EPIC

Environmental Protection Indicators for California

Understanding environmental conditions through indicators

-2002-

California Environmental Protection Agency – California Resources Agency

MESSAGE

From the Agency Secretaries

We are fortunate to live in a state with rich scenic beauty and abundant natural resources. Since the Gold Rush, California's diverse environmental assets have drawn people to the state and driven the development of the now-fifth largest economy in the world. However, the stresses of continuing population growth and economic expansion challenge our ability to protect public health and environmental quality. Meeting these challenges will require new approaches that rely on better information about our environment.

This report, *Environmental Protection Indicators for California,* presents the foundation for measuring the state's environmental quality in terms relevant to both human and ecosystem heath. The indicators in this report provide objective, scientific information by which to assess California's environment and to guide our efforts in sustaining it for future generations.

This report represents an 18-month effort of the California Environmental Protection Agency and the California Resources Agency – two cabinet-level agencies with different, yet complementary, missions to protect the environment. Other state entities, including the Department of Health Services, as well as various other stakeholders, collaborated on its development. Consequently, we have not only established an environmental indicator system, but also have built and strengthened partnerships that will help us achieve our shared goals.

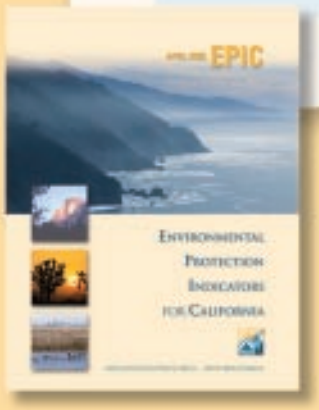
This report is just the beginning of an ongoing process to integrate and use information about the environment in a more meaningful way. In developing the initial set of indicators, we have gained a better awareness of what we know, and of what we need to know, about our environment. In the coming years, the Environmental Protection Indicators for California, or EPIC, Project will work with the Resources Agency's Legacy Project and other related assessment efforts within state government to enhance our capacity to report on California's environment and natural resources and to frame new approaches to solving environmental problems.

We hope this report provides you useful information about California's environment. We are committed to assessing and updating these indicators to ensure that our efforts to protect California's environment are worthy of you, the people of California.

Winston H. Hickox
Secretary for Environmental Protection

Mary D. Nichols
Secretary for Resources

Message page from the full report



This document draws upon information from the full report, *Environmental Protection Indicators for California, April 2002.*

To request a copy of the full report (in hard copy and in CD-ROM), or additional copies of this document, contact:

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Both documents can also be downloaded from: www.oehha.ca.gov

STATE OF CALIFORNIA
Gray Davis, Governor

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Cover photograph—Big Sur
Insets, top—Half Dome at Sunset–Yosemite Valley, Daryn Dodge
Middle—Joshua Tree National Park
Bottom—Sacramento skyline above Vic Fazio Yolo Wildlife Area, Daryn Dodge

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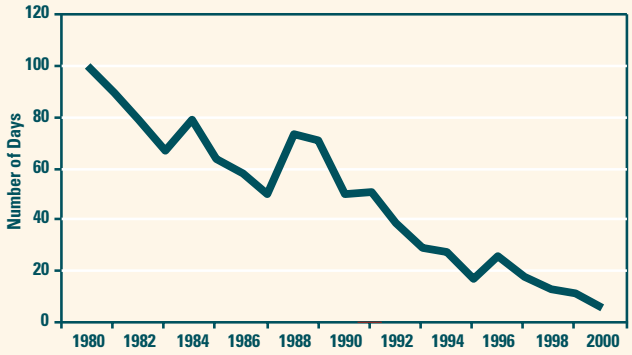
Understanding environmental conditions through indicators

What are environmental indicators?

Environmental indicators are measurements that track environmental conditions over time. In recent years, more and more regions, states and localities in the United States, as well as countries and international organizations, have adopted environmental indicators. Examples of environmental indicators include levels of air pollution (such as trends in the number of days above the carbon monoxide standard), the volume of waste sent to landfills and the extent of forest acreage in the state.

Days Over California 8-Hour Carbon Monoxide Standard, Los Angeles Area



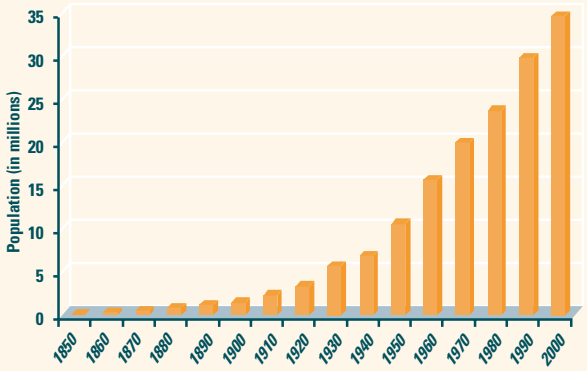
This indicator shows that days with unhealthy levels of carbon monoxide are decreasing in the Los Angeles area. This area was the only major urbanized area in the state with any unhealthy days since the early 1990s. This trend is primarily due to the state's efforts to reduce gasoline vehicle emissions.

Why does California need environmental indicators?

Environmental planning is more important now than ever before. The stresses of population growth and economic expansion present challenges to the environment. Taking appropriate action to meet these challenges will require new approaches that rely on better information about our environment. Environmental indicators provide objective, scientifically based tools for tracking changes occurring in the environment. They improve our understanding of the environment and how human activities (along with other factors) can influence it. When included as part of a planning process, environmental indicators can be used in setting goals and tracking progress toward those goals.

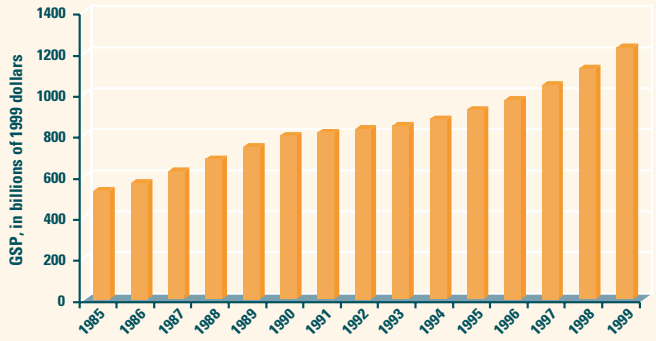
Traditionally, many of California's environmental programs have relied heavily upon measures of activity, such as the number of permits granted, notices of violation issued, or regulatory standards adopted. Environmental indicators can show the effects of these activities on the environment. Some environmental regulatory programs in the state already use direct measures of specific environmental conditions and effects to gauge the effectiveness of their efforts. Until now, however, there has not been a coordinated effort to develop a comprehensive system of indicators encompassing multiple aspects of the environment.

California Population 1850-2000



California is currently home to an estimated 35 million people. Each year in the past four years, over half a million people have been added to the state's population. This growth is expected to continue, and along with it the potential to increasingly impact the state's air, water, and land resources. Population growth also impacts other major forces that affect the environment, such as the economy, the consumption of energy and materials, and the movement of people and goods.

California Gross State Product 1985-1999



California's economy, as measured by Gross State Product (GSP), has steadily increased over the last 15 years. The GSP is the market value of the goods and services produced by a state, and is the state counterpart of the nation's gross domestic product.

What is the Environmental Protection Indicators for California (EPIC) Project?

The *Environmental Protection Indicators for California (EPIC) Project* was created to establish and implement a process for developing environmental indicators. The EPIC Project is responsible for maintaining an environmental indicator system to assist environmental programs in evaluating the outcomes of their efforts, and in identifying areas that require more attention.

The California Environmental Protection Agency (Cal/EPA) and the California Resources Agency have separate, but complementary, missions to restore, conserve and enhance the state's natural resources; Cal/EPA's mission also addresses the protection of human health from the adverse effects of environmental contaminants. The environmental indicator system maintained by the EPIC Project will be useful in measuring how well the state is achieving goals such as those identified in Cal/EPA's *Strategic Vision* document (posted at: www.calepa.ca.gov).

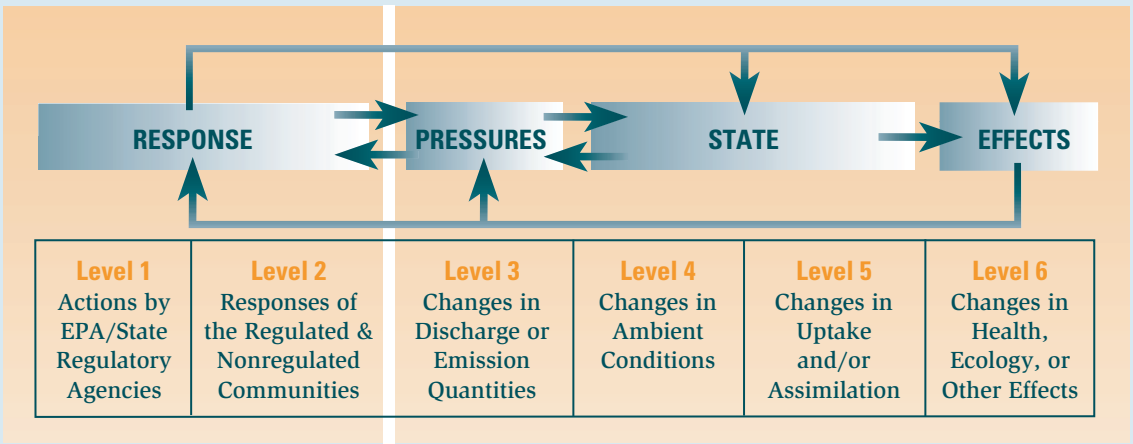
How did the EPIC Project develop indicators?

During its first year, the EPIC Project identified significant environmental issues confronting California and generated an initial set of approximately 90 indicators for these issues. These issues were grouped in the following categories: **air quality, water (quality, supply and use), waste management, pesticides, transboundary issues, human health, and ecosystem health.**

The major consideration for selecting an indicator is its scientific validity. About half of the indicators are derived using data from ongoing monitoring and data collection; when there are adequate data with which to present a status or trend, these are used to derive the "Type I" indicators. The rest of the indicators either need further data collection or analysis (the "Type II" indicators), or require the establishment of a system to collect data on a regular basis (the "Type III" indicators).

Selected indicators are highlighted in this report. The complete list of indicators can be found on pages 25-27.

In order to accomplish their missions, environmental agencies take action or initiate ***responses*** – such as enacting new policies and regulations — directed at activities that exert pressures on the environment. These pressures (such as the emission of air pollutants, or the discharge of contaminants into water) can change the ***state***, or the quality and quantity of natural resources. Changes in the state of the environment can, in turn, produce ***effects*** on human and ecological health. This concept is illustrated by the following diagram:



Air Quality

Air pollution is one of the major environmental challenges for California. Because of its potential for impacting human health, air pollution consistently ranks high among public concerns. Over 90 percent of Californians breathe unhealthy levels of one or more air pollutants during some part of the year. While air pollution can be a problem in nearly all regions of the state, the air quality of California's major urban areas is of particular concern. For example, the Los Angeles area is one of the regions with the worst air pollution problems in the entire country.

Sources of outdoor air pollution include automobiles, trucks, and other on- and off-road mobile sources; paints, consumer products, pesticides, and other widespread sources; and power plants, refineries, and other large "stationary sources." The gasoline-powered automobile is the number one source of air pollution in California.

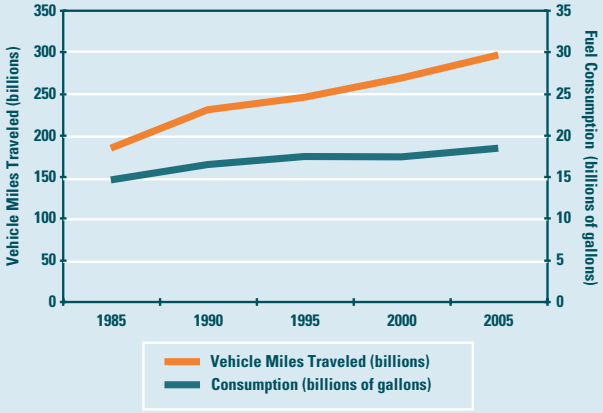
Criteria Air Pollutants that are monitored in California:

- Ozone
- Nitrogen dioxide
- Particulate matter
- Sulfur dioxide
- Carbon monoxide

Criteria air pollutants

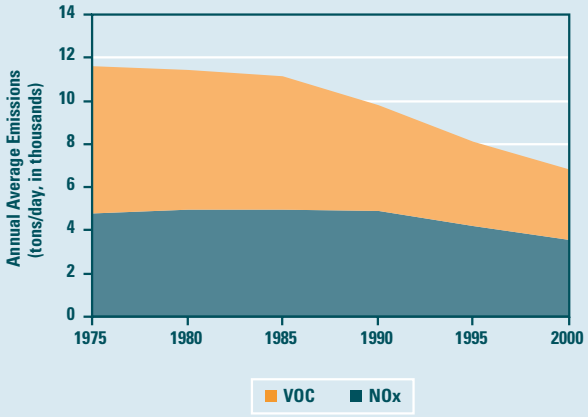
The most worrisome "traditional" air pollutants include ozone, carbon monoxide, diesel soot and other small particles known as particulate matter. These pollutants are called "criteria" air pollutants because they are regulated on the basis of permissible levels derived from health-based criteria (science-based guidelines). These pollutants are emitted to or formed in California's air chiefly as a result of the combustion of fossil fuels, such as the use of gasoline in motor vehicles.

Vehicle Miles Traveled and Fuel Consumption for Gasoline-Powered Vehicles



The amount of vehicle miles traveled (VMT) in the state continues to increase each year, and presents a continued challenge to preventing further degradation of our air quality. One bright note is that motor vehicle gasoline consumption has not increased at the same rate as VMT. The average fuel efficiency for gasoline-powered vehicles improved from 12.6 miles per gallon in 1985 to 15.5 miles per gallon in 2000. The steady increase in fuel efficiency is primarily the result of actions by state agencies to tighten emission standards for California vehicles, and the continual retirement of older, less fuel-efficient vehicles from California roads.

Volatile Organic Compound (VOC) and Nitrogen Oxide (NOx) Emission Trends

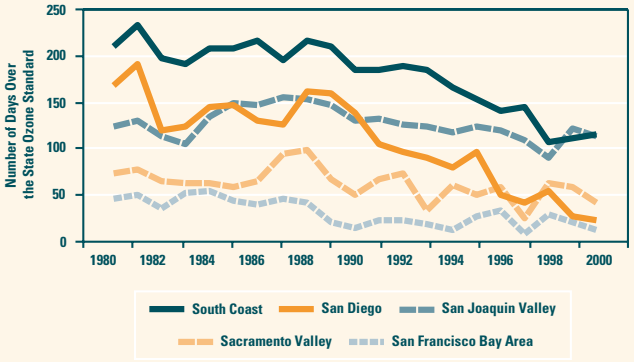


Two classes of air pollutants emitted by motor vehicles, nitrogen oxides (NOx) and volatile organic compounds (VOCs), have been declining. This is occurring in spite of the increasing number of vehicle miles traveled by Californians every year. These declines are largely due to the state's emissions control and clean fuels programs for gasoline-powered vehicles. Local and state air pollution agency efforts to decrease emissions from stationary sources, such as power plants, have also contributed to the declining trends.

In addition to being air pollutants in their own right, VOCs and NOx contribute to the formation of one of the most troublesome air pollutants in California, ozone. This gas irritates the eyes, throat and lungs and can worsen asthma and lung diseases such as bronchitis and emphysema. Ozone in the lower atmosphere (at "ground level") is not directly emitted from motor vehicles, but is

formed when VOCs and NOx react in the presence of sunlight. Total emissions of both of these classes of ozone-forming compounds serve as an indicator of ozone-forming potential in the state.

Days Over the State Ozone Standard



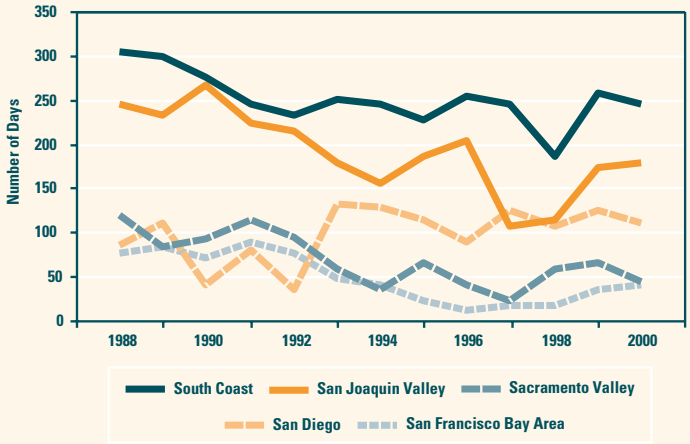
During the 1990s, the number of days with unhealthy levels of ground level ozone declined in all major urban air basins to varying degrees, with the greatest improvement seen in the San Diego and South Coast (including Los Angeles) air basins. The decline can be linked to overall reductions of NOx and VOC emissions during the same period of time; current and upcoming emission controls should further reduce ozone levels in the future.

Clearly, the indicators together show that decreases in emissions of pollutants responsible for the formation of ozone have led to an improvement in air quality in California's major urban areas. However, despite these improvements, unhealthy levels of ozone still occur in nearly all the major urban areas of the state.

Another major pollutant throughout California is particulate matter. Particulate matter smaller than 10 microns, known as PM10, can lodge deeply in the lungs when inhaled. PM10 can originate from motor vehicle exhaust and other combustion sources; it is also present in windblown dust and soil. Some PM10 are not emitted directly but are instead formed from gases that are transformed into particles in the atmosphere; these are referred to as secondary particles. PM10 can increase the number and severity of asthma attacks, and cause or aggravate bronchitis and other lung diseases. PM10 exposure has also been linked with premature death among people with heart and lung disease, especially the elderly. Also, there is growing evidence that greater infant mortality is associated with PM10 exposure.

California Air Resources Board

Calculated Days Over the State 24 hr PM10 Standard (50 μg/m³)



Despite the increase in population and vehicle miles traveled, PM10 levels have been decreasing or holding steady in most regions. This is due in large part to reductions in emissions from vehicles and from stationary sources. Nevertheless, unhealthy levels of PM10 still occur frequently in all major urban areas of the state.

New and current emission controls should help to further reduce levels of PM10. As California's population continues to grow, however, it will be increasingly difficult to sustain the emission reductions achieved, particularly in the fastest growing parts of the state.

Ten TACs posing the greatest known health risk in California:

Acetaldehyde
Benzene
1,3-Butadiene
Carbon tetrachloride
Chromium (Hexavalent)
para-Dichlorobenzene
Diesel particulate matter
Formaldehyde
Methylene chloride
Perchloroethylene

Toxic air contaminants

In addition to the criteria air pollutants, there are other air pollutants that may cause serious, long-term effects, such as respiratory, nervous system and reproductive effects, and cancer. These are called "toxic air contaminants" (TACs). Most TACs have no known safe levels, and some may accumulate in the body from repeated exposures.

Measurable levels of the ten TACs posing the greatest known health risk in the state can be found in major urban areas. As with the criteria air pollutants, these TACs are mostly emitted as a result of the use and combustion of fossil fuels. In addition, certain industries emit TACs that are unrelated to fuel combustion, such as perchloroethylene emitted from dry cleaning facilities.

Current air monitoring data point to an overall 40 percent reduction in TAC levels in urban air basins over the last 10 years. Indicators that describe potential health risks associated with exposure to TACs are under development.

Visibility

Air pollutants can make the air look "dirty". Not only does poor visibility obscure mountains and other scenic areas, it can also result in reduced airport safety, lower real estate values, and discourage tourism.

The methods necessary to develop seasonal measures of visibility for urban air basins, national parks and pristine regions are being developed. Reporting visibility as average summer and winter "visual ranges" will provide a measure of progress on improving visibility in California.

Indoor air pollution

Indoor air pollutants in homes, schools, and public buildings can be as harmful, if not more so, than outdoor air pollution. Studies of human exposure to air pollutants indicate that indoor levels of many air pollutants may be two to five times (and occasionally more than 100 times) higher than outdoor levels. Because most people spend much of their time indoors, breathing indoor air may present greater health risks compared to breathing outdoor air, yet there is currently little information available to develop indicators.

Other Findings

- Carbon monoxide has ceased being a major air pollutant in all areas of the state, except in some border areas with Mexico and in the South Coast Air Basin, which have had infrequent exceedances of the standard.
- An indicator based on an inventory of toxic air contaminant emissions is currently under development. This indicator will track toxic air contaminant emissions in the major urban areas of the state and assist in emission reductions from stationary sources and other area-wide sources.
- Statewide air levels and composition of PM2.5 (particulate matter with an aerodynamic diameter of 2.5 microns or smaller) are currently being collected. This fraction of particulate matter can be inhaled most deeply in the lungs and likely represents a better indicator of potential human injury than the PM10 fraction that is now collected.

California Air Resources Board

The following websites provide additional information on air quality:

Criteria air pollutants and toxic air contaminants:
www.arb.ca.gov/aqd/almanac01/almanac01.htm

Air pollution and health: **arbis.arb.ca.gov/research/health/fs/fs.htm**

Visibility: **www.arb.ca.gov/planning/reghaze/reghaze.htm**

Indoor air quality: **www.arb.ca.gov/research/indoor/indoor.htm**

Water

Water is one of California's most precious resources, serving a multitude of needs, including drinking, recreation, supporting aquatic life and habitat, and agricultural and industrial uses. It provides an essential lifeline for the state's burgeoning population.

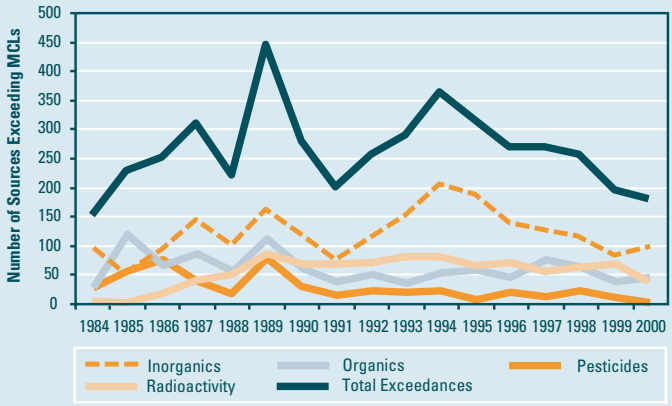
Pollutants can compromise our ability to use water resources. Sources of pollution may include point sources such as sewage system overflows, spills, discharges in violation of permit limits, and unauthorized discharges such as leaking underground fuel tanks and leaking landfills. Pollution can also result from past mishandling of hazardous materials and drainage from abandoned mines. Additionally, pollution can originate from diffuse or nonpoint sources, such as agricultural activities, forest harvesting, animal grazing and urban runoff. In many cases, pollution may impact or threaten to impact drinking water supplies, reducing the amount of available drinking water, or requiring additional water treatment.

California has over 1,600 miles of coastal shoreline, 800,000 acres of estuaries, 25,000 miles of rivers/streams, and 1,700,000 acres of lakes/reservoirs. The state has over 68,000 square miles of groundwater basins of varying depths and geological characteristics. In order to determine the quality of the state's waters, different types of monitoring must be conducted for different types of waters and the hundreds of potential pollutants of concern. Water quality monitoring provides vital information on the suitability of these waters for all the different types of uses ("beneficial uses"), from drinking water to aquatic life protection to aesthetics. As the State and Regional Water Boards implement enhanced programs for monitoring water quality, more meaningful environmental indicators will be identified for future use.

Drinking Water

Federal and state laws set limits on the amounts of toxic chemicals allowed in drinking water. These limits (maximum contaminant levels or MCLS) are intended to protect against harmful effects from consuming drinking water contaminants.

MCL Exceedances in Drinking Water Sources

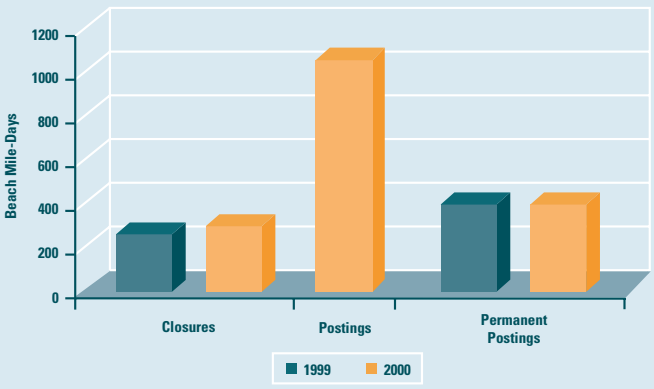


Since 1984, less than one percent of the 20,000 municipal drinking water sources in the state contained chemical concentrations that exceeded drinking water standards (maximum contaminant levels, or MCLs). These drinking water sources include both wells and surface waters, and exceedances can be due to natural as well as human causes. Sources found to contain chemicals exceeding the MCLs are either treated or taken out of service, so that human exposures to drinking water contaminants are reduced or prevented. The number of sources exceeding MCLs has been decreasing since the mid-1990s.

Coastal Beach Waters

Many Californians and visitors to the state enjoy its hundreds of miles of beaches. Swimming at these beaches may not always be safe due to microbial contamination in the shore waters. Beginning in 1999, county health officers are required by law to regularly test water for bacterial contamination at designated coastal beaches. When bacterial levels in waters present a threat to human health, beaches are posted with warnings. In cases where contamination is judged to be severe, beaches are closed to the public.

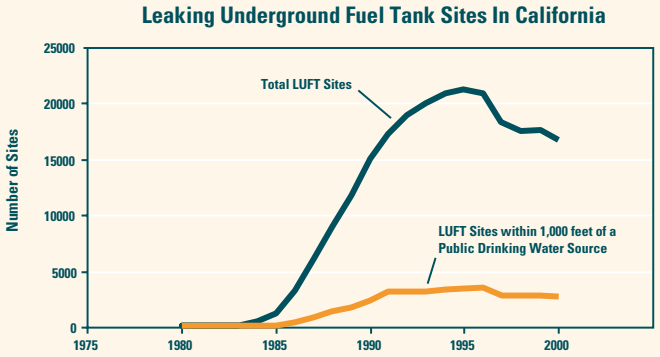
California has been compiling information on postings and closures of coastal beaches. This information is presented as coastal beach-mile days (BMD) posted and closed. BMD is a measure of the number of miles and the number of days when beaches were not available for swimming in a given year.



Beach closures increased 15 percent from 1999 to 2000; this increase is likely due to new requirements for testing. Partial year data for beach postings in 1999, the year when new posting standards were implemented, are not presented. With the recent standardization of beach posting protocols, more consistent data will be available to determine trends in coastal beach water quality.

Groundwater

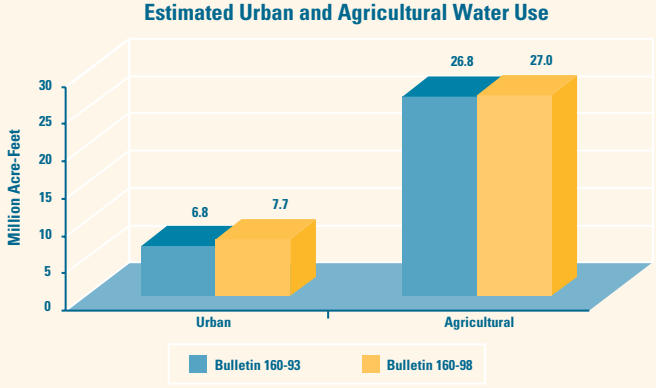
Groundwater is an important source of water for drinking, farming and other uses. Groundwater is vulnerable to contamination by leaking underground fuel tanks and industrial and agricultural activities and other sources.



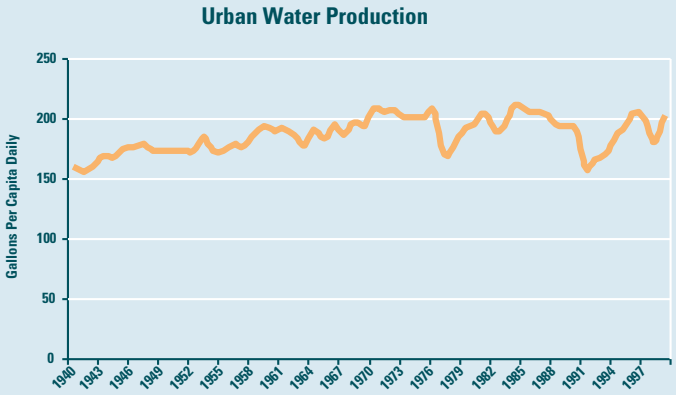
Due to increased monitoring between 1985 and 1995, the number of discovered leaking fuel tanks increased. Since 1996, the number has been declining due to the cleanup of sites and the upgrading of operating tanks. In the year 2000, about 15 percent of leaking underground fuel tank sites were considered potential threats to drinking water supplies.

Water supply

California experiences a wide range of conditions that affect its water supply. To ensure an adequate supply of water for all of California's needs, we need to know how much water we use for urban, agricultural and environmental purposes, and how much water we conserve and recycle.



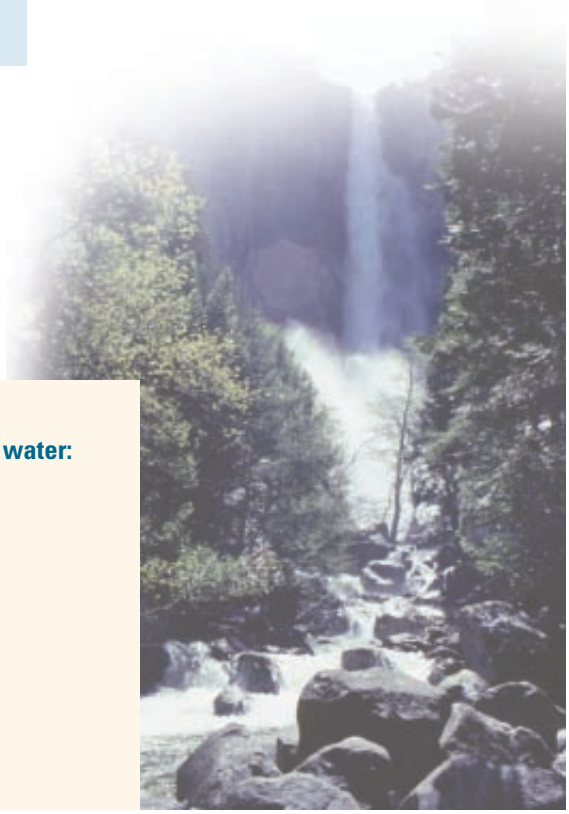
The percentage of the water supply demanded by urban uses has increased from 1994 to 1998, largely due to the state's increasing population. At the same time, the water available for agricultural uses has leveled off, largely because more agricultural land has been developed for urban use. Although water supplies have closely tracked use requirements to date, advanced planning will be necessary to meet future needs.



The amount of water per person provided to urban users has fluctuated over the years. During drought conditions, less water is supplied due to enforced water conservation measures. After the severe but brief 1976-77 drought , statewide urban per capita water production returned to pre-drought levels within three to four years. During the longer 1987-92 drought, urban per capita water production declined by about 19 percent. Most requirements for water-conserving plumbing fixtures did not take effect until after the 1987-92 drought. Nevertheless, per capita water production increased following the drought, due to removal of mandatory water rationing and other short-term restrictions.

Other Findings

- A significant portion of the state's waters has not been assessed to determine whether they support various uses (such as fishing, recreation, aquatic life support). The State Water Resources Control Board is implementing comprehensive monitoring programs to more completely assess the state's surface waters and groundwaters. Additional environmental indicators will result from these programs.
- From 1997 to 2000, the number of reported sewage spills to waters increased by approximately 75 percent. In general, these spills have caused temporary conditions of pollution or nuisance.
- Recycling or reuse of municipal wastewater increased by 50 percent between 1987 and 2000. In 2000, the amount of recycled water was equivalent to the annual water supply needs of over 1,600,000 people.



Daryn Dodge

The following websites provide additional information on water:

Water quality: **www.swrcb.ca.gov/quality.html**

Coastal beaches: **www.swrcb.ca.gov/beach/index.html**

Drinking water quality: **www.dhs.ca.gov/ps/ddwem/**

Groundwater quality: **www.swrcb.ca.gov/cwphome/**

Water use and supply: **www.waterplan.water.ca.gov**

Water recycling: **www.swrcb.ca.gov/recycling/index.html**

Waste Management

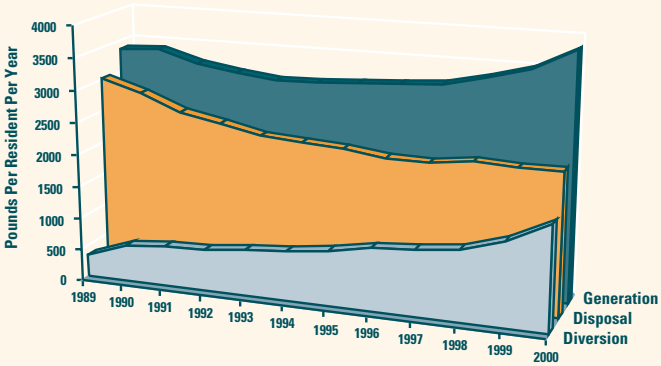
California is faced with the formidable task of properly managing the waste generated by its 35 million residents and a $1.2 trillion economy ranked fifth in the world. Solid wastes are non-hazardous garbage or trash (such as paper, refuse, demolition and construction wastes, and vegetable or animal solid or semi-solid wastes). Hazardous wastes are ignitable, corrosive, reactive, or toxic. California hazardous waste laws regulate certain wastes that are not considered hazardous under federal law.

Waste is a pressure on the environment—in terms of the loss of land and other resources necessary for its disposal or treatment, and of the environmental contamination that may potentially result from its treatment, storage, disposal and other handling. Today's waste management strategies, which focus on reducing the amount of waste generated and improving the management of waste, are designed to conserve resources, and to protect public health and the environment.

Solid Waste Generation, Disposal, and Diversion

A California law passed in 1990 (the Integrated Waste Management Act) set the stage for a series of statewide reforms in waste management. Among other things, the law created an integrated waste management hierarchy that emphasizes waste reduction and recycling over all other options, and requires all jurisdictions in California to divert half of their waste in the year 2000. Under the oversight of the California Integrated Waste Management Board, cities, counties and businesses in the state have implemented thousands of waste prevention, recycling and composting programs (collectively know as diversion programs). The statewide diversion rate has increased from 10 percent in 1989 to 42 percent in 2000.

Solid Waste Generation, Disposal and Diversion, per Capita



Since 1989, per capita disposal of solid waste has decreased even as generation has increased due to a sharp increase in waste diversion. Disposal measures the solid waste deposited into California's landfills or waste-to-energy facilities, or exported out of the state. Generation measures total waste produced in the state; it is the sum of waste disposed and waste diverted. Diversion measures waste prevented, waste re-used, waste recycled or waste composted.

California Integrated Waste Management Board

Photo: Kathryn Dowling

California Integrated Waste Management Board

Hazardous Waste Generation and Management

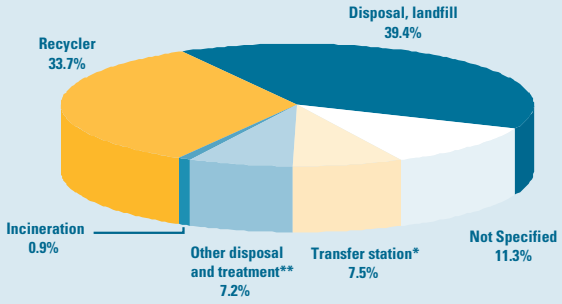
Shipments of hazardous waste are closely tracked from their origin to their destination through shipping papers called manifests, which are required by regulation to be completed by the generator of the waste. The amount of hazardous wastes shipped is used to represent hazardous waste generation, although not all hazardous wastes are shipped from the location where they were produced.

The total amount of hazardous waste generated in California, and subsequently shipped for treatment, storage and disposal has been increasing since 1996. The amounts shown include hazardous wastes generated in the course of commercial or industrial operations, as well as those generated following the cleanup of contaminated sites.

When calculated per $10,000 of the gross state product, the amount of hazardous waste generated per unit of economic activity has decreased in the past 7 years; 30 percent less waste was generated per $10,000 of gross state product in 1999 than in 1993. The generation of hazardous waste is significantly influenced by the nature and extent of economic activity. (See page 2 for a graph of California's GSP.)

Kathryn Dowling

Hazardous Waste Disposal, 2000



* Transfer stations are facilities where shipments of hazardous waste are held and/or transferred during the normal course of transportation; hazardous wastes in a transfer stations are eventually shipped for recycling or other treatment, or disposal.

** Includes surface impoundment, land application, injection wells, tank treatment and others.

Almost three-quarters of the hazardous waste shipments in 2000 were destined for disposal in hazardous waste landfills and for recycling. Forty percent of the shipments ended up in hazardous waste landfills, while about 34 percent was sent to recyclers. Since 1993, shipments to recyclers increased by about 19 percent, while shipments to landfills increased by about 65 percent.

Although today's permitted hazardous waste landfills are designed to prevent the movement of hazardous constituents, the possibility of environmental contamination still exists; further, landfill disposal uses up valuable land resources. Recycling is a preferred alternative to landfill disposal. By recovering and reprocessing usable chemicals from wastes, recycling reduces the volume of waste destined for disposal, and reduces the need to extract and/or process virgin material.

Other Findings

- For the year 2000, California was challenged with responsibly managing 31.6 million reusable and waste tires. Nearly 23 million waste tires (72.5 percent) are diverted annually for various alternative uses, including reuse, re-treading, recycling, and combustion. The remaining 8.7 million tires are shredded and disposed in California's permitted solid waste landfills, stored at permitted sites, or illegally disposed around the state. In addition, an estimated two million waste tires are stockpiled throughout the state, posing a health and safety risk to the public.
- There are no clear trends for hazardous material incidents, for soil cleanups at hazardous waste sites, and for the number of contaminated sites.
- Information on the magnitude and scope of environmental contamination resulting from the unsound management of solid and hazardous waste is very limited and fragmented.
- Conservation and waste diversion efforts are generally not captured well by environmental indicator systems. Although conservation-based programs can clearly affect natural resources and environmental quality in the long-term, their environmental impacts are difficult to measure using environmental indicators. Nevertheless, these programs and activities lessen pressures on the environment through waste reduction, recycling, and diversion.

California Integrated Waste Management Board

The following websites provide additional information on solid and hazardous waste:

Solid waste: **www.ciwmb.ca.gov**

Recycling, reuse and waste prevention: **www.ciwmb.ca.gov/PublicEd/**

Hazardous waste: **www.dtsc.ca.gov**

Beverage container recycling: **www.consrv.ca.gov/dor/index.htm**

Pesticides

Pesticides are substances intended to control, destroy, repel, or attract pests (insects, rodents, weeds, fungi, or microorganisms that cause damage, or that transmit or cause disease). Some examples of the many uses of pesticides include protecting crops against damage; controlling disease-carrying insects or rodents; destroying microbial agents; and preserving or protecting structures from destruction by insects or fungi.

Although pesticides are designed to be toxic to a target organism, there have been instances when they have caused harmful effects in other species. Regulations and restrictions on pesticide use are intended to protect humans, the environment and wildlife from pesticide exposures that may be harmful. Such exposures might occur directly as a result of applying pesticides, or indirectly, following exposure to pesticides in air, water, soil, vegetation, or plants and animals consumed as food.

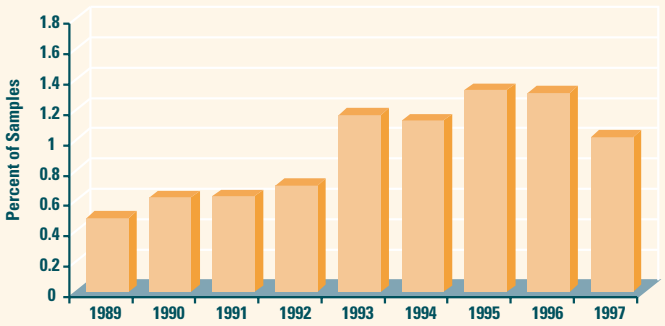
California has approximately 11,000 registered pesticide products, and a comprehensive, science-based body of laws and regulations governing every aspect of pesticide sales and use. Data collection and environmental monitoring are conducted to help ensure that these regulations effectively protect against harmful health and environmental effects.

Illegal Pesticide Residues in Produce

Monitoring pesticide residues in produce helps ensure that produce offered for sale complies with regulatory standards. Tracking pesticide residues is an important tool to enforce regulatory standards designed to prevent potentially harmful human exposures to pesticide residues.

U.S. Department of Agriculture

Percent of Produce Sampled that Violated or Lacked Tolerance



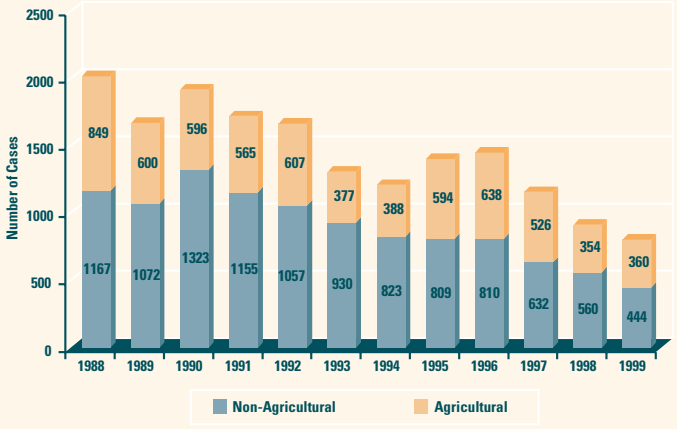
Since 1989, less than 2 percent of the more than 7,000 samples of produce tested annually contained illegal pesticide residues. Pesticide residues are illegal when they exceed a regulatory allowable level (called "tolerance"), or when the pesticide is not registered for use on the commodity in which it was found. Less than half a percent of the produce sampled each year exceeded tolerance levels.

Occupational Illnesses and Injuries Related to Pesticides

Workers applying pesticides or working in fields where pesticides have been used represent two groups that have the highest potential exposures to pesticides. Hence, they are the groups most likely to experience pesticide-related illnesses or injuries. Tracking cases of occupational illnesses and injuries is useful in identifying and evaluating situations in which pesticide use can cause human harm. This information allows regulators to modify use practices, improve safety information on pesticide labels, and focus enforcement efforts on potential problem areas.

California law requires physicians to contact their local health department whenever they suspect an illness or injury related to pesticide exposure. Reports to the state workers' compensation system are also reviewed for additional cases.

Reported Illnesses and Injuries Related to Occupational Pesticide Exposure



Reported occupational pesticide-related illness and injuries have declined over the past 11 years. More of the reported incidents are related to non-agricultural rather than agricultural pesticide use.

Other Findings

- The extent of pesticide contamination in groundwater can only be partially characterized at this time. As of 2000, approximately 460 square miles within California have been designated as "pesticide management zones." These zones are areas where pesticide use is regulated because residues have been detected in well water. This measure is largely driven by the number of wells monitored annually, and the regulatory response to the discovery of groundwater contamination.

- Limited information is available on the magnitude and scope of the impacts of pesticides on surface waters. Currently, surface water monitoring is designed to characterize pesticide contamination at a particular site for a specific period of time, rather than to track overall, long-term trends. Similarly, monitoring data on pesticides designated as toxic air contaminants cannot be used to generate an environmental indicator because air samples are typically collected on a one-time basis.

The following websites provide additional information on pesticides:

Fact sheets: **www.cdpr.ca.gov/docs/factshts/factmenu.htm**

Pesticide data for California: **www.cdpr.ca.gov/dprdatabase.htm**

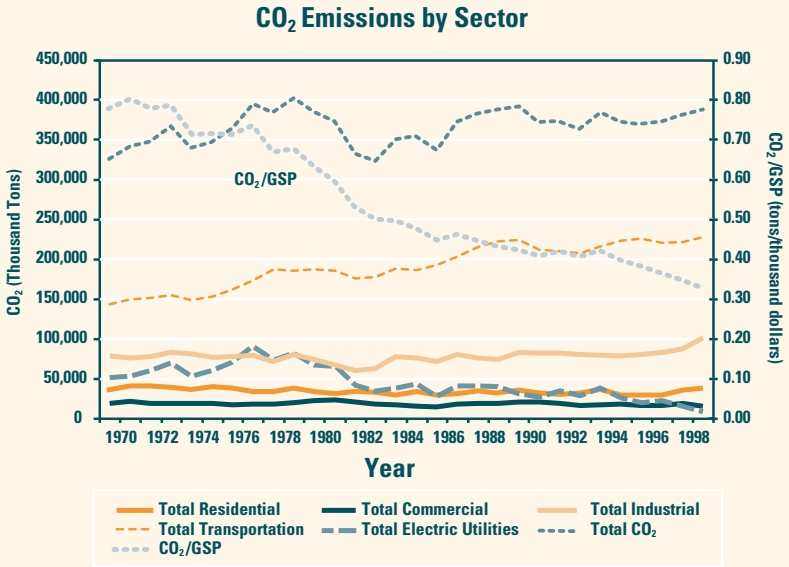
Transboundary Issues

Pollutants that originate in other states and countries, carried by atmospheric air currents, watersheds, trade, and travel can impact California's environment. Conversely, the same mechanisms can transport pollutants from California to other jurisdictions. The impacts of the transboundary movement of pollutants can occur at a global level, or within a defined geographical area, such as the California/Baja California, Mexico border.

Climate Change

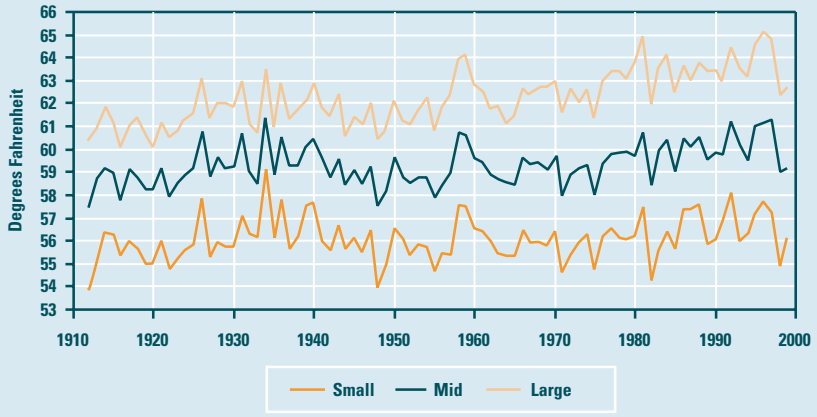
Scientific evaluations (conducted by the National Research Council and the United Nations Intergovernmental Panel on Climate Change) conclude that the global climate is changing at a rate unmatched in the past one thousand years. New and stronger evidence suggests that most of the global warming observed over the last fifty years is attributable to human activities, and that human-induced climate change will persist for many centuries.

Climate change refers to long-term changes in temperature, precipitation, wind and other elements of the earth's climate. Although these fluctuations can be due to natural processes, such as the cycles associated with ice ages, the release of greenhouse gases (GHGs) from industrial activities and transportation may be accelerating these changes. Greenhouse gases include carbon dioxide, methane, nitrous oxide, and fluorocarbons. Carbon dioxide from the combustion of fossil fuels accounts for the largest percentage of GHG emissions.

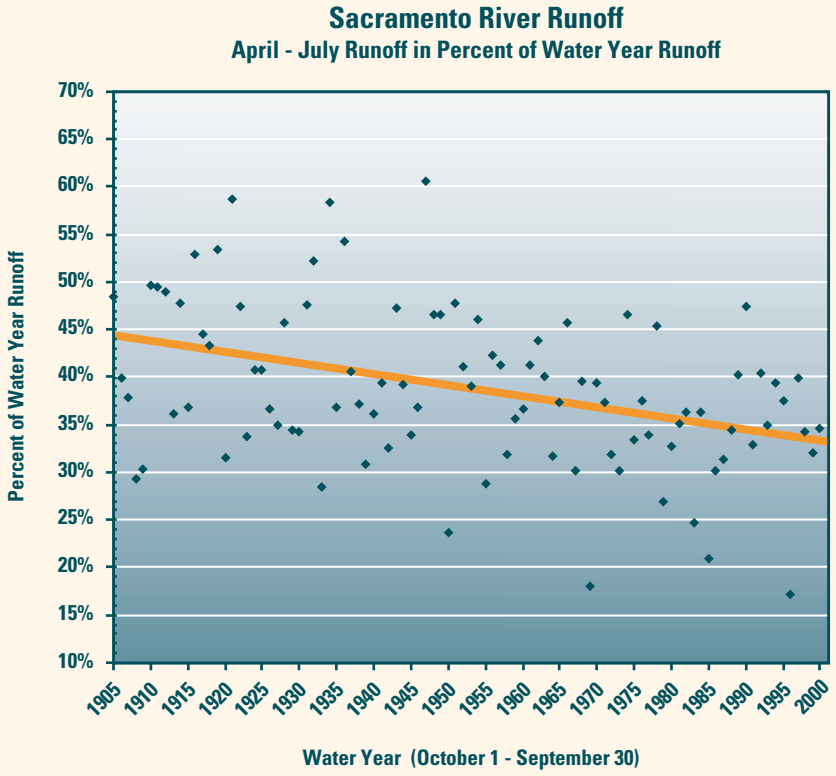


California's emissions of carbon dioxide from the burning of fossil fuels have increased in the past 20 years. Despite increases in fuel use and population growth, however, the state's carbon dioxide emissions per unit of the economy (shown as emissions per $1,000 of the gross state product or GSP in the graph) have been decreasing.
(See page 2 for the graph of California's GSP.)

Scientists believe that increasing atmospheric concentrations of GHGs are contributing to a phenomenon known as "global warming". GHGs retain heat that would have been radiated from the earth back into space, thus warming the earth's surface and the lower atmosphere. Increases in the concentrations of GHGs are predicted to change regional and global climate parameters such as temperature, precipitation, soil moisture, and sea level.



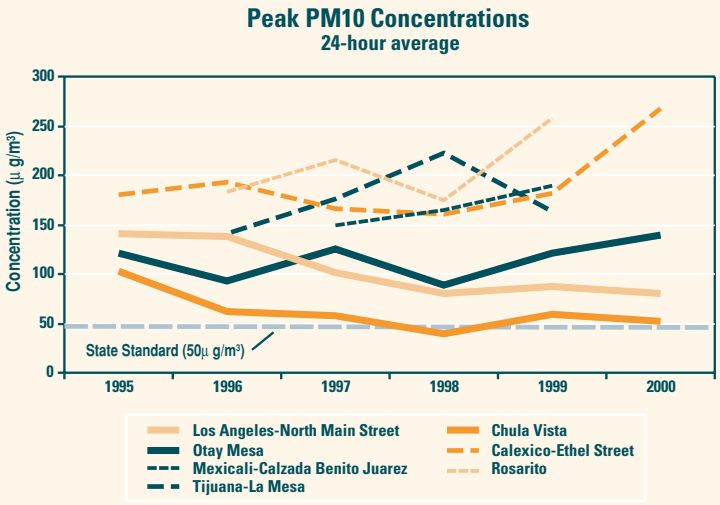
Air temperature has increased in California over the past 90 years, more so in large cities than in rural areas.



Large accumulations of snow occur in the Sierra Nevada each winter. Spring warming causes snowmelt runoff, mostly during April through July. The volume of water from spring snowmelt runoff, relative to the total volume of runoff for the "water year", provides a measure of temperature-related precipitation and runoff patterns. If winter temperatures increase, more precipitation will fall as rain instead of snow, resulting in less snowmelt runoff in the spring. The spring snowmelt runoff into the Sacramento River has decreased by about 12 percent since 1906.

California/Baja California, Mexico Border

California shares its southern border with the Mexican state of Baja California. The border region is the 62-mile zone on either side of the international border. The movement of pollutants in either direction at the border is dependent on wind direction, seasonal agriculture, industrial activities, and other factors.



Since 1995, harmful air pollutants have been measured in the California/Baja California, Mexico border region. Air monitoring stations in the San Diego/Tijuana and Imperial Valley/Mexicali border areas have reported peak ozone, carbon monoxide and particulate matter (particulates 10 microns in diameter and less, or PM10) concentrations that continue to exceed state air quality standards. Major sources of PM10 in the Calexico/Mexicali area include windblown soil from unpaved roads in Mexico and farming activities in the Imperial Valley.

Other Findings

- Stratospheric ozone levels over the mid-latitudes of the Northern Hemisphere (including California and the continental U.S.) have gradually declined from 1979 to the early 1990s. However, the downward trend has not continued in recent years as levels of ozone-depleting substances, including chlorine and bromine, stabilize in the stratosphere. Stratospheric ozone protects the earth's surface from much of the sun's harmful ultraviolet rays. Additional atmospheric processes that occur in the Polar Regions cause ozone depletion in these regions to be greater than over California.

- As world trade and travel have increased, the rate of introduction of invasive plant and animal species has grown exponentially. The introduction of non-indigenous plant or animal species (such as via ballast waters in ships from other countries) may adversely affect ecological and human health. Non-native species can compete with native species for existing resources and carry new diseases to crops in agricultural regions, thus creating economic hardship.

The following websites provide additional information on transboundary issues:

Global climate change and California: **www.energy.ca.gov/global_climate_change/index.html**

National Oceanic andAtmospheric Administration (NOAA) data: **www.co-ops.nos.noaa.gov**

Global warming, California impacts: **www.epa.gov/globalwarming/impacts/stateimp/california/index.html**

Global warming/future climate/sea level fact sheet: **www.epa.gov/globalwarming/climate/future/sealevel.html**

California/Baja California Border Program: **bep.calepa.ca.gov/**

Human Health Impacts

Many factors can impact human health, including poor nutrition, lack of exercise, genetic predisposition, inadequate medical treatment, and exposure to pollutants in the environment.

Protecting human health is the underlying basis for many environmental regulations. Over the years, these regulations have led to significant reductions in the levels of contaminants in the environment. Cal/EPA programs aim to control the presence of harmful chemicals in the environment to ensure that all individuals, including the sensitive and highly exposed, are protected from exposures that may lead to adverse health effects.

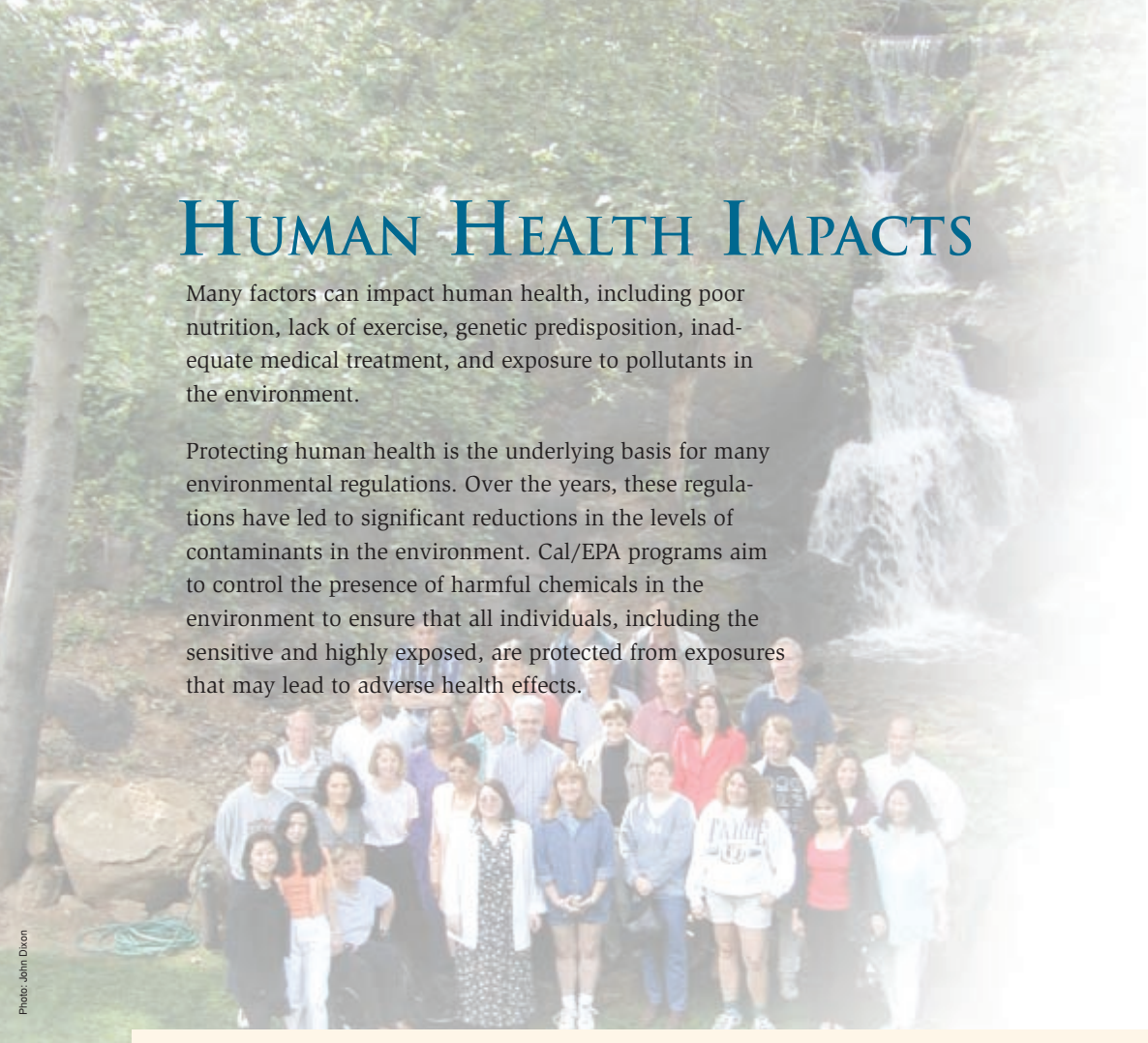
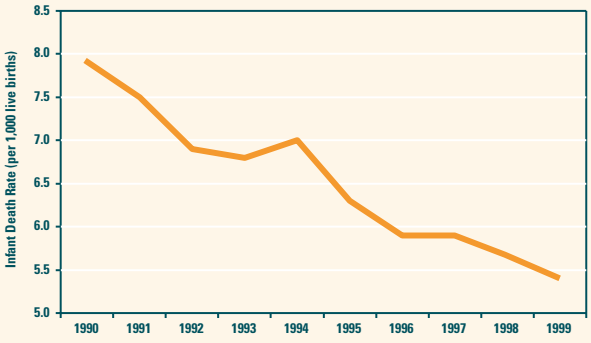


Photo: John Dixon

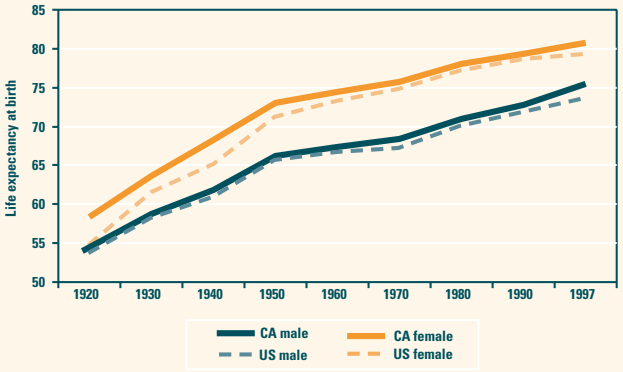
Largely due to better sanitation, healthier lifestyles, and improvements in the quality of medical care, there have been steady declines in infant death rates and increases in life expectancy.

Infant Death Rate in California



In 1999, California had the lowest infant death rate ever recorded for the state: 5.4 deaths per 1,000 live births. This rate is lower than the estimated infant death rate of 6.9 per 1,000 live births for the U.S.

Life Expectancy at Birth for U.S. and California



In 1997, life expectancy at birth was 75.5 years for California males and 80.7 years for California females. Since 1920, life expectancy at birth has increased 21 years for California males and 22.3 years for California females. The same improvement in life expectancy is also evident at the national level.

The majority of the environmental indicators developed by the EPIC Project are based on protecting the public from the deleterious effects of environmental contaminants. These indicators provide an indirect measure of how well the public is protected from environmental contaminants. For example, declining trends in the levels of pollutants in air, or in the occurrence of contaminants in drinking water translate to reduced human exposures to potentially harmful chemicals.

Perhaps the most notable environmental success story is the dramatic decrease in the levels of lead in the environment over the past three decades. In the early 1970s, it was observed that a significant number of children had elevated levels of lead in their blood and were suffering from lead poisoning. It was also recognized that large amounts of lead were being introduced into the environment from leaded gasoline and from the use of lead in paints, solder and other products. Lead in these products were either banned or reduced. As a result, blood lead levels in children have decreased by about 80 percent since the 1970s. Continued efforts to remove lead paint and other sources of exposures to lead should further protect against elevated blood lead levels.

Many diseases and conditions are monitored through programs in the California Department of Health Services and Cal/EPA. However, when many factors cause or contribute to disease occurrence, it is not always clear what the contribution is from environmental chemicals. Increased efforts are being made to correlate the detection of certain chemical contaminants in blood and other human tissues with environmental exposures. Although the detection of these chemicals does not necessarily mean that harmful health effects will occur, knowing that people have been exposed can help investigators locate the possible sources and prevent future exposures.

U.S. Department of Agriculture

The following websites provide additional information on human health:

California life expectancy, infant mortality and other vital statistics: **www.dhs.ca.gov/hisp/chs/OHIR/vssdata/tables.htm**

Childhood Lead Program: **ww.dhs.ca.gov/childlead/index.htm**

A Guide to Health Risk Assessment: **www.oehha.ca.gov/pdf/HRSguide2001.pdf**

Hazardous substances: **www.atsdr.cdc.gov/atsdrhome.html**

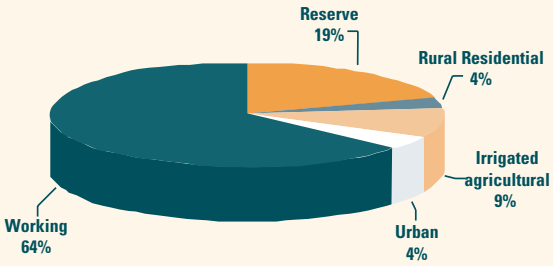
Ecosystem Health

An ecosystem is an interdependent grouping of plants, animals, and nonliving components, such as water and soil. California has diverse natural ecosystems, which consist of forests, grasslands, deserts, and freshwater and coastal ecosystems. In addition, two other ecosystems in the state are managed for the benefit of people: agricultural and urban ecosystems. These ecosystems support a variety of plant and animal life, and supply essential material and recreational resources for the state and its inhabitants. The diversity of plant and animal life, the quality and extent of habitat, and its ability to sustain itself as a functional system are significant measures that reflect the health of an ecosystem.

Land Use and Management

The greatest impacts caused by humans on ecosystems result from changes in land use. For example, as urban areas expand, the natural landscape is altered. Native biological communities are replaced with agricultural systems or suburbs and towns. Often, important habitat is fragmented by land use changes, leading to degradation of habitat quality. Defining the nature of these changes is a crucial first step in understanding their potential ecological impacts and the preservation of ecologically sensitive areas.

Land Management in California



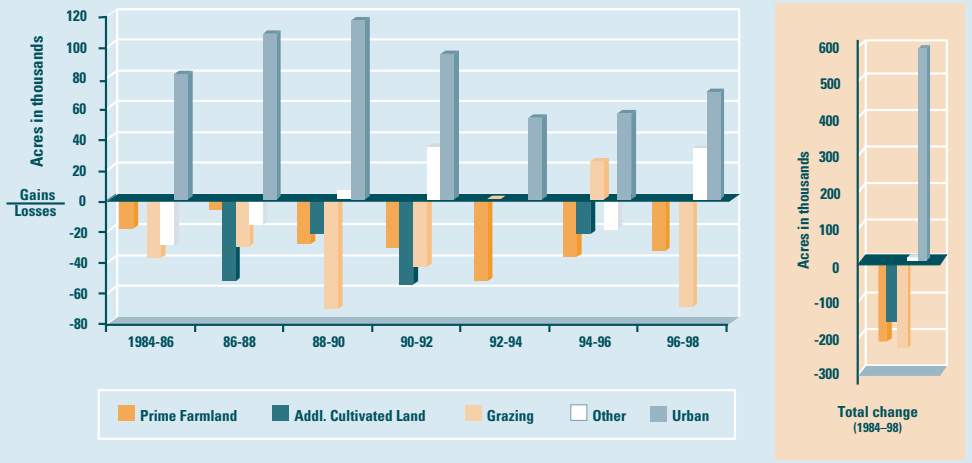
California covers approximately 100 million acres of land. Approximately 19 percent of these lands are managed in such a way as to cause minimal ecological disruption. These lands, which include state parks and wildlife areas, are in the "reserve" category. About 64 percent of the state is designated as "working" lands – lands that provide varying degrees of habitat value (such as substantially unaltered vegetation), but from which commodities are withdrawn; examples are timber and grazing lands. The remaining lands, agricultural, rural residential and urban, are significantly transformed by human activities.

Daryn Dodge

Conversion of Farmland to Other Uses

California's rich land, water resources, and mild climate have allowed it to become the world's leading agricultural producer. Farmland is not only an essential resource for growing crops, but it also provides open space and habitat for many animals, especially migratory birds. Population growth in California is the primary factor driving the conversion of agricultural land to residential use. Sound, regionally-based land use planning can avoid fragmenting agricultural and natural ecosystems in general into small, isolated units that cannot function properly.

Gains & Losses in Agricultural and Urban Lands



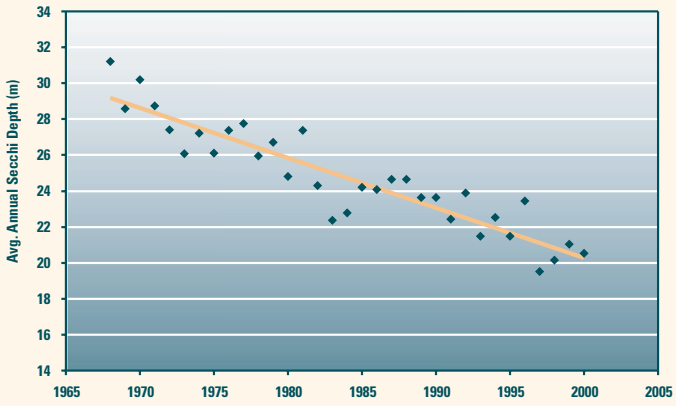
Over the past 16 years, about 42,000 acres per year, or 5 percent of the state's farmland has been converted to other uses, primarily development for new cities and suburbs.

Health of Aquatic Ecosystems

Loss of clarity is associated with two factors: eutrophication and sedimentation. Eutrophication is a natural process where levels of nutrients—such as phosphorus and nitrogen—rise, promoting increased algae and plant growth in lake waters. Increases in lake algae can cause periodic decreases in the levels of oxygen in the lake, which can be harmful to many organisms. The consequence of this lower level of oxygen is a change in the types of plants and animals that can survive in the lake. The rate of eutrophication in Lake Tahoe has been accelerated by the washing of fertilizers used to maintain public and private lawns into the lake.

Sedimentation, the increase in the amount of soil in a water body, has increased due to development around Lake Tahoe. Soils have been disturbed, allowing rain and wind to carry particles into the lake, thereby decreasing clarity and affecting many natural processes.

Water Clarity of Lake Tahoe, 1968-2000



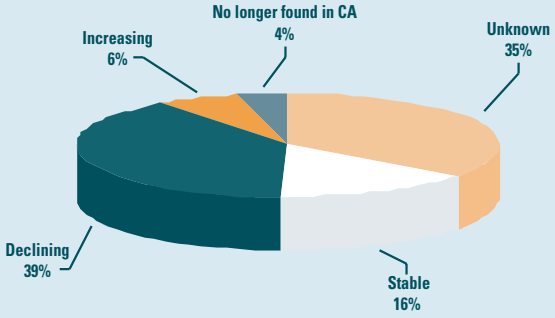
Considered one of the "jewels" of the Sierra for its pristine, crystal-clear waters, Lake Tahoe is a highly valued lake in the state. The clarity of Lake Tahoe's water has been decreasing at an average of about one foot per year since measurements began in 1968.

Status of Threatened and Endangered Animals

Many plants, invertebrates (such as butterflies and beetles), amphibians, fish, reptiles, birds, and mammals at risk for extinction from the state are found on California's Threatened and Endangered Species List. This list contains names of plants and animals whose continued viability in the state is threatened. Presently, there are 294 rare, threatened, and endangered species on the list; 169 of these also appear on the federal list. Populations of listed species may be increasing, declining, stable, or unknown; in addition, certain listed species are no longer found in California.

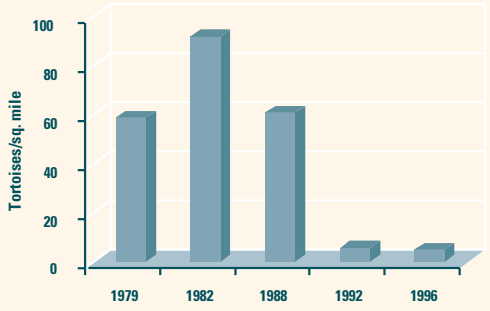
Habitat loss or degradation has been identified as a major cause of declines in populations of listed species. The protection of these species is important for the preservation of biodiversity and the health of the ecosystem as a whole.

Status of Animals on the California Threatened and Endangered Species List
(Based on Year 2000 Data)



In 2000, there were more threatened and endangered animals in the "unknown" category than in 1989. Over this same period, there are reportedly fewer animals in the "increasing" or "declining" categories. Insufficient information and/or resources are available to carefully assess the population status of all species.

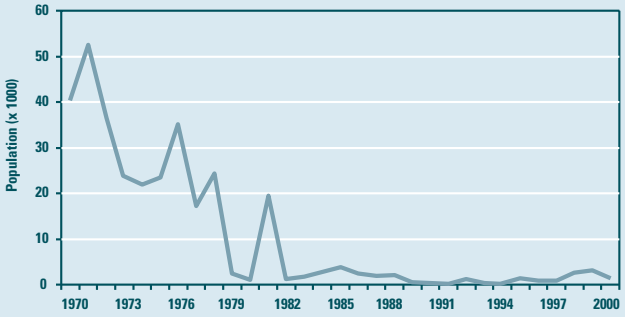
Tortoise Population at the Desert Tortoise Natural Study Plot (adults only)



The desert tortoise was listed as a threatened species by the federal government in 1990. Desert tortoises live in parts of the Mojave, Colorado and Sonora Deserts. Populations of this species in the Desert Tortoise Natural Study Area in the Colorado desert in southeastern California have declined substantially in the past decade. This decline is due to a variety of factors, including habitat degradation from off-highway vehicles, military activities, and vehicle emissions, as well as from bacterial infections and possible arsenic poisoning.

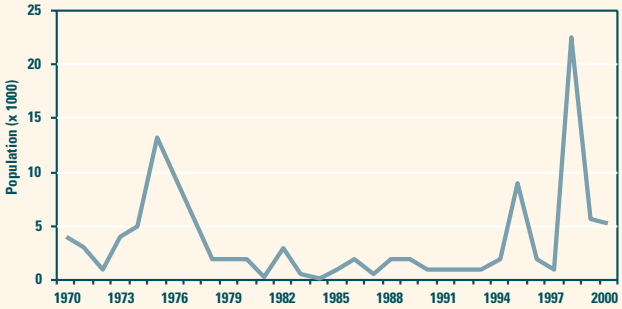
Chinook or king salmon move into the Sacramento River and its tributaries four times each year. Salmon from two of these runs, the spring and winter runs, are listed as threatened and endangered, respectively. Spring-run chinook salmon, a federal and state threatened species, are found only in tributaries of the Sacramento River.

Sacramento River Winter-Run Chinook

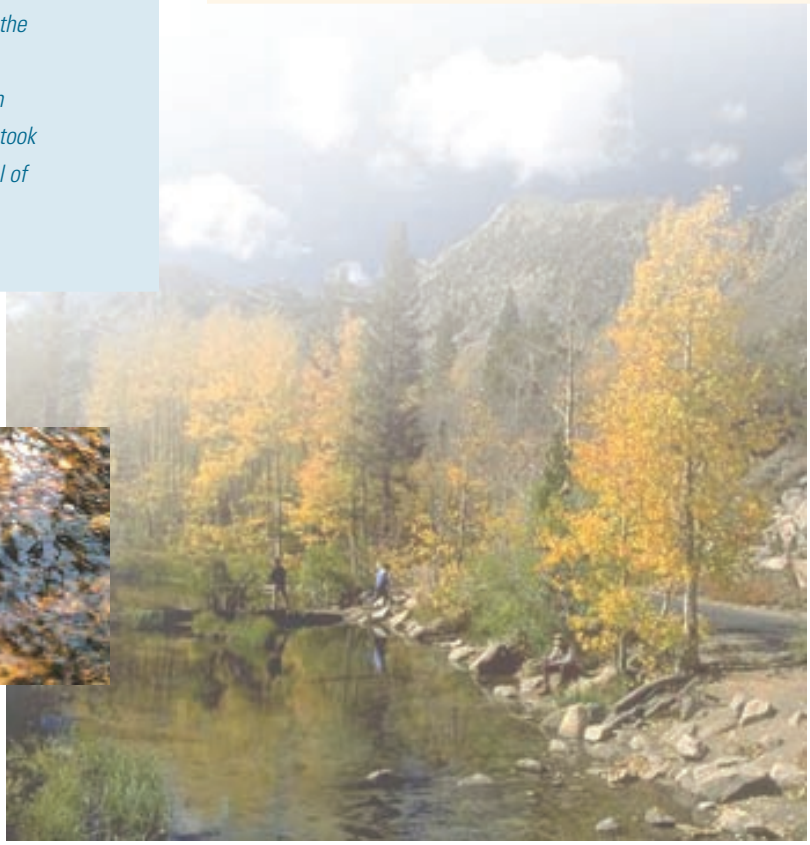


The winter-run chinook is presently listed as endangered because their population status is precariously low. Blockage of access to spawning areas due to dam construction and inadequate water flow have been the major factors that have contributed to the present condition of these fish. In the late 1990s, population levels appeared to be increasing, but unfortunately took a downturn in 2000, when estimates showed a total of slightly less than 1400 winter-run chinook.

Spring-Run Chinook in Sacramento River Tributaries



Compared to conditions 100 years ago, when spring-run salmon spawned in the upper reaches of numerous northern California rivers, today their runs are restricted to a handful of rivers and number in the thousands. Efforts initiated at the state and federal levels to remedy this situation have produced positive results, with some indication of an increase in the population in recent years. A combination of the removal of diversion dams, in-stream habitat and water flow improvement and adoption of protective practices by farmers and ranchers whose properties are adjacent to the creeks have contributed to signs of recovery over the past five years.



Wildfires in Forests

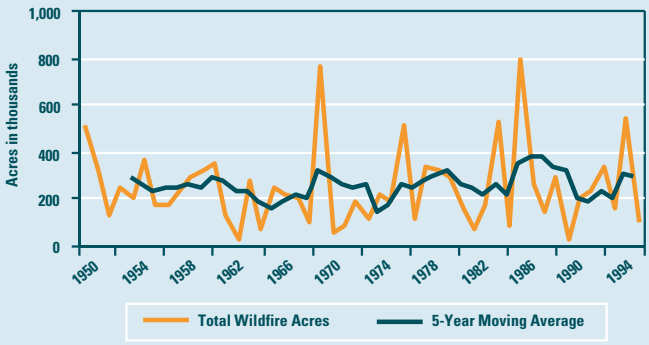
Forest fires can destroy homes, businesses and other property, and have significant economic impacts. Fires are part of a natural process, performing an important role in the ecological health of forests. Fires affect the types and arrangement of vegetation communities. They promote the cycling of nutrients such as nitrogen and phosphorus, and trigger changes needed to maintain natural ecosystem functions.

Over the past 100 years, wildfires have been suppressed, allowing for an unnatural level of fuel to build up in many forests. As a consequence, many fires today burn with very high intensity, increasing the likelihood of killing most trees, damaging the soil, increasing susceptibility to insect infestation, and threatening the overall health of the forest.

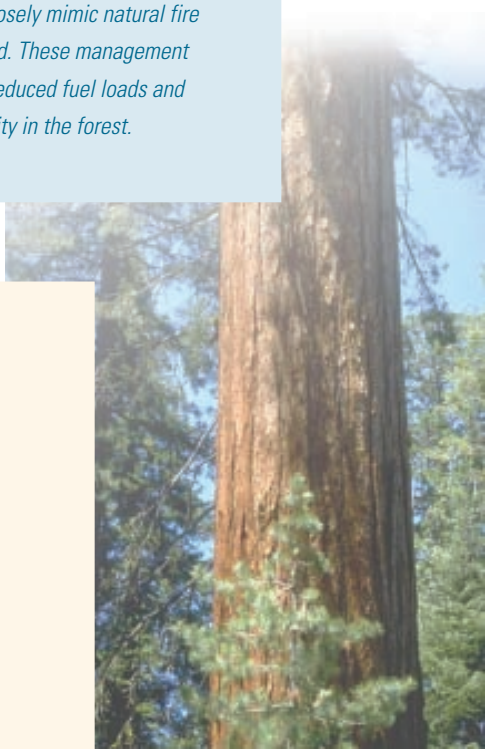
Other Findings

- Pest and other disease- related mortalities of trees in California's forests have significantly declined over the past six years.
- Adult survival of the northern spotted owl, a measure of the health of old growth forests, continues to decline.
- The least tern, a seabird on both the state and federal endangered species lists, lives in colonies along the coast. Since the 1970s, when the number of breeding pairs was fewer than 1000, their population has increased to greater than 4,000 breeding pairs of tern. This improvement, although still tenuous, is a consequence of habitat preservation.

Historical Wildfire in California, 1950 to 1997



Since 1970, the occurrence of years in which the total number of acres burned statewide exceeded 500,000 acres is becoming more frequent. This is likely associated with increased fuel loads as well as periodic drought. To minimize the adverse effects of fuel accumulation, new approaches to forest management that more closely mimic natural fire patterns are being adopted. These management techniques will promote reduced fuel loads and enhance ecological integrity in the forest.



The following websites provide additional information on ecological health:

Ecosystems and biodiversity: **www.wwfus.org/ecoregions/index. htm**

Farmland conversion: **www.consrv.ca.gov/dlrp/fmmp**

Threatened and endangered species: **www.dfg.ca.gov/hcpb/species/t_e_spp/ tespp.shtmlendangered.fws.gov**

Land cover and management**frap.cdf.ca.gov/projects/land_cover/index.html**

Health of Lake Tahoe: **www.trg.ucdavis.edu/**

List of environmental websites:**www.epa.gov/emap/html/olinks.html**

The Initial Set of Environmental Protection Indicators for California

The issues represented by the indicators are shown as bold text.
Each indicator is classified based on the availability of data, as follows:

Type I: adequate data are available for presenting a status or trend.

Type II: further data collection/analysis/management is needed before a status or trend can be presented.

Type III: conceptual indicators for which systematic data collection is not in place.

Photo: Daryn Dodge

Air Quality Indicators

Criteria Air Pollutants

Ozone

- Days with unhealthy levels of ozone pollution (Type I)
- Peak 1-hour ozone concentration (Type I)
- Exposure to unhealthy ozone levels in the South Coast air basin (Type I)
- Emissions of ozone precursors —Volatile organic compounds + Oxides of nitrogen (Type I)

Particulate matter (PM10)

- Days with unhealthy levels of inhalable PM10 (Type I)
- Peak 24-hour PM10 concentration (Type I)
- Annual PM10 concentration (Type I)
- Total primary and precursor PM10 emissions (Type II)

Carbon monoxide

- Days with unhealthy levels of carbon monoxide (Type I)
- Peak 8-hour carbon monoxide concentration (Type I)
- Carbon monoxide emissions (Type I)

Toxic air contaminants (TACs)

- Total emissions of TACs (Type II)
- Community-based cancer risk from exposure to TACs (Type II)
- Cumulative exposure to TACs that may pose chronic or acute health risks (Type II)

Visibility

- Visibility on an average summer and winter day and in California national parks and wilderness areas (Type II)

Indoor air quality

- Household exposure of children to environmental tobacco smoke (Type I)
- Indoor exposure to formaldehyde (Type III)

Water Indicators

Water quality

Multiple beneficial uses

- Aquatic life and swimming uses assessed in 2000 (Type I)
- Spill/Release episodes – Waters (Type I)
- Leaking underground fuel tank (LUFT) sites (Type I)
- Groundwater contaminant plumes – Extent (Type II)
- Contaminant release sites (Type II)

Drinking water

- Drinking water supplies exceeding maximum contaminant levels (MCLs) (Index)

Recreation

- Coastal beach availability – Extent of coastal beaches posted or closed (Type I)

Fish and shellfish

- Bacterial concentrations in commercial shellfish growing waters (Type I)
- Fish consumption advisories – Coastal waters (Type I)
- Fish consumption advisories – Inland waters (Type III)

Water supply and use

- Statewide water use and per capita consumption (Type I)
- Water use efficiency – Recycling municipal wastewater (Type I)
- Groundwater supply reliability (Type III)

Land, Waste and Materials Management Indicators

Waste generation

Waste generation, in general

- Statewide solid waste generation, disposal and diversion, per capita (Type l)
- Number of tires diverted from landfills (Type I)
- Hazardous waste shipments (Type I)
- Federal and California-only hazardous waste generation (Type II)

Accidents/disasters/spills/releases
Hazardous material incidents (Type I)

Waste importation/exportation
Hazardous waste imported/exported (Type II)

Disposal to land
Statewide solid waste disposal per capita (Type I)

Hazardous waste disposal (Type I)

Site contamination
Cleanup of illegal solid waste disposal sites (Type II)

Tire cleanup (Type II)

Soil cleanup (Type I)

Contaminated sites (Type I)

Cross-media contamination
Number of environmental releases from active landfills (Type III)

Groundwater contaminant plumes – Extent (see Water section)

Contaminant release sites (see Water section)

Pesticide Indicators

Air
Number of detections of pesticides identified as toxic air contaminants and the percent that exceeds numerical health standards each year (Type III)

Water
Area with pesticides detected in well water (Type I)

Simazine and breakdown products in a monitoring network of 70 wells in Fresno and Tulare Counties (Type I)

Pesticide detections in surface water and the percent that exceeds water quality standards (Type III)

Pesticides in food
Percent of produce with illegal pesticide residues (Type I)

Pesticide use
Pesticide use volumes and acres treated, by toxicological and environmental impact categories (Type II)

Integrated pest management
Number of growers adopting reduced-risk pest management systems and the percent reduction in use of high risk-pesticides (based on Alliance grant targets) (Type II)

Human health
Number of reported occupational illnesses and injuries associated with pesticide exposure (Type I)

Ecological health
Number of reported fish and bird kills due to pesticide exposure each year (Type II)

Transboundary Indicators

Global pollution

Climate change
Carbon dioxide emissions (Type I)

Air temperature (Type I)

Annual Sierra Nevada snowmelt runoff (Type I)

Sea level rise in California (Type I)

Stratospheric ozone
Stratospheric ozone depletion (Type I)

Trans-border pollution

California-Baja California, Mexico border issues
Air pollutants at the California/Baja California, Mexico border (Type I)

Domestic border issues
Amount of hazardous waste imported/exported (See Land, Waste and Materials Management Section) (Type II)

International border issues
Ballast water program (Type III)

Environmental Exposure Impacts Upon Human Health Indicators

Human body concentrations of toxic chemicals

Surveillance of persistent organic pollutants in body tissues and fluids
Concentrations of persistent organic pollutants in human milk (Type III)

Lead in children and adults
Elevated blood lead levels in children (Type II)

Mercury in children and adults
Mercury levels in blood and other tissues (Type III)

Ecosystem Health Indicators

Land cover and management & threatened and endangered species

Land cover
Land cover of major terrestrial ecosystems in California (Type I)

Land management
Land management in California (Type I)

Threatened and endangered species
California threatened and endangered species (Type I)

Health of aquatic and coastal ecosystems

Aquatic life protection and biodiversity
Status of Central Valley Chinook salmon populations (Type I)

California least tern populations (Type I)

Persistent organic pollutants in harbor seals (Type III)

Habitat and water quality protection

Clarity of Lake Tahoe (Type I)

Stream bioassessment - invertebrate populations (Type II)

Endocrine-disrupting chemicals in aquatic ecosystems (Type III)

Desert ecosystem health

Alteration in biological communities

Status of the desert tortoise population (Type I)

Habitat degradation

Impacts of off-highway vehicles on the desert (Type II)

Distribution of exotic plants (Type III)

Health of forests, shrub land, and grassland (terrestrial) ecosystems

Habitat quality and quantity

Change in habitat quantity in rangelands and forests (Type I)

Change in forest canopy (Type I)

Pest and disease related mortality in forests (Type I)

Wildfires in forests and grasslands (Type I)

Sustainability of California's forests (Type I)

Loss of biodiversity

Status of northern spotted owl (Type II)

Status of amphibian populations (Type III)

Ozone injury to pine needles (Type III)

Agroecosystem health

Availability of natural resources

Conversion of farmland into urban and other uses (Type I)

Soil salinity (Type II)

Positive and negative environmental impacts

Urban ecosystems

Urban tree canopy (Type III)

Background Indicators*

Population Demographics

Total California population

Annual population growth

Economy

Gross State Product (GSP)

Energy Consumption

Total energy consumption vs. GSP

Energy consumption in California by sector (transportation, industrial, residential, and commercial)

Residential energy consumption per household

Transportation

Motor gasoline consumption, vehicle miles traveled, and efficiency

Human Health

Life expectancy at birth for the United States and California; including a status of leading causes of death in California

Infant death rate

Self-reported asthma prevalence among adults in California and U.S.

Estimated U.S. annual average rate of self-reported asthma

Water supply

California's water supplies with existing facilities and programs

Land use

Progression of development of California's land

* Background indicators do not represent particular environmental issues in themselves, but provide information with which to interpret the meaning of various environmental indicators presented in this document.

What are the next steps for the EPIC Project?

The EPIC Project is still in its formative stages. On an ongoing basis, the current set of indicators will be evaluated, new indicators identified as needed, and indicators revised and replaced as appropriate. The project will consider the need for regional indicators that could produce meaningful information on specific regions of the state, as well as indicators that could provide information on subjects such as sustainability and pollution prevention. Information provided by the indicators is anticipated to be used by the state's environmental agencies for developing agency policies, budgets and strategic plans. Progress reports will be published on a regular basis.