

# **ENVIRONMENTAL PROTECTION INDICATORS FOR CALIFORNIA**

Supplemental Report to the Legislature  
Pursuant to the 2005 Budget Act

Office of Environmental Health Hazard Assessment  
California Environmental Protection Agency  
January 2006

## EXECUTIVE SUMMARY

The Environmental Protection Indicators for California (EPIC) Project is a collaborative effort involving the California Environmental Protection Agency (Cal/EPA), its constituent boards and departments, the Resources Agency, and the Department of Health Services. The project is charged with developing and maintaining a set of "environmental indicators" for California. Environmental indicators are scientific measurements of environmental conditions. The Office of Environmental Health Hazard Assessment (OEHHA) in Cal/EPA is the lead agency for the EPIC Project.

The Project was initiated in 2000 to support Cal/EPA's commitment to implement "results-based management," wherein information about environmental conditions – as reflected by indicators – are considered as part of the program planning and evaluation processes. Following the adoption of a process for identifying and selecting environmental indicators, the EPIC Project published a report in 2002 presenting an initial set of about 80 environmental indicators addressing air quality, water quality, water supply and use, waste management, human health, ecosystem health, pesticides, and transboundary issues. Collectively, the indicators characterize the state of California's environment and natural resources, and are intended as a starting point for a results-based management system in Cal/EPA.

The Legislature in 2003 acknowledged the importance of environmental indicators by enacting AB 1360 (Steinberg, Chapter 664, Statutes of 2003). This legislation mandates OEHHA, on behalf of the Cal/EPA Office of the Secretary, to develop, maintain and use an environmental indicator system, provided that funding is allocated for this purpose. A sustained, systematic effort to maintain, refine and use environmental indicators would better enable Cal/EPA programs and other regulatory agencies to identify problem areas, craft cost-effective strategies and regulations, make adjustments to programs, and report on environmental outcomes.

The updated indicators continue to show mixed results. There have been continuing improvements in some areas of environmental quality, but trends in other areas have been inconclusive. For example, while carbon monoxide now occurs at levels in ambient air that meet regulatory standards, ozone and particulate matter continue to occur at unhealthy levels. Coastal beach closures increased, while postings of health hazards at beaches have declined. While the population of winter-run Chinook salmon in the Central Valley has increased, it still remains low. Diversion of solid waste and recycling or waste tires continue to increase. The amount of hazardous waste shipped for treatment, storage or disposal has been fluctuating; however, there is a downward trend when viewed per unit of economic activity. The detection of illegal pesticide residues in produce remains at an extremely low rate of less than two percent. Indicators of climate change – such as air temperature, spring snowmelt, and sea level rise – show unfavorable trends.

Challenges remain not only in improving environmental conditions represented by various indicators, but also in ensuring the availability and quality of data needed to better understand environmental conditions. Gaps in much needed data must be addressed to enable environmental programs to better understand and more effectively act on areas of concern.



**ENVIRONMENTAL PROTECTION INDICATORS FOR CALIFORNIA (EPIC)  
SUPPLEMENTAL REPORT TO THE LEGISLATURE  
2006**

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## **BACKGROUND**

The 2002 Environmental Protection Indicators for California (EPIC) Report presented an initial set of about 80 environmental indicators addressing air quality, water quality, water supply and use, waste management, human health, ecosystem health, pesticide, and transboundary issues. Collectively, the indicators characterize the state of the state's environment and natural resources, and are intended as a starting point for a results-based management system in the California Environmental Protection Agency (Cal/EPA).

In 2004, an update to the EPIC Report was published, with data presented for 43 of the 50 indicators designated as "Type I" indicators – i.e., indicators for which sufficient status or trend data are available, and data collection is conducted on an ongoing, systematic basis.

## **FINDINGS**

Key findings based on updated data are discussed below.

### *AIR QUALITY*

Extensive monitoring of air pollutants by the State originally arose out of the need to tackle some of the worst urban air pollution in the country. Over the past 20 years, technological advances and regulatory strategies have yielded significantly cleaner air in spite of substantial growth in population and vehicular travel. The dramatic progress toward improving air quality is a direct result of our comprehensive emission control programs implemented at the State and local levels. However, weather can play a significant role in year-to-year changes in air quality. Some years have more extreme weather conditions, with many more hot stagnant days, that are conducive to the formation of ozone. For example, during 2003, the weather in the South Coast Air Basin was more conducive to forming ozone than any of the past 25 years and as a result there appeared to be a reversal of air quality progress. However, in 2004, when weather returned to more normal conditions, progress was again evident, with lower peak levels and fewer days with unhealthy ozone levels. For this reason, it is important to look at long-term air quality trends, rather than year-to-year changes in the trends. The indicators for air quality show the following:

- California has made substantial progress in reducing unhealthy levels of ozone. In the South Coast Air Basin, peak ozone, the frequency of days that exceed the air quality standards, and population-based exposure have declined dramatically. In the San Joaquin Valley, population-based exposure to ozone has dropped since the late 1980's, but other indicators show less progress.
- Carbon monoxide is a success story. The South Coast recently attained both the State and federal carbon monoxide standards. This brings the entire State into attainment with the exception of Calexico near the Mexican border. However, Calexico continues to make good progress toward attaining the standards.

- Exposure to inhalable particulate matter (PM10) has declined moderately in most regions of the State. In 2002, a new standard for the smallest particles (PM2.5) was adopted. PM2.5 levels have also declined since 1999 when monitoring was initiated. Urban sources of PM10 and PM2.5 currently represent one of the biggest challenges in reducing air pollution. Diesel particulate, an important component of PM2.5, continues to decline statewide. *(Note: No indicators are included in this update for PM2.5 or diesel particulate. See <http://www.arb.ca.gov/aqd/almanac/almanac05/chap205.htm> for more information.)*

## WATER

California's water needs must be met by an adequate supply of water of the quality appropriate for many purposes (called "beneficial uses"), including drinking, swimming, fishing, supporting aquatic life and habitat, and agricultural and industrial uses. The indicators for water show the following:

- California's economy and environmental quality are dependent upon the availability of clean, useable water supplies. In general, while all water bodies do not at all times comply with all water quality standards, it is a rare exception that beneficial use of a water body cannot occur. A snapshot of the 2002 assessment is presented. Status and trends hopefully can be more fully documented through a newly implemented monitoring program that was initiated in 2003. The first report will be available in late 2005.
- From 1997 to 2001, spills reported to the Office of Emergency Services (OES) increased approximately 70 percent, while reported incidents decreased approximately 10 percent from 2001 to 2002. The recent downward trend is encouraging, however, there are no clear-cut factors explaining why. Change in annual rainfall is often a factor, but correlations have not been made. Because of certain limitations of the OES database (it does not record spills smaller than 1000 gallons, reporting to it has been unreliable, and it was never designed for indicator development purposes) and other needs, the State Water Board is developing a sanitary sewer overflow database to collect water quality related-information about sewage spills. In addition, alternative sources of petroleum spill data will be identified for future updates.
- The number of leaking underground fuel tank sites continued to decline since 1995, a trend resulting from the upgrading of nearly all active tanks.
- From 1996 through 2000, monitoring results show a slight decrease in the number of drinking water sources with first-time detections of contaminants at levels above regulatory standards. The number of detections increased in 2001 and 2002, but this is likely due to new reporting requirements.
- Coastal beach postings have remained relatively constant from 1999 (when weekly bacterial testing began) to 2003. Beach closures increased in 2003, primarily due to the impacts of urban runoff and sewage flowing from Mexico.
- Commercial shellfish growing waters continue to meet the regulatory standard for fecal coliform bacteria during the open harvesting periods.

- Fish contamination data from 808,501 acres (out of 1,369,069 total acres) of bays and estuaries have been assessed as of 2004. The number of acres of bays and estuaries from which fish can safely be eaten once a week by the general population remains unchanged from 1995.
- Water supply is a major concern for California. The *California Water Plan Update* develops statewide and regional water balance information and forecasts. Among the findings of the *California Water Plan 2004 Update* are: cities use about the same amount of water today as they did in the mid-1990's, while accommodating 3.5 million more people; most agricultural water demands are met in average water years; although more water is dedicated today to restore ecosystems, some environmental requirements are not always met; and, California relies on over-pumping its groundwater basins, a practice that reduces available water supply, increases pumping costs, and in some areas, degrades groundwater quality.
- Recycling or reuse of treated municipal wastewater increased by 30 percent between 2000 and 2002 (the most recent year data are available).

## *LAND, WASTE AND MATERIALS MANAGEMENT*

California is faced with the formidable task of properly managing the waste generated by more than 36 million residents and a \$1.4 trillion economy ranked seventh in the world. Waste is a by-product of human activity and, if not managed properly, can exact considerable costs in terms of lost resources, environmental contamination, and adverse effects on human health and the environment. California's waste management programs seek to reduce the potential for such adverse impacts by focusing on reducing the amount of waste generated in the first place, promoting reuse or recycling to divert wastes from landfills, and improving the management of waste through regulations designed to ensure the safety of waste storage, treatment and disposal. Where past human activities have contaminated land, water and air, the state performs or oversees the cleanup of sites to prevent further contamination and harmful human exposures to hazardous constituents or decomposition products of the waste. Indicators relating to solid and hazardous wastes show that:

- Over the last 15 years, since the Integrated Waste Management Act (AB 939) went into effect, per capita disposal rates have decreased due to increased diversion, even as generation has increased. Diversion involves recycling, composting and reduction in waste generation. Statewide diversion has increased from 10 percent in 1989 to 48 percent in 2004. Recent increases in generation and disposal may reflect an economy more dependent than ever on construction activities.
- Over the past 13 years, the quantity of tires that have been recycled or reused in some manner has increased, while the quantity disposed of at landfills has decreased. Statewide diversion has increased from 34 percent in 1990 to more than 73 percent in 2003. More than 28 million tires (73.1 percent) are diverted annually for various alternative uses, including reuse, re-treading, recycling, and combustion. The remaining 10.5 million tires are shredded and disposed of in California's permitted solid waste landfills, stored at permitted sites, or illegally disposed of around the State.

- The total amount of hazardous waste shipped for treatment, storage and disposal has fluctuated over the past decade, with the lowest amounts shipped in 1996 and 1997, and the highest in 2001. However, the amount of hazardous waste generated per unit of economic activity has continued to decline over the past decade.
- Most hazardous waste shipped offsite is destined for disposal in landfills, or for recycling. In 2003, more than 75 percent of hazardous wastes shipped were destined for disposal in landfills or recycling. The amount of hazardous waste disposed in landfills has fluctuated over the past ten years, but has increased overall; the amount recycled has increased slightly over the same period of time.
- No clear trends were noted for hazardous material spills or soil cleanup at hazardous waste sites.
- 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.

## *PESTICIDES*

Pesticides are unique among toxic chemicals in that they are deliberately released into the environment to achieve a specific purpose. While pesticides have brought significant benefits, they have the potential to adversely impact human and ecological health because of their inherent toxicity. Hence, it is important to track the human and ecological effects of pesticides, as well as the presence of pesticides in air, water, or produce. The pesticide indicators in this report show that:

- From 1989 through 2003, less than two percent of produce samples (approximately 3,500/year) had illegal pesticide residues. Of these, less than half a percent exceeded the allowable levels (tolerances); a higher portion contained residues for which allowable levels of the pesticide have not been established for the produce in which it was found.
- Although a slight increase in reported occupational pesticide illnesses and injuries occurred in 2002, the overall trend continues to decline over the past 14 years. Reported pesticide illnesses declined by about 60 percent (from 2,016 reports in 1988, to 793 in 2002). The increase in 2002 cases is the result of a few incidents in which a larger number of people were exposed. These were primarily due to pesticides or their breakdown products that moved beyond the area targeted for pesticide application.
- Well water sampling conducted to detect pesticide residues in ground water has been used to characterize geographic areas vulnerable to pesticide contamination. Vulnerable areas have been delineated based on relationships of detections to soil properties and depth-to-ground water characteristics. Recent regulations adopted by the Department of Pesticide Regulation regulate the use of detected pesticides in vulnerable areas. Pesticides have been detected in new areas, resulting in ongoing investigations to determine factors of vulnerability in these new geographic locations.

## *TRANSBOUNDARY ISSUES*

The movement of certain pollutants by natural processes, meteorological forces, and human activities can produce environmental threats extending beyond California's geographical boundaries. Conversely, pollutants originating in other states, countries or ecosystems, carried by atmospheric air currents, watersheds, trade, and travel can impact California. The transboundary indicators show that:

- Carbon dioxide emissions from the combustion of fossil fuels account for about 75 percent of greenhouse gas emissions. Total emissions have increased nearly 30 percent since 1970. However, emissions have been decreasing, on both a per capita and a per \$1,000 gross state product basis.
- California air temperatures have gone up approximately one degree Fahrenheit (1<sup>0</sup>F) in rural areas over the past century. This can be compared to an increase of about 3<sup>0</sup>F in cities, a larger increase due to the "urban heat island effect," which can skew temperature readings. Sea surface temperatures can moderate land temperatures in coastal areas. Global air temperatures are estimated to have increased by 0.5<sup>0</sup>F to 1<sup>0</sup>F since the late 19th century.
- Average spring snowmelt from the Sierra Nevada into the Sacramento River has decreased by about 12 percent since 1906. The decrease, especially after 1950, is likely due to increased air temperatures. Other factors, such as the Pacific Ocean sea surface temperature pattern oscillations, solar radiation, and air pollution probably contribute to the patterns observed.
- Global warming may escalate sea level rise. California's mean sea level, as shown by tidal measurements in the past century has risen, but local land subsidence, and conversely, geologic uplifting of land mass can affect tidal calculations.
- California and Mexican air monitoring stations in the San Diego/Tijuana and Imperial Valley/Mexicali border areas reported peak ozone, carbon monoxide and inhalable particulate matter (PM 10) concentrations that continue to exceed California air quality standards. However, nitrogen dioxide concentrations have basically shown attainment of the state standard since 1994.

## *HUMAN HEALTH*

Most environmental protection programs are aimed at protecting human health against harmful exposures to environmental contaminants. Human health indicators are intended to reflect the impacts of exposures to environmental contaminants directly on people: the retention of toxic chemicals in human body tissues, and human conditions and diseases related to environmental exposures. Although it is known that certain environmental pollutants influence disease, other factors including genetics and lifestyle also play a role. The degree to which these various factors contribute to reported diseases or conditions from environmental pollutant exposures is largely undetermined, making it difficult to identify a cause and effect relationship that would support the development of indicators at the present time.

Certain background indicators show the following health-related trends:

- The life expectancy of Californians continues to increase, and compares favorably to national averages. In 2002, life expectancy at birth was 77 years for males and 81.7 years for females in California, compared to 74.7 for males, and 79.9 for females nationally.
- Infant mortality rates continue to decrease, from almost 8 deaths per 1,000 live births in 1990 to 5.3 deaths per 1,000 live births in 2001 (compared to a national rate of 6.8 deaths per 1,000 live births).
- Based on a survey of individuals aged 18 and over, the lifetime asthma prevalence (i.e., the percent of individuals surveyed who responded “yes” to the question, “Have you ever been told by a doctor that you have asthma?”) increased in 2002 to 12.7 percent in California and 11.8 percent in the United States, compared to 11.5 and 10.5 percent, respectively in 2000. During the same period of time, however, current asthma prevalence (i.e., the percent of individuals surveyed who responded “yes” to the question, “Do you still have asthma?”) decreased from 7.3 to 6.4 percent in California, while increasing from 7.2 to 7.5 percent nationally.

## *ECOSYSTEM HEALTH*

An ecosystem is an interdependent grouping of living and non-living components in the environment. The 2002 report addresses the health of four natural ecosystems (forests, grasslands and rangeland; the desert; freshwater aquatic; and coastal aquatic) and two ecosystems managed for the benefit of people, urban and agricultural. The key issues of concern in the natural ecosystems are: (1) preservation of habitat quantity and quality; (2) biodiversity; and, (3) maintenance of ecological function. Changes in the structural components of an ecosystem (habitat, species diversity) can ultimately alter ecological function and the viability of the ecosystem.

The updated indicators presented here show that:

- Since the late 1960s, the clarity of Lake Tahoe has been decreasing by about one foot per year. Water clarity is an indicator of the health of a lake.
- The population of winter-run Chinook salmon in the Central Valley, one of the endangered species for which reasonably good information exists, has increased compared to perilously low levels in the early 1990's; however, the population remains well below the proposed level for recovery. At present, these salmon spawn only in the mainstem Sacramento River and number approximately 8,000 fish.
- The population of the least tern, a coastal shorebird on the federal and State lists of endangered species, has increased since 1970, although production of young has been relatively poor since the late 1990s. The record-high total of 6,688 pairs reported in 2003 was more than twice the average annual breeding population size during the mid-1990s.
- The annual acreage of forests and grasslands burned in wildfires over the last fifty years has been highly variable, and is largely related to climate.

- Farmland continues to be lost to urban development, removed from active use, or used for environmental restoration purposes. Between 2000 and 2002, prime farmland accounted for 21 percent of the 92,750 new urban acres, while other irrigated farmland categories comprised an additional 8 percent of new urban land.

## **CONCLUSION**

The updated indicators continue to show mixed results that include both continuing improvements in California's environmental quality, remaining challenges, and inconclusive trends. For example, while carbon monoxide now occurs at levels that meet regulatory standards, ozone and particulate matter continue to occur at unhealthy levels. Coastal beach closures increased, while postings declined. While the population of winter-run Chinook salmon in the Central Valley has increased, it still remains low. Diversion of solid waste and recycling or waste tires continue to increase. The amount of hazardous waste shipped for treatment, storage or disposal has been fluctuating; however, there is a downward trend when viewed per unit of economic activity. The detection of illegal pesticide residues in produce remains at an extremely low rate of less than two percent. Indicators of climate change – such as air temperature, spring snowmelt, and sea level rise – show unfavorable trends.

Challenges exist not only in the conditions or issues represented by the indicator, but also in the availability or quality of the data needed to better understand the environment. While not evaluated as part of the update process, gaps in much needed data must be addressed to enable environmental programs to better understand and more effectively act on areas of concern.

A sustained, systematic effort to maintain and use environmental indicators can provide long-term benefits to the State. Environmental indicators better enable Cal/EPA programs and other regulatory agencies to identify problem areas, craft cost-effective strategies and regulations, make adjustments to programs, and report on environmental outcomes.

## INDICATOR UPDATES

Updated data are presented in the following pages for 43 of the 50 “Type I” indicators included in the *Environmental Protection Indicators for California Report* (April 2002). Type I indicators are those supported by ongoing, systematic data collection, and for which sufficient data are available for presenting a status or trend. The indicators with updated data are listed below:

### AIR QUALITY INDICATORS

- Days with unhealthy levels of ozone
- Peak 1-hour ozone concentration
- Exposure to unhealthy ozone levels (South Coast Air Basin)
- Emissions of ozone precursors – Volatile organic compounds + Oxides of nitrogen
- Days with unhealthy levels of inhalable particulate matter (PM10)
- Peak 24-hour inhalable particulate matter (PM10) concentration
- Annual inhalable particulate matter (PM10) concentration
- Days with unhealthy levels of carbon monoxide
- Peak 8-hour carbon monoxide concentration
- Carbon monoxide emissions
- Household exposure of children to environmental tobacco smoke

### WATER INDICATORS

- Aquatic life and swimming uses assessed
- Spill/Release episodes – Waters
- Leaking underground fuel tank (LUFT) sites
- Drinking water supplies exceeding maximum contaminant levels (MCLs)
- Coastal beach availability – Extent of coastal beaches posted or closed
- Bacterial concentrations in commercial shellfish growing waters
- Fish consumption advisories - Coastal waters
- Statewide water balance summaries  
(replaces “Statewide water use and per capita consumption)
- Water use efficiency – Recycling municipal wastewater

### LAND, WASTE AND MATERIALS MANAGEMENT INDICATORS

- Statewide solid waste generation, disposal and diversion, per capita
- Number of tires diverted from landfills
- Hazardous waste shipments
- Hazardous material incidents
- Hazardous waste disposal
- Soil cleanup
- Contaminated sites

### PESTICIDE INDICATORS

- Area with pesticides detected in well water
- Simazine and breakdown products in a monitoring network of 70 wells  
in Fresno and Tulare Counties
- Percent of produce with illegal pesticide residues
- Number of reported occupational illnesses and injuries  
associated with pesticide exposure

## TRANSBOUNDARY INDICATORS

- Carbon dioxide emissions
- Air temperature
- Annual Sierra Nevada snowmelt runoff
- Sea level rise in California
- Air pollutants at the California/Mexico border

## ECOSYSTEM HEALTH INDICATORS

- Land cover of major terrestrial ecosystems in California
- Land management in California
- Clarity of Lake Tahoe
- Status of Central Valley Chinook salmon populations
- California least tern populations
- Wildfires in forests and grasslands
- Conversion of farmland into urban and other uses

## INDICATORS OF ENVIRONMENTAL EXPOSURE IMPACTS UPON HUMAN HEALTH

- No Type I's

## BACKGROUND INDICATORS\*

### *Population demographics*

- Total California population
- Annual population growth

### **Economy**

- Gross State Product

### **Energy consumption**

- Total energy consumption and Gross State Product
- Energy consumption per GSP
- Energy consumption in California by sector

### **Transportation**

- Vehicle miles traveled, fuel consumption and fuel efficiency

### **Human health**

- Life expectancy at birth
- Leading causes of death in California
- Infant death rate
- Asthma prevalence among adults

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\* Background indicators are intended to provide information with which to interpret environmental indicators.