but when stimulated by abundant nutrients, sunlight, and warm temperatures, they rapidly multiply to become a nuisance to recreational users while seriously affecting water quality for other uses. These plant nuisances may curtail or even eliminate recreational activities (such as swimming, boating, and fishing), impart tastes and odors to water supplies, and cause toxic conditions which adversely affect other aquatic life in the lakes. For example, when sufficient quantities of these growths die, the decaying process may consume quantities of dissolved oxygen sufficient to kill fish and other aquatic life. The recreational use of lakes in itself can affect water quality. Power boats create waves that erode banks, contributing to sediment, nutrients, and muddy water; they also release mixtures of oil and gasoline and associated contaminants to the water. Removal of vegetation along shorelines to enhance public access can also lead to erosion.

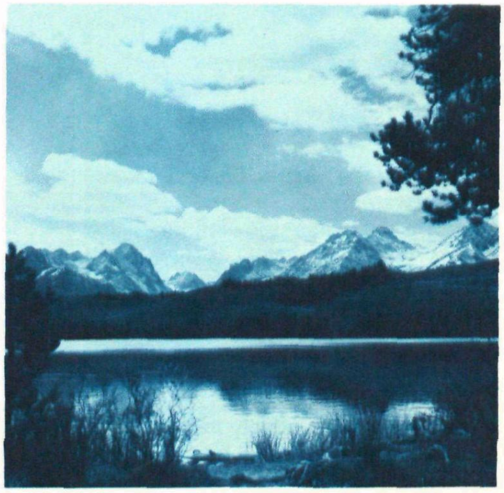
Table 3. Criteria for Evaluating Impairment of Lakes

	DEGREE OF IMPAIRMENT	
RECREATIONAL USE	NONE	
	CRITERIA	SCORE
Swimming	Very low bacteria levels (Fecal coliforms geometric mean less than 50 per 100 ml)	1
Fishing	No adverse conditions. Healthy fish population.	1
Boating	Less than 10% of surface area affected by aquatic weeds	1
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
SCORE	(No uses impaired)	4
RECREATIONAL USE	MODERATE	
	CRITERIA	SCORE
Swimming	Moderate bacteria levels (Fecal coliforms 50 to 200 per 100 ml)	2
Fishing	Slightly adverse conditions. Slight reduction in fish population.	2
Boating	10% to 30% affected	2
Aesthetics	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
SCORE	(All uses moderately impaired)	5-8
RECREATIONAL USE	SIGNIFICANT	
	CRITERIA	SCORE
Swimming	Unhealthy bacteria levels (Fecal coliforms greater than 200 per 100 ml)	3
Fishing	Adverse conditons. Significant reduction in fish population.	3
Boating	More than 30% affected	3
Aesthetics	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	(All uses significantly impaired)	9-12

The Regional Overview

The principal recreational lakes within the Region are of good quality, with relatively few impairments related to human activities. Figure 36 compares the percentage of lakes impaired for recreational use in each state. Figure 37 shows the location and impairment status of each lake on regional maps. Approximately half of the lakes assessed in Oregon, Washington, and Idaho, and most of the Alaskan lakes for which there is information, have little or no recreational impairment. However, some of these lakes are approaching a level of eutrophication that interferes with their desired uses.

The EPA Clean Lakes Program provides Federal grants to state water quality agencies to improve lake quality. In Washington, this program is supplemented by a state lake restoration program which provides matching funds to local agencies. Some measures being implemented to improve lake water quality include dredging to remove nutrient-containing sediments and decomposing plant material that consumes oxygen, flushing, bank erosion control, aeration, physically removing aquatic plants, and both chemical and biological controls to prevent eutrophication. Through these programs, many of the high-use recreational lakes in the Region are being restored and preserved for future generations.



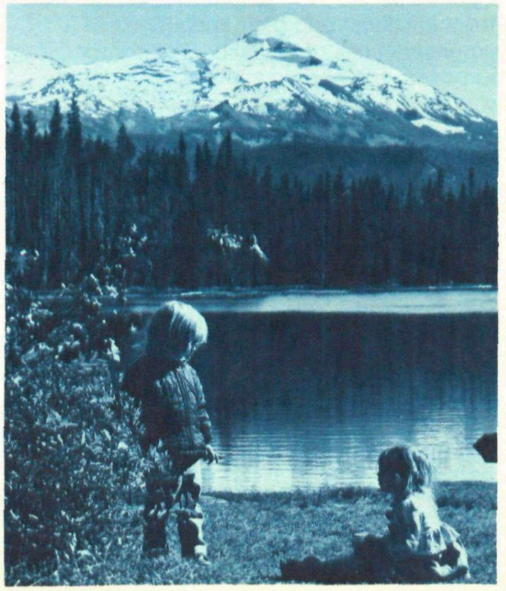
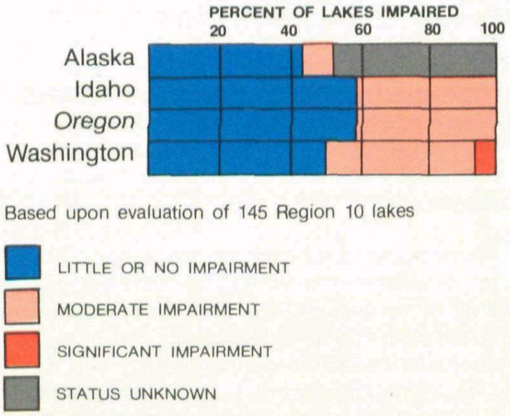


Figure 36.
Impairment Status of Recreational Lakes in Region 10



Based upon evaluation of 145 Region 10 lakes

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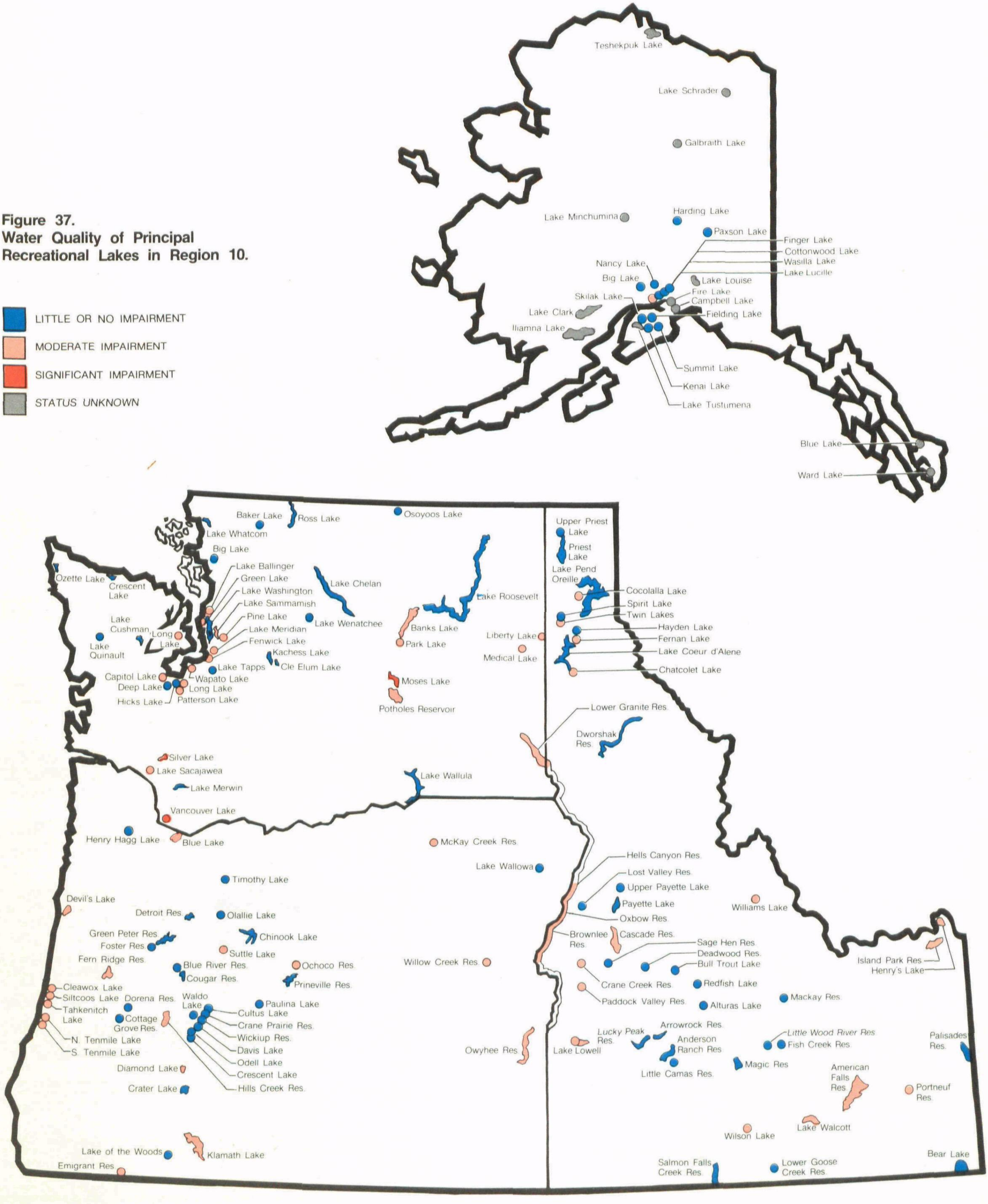
*A Secchi Disc is a round black and white plate suspended on a chain and used to determine water clarity.

**ug/l = micrograms per liter, a measurement used for low concentrations of dissolved substances.

Figure 37.
Water Quality of Principal Recreational Lakes in Region 10.

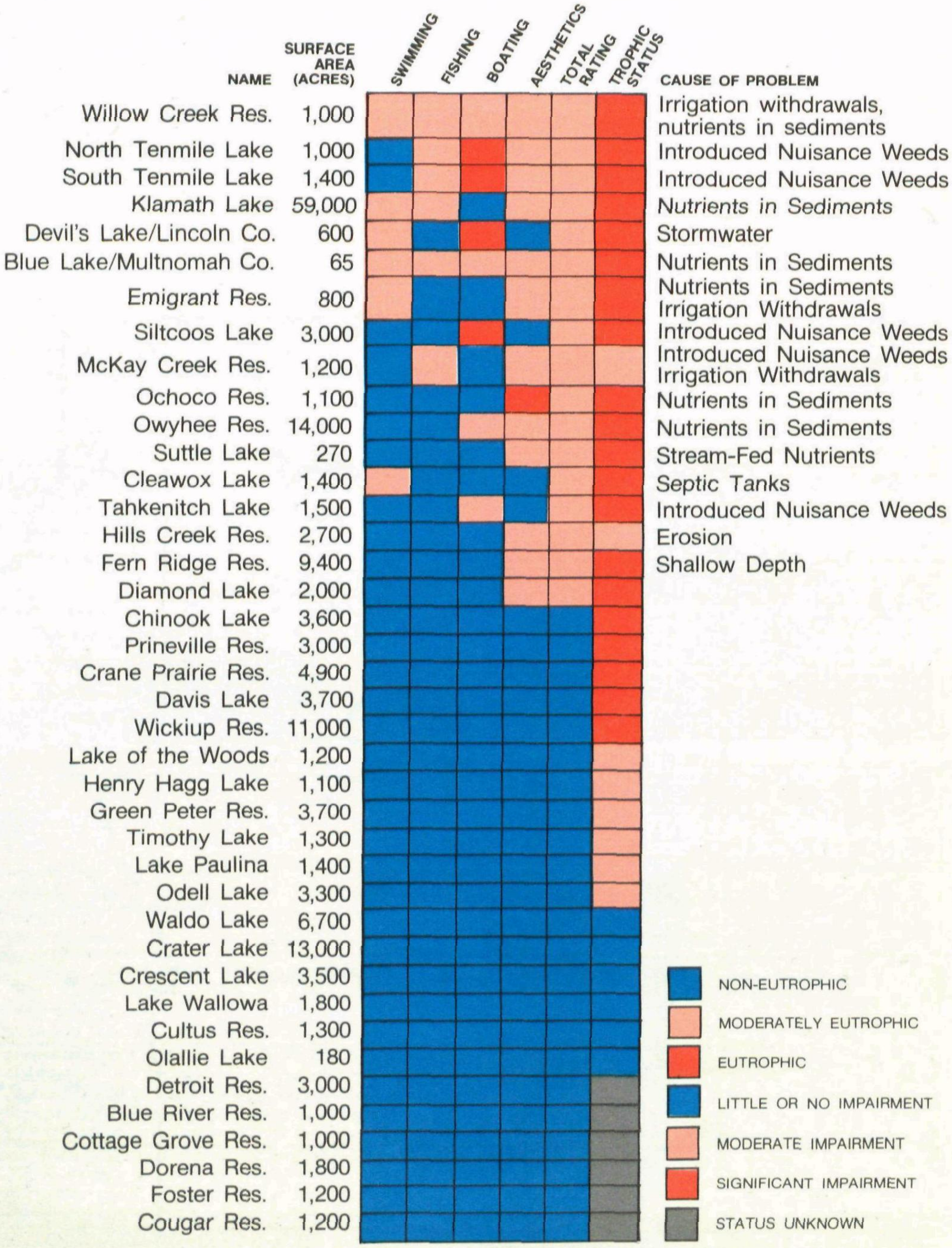


Oregon Lake Water Quality

Figure 38 shows the extent and major causes of use impairment for the principal recreational lakes in Oregon. Seventeen of these lakes are moderately impaired, mostly due to aesthetic conditions (algae blooms) and aquatic weed growths. Nutrients that support the weed and algal growths are, in some cases, supplied by bottom muds accumulated from soil erosion, and in others are due to septic drainage from recreational and residential development.

The quality of a few of these lakes has been at least partially restored. Commonwealth Lake near Portland, for example, which suffered from algae blooms and proliferation of aquatic weeds, was successfully restored by dredging and flushing with water diverted from a nearby creek. Riprap, bulkheads, and a perimeter walkway reduced siltation in the lake. In Diamond Lake, Douglas County, nutrients from sewage had accelerated eutrophication. Sewage was diverted from the lake drainage, and fish-cleaning and trailer-dumping stations were installed to further limit nutrients reaching the lake. Other lakes still have problems. Blue Lake near Portland, for example, has high recreational potential, but it is highly eutrophic with summer blooms of algae. This is due in part to a nutrient-rich water supply. On the coast, Devil's Lake experiences rapid siltation due to stormwater runoff. Feasibility studies have been initiated under the Clean Lakes Program for the restoration of Devil's Lake, Klamath Lake, Fern Ridge Reservoir, Sturgeon Lake, and Mirror Pond.

Figure 38.
The Recreational Impairment and Trophic Status of Principal Recreational Lakes in Oregon



NAME	SURFACE AREA (ACRES)	SWIMMING	FISHING	BOATING	AESTHETICS	TOTAL RATING	TROPHIC STATUS	CAUSE OF PROBLEM
Willow Creek Res.	1,000	▨	▨	▨	▨	▨	🟥	Irrigation withdrawals, nutrients in sediments
North Tenmile Lake	1,000	🟦	▨	🟥	▨	▨	🟥	Introduced Nuisance Weeds
South Tenmile Lake	1,400	🟦	▨	🟥	▨	▨	🟥	Introduced Nuisance Weeds
Klamath Lake	59,000	▨	▨	🟦	▨	▨	🟥	Nutrients in Sediments
Devil's Lake/Lincoln Co.	600	▨	🟦	🟥	🟦	▨	🟥	Stormwater
Blue Lake/Multnomah Co.	65	▨	▨	▨	▨	▨	🟥	Nutrients in Sediments
Emigrant Res.	800	▨	🟦	🟦	▨	▨	🟥	Nutrients in Sediments Irrigation Withdrawals
Siltcoos Lake	3,000	🟦	🟦	🟥	🟦	▨	🟥	Introduced Nuisance Weeds
McKay Creek Res.	1,200	🟦	▨	🟦	▨	▨	▨	Introduced Nuisance Weeds Irrigation Withdrawals
Ochoco Res.	1,100	🟦	🟦	🟦	🟥	▨	🟥	Nutrients in Sediments
Owyhee Res.	14,000	🟦	🟦	▨	▨	▨	🟥	Nutrients in Sediments
Suttle Lake	270	🟦	🟦	🟦	▨	▨	🟥	Stream-Fed Nutrients
Cleawox Lake	1,400	▨	🟦	🟦	🟦	▨	🟥	Septic Tanks
Tahkenitch Lake	1,500	🟦	🟦	▨	🟦	▨	🟥	Introduced Nuisance Weeds
Hills Creek Res.	2,700	🟦	🟦	🟦	▨	▨	▨	Erosion
Fern Ridge Res.	9,400	🟦	🟦	🟦	▨	▨	🟥	Shallow Depth
Diamond Lake	2,000	🟦	🟦	🟦	▨	▨	🟥	
Chinook Lake	3,600	🟦	🟦	🟦	🟦	🟦	🟥	
Prineville Res.	3,000	🟦	🟦	🟦	🟦	🟦	🟥	
Crane Prairie Res.	4,900	🟦	🟦	🟦	🟦	🟦	🟥	
Davis Lake	3,700	🟦	🟦	🟦	🟦	🟦	🟥	
Wickiup Res.	11,000	🟦	🟦	🟦	🟦	🟦	🟥	
Lake of the Woods	1,200	🟦	🟦	🟦	🟦	🟦	▨	
Henry Hagg Lake	1,100	🟦	🟦	🟦	🟦	🟦	▨	
Green Peter Res.	3,700	🟦	🟦	🟦	🟦	🟦	▨	
Timothy Lake	1,300	🟦	🟦	🟦	🟦	🟦	▨	
Lake Paulina	1,400	🟦	🟦	🟦	🟦	🟦	▨	
Odell Lake	3,300	🟦	🟦	🟦	🟦	🟦	▨	
Waldo Lake	6,700	🟦	🟦	🟦	🟦	🟦	🟦	
Crater Lake	13,000	🟦	🟦	🟦	🟦	🟦	🟦	
Crescent Lake	3,500	🟦	🟦	🟦	🟦	🟦	🟦	
Lake Wallowa	1,800	🟦	🟦	🟦	🟦	🟦	🟦	
Cultus Res.	1,300	🟦	🟦	🟦	🟦	🟦	🟦	
Olallie Lake	180	🟦	🟦	🟦	🟦	🟦	🟦	
Detroit Res.	3,000	🟦	🟦	🟦	🟦	🟦	▩	
Blue River Res.	1,000	🟦	🟦	🟦	🟦	🟦	▩	
Cottage Grove Res.	1,000	🟦	🟦	🟦	🟦	🟦	▩	
Dorena Res.	1,800	🟦	🟦	🟦	🟦	🟦	▩	
Foster Res.	1,200	🟦	🟦	🟦	🟦	🟦	▩	
Cougar Res.	1,200	🟦	🟦	🟦	🟦	🟦	▩	

🟦 NON-EUTROPHIC
▨ MODERATELY EUTROPHIC
🟥 EUTROPHIC
🟦 LITTLE OR NO IMPAIRMENT
▨ MODERATE IMPAIRMENT
🟥 SIGNIFICANT IMPAIRMENT
▩ STATUS UNKNOWN

Washington Lake Water Quality

Figure 39 shows the extent and major causes of use impairment for the principal recreational lakes in Washington. Vancouver Lake, Moses Lake, and Silver Lake are considered significantly impaired in two or more respects. Another 17 lakes are moderately impaired, mostly due to aesthetic conditions. Most of the lakes with water quality problems receive stormwater runoff and septic tank seepage from lakeside residential areas. The large lakes and reservoirs of eastern Washington receive irrigation return flows and runoff from agricultural lands that contain fertilizers and animal wastes which accelerates the eutrophication processes.

Some measures are being implemented through the state and Federal programs to restore recreational amenities. For example, Medical Lake was treated with alum to precipitate excess phosphorous to the lake bottom, to form a layer over the sediments. This treatment resulted in a 90% reduction in phosphorous and substantially reduced the algal growths. Spada-Chaplain Lake had high levels of turbidity which were reduced by re-routing stream channels and stream beds to reduce erosion of clay into the lake and by revegetating the banks of the lake. Plans to improve water quality in Vancouver Lake and Lake Sacajawea include dredging, dilution, and control of polluting urban and agricultural runoff.

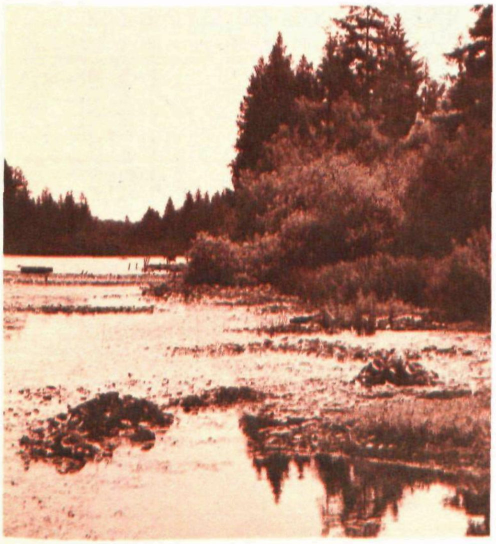
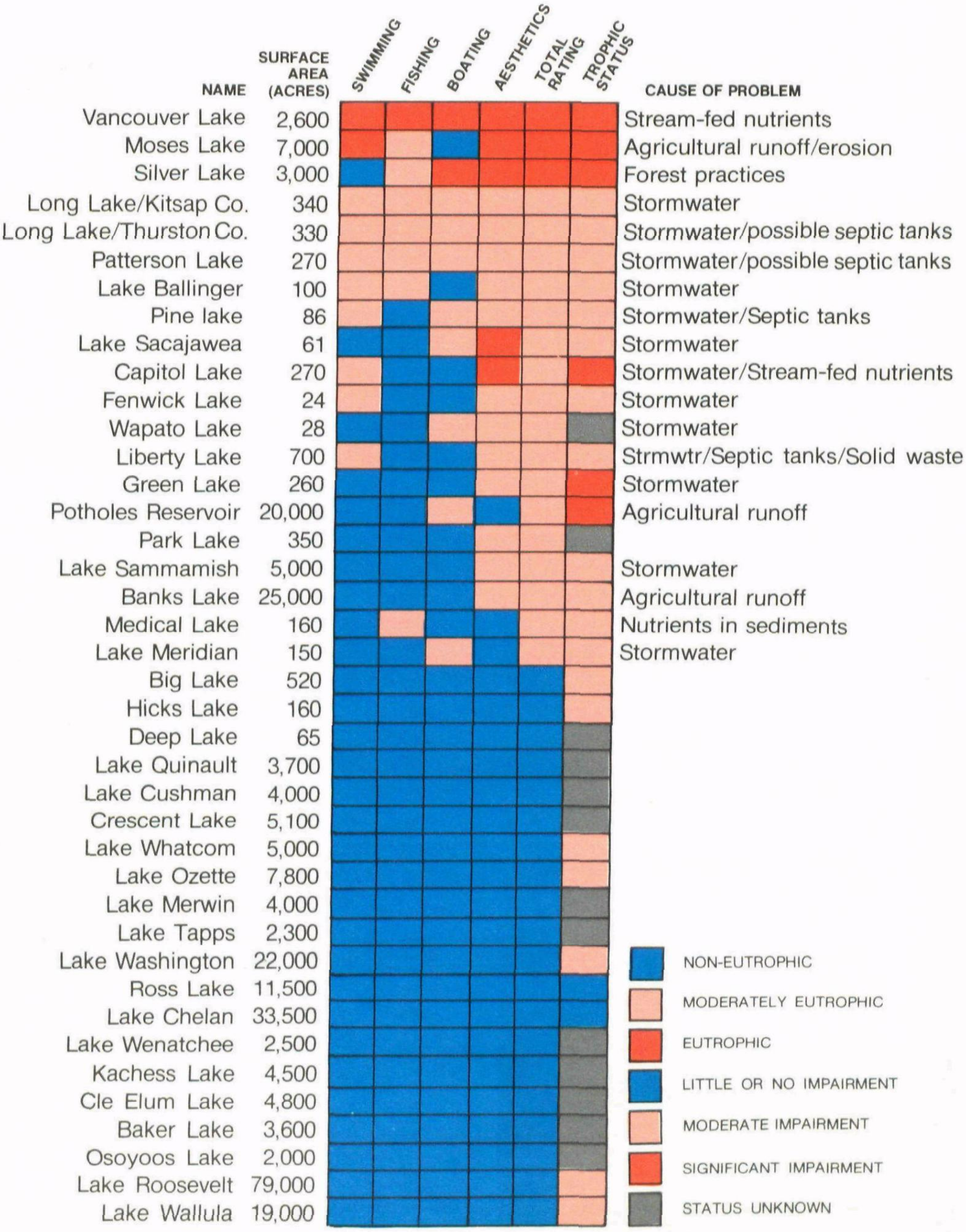


Figure 39.
The Recreational Impairment and Trophic Status of the Principal Recreational Lakes in Washington



NAME	SURFACE AREA (ACRES)	SWIMMING	FISHING	BOATING	AESTHETICS	TOTAL RATING	TROPHIC STATUS	CAUSE OF PROBLEM
Vancouver Lake	2,600	🟥	🟥	🟥	🟥	🟥	🟥	Stream-fed nutrients
Moses Lake	7,000	🟥	🟧	🟦	🟥	🟥	🟥	Agricultural runoff/erosion
Silver Lake	3,000	🟦	🟧	🟥	🟥	🟥	🟥	Forest practices
Long Lake/Kitsap Co.	340	🟧	🟧	🟧	🟧	🟧	🟧	Stormwater
Long Lake/Thurston Co.	330	🟧	🟧	🟧	🟧	🟧	🟧	Stormwater/possible septic tanks
Patterson Lake	270	🟧	🟧	🟧	🟧	🟧	🟧	Stormwater/possible septic tanks
Lake Ballinger	100	🟧	🟧	🟦	🟧	🟧	🟧	Stormwater
Pine lake	86	🟧	🟦	🟧	🟧	🟧	🟧	Stormwater/Septic tanks
Lake Sacajawea	61	🟦	🟦	🟧	🟥	🟧	🟧	Stormwater
Capitol Lake	270	🟧	🟦	🟦	🟥	🟧	🟥	Stormwater/Stream-fed nutrients
Fenwick Lake	24	🟧	🟦	🟦	🟧	🟧	🟧	Stormwater
Wapato Lake	28	🟦	🟦	🟧	🟧	🟧	⬛	Stormwater
Liberty Lake	700	🟧	🟦	🟦	🟧	🟧	🟧	Strmwtr/Septic tanks/Solid waste
Green Lake	260	🟦	🟦	🟦	🟧	🟧	🟥	Stormwater
Potholes Reservoir	20,000	🟦	🟦	🟧	🟦	🟧	🟥	Agricultural runoff
Park Lake	350	🟦	🟦	🟦	🟧	🟧	⬛	
Lake Sammamish	5,000	🟦	🟦	🟦	🟧	🟧	🟧	Stormwater
Banks Lake	25,000	🟦	🟦	🟦	🟧	🟧	🟧	Agricultural runoff
Medical Lake	160	🟦	🟧	🟦	🟦	🟧	🟧	Nutrients in sediments
Lake Meridian	150	🟦	🟦	🟧	🟦	🟧	🟧	Stormwater
Big Lake	520	🟦	🟦	🟦	🟦	🟦	🟧	
Hicks Lake	160	🟦	🟦	🟦	🟦	🟦	🟧	
Deep Lake	65	🟦	🟦	🟦	🟦	🟦	⬛	
Lake Quinault	3,700	🟦	🟦	🟦	🟦	🟦	⬛	
Lake Cushman	4,000	🟦	🟦	🟦	🟦	🟦	⬛	
Crescent Lake	5,100	🟦	🟦	🟦	🟦	🟦	⬛	
Lake Whatcom	5,000	🟦	🟦	🟦	🟦	🟦	🟧	
Lake Ozette	7,800	🟦	🟦	🟦	🟦	🟦	🟧	
Lake Merwin	4,000	🟦	🟦	🟦	🟦	🟦	⬛	
Lake Tapps	2,300	🟦	🟦	🟦	🟦	🟦	⬛	
Lake Washington	22,000	🟦	🟦	🟦	🟦	🟦	🟧	
Ross Lake	11,500	🟦	🟦	🟦	🟦	🟦	🟦	
Lake Chelan	33,500	🟦	🟦	🟦	🟦	🟦	🟦	
Lake Wenatchee	2,500	🟦	🟦	🟦	🟦	🟦	⬛	
Kachess Lake	4,500	🟦	🟦	🟦	🟦	🟦	⬛	
Cle Elum Lake	4,800	🟦	🟦	🟦	🟦	🟦	⬛	
Baker Lake	3,600	🟦	🟦	🟦	🟦	🟦	⬛	
Osoyoos Lake	2,000	🟦	🟦	🟦	🟦	🟦	⬛	
Lake Roosevelt	79,000	🟦	🟦	🟦	🟦	🟦	🟧	
Lake Wallula	19,000	🟦	🟦	🟦	🟦	🟦	🟧	

🟦 NON-EUTROPHIC
🟧 MODERATELY EUTROPHIC
🟥 EUTROPHIC
🟦 LITTLE OR NO IMPAIRMENT
🟧 MODERATE IMPAIRMENT
🟥 SIGNIFICANT IMPAIRMENT
⬛ STATUS UNKNOWN

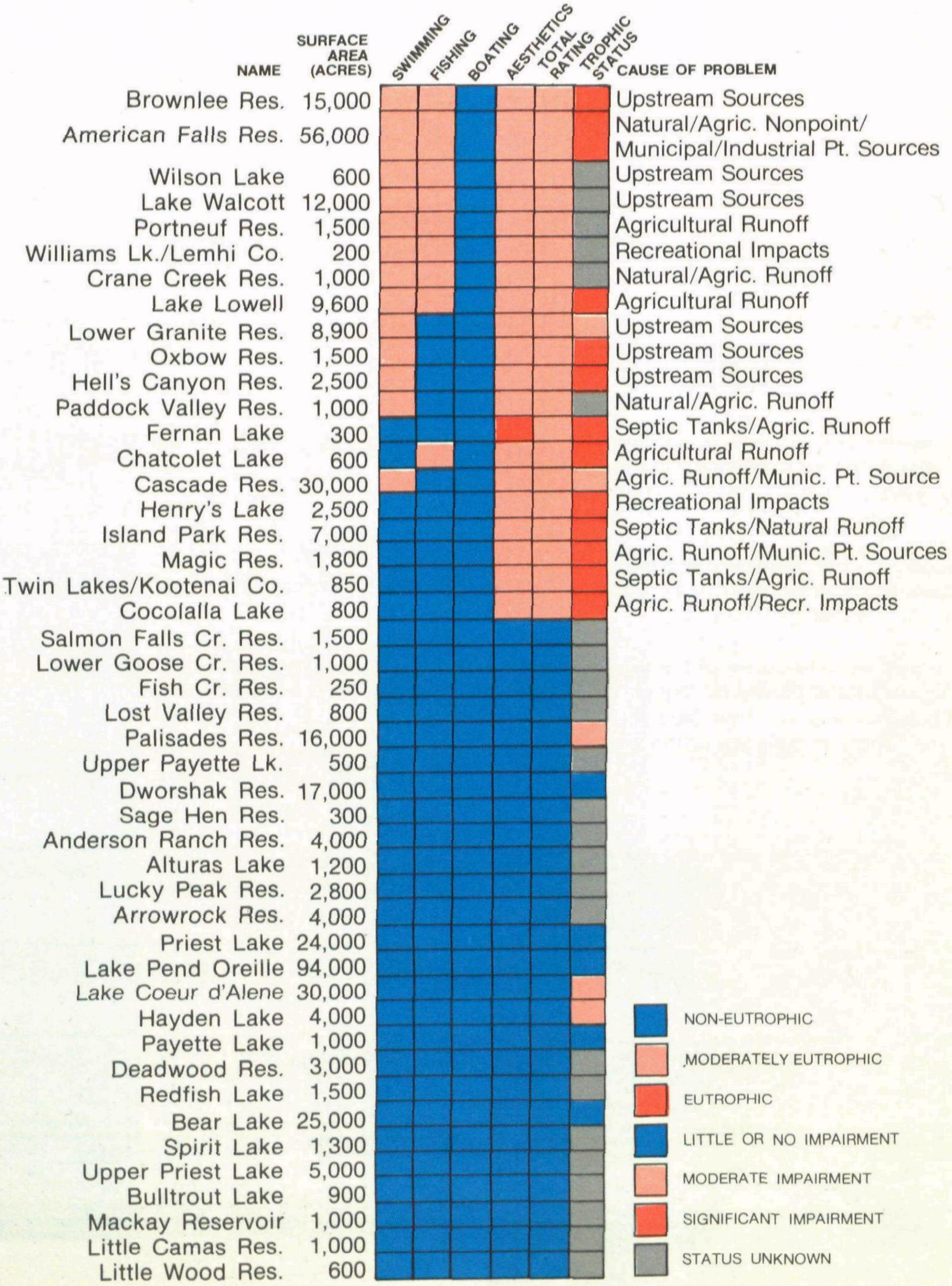
Idaho Lake Water Quality

Figure 40 shows the extent and major causes of use impairment for the principal lakes in Idaho. Most impairments appear to be due to algal blooms stimulated by nutrients from agricultural runoff and septic tanks. Runoff from agricultural non-point sources entering the Snake River upstream of Oxbow and Brownlee Reservoirs has degraded these two lakes. Lake Lowell, an off-stream reservoir near Boise, receives heavy recreational usage by residents of the Boise Valley. Excessive algal growth in the summer impairs such use. The photosynthetic activity and eventual decomposition of the algae reduce the dissolved oxygen levels, which may be adversely affecting the fishery resource of the reservoir. These conditions are primarily due to the nutrient enrichment of summer inflows by agricultural non-point sources.

The water quality of American Falls Reservoir is affected by nutrients from dryland and irrigated agriculture, winter discharges of treated sewage effluent from Pocatello, phosphate deposits in the soils, and from many springs in the area.

Measures are being considered to restore a few of these lakes. Studies have been performed to better define sources of nutrients and the other water quality problems in Lake Lowell. No restoration program has been initiated, however. The wastewater from the Simplot Plant at Pocatello and summer discharges from the Pocatello sewage treatment plant have been removed from the Portneuf River, which flows into the American Falls Reservoir. This, plus the eventual application of best management practices to agriculture, should reduce this reservoir's problems considerably.

Figure 40.
The Recreational Impairment and Trophic Status of the Principal Recreational Lakes in Idaho



NAME	SURFACE AREA (ACRES)	SWIMMING	FISHING	BOATING	AESTHETICS	TOTAL RATING	TROPHIC STATUS	CAUSE OF PROBLEM
Brownlee Res.	15,000	🟧	🟧	🟦	🟧	🟧	🟥	Upstream Sources
American Falls Res.	56,000	🟧	🟧	🟦	🟧	🟧	🟥	Natural/Agric. Nonpoint/ Municipal/Industrial Pt. Sources
Wilson Lake	600	🟧	🟧	🟦	🟧	🟧	⬛	Upstream Sources
Lake Walcott	12,000	🟧	🟧	🟦	🟧	🟧	⬛	Upstream Sources
Portneuf Res.	1,500	🟧	🟧	🟦	🟧	🟧	⬛	Agricultural Runoff
Williams Lk./Lemhi Co.	200	🟧	🟧	🟦	🟧	🟧	⬛	Recreational Impacts
Crane Creek Res.	1,000	🟧	🟧	🟦	🟧	🟧	⬛	Natural/Agric. Runoff
Lake Lowell	9,600	🟧	🟧	🟦	🟧	🟧	🟥	Agricultural Runoff
Lower Granite Res.	8,900	🟧	🟦	🟦	🟧	🟧	🟧	Upstream Sources
Oxbow Res.	1,500	🟧	🟦	🟦	🟧	🟧	🟥	Upstream Sources
Hell's Canyon Res.	2,500	🟧	🟦	🟦	🟧	🟧	🟥	Upstream Sources
Paddock Valley Res.	1,000	🟧	🟦	🟦	🟧	🟧	⬛	Natural/Agric. Runoff
Fernan Lake	300	🟦	🟦	🟦	🟥	🟧	🟥	Septic Tanks/Agric. Runoff
Chatcolet Lake	600	🟦	🟧	🟦	🟧	🟧	🟥	Agricultural Runoff
Cascade Res.	30,000	🟧	🟦	🟦	🟧	🟧	🟧	Agric. Runoff/Munic. Pt. Source
Henry's Lake	2,500	🟦	🟦	🟦	🟧	🟧	🟥	Recreational Impacts
Island Park Res.	7,000	🟦	🟦	🟦	🟧	🟧	🟥	Septic Tanks/Natural Runoff
Magic Res.	1,800	🟦	🟦	🟦	🟧	🟧	🟥	Agric. Runoff/Munic. Pt. Sources
Twin Lakes/Kootenai Co.	850	🟦	🟦	🟦	🟧	🟧	🟥	Septic Tanks/Agric. Runoff
Cocolalla Lake	800	🟦	🟦	🟦	🟧	🟧	🟥	Agric. Runoff/Recr. Impacts
Salmon Falls Cr. Res.	1,500	🟦	🟦	🟦	🟦	🟦	⬛	
Lower Goose Cr. Res.	1,000	🟦	🟦	🟦	🟦	🟦	⬛	
Fish Cr. Res.	250	🟦	🟦	🟦	🟦	🟦	⬛	
Lost Valley Res.	800	🟦	🟦	🟦	🟦	🟦	⬛	
Palisades Res.	16,000	🟦	🟦	🟦	🟦	🟦	🟧	
Upper Payette Lk.	500	🟦	🟦	🟦	🟦	🟦	⬛	
Dworshak Res.	17,000	🟦	🟦	🟦	🟦	🟦	🟦	
Sage Hen Res.	300	🟦	🟦	🟦	🟦	🟦	⬛	
Anderson Ranch Res.	4,000	🟦	🟦	🟦	🟦	🟦	⬛	
Alturas Lake	1,200	🟦	🟦	🟦	🟦	🟦	⬛	
Lucky Peak Res.	2,800	🟦	🟦	🟦	🟦	🟦	⬛	
Arrowrock Res.	4,000	🟦	🟦	🟦	🟦	🟦	⬛	
Priest Lake	24,000	🟦	🟦	🟦	🟦	🟦	🟦	
Lake Pend Oreille	94,000	🟦	🟦	🟦	🟦	🟦	🟦	
Lake Coeur d'Alene	30,000	🟦	🟦	🟦	🟦	🟦	🟧	
Hayden Lake	4,000	🟦	🟦	🟦	🟦	🟦	🟧	
Payette Lake	1,000	🟦	🟦	🟦	🟦	🟦	🟦	
Deadwood Res.	3,000	🟦	🟦	🟦	🟦	🟦	⬛	
Redfish Lake	1,500	🟦	🟦	🟦	🟦	🟦	⬛	
Bear Lake	25,000	🟦	🟦	🟦	🟦	🟦	🟦	
Spirit Lake	1,300	🟦	🟦	🟦	🟦	🟦	⬛	
Upper Priest Lake	5,000	🟦	🟦	🟦	🟦	🟦	⬛	
Bulltrout Lake	900	🟦	🟦	🟦	🟦	🟦	⬛	
Mackay Reservoir	1,000	🟦	🟦	🟦	🟦	🟦	⬛	
Little Camas Res.	1,000	🟦	🟦	🟦	🟦	🟦	⬛	
Little Wood Res.	600	🟦	🟦	🟦	🟦	🟦	⬛	

🟦 NON-EUTROPHIC
🟧 MODERATELY EUTROPHIC
🟥 EUTROPHIC
🟦 LITTLE OR NO IMPAIRMENT
🟧 MODERATE IMPAIRMENT
🟥 SIGNIFICANT IMPAIRMENT
⬛ STATUS UNKNOWN

Alaska Lake Water Quality

Little is known about most Alaska lakes. Several of the more readily accessible lakes near Anchorage are exhibiting signs of advancing eutrophication and recreational use impairment as shown in Figure 41.

Recently the state studied certain lakes in the Palmer-Wasilla area, a fertile farming region near Anchorage which is experiencing rapid residential development. The population has grown by 15 to 20 percent a year over the past 3 years. The Alaska Department of Fish and Game has found 36 of over 100 lakes with low dissolved oxygen in the winter, although the cause is unknown. For many lakes, it may be a natural condition; however, human activities may be a contributing factor.

The trophic conditions of four lakes near Wasilla (Lucille, Wasilla, Cottonwood, and Finger) were studied more intensely. All are heavily used for recreation, and the public has expressed some concern about water quality. Of the four, Lucille is the most shallow, with a mean depth of 1.7 meters, and also the most eutrophic. In winter dissolved oxygen levels drop to almost zero, and the lake has a history of fish kills. There is considerable algae growth in the summer, though not yet to the extent that it interferes with boating. The lake is not used much for swimming since it is so shallow. The other three lakes are deeper and are only moderately eutrophic, with some algae growth in isolated portions of the lakes.

Alaska is becoming involved in the Clean Lakes Program and other problem lakes are being identified.

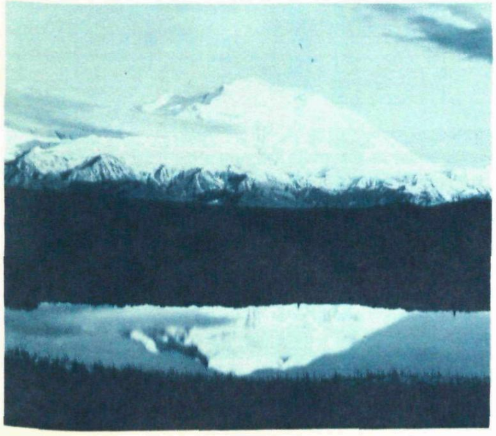
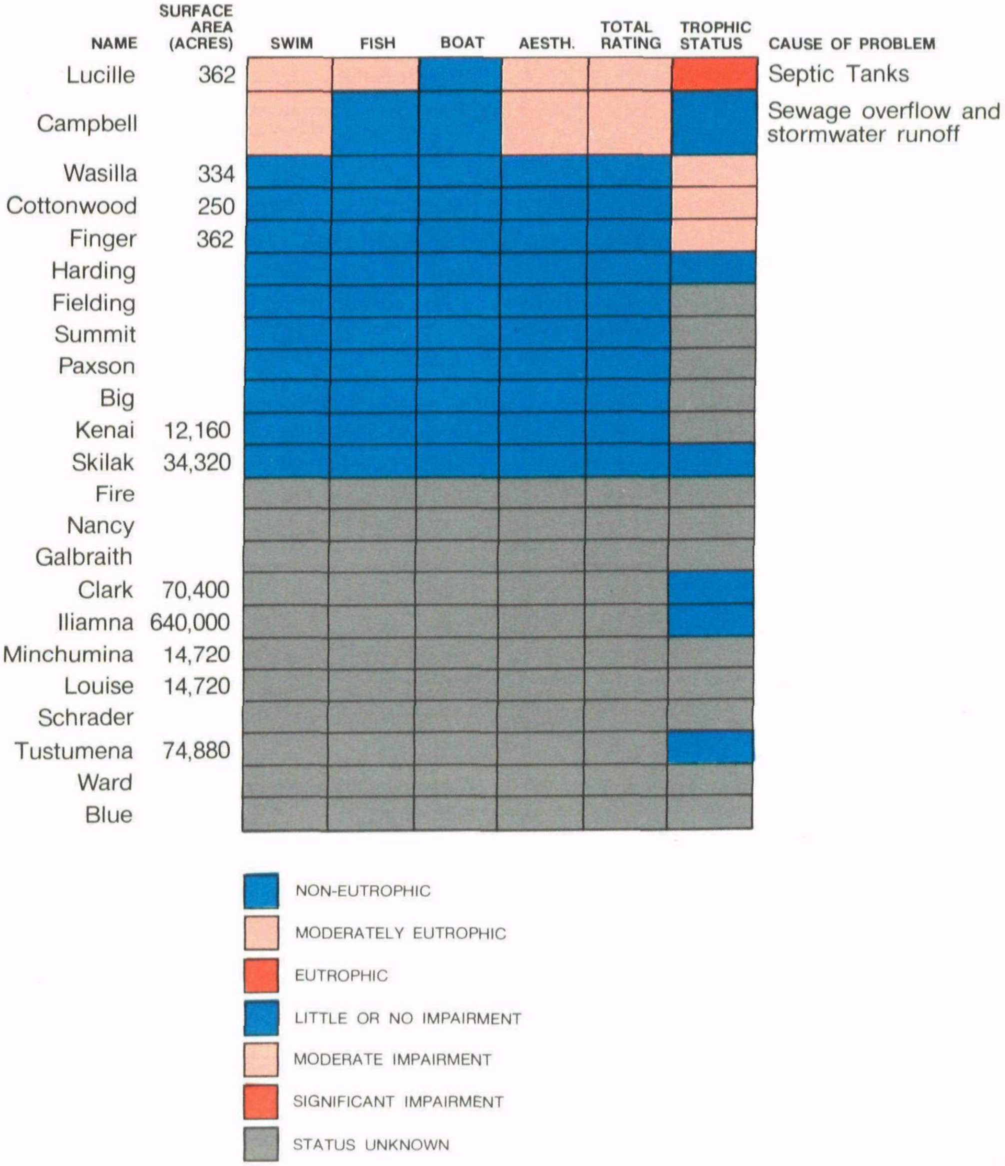


Figure 41.
The Recreational Impairment and Trophic Status of the Principal Recreational Lakes in Alaska



NAME	SURFACE AREA (ACRES)	SWIM	FISH	BOAT	AESTH.	TOTAL RATING	TROPHIC STATUS	CAUSE OF PROBLEM
Lucille	362	🟧	🟧	🟦	🟧	🟧	🟥	Septic Tanks
Campbell		🟧	🟦	🟦	🟧	🟧	🟦	Sewage overflow and stormwater runoff
Wasilla	334	🟦	🟦	🟦	🟦	🟦	🟧	
Cottonwood	250	🟦	🟦	🟦	🟦	🟦	🟧	
Finger	362	🟦	🟦	🟦	🟦	🟦	🟧	
Harding		🟦	🟦	🟦	🟦	🟦	🟦	
Fielding		🟦	🟦	🟦	🟦	🟦	▩	
Summit		🟦	🟦	🟦	🟦	🟦	▩	
Paxson		🟦	🟦	🟦	🟦	🟦	▩	
Big		🟦	🟦	🟦	🟦	🟦	▩	
Kenai	12,160	🟦	🟦	🟦	🟦	🟦	▩	
Skilak	34,320	🟦	🟦	🟦	🟦	🟦	🟦	
Fire		▩	▩	▩	▩	▩	▩	
Nancy		▩	▩	▩	▩	▩	▩	
Galbraith		▩	▩	▩	▩	▩	▩	
Clark	70,400	▩	▩	▩	▩	▩	🟦	
Iliamna	640,000	▩	▩	▩	▩	▩	🟦	
Minchumina	14,720	▩	▩	▩	▩	▩	▩	
Louise	14,720	▩	▩	▩	▩	▩	▩	
Schrader		▩	▩	▩	▩	▩	▩	
Tustumena	74,880	▩	▩	▩	▩	▩	🟦	
Ward		▩	▩	▩	▩	▩	▩	
Blue		▩	▩	▩	▩	▩	▩	

🟦 NON-EUTROPHIC
🟧 MODERATELY EUTROPHIC
🟥 EUTROPHIC
🟦 LITTLE OR NO IMPAIRMENT
🟧 MODERATE IMPAIRMENT
🟥 SIGNIFICANT IMPAIRMENT
▩ STATUS UNKNOWN

Marine Water Quality

Coastal and estuarine waters contribute greatly to the commercial and recreational assets of the Northwest. While the majority of these waters are relatively free of pollution, there is some generally localized contamination from municipal sewage discharge and from agricultural and logging operations carried to estuaries by some rivers.

How Marine Water Quality is Determined

Since sampling and analysis of marine water is complex and expensive, the amount of available data is limited, and a marine water index has not been devised. The quality of certain saltwater areas, however, can be inferred from the condition of shellfish. Shellfish concentrate disease-causing bacteria, viruses, toxic chemicals, and other contaminants from the water in which they live. Consequently, shellfish indicate the degree of pollution in marine waters and provide an indirect way of assessing the success of pollution control efforts.

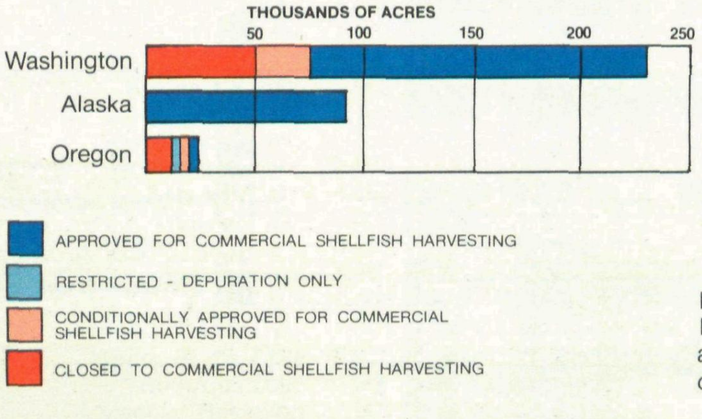
In this report, marine water quality determinations are based upon criteria designed for human consumption of shellfish, which are established by the U.S. Food and Drug Administration for the National Shellfish Sanitation Program. Waters that are free from fecal contamination (bacteria from sewage), industrial wastes, radioactive elements, and biotoxins (certain naturally produced poisons) are classified as "approved for commercial shellfish harvesting." "Conditionally approved" waters may be closed when seasonal increases in population, freshwater runoff containing contaminants at certain times of the year, or temporary malfunctioning of wastewater treatment plants result in failure to meet the criteria. Waters found to be contaminated or suspected of being contaminated, which would produce shellfish unsafe for human consumption, are classified as "closed."

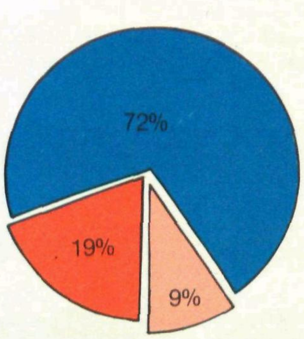
The Regional Overview

A total of 349,000 acres has been classified as commercial shellfish growing area in Region 10 (see Figure 42). This represents approximately 2 percent of the classified growing waters in the Nation. Of the regional growing area, 72 percent is classified as approved, 9 percent conditionally approved, and 19 percent closed. Regionally, Washington contains the largest percentage of the total classified area (65 percent or 228,900 acres), followed by Alaska (27 percent or 92,400 acres), and Oregon (8 percent or 28,100 acres).

Information on the quality of many marine waters used for swimming and recreational shellfish harvesting is quite limited. Until more is obtained, it is generally not recommended that these pursuits be undertaken near sewage treatment plant discharges, in areas subject to septic tank drainage, or in areas known to receive agricultural, livestock, or industrial wastes. When in doubt about the status of a swimming beach or "sports" shellfish area, individuals should contact their county or state health agency for current information about the quality of the waters in question.

Figure 42.
Status of Classified Shellfish Growing Areas in Region 10





Regional Summary: Percentage of the Region's active shellfish areas that are open for harvesting.

Oregon's Marine Waters

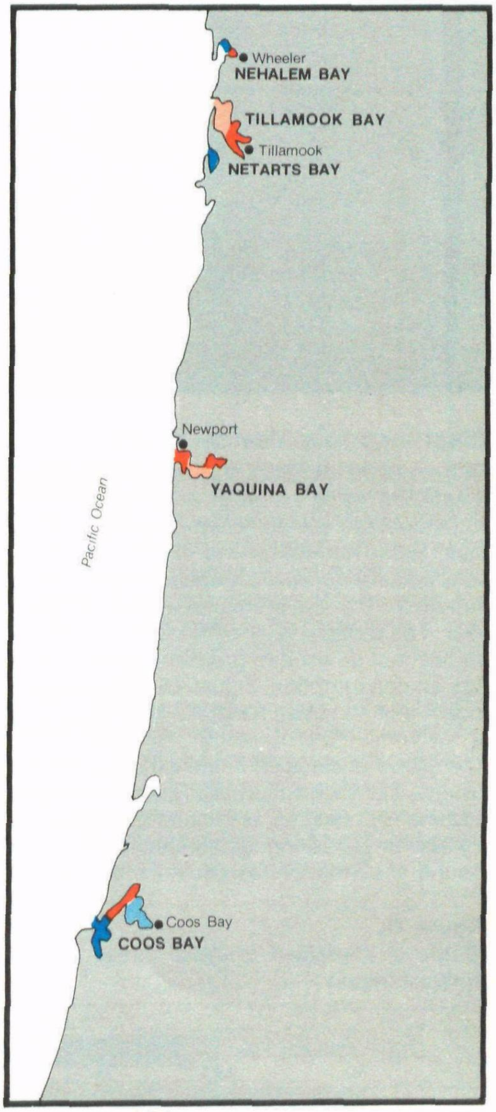
Of the 28,100 acres of classified commercial shellfish growing waters in Oregon, about 25 percent are currently approved for commercial harvesting and 25 percent are conditionally approved, depending on specific conditions that are monitored throughout the year. Ten percent have recently been reclassified from closed to "restricted—for depuration only" (see below). The remaining 40 percent are classified as closed and cannot be used to produce shellfish for human consumption. Figure 43 shows the location of the classified waters in Oregon.

Figure 44 indicates that almost one-third of Coos Bay is closed to commercial shellfishing because of bacterial pollution from sewage treatment plant discharges, although the South Slough of Coos Bay is approved for commercial shellfish harvesting. The state has recently reclassified the inner portions of Coos Bay from closed to "restricted—for depuration only." (Depuration is a process shellfish can be subjected to which reduces bacterial contamination to acceptable levels by utilizing their natural purification abilities.) Commercially grown shellfish from this area must be so treated before they are harvested for sale to the public.

Potential treatment plant failures as well as a number of non-point sources of fecal pollution have made it necessary to close or only conditionally approve Tillamook Bay for shellfish harvest. Areas of Yaquina Bay are either closed or conditionally approved due to non-point source and industrial pollution problems. The Nehalem River also has problems related to non-point source pollution and increasing population density. Netarts Bay, although not a major commercial shellfish growing area, is considered to have good water quality suitable for oyster culture.

Several measures are being taken to restore Oregon's marine waters for shellfish harvest. Sewage treatment improvements planned for the cities of Coos Bay and North Bend should reduce bacterial pollution in Coos Bay. The City of Tillamook is constructing a new sewage treatment plant, and an EPA-funded project is underway to identify non-point sources of pollution around Tillamook Bay, after which a pollution control plan will be prepared.

Figure 43.
Water Quality Map of Oregon's Commercial Shellfish Growing Areas



🟦 APPROVED FOR COMMERCIAL SHELLFISH HARVESTING

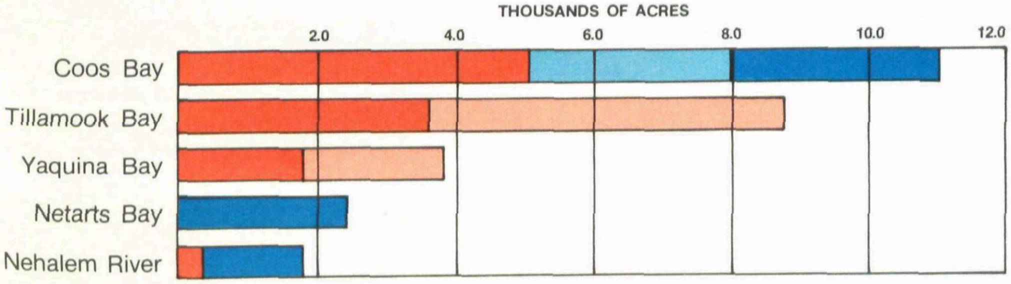
🟦 RESTRICTED - DEPURATION ONLY

🟧 CONDITIONALLY APPROVED FOR COMMERCIAL SHELLFISH HARVESTING

🟥 CLOSED TO COMMERCIAL SHELLFISH HARVESTING

☐ UNCLASSIFIED AREAS

Figure 44.
Status of Classified Shellfish Growing Areas in Oregon



Washington's Marine Waters

Of the 228,900 acres of classified commercial shellfish growing waters in Washington, about 68 percent are currently approved for commercial harvesting and 11 percent are conditionally approved, depending on specific conditions that are monitored throughout the year. The remaining 21 percent are closed and cannot be used to produce shellfish for human consumption. Figure 45 shows the location of classified waters in Washington.

The extent of closures in the various commercial shellfish areas is shown in Figure 46. The approved areas include most of Willapa Bay, northern and southern Puget Sound, the Strait of Juan de Fuca, and all of Hood Canal and the Pacific Ocean beaches. Central Puget Sound is mostly closed, due to potential pollution arising from the urban-industrial areas of Seattle, Tacoma, and Bremerton. Municipal sewage treatment plant discharges and septic tank problems also contribute to closures. In Burley Lagoon, for instance, 135 acres of oyster-growing area were closed when the lagoon was polluted with fecal material from domestic septic tanks and nearby pastures. Industrial waste discharges along the Tacoma waterfront have occasionally degraded water quality and caused fish kills.

On occasion, harvesting has had to be restricted in northern and central Puget Sound because of increased levels of paralytic shellfish poison. This is a naturally occurring substance commonly known as "red tide." Some water quality improvements have been noted in Everett and Bellingham due to reduced effluents from the pulp mills in the area, but additional improvements are needed.

Less than half of the available shellfish growing area of Grays Harbor is approved for use. Major point source contributors are pulp mills and inadequate sewage treatment, although improved waste treatment programs have reduced their contributions. Agricultural activities, coupled with seasonal fluctuations in freshwater runoff also contribute to water quality problems. In Willapa Bay, discharges from municipal sewage treatment plants in the vicinity of South Bend and Raymond are

Figure 45.
Water Quality Map of Washington's Classified Commercial Shellfish Growing Areas

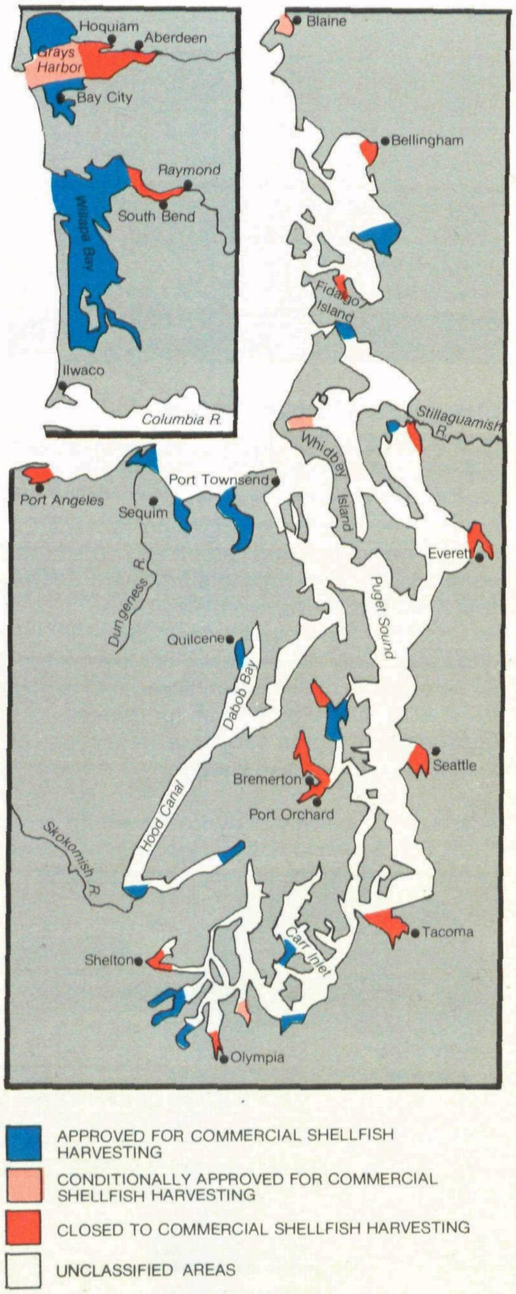
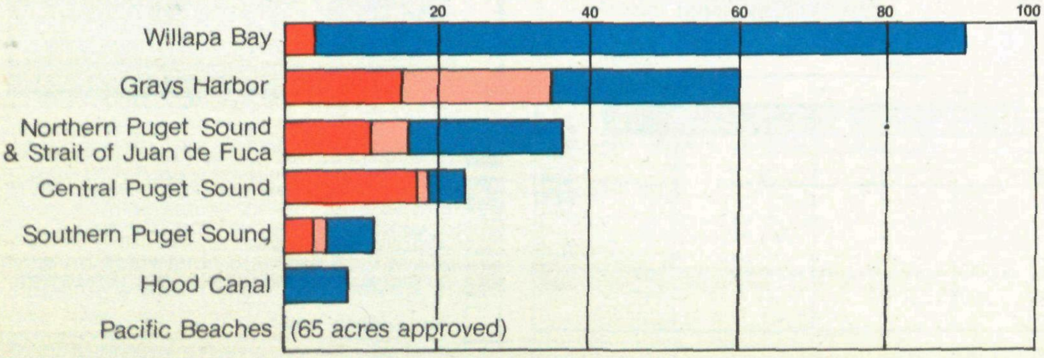
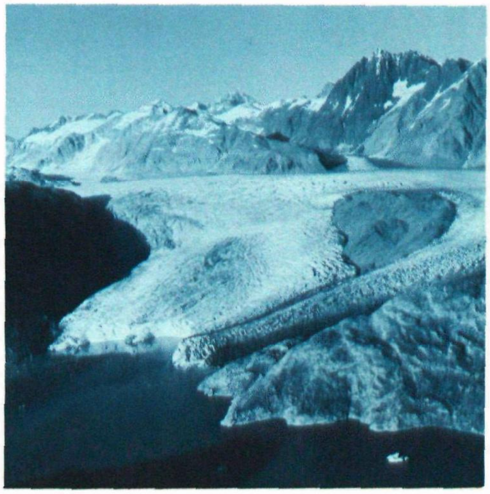


Figure 46.
Status of Classified Shellfish Areas in Washington





primarily responsible for the closure of a small part of the bay to oyster harvesting.

Because of wastewater treatment programs, marine water quality in Washington has improved in recent years. For example, improved water treatment programs at Grays Harbor pulp mills have reduced the contribution of these sources and should reduce them further in the future. However, further reductions in contamination from sewage treatment plants and industrial discharges will be required to restore those waters conditionally approved or closed to shellfish harvesting. At the same time, care must be taken to maintain high quality areas. The Pierce County Commissioners have passed a resolution establishing Burley Lagoon and three other shellfish growing areas in Pierce County as "environmentally sensitive" areas. Population growth along Hood Canal, for instance, could create problems in the future.

Alaska's Marine Waters

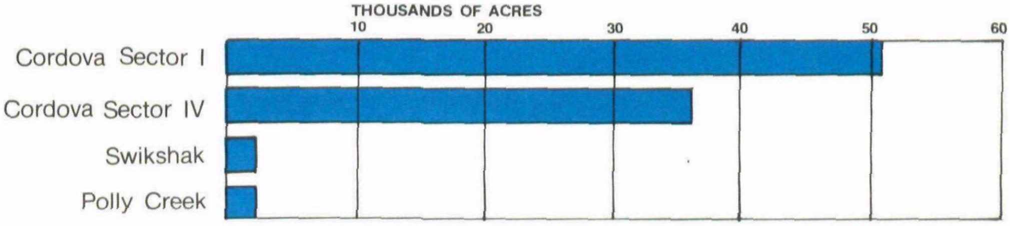
Of the 92,400 acres of commercial shellfish growing area that have been classified in Alaska (see Figure 47), all are open to the harvest of shellfish (razor clams only). The remaining areas are unclassified because they have not been surveyed or monitored for the presence of paralytic shellfish poison. Alaska's 33,904-mile shoreline encompasses vast amounts of estuarine and freshwater wetlands that provide important habitat for aquatic species. EPA and the State of Alaska are taking an active role in regulating dredging, filling, and draining, and other activites that reduce wetland habitat.

Although no Alaskan coastal waters are closed to shellfish harvesting, the state has a potential problem with chronic, low-level oil pollution in certain areas, such as upper Cook Inlet and Port Valdez. This oil comes from such sources as urban runoff, ballast discharges, and disposal of "formation water" (wastewater from oil production platforms and onshore wells discharging into coastal waters). Oil terminal facilities, tanker traffic, and petroleum production also generate potentials for large oil spills. In 1976, the Alaska 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.

Alaska Lumber and Pulp Company and Louisiana-Pacific have submitted water quality data to the state that reveal depressed dissolved oxygen and pH levels and some high sulfite waste liquor concentrations in Silver Bay near Sitka and Ward Cove near Ketchikan, where the two plants are located. Seafood processing also contributes significant levels of nutrients to marine waters. EPA and the State of Alaska recently conducted studies at Petersburg, Juneau, Ketchikan, Akutan, Cordova, and Dutch Harbor to determine the environmental impact of seafood processors' waste disposal practices. In Dutch Harbor, these wastes covered the bottom more rapidly than they could be dissipated, resulting in areas of oxygen depletion and hydrogen sulfide gas production. Processors operating at other locations do not seem to be causing persistent pollution problems.

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. In other areas, however, increasing environmental pressures will be experienced due to the expanding commercial fishing industry.

Figure 47.
Status of Classified Shellfish Growing Areas in Alaska



Areas depicted represent only those portions of the total estuarine and coastal areas that have been classified by the Alaska State Department of Health and Social Services.

Drinking Water Quality

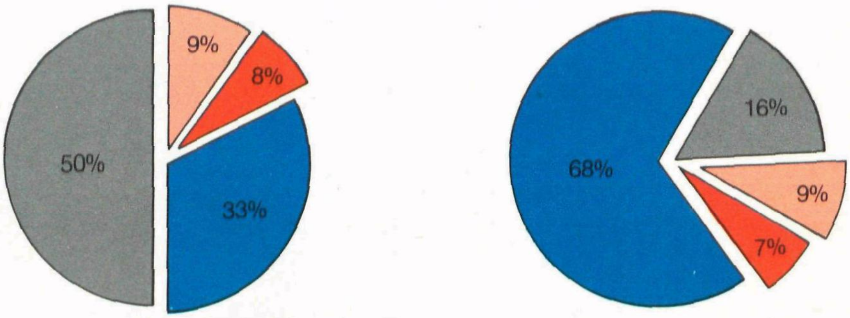
The drinking water supplied to most residents of the Pacific Northwest and Alaska is considered safe; however, waterborne disease outbreaks occasionally occur. In April 1980, over 200 persons in a Washington community became ill from a waterborne disease (suspected to be giardiasis), and during the fall of 1979, 4 communities in Oregon experienced waterborne outbreaks of giardiasis and gastroenteritis affecting over 150 persons. In addition to acute problems such as giardiasis, long-term or chronic disease may result from ingesting water containing certain inorganic or organic chemicals, as well as radioactive materials. Few water systems, however, are expected to exceed chemical or radiochemical standards; therefore few, if any, cases of chronic diseases are expected.

Public Water System Program

The Safe Drinking Water Act, passed in 1974, gave EPA primary responsibility for establishing drinking water standards and assuring national program consistency, but intended that the states implement programs ensuring public water systems' compliance with standards.

In Region 10, Alaska, Idaho, and Washington have assumed primary responsibility for working with public water systems to implement drinking water standards. Oregon has chosen not to assume primary responsibility. Consequently, since July 1977, EPA has worked directly with Oregon's public

Figure 48.

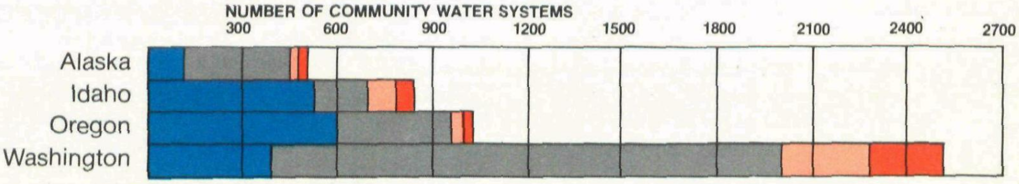


a. Regional Summary Based on Percentage of Community Water Systems

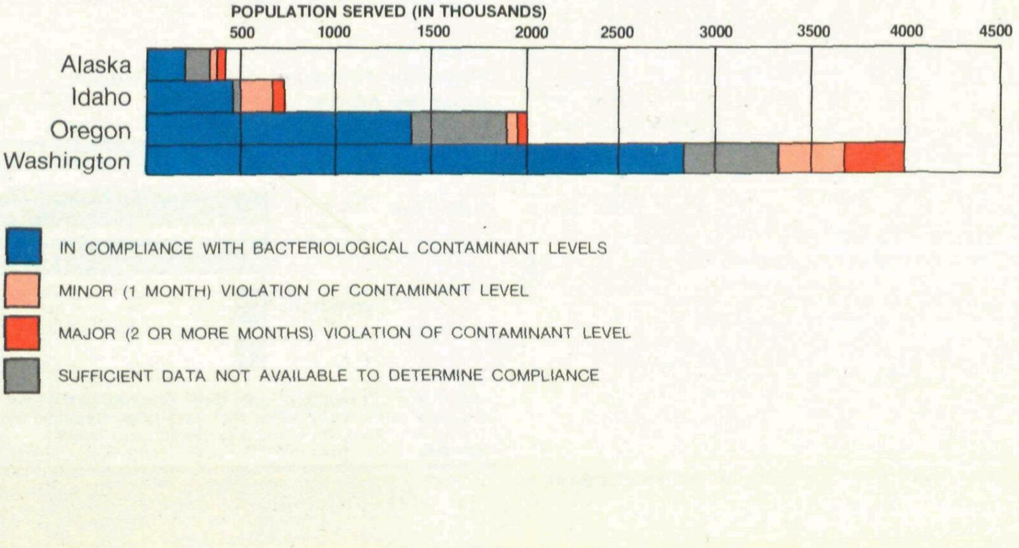
b. Regional Summary Based on Population Served by Community Water Systems

Figure 49.
Compliance with EPA Drinking Water Standards

a. Community Water Systems



b. Persons Served by Community Water Systems



water systems to implement the provisions of the Safe Drinking Water Act. More recently, EPA and the Oregon State Health Division (OSHD) joined forces to take advantage of an existing working relationship whereby OSHD agreed to cover the drinking water program at facilities for which it issues food services or similar licenses. Thus both EPA and OSHD work with public water systems. Emphasis has been placed on voluntary compliance with the National Interim Primary Drinking Water Regulations, but when voluntary efforts fail, EPA has been pursuing more formal enforcement procedures.

The national drinking water standards address finished water quality characteristics, as measured in periodic tests. EPA recognizes that these are minimum standards and are not adequate in themselves to protect public health. Therefore, EPA encourages states to implement comprehensive programs that go beyond just addressing finished water quality.

The primary means to assure safe drinking water is for public water systems to have properly operated, well-maintained, adequate facilities. A major part of a state's program, therefore, is evaluation of facility design and inspection of water systems to determine facility deficiencies which may present health hazards. Two Region 10 states, Alaska and Washington, have state funding programs that provide financial assistance to municipally owned water systems for facility improvements. To ensure proper operation and maintenance, Alaska and Washington also have mandatory operator certification programs. Idaho and Oregon have voluntary certification programs. All four states, to varying degrees, sponsor or assist in operator training activities. Also, to help ensure proper water system operation and maintenance in Washington, the state is implementing a satellite support system program whereby operation of small systems is provided by a highly qualified regional support organization.

Fiscal year 1979 represented the second full year of implementation of the national drinking water standards. The bacteriological data from FY79 are presented in Figures 48 and 49. While a significant percentage (50%) of Region 10's 4,800 community water systems are not yet conducting adequate bacteriological water quality monitoring, the total population served by these systems is relatively small (16%), indicating that these systems serve predominantly small numbers of people.

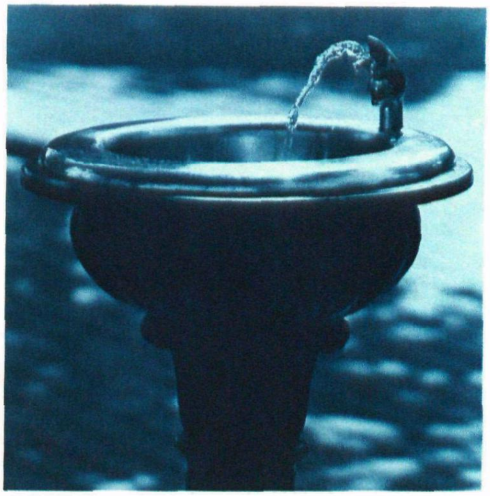
Seventeen percent of the Region's water systems, which serve approximately 16 percent of the population, experienced either major or minor bacteriological standard violations during FY79. While many causes of these violations have been corrected, the number of standards violations actually noted may increase over the next few years as more systems conduct required monitoring.

Chemical monitoring data are not yet available for many of Region 10's public water systems; however, information presently available indicates that very few systems will fail to meet chemical standards. Public water systems using surface water sources are also required to monitor for turbidity. Current data indicate that many systems will be unable to continuously comply with the turbidity standard. These systems will require development of a ground water source, installation of filtration for the surface water source, or interconnection with a system presently meeting standards for safe drinking water.

Ground Water Protection

The Safe Drinking Water Act also established a program to protect underground sources of drinking water (ground water). EPA's role is to develop national Underground Injection Control (UIC) regulations, provide oversight, and ensure national program consistency. Congress intended for the states to implement the UIC Program and that EPA would list, over a period of time, the states needing the program. Washington and Oregon were listed in June 1979. Idaho, although not initially listed, petitioned on July 30, 1979, to be included in the initial UIC listing. Alaska was listed in March 1980.

The UIC Program in Region 10 was initiated by the awarding of EPA grants to Idaho and Washington during December 1979. Alaska and Oregon have chosen not to participate. Idaho and Washington are using their developmental grant funds to collect background data on aquifers, inventory injection wells, and evaluate the adequacy of state laws and regulations for primary

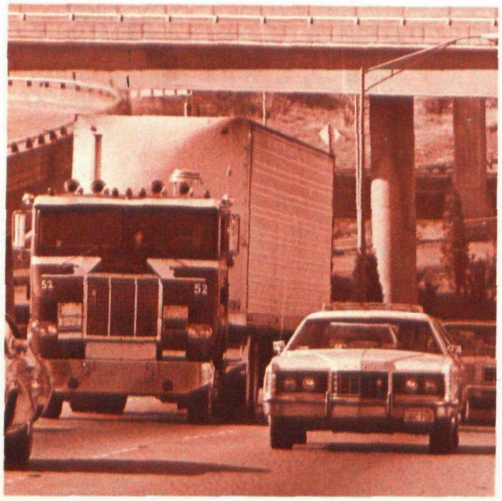


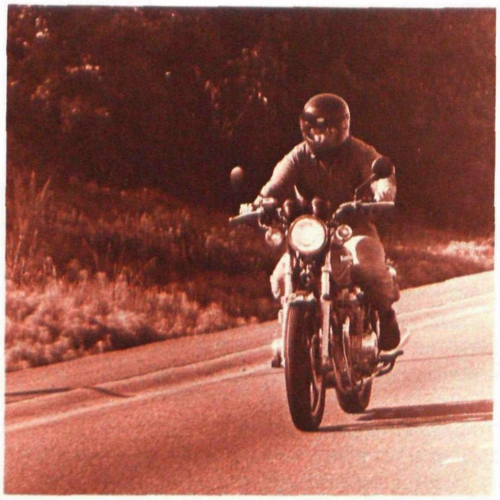
surveillance and enforcement authority. EPA, in conjunction with the U.S. Geological Survey and Oregon State University, is collecting background information for EPA implementation of a UIC Program in Oregon. For the State of Alaska, EPA has a similar agreement with the University of Alaska. EPA will also be responsible for UIC activities on Indian lands throughout the Region. The UIC Program will provide additional protection for the Region's ground water resources from the practices of well injection of fluids.

The Region's surface impoundment assessment (pits, ponds, and lagoons) has been completed. Approximately 1,200 sites, accounting for over 2,500 individual impoundments, were inventoried. While the study indicates there is a high potential for the impoundments to contaminate ground water, to date few actual cases of ground water contamination have been documented.

"Sole source aquifer designation" is another feature of the national ground water protection program. In 1979, the Region entered into its first full year of implementing protective activities within the Spokane Valley-Rathdrum Prairie Aquifer. This aquifer, first designated a sole source aquifer in 1978, provides drinking water for about 40,000 Idaho residents and 300,000 Washington residents in the Coeur d'Alene and Spokane areas. The designation prohibits any Federal agency from financially assisting any project which EPA determines may contaminate this important aquifer.

Noise





Only during the past few years has noise been recognized as a major environmental issue. In Region 10, noise is not a major problem as compared to other highly urbanized areas. Noise control throughout Region 10 is being addressed by state and local agencies, with the assistance of EPA, through studies, establishment of standards, rules, and regulations. The problem is not limited to acute situations such as occupational noise that causes hearing loss, but also includes chronic community noise, which affects us physically and mentally by causing nervousness, tension, and loss of sleep. Transportation noise dominates the problem—airplanes, trucks, passenger vehicles, motorcycles, motorboats, and snowmobiles are all contributors.

The Federal Noise Control Act of 1972 authorizes EPA to set noise standards for cars, trucks, interstate railroads, aircraft, etc. However, primary responsibility for control of noise rests with state and local governments. EPA has assisted Oregon and Washington in developing noise regulations, has helped Anchorage, Seattle, and Portland develop noise control ordinances, and has assisted with monitoring of noise levels from railroad locomotives, ferries, and auto and motorcycle racetracks.

No state agency has statutory responsibility for noise control in Alaska, and few local governments have noise abatement ordinances. In December 1978, the City of Anchorage adopted a comprehensive noise control ordinance covering land use and motor vehicle noise. Law enforcement personnel are trained to enforce the motor vehicle standards. Fairbanks is being assisted through an EPA grant and the University of Washington Regional Noise Technical Assistance Center, to conduct a physical noise survey that will identify major noise sources.

Idaho has no state noise control program for stationary or motor vehicle noise sources that is actively enforced. The Lewiston City Council recently directed the Mayor to appoint a citizens' committee to study noise control and they expect a proposed comprehensive noise ordinance by November 1980. Other than the current efforts in Lewiston, the only local ordinances that exist deal with nuisance-type noises.

Oregon's Department of Environmental Quality (DEQ) has developed and enforced noise control rules since 1974. Rules setting noise emission limits for new motor vehicles, including cars, trucks, buses, motorcycles, snowmobiles, and motorboats, require manufacturers and Oregon dealers to meet applicable rules and standards. In-use operational standards have been established for motor vehicles to ensure noise control equipment has neither deteriorated nor been modified to significantly increase noise emissions. Such in-use motor vehicle standards are being implemented by appropriate enforcement jurisdictions throughout the state. Through ambient noise standards, residential and other noise sensitive property is protected from excessive noise emissions by industrial and commercial activities. These standards are primarily enforced upon verification of a citizen complaint. New industrial and commercial sources are subject to ambient limits as well as nondegradation standards. Airport noise is controlled under rules that require airport proprietors to develop an airport noise abatement program, with land use controls as well as airport operational controls. Presently, over 40 technical staff people on a part-time basis are trained and involved in the implementation of the DEQ noise control program.

In addition, DEQ is assisting in development and implementation of city and county noise control programs. Often noise is a local problem needing local resolution; therefore, DEQ is providing the technical assistance needed by communities to identify their noise sources and develop a control program. Once established, the local program becomes self-sustaining with assistance from DEQ as needed.

Already two Oregon cities, Portland and Eugene, are actively enforcing noise control ordinances. Portland's noise control staff responds to complaints and enforces sound level standards for environmental land use and nuisance noises. In Eugene, a police officer team enforces motor vehicle noise standards.

The Washington Noise Control Act of 1974 gave the Washington State Department of Ecology (DOE) authority to establish standards for stationary noise sources, such as commerce and industry, as well as for motor vehicles and watercraft. DOE is authorized to enforce standards related to land use, while the State Patrol and local law enforcement agencies enforce standards for motor vehicles. DOE is assisting the development and implementation of city and county noise control programs. Again, noise is often a local problem needing local resolution; therefore, DOE is providing the technical assistance needed by communities to identify their noise sources and develop a control program. Once established, the local program becomes self-sustaining with assistance from DOE as needed.