Assessing the Region Via Indicators

The Environment

The State of the Great Central Valley of California

Supporting the economic, social, and environmental well being of California's Great Central Valley

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Dear Friends:

This publication, *The State of the Great Central Valley—The Environment,* is the second in a series of regional reports measuring the standing and status of California's Central Valley in a variety of categories. As the region grows and changes, the quality and quantity of water, the health of the air, the number of acres of farmland urbanized or impacted by salinity—the general health and quality of the environment—will become increasingly important. Not only do larger populations have bigger impacts on the environment, they also have higher expectations for a good quality of life.

Generally, the subregions used in the report reflect two major natural organizing elements of the Central Valley, the Sacramento and the San Joaquin Rivers. The Sacramento Valley includes the ten counties from Sacramento north to Shasta, and the San Joaquin Valley includes the eight counties from San Joaquin south to Kern.

This report establishes a baseline from which regional progress can be measured. While the Central Valley has significant environmental challenges, much non-attainment is the result of recently established environmental regulations or new standards. When evaluating the data, it is important to look broadly at the current status or trends presented. The information is aggregated broadly and cannot generally be applied to individual properties or localities without further research.

With its 20 indices and measures of the Valley's environment, this study is a document of opportunity. The cities and counties of the region can, through planning and policy initiatives, ensure that the region will continue the progress that is being made in river restoration and clean-ups, reducing air pollution, protecting threatened and endangered habitats and ensuring clean drinking water. As individuals, we can walk more often, and "spare the air," we can recycle, conserve water and energy, and support environmentally savvy businesses. A lot can be done to sustain and improve the environmental health of our region.

Special thanks must be given to Doug Jackson, Senior Programs Assistant for the Great Valley Center, for his work coordinating the research and publication efforts for this document, and to Professor John Landis of the City and Regional Planning Department, UC Berkeley and Logan Hennessey, Ph.D candidate in the School of Natural Resources at UC Berkeley, for their efforts in defining categories, gathering the data and providing analysis. As with all reports of this type, there is much more information available than can be easily presented. Further detail and information can be obtained by contacting the agencies and sources identified, all of whom have been instrumental in supplying information and guiding this effort.

The State of the Great Central Valley—The Environment is meant to inform residents, state and local policy makers and others of both the strengths and the challenges that must be met to ensure a sustainable Central Valley, now and in the future.

Sincerely yours,

Carol Whiteside

Carol Whiteside
President

The State of the Great Central Valley—The Environment

Assessing the Region Via Indicators

The State of the Great Central Valley series measures the region's performance with a variety of indices. While this report addresses the environment, the flagship report (released in 1999 and to be revisited again in five-year increments) and future focused studies will measure progress in the variety of other areas important to quality of life for the Valley's growing population.

The Central Valley

The Central Valley is a vast region—some 450 miles long, averaging 50 miles wide. It is bound by mountain ranges—to the east and north are the snow-capped Sierra Nevada and the Cascades, and to the west are the Coast Ranges, a barrier against the moister and milder climate of the Pacific Coast. The Tehachapis separate the Central Valley from the metropolitan areas to the south. The Valley's fertile soil is the result of centuries of alluvial deposits as floodwaters coursed out of the mountains onto the Valley floor. Immensely productive, the Valley is an important agricultural resource and contains important natural resources as well.

What Are Indicators?

Indicators are presentations of data that measure performance. They show change over time and can be a useful tool for communities that want to identify trends and track progress toward desired outcomes. In some cases trends cannot be established but rather the data provides a baseline against which future change and progress can be measured.

What Are Good Indicators?

A good indicator has several characteristics:

- It reflects the fundamentals of long-term community or regional well being;
- It is clear, understandable and acceptable;
- The data can be tracked, statistically measured at regular intervals, and comes from a reliable source;
- It is easy to communicate in concept as well as in terms of its value and its importance to the region.
- It indicates an outcome rather than an input.

About this Report

This report uses available data to assess the current state of, and trends affecting, the Central Valley's environmental assets.

The growing population in the region (with an expected doubling by 2040) will have an increasing impact on the Valley's air, water, and land resources. In many cases the data demonstrates that much improvement is needed to provide a high quality of life during this period of growth. The State of the Great Central Valley—the Environment also highlights some successful efforts that combine the region's goals of economic growth and environmental stewardship.

Generally the subregions used in the report reflect two major organizing elements of the Central Valley, the Sacramento and the San Joaquin Rivers. The Sacramento Valley includes the ten counties from Sacramento north to Shasta, and the San Joaquin Valley includes the eight counties from San Joaquin south to Kern.

Because much of the data is most readily available by county, it is presented in that form. Jurisdictional lines, however, mean little when discussing air quality, watersheds, or habitat conservation. It is necessary to look more broadly than the county level to identify overlying trends in the data that can provide starting points for collaboration or results of existing regional efforts.

How to Use the Report

The report can be used as a benchmark for assessing the progress of the Valley and identifying and monitoring critical issues and challenges to be addressed by the civic leaders and stakeholders of the region. The information is broadly aggregated, and so every condition may not be equal in every community.

As with any indicators effort, the data should be used with the understanding that there is much more information available to create a more complete, and sometimes more local, assessment. The sources listed in each section are a good starting point.

Based on the information analysis and structure provided in this report, individual communities may develop specific indicators based on their own concerns. This is recommended as this report covers a vast region (18 counties) and not all issues are shared equally by every area.

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Great Valley Center

AIR QUALITY AND POLLUTION

A Story of Geography, Land Use, Transportation & Public Health

The geography that defines the Valley and which contributes to many of its positive attributes also creates a collection point for air pollutants that originate from both from within the Valley and from the San Francisco Bay Area.

Carbon monoxide, particulates, nitrogen dioxide and unburned hydrocarbons that are principally produced by the burning of fossil fuels, refuse, and agricultural products settle in the Valley's two air basins — the Sacramento Valley Air Basin, extending from Sacramento County north, and the San Joaquin Valley Air Basin, extending from San Joaquin County south.

Air quality is a major factor in the quality of life in the Valley and reduced air quality is a problem common to many growing regions. Air pollution affects health, reduces crop yield, and limits visibility. Due to the projected growth in the region and the strong connections between air quality, transportation forms and patterns, land use, and respiratory health, it is critical to monitor air quality as the region grows.

Photographs by Steve Kosko except when noted otherwise.

OZONE EXCEEDENCE

Recent state air quality gains not realized in the Central Valley

What does this mean?

In the presence of sunlight, nitrogen dioxide and hydrocarbons combine to form smog and ground-level ozone. Ozone is measured as a series of localized, or ambient readings. Air quality in relation to ozone levels is typically measured in the number of days in a year in which the ozone level is above the State's standard acceptable levels for 1-hour and 8-hour stretches (1-hour and 8-hour exceedence days).

Why is this important?

Ozone is harmful for all living things, but it most affects the very young, the very old, and those with chronic breathing problems. It can exacerbate existing respiratory illnesses, restrict outdoor activities, and may be associated with the rate of asthma in the population.

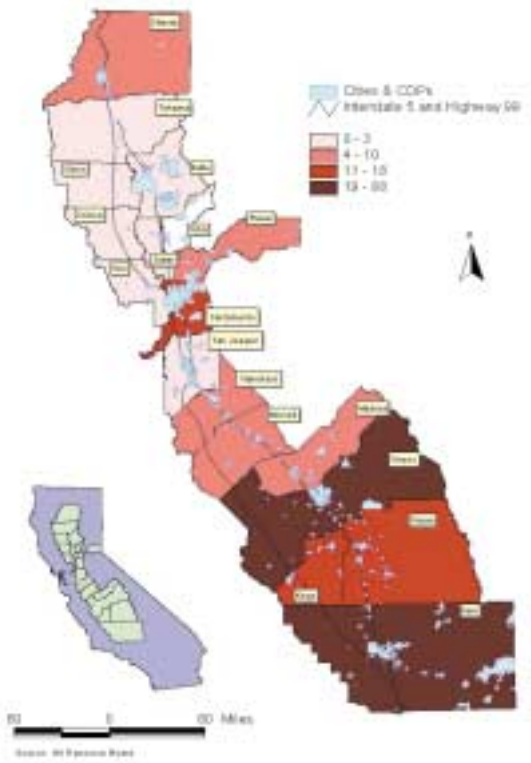
How are we doing?

California's air quality has improved significantly during the last 30 years, thanks to improved emissions control technologies and more stringent emissions standards. However, the same improvements have not been seen in the Valley, where the number of days in which the standard was exceeded has remained virtually level.

According to the American Lung Association's 2000 ranking of the 25 worst ozone-polluted counties in all of the United States, Kern ranked 3rd, Fresno 4th, Tulare 6th, Kings 9th, Merced 16th, Sacramento 20th, and Shasta 23rd.

Between 1990 and 1998, the San Joaquin Valley Air Basin exceeded the 8-hour ozone standard an average of 97 days per year while the Sacramento Valley Air Basin exceeded it an average of 30 days per year. The number of days was generally higher in more populated counties (e.g., Fresno, Kern, and Sacramento) and in counties at the eastward ends of the Valley. It was greatest by far in Kern, Fresno, and Tulare counties.

Unhealthy Ozone Exposure Days Map (1996-1998)



Source: California Air Resources Board
American Lung Association, State of the Air Report, 2000

OZONE AT-RISK COUNTS

Greater hazards exist for at-risk population in the southern portion of the Valley.

What does this mean?

To better describe the health risks of ozone, the American Lung Association and the California Air Resource Board subdivide the number of 8-hour ozone exceedence days into categories of "unhealthy," "very unhealthy," and "hazardous." The at-risk count is achieved by multiplying the at-risk population by the number of very unhealthy and hazardous ozone exceedence days.

Why is this important?

Understanding who poor air quality affects creates a more complete picture of ozone as a public health issue and can help to target pollution-reduction strategies and health-promotion outreach.

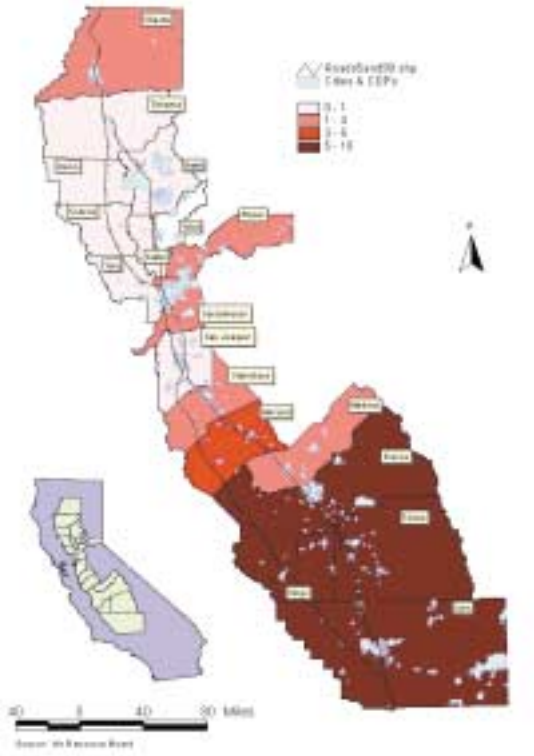
How are we doing?

According to the American Lung Association, the number of Valley residents "at-risk" from high levels of ozone varies from a high of 129,000 in Sacramento County to a low of 2,100 in Colusa County. Children, adults who are active outdoors, and individuals with lung diseases or chronic conditions such as emphysema and asthma are especially vulnerable to ozone.

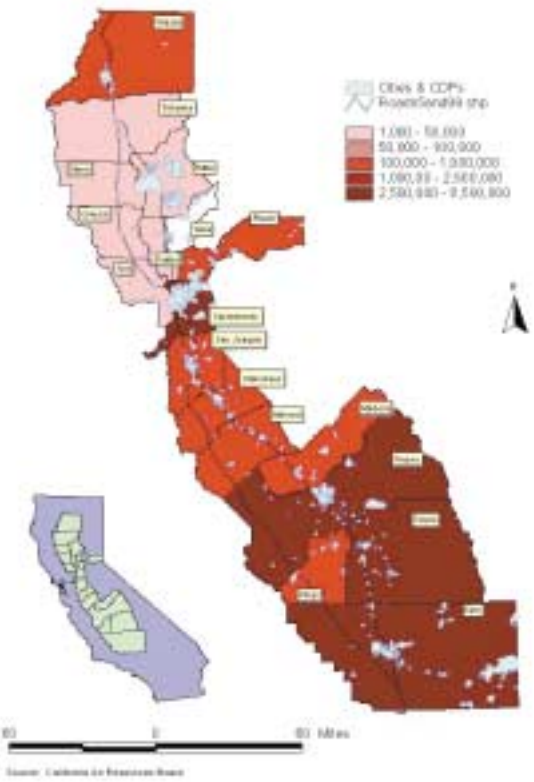
There are also otherwise healthy adults who have a higher susceptibility to ozone although scientists do not know why.

The number of "at-risk" very unhealthy and hazardous ozone exceedence days in 1998 ranged from a low of zero in six counties (Butte, Colusa, Glenn, San Joaquin, Sutter, and Yolo) to highs of 6.2 million in Kern County and 4.9 million in Fresno County.

Average Annual Unhealthy Ozone Exposure Days—
At-Risk Population



Exceedence Days *At Risk Population



Source: California Air Resources Board
American Lung Association, State of the Air Report, 2000

PARTICULATE EMISSIONS

Particulate emissions are increasing.

What does this mean?

Particulates—otherwise known as dust, smoke, and haze—are a complex mixture of solid and liquid particles that transport other pollutants on their surfaces. Coarse particles (PM-10) are generally emitted from sources such as vehicles traveling on unpaved roads, crushing and grinding operations, and windblown dust. The burning of fossil fuels, refuse and plant materials in agricultural practices also releases particulates, along with carbon monoxide and nitrogen dioxide, into the air.

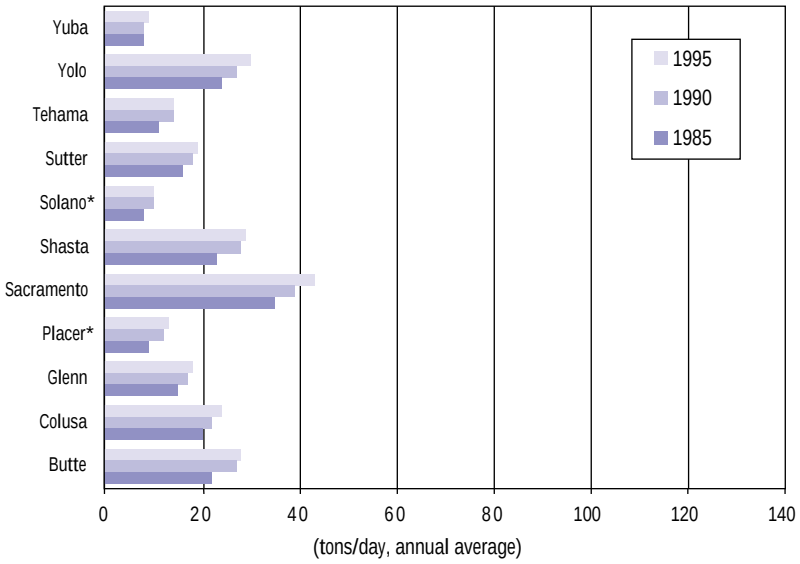
Why is it important?

Particulates reduce visibility and impair respiratory functions when inhaled.

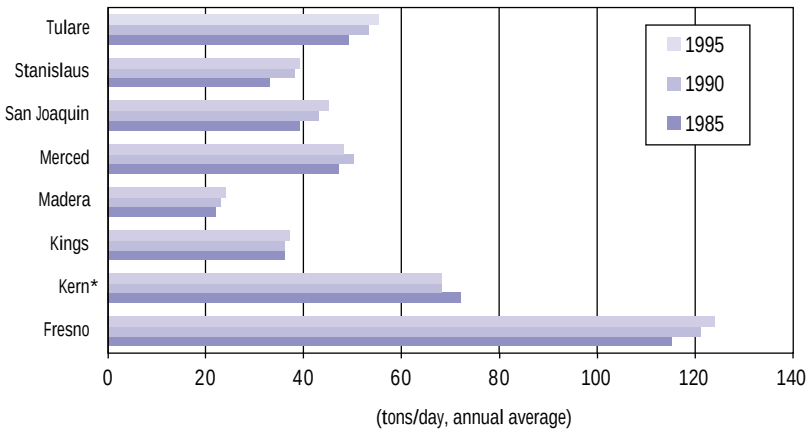
How are we doing?

Particulate emissions are on the upswing. Among counties in the Sacramento Valley Air Basin, average daily coarse particulate emissions (PM-10) have increased from 15.6 tons in 1985 to 19.4 tons in 1995. Among San Joaquin Valley counties, particulate emissions have increased from an average of 51.4 tons per day in 1985 to 54.8 tons per day in 1995. Particulate emissions are generally higher in the San Joaquin Valley than in the Sacramento Valley because of increased burning of refuse and agricultural material.

Particulate Emissions, Sacramento Valley Air Basin, 1985-1995



Particulate Emissions, San Joaquin Valley Air Basin, 1985-1995



* parts of this county lie in a different air basin

Source: California Air Resources Board, 1999 Almanac of Emissions and Air Quality

CARBON MONOXIDE EMISSIONS AND HYDROCARBONS

Emission levels falling, but will the trend continue?

What does this mean?

Carbon monoxide is emitted by vehicles, power plants, and refuse and agricultural burning, while reactive organic gas emissions (i.e., hydrocarbons) are the product of both burned and unburned petroleum products—including gasoline, oil, kerosene, paints, and solvents.

Whether this trend can continue is unknown. In recent years, Central Valley residents, like their counterparts everywhere in America, have shifted away from smaller and more fuel-efficient cars to larger, less fuel-efficient trucks and sport utility vehicles. Additionally, new power plant construction is likely to lead to an increase in total carbon monoxide emissions.

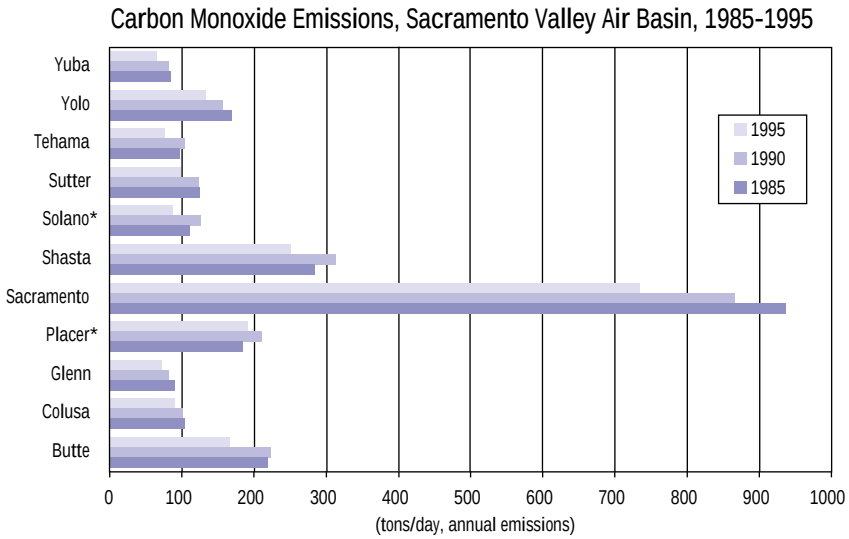
Why is it important?

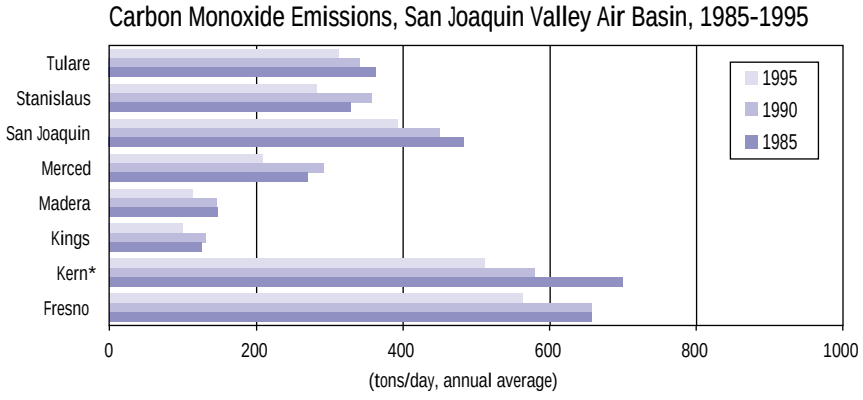
Carbon monoxide blocks the delivery of oxygen to organs and tissues. Reactive organic gases contribute to smog.

How are we doing?

Carbon monoxide and hydrocarbon emissions follow similar patterns: emissions are falling despite the continued population growth and the increase in vehicle miles traveled as older cars give way to cleaner-burning, newer models.

Carbon monoxide emissions vary from a high of over 700 tons per day in Sacramento County to less than 100 tons per day in Yuba, Glenn, and Colusa counties. Reactive organic gas emissions are the highest in the most populated areas, yet have declined the most in those same areas due to tighter emission controls and the increased use of cleaner-burning vehicles.





* parts of this county lie in a different air basin

Source: California Air Resources Board, 1999 Almanac of Emissions and Air Quality

The American Lung Association's Top Ten Tips for Green Driving

The automobile is still the single biggest source of air pollution. New technologies such as the development of hybrid gas/electric vehicles and fuel cell technology may lead to a reduction in emissions, but there are some other ways that individual Valley residents can help as well.

1. Trip chain more often: combine your errands into one trip. It helps you get things done and it helps reduce air pollution. When you first start a car after it has been sitting for more than an hour, it pollutes up to five times more than when the engine's warm.

2. Take mass transit, share a ride, or car pool. Even if you do it just once or twice a week, you'll reduce traffic congestion and pollution, and save money. The average driver spends about 44 cents per mile including ownership and maintenance.

3. Have fun! Ride your bike. It's a great way to travel and it can help you and the air get into condition. Vehicles on the road create more than 25% of all air pollution nationwide.

4. Take things in stride. Walk or in-line skate instead of driving. They're easy ways to get exercise and they're easy on the air.

5. Care for your car. Regular maintenance and tune-ups, changing the oil and checking tire inflation can improve gas mileage, extend your car's life and increase its resale value. It can also reduce traffic congestion due to preventable breakdowns and it could reduce your car's emissions by more than half.

6. Get fuel when it's cool. Refueling during cooler periods of the day or in the evening can prevent gas fumes from heating up and creating ozone. And that can help reduce ozone alert days.

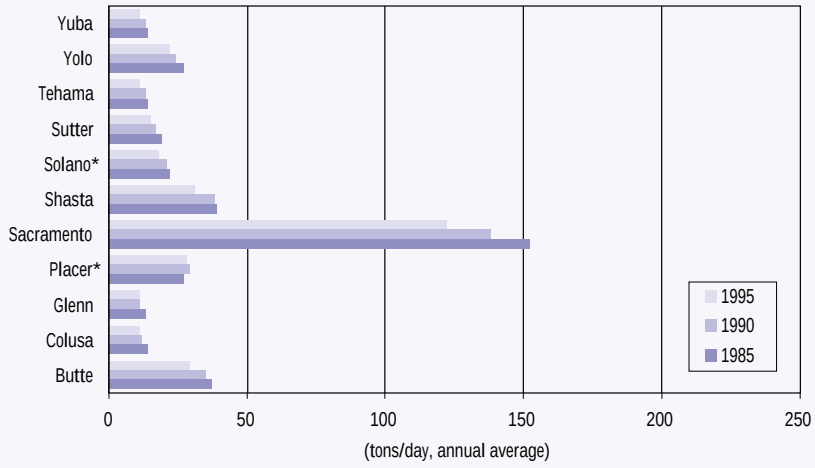
7. Don't top off the tank. It releases gas fumes into the air and cancels the benefits of the pump's anti-pollution devices. So stopping short of a full tank is safer and reduces pollution.

8. Telecommute. Work at home sometimes. You'll save time and money, and reduce emissions and traffic congestion.

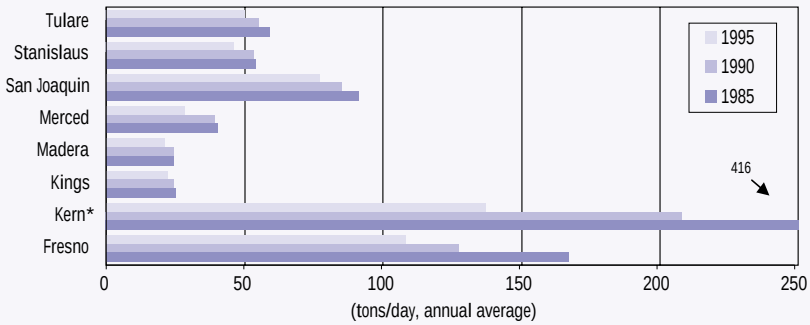
9. Know before you go. If your area has a travel and transit information network, use it by calling, visiting the web site or tuning into the cable station. Get travel and transit updates before you leave home and you won't get stuck in a jam.

10. Call your local Lung Association at 1-800-LUNG-USA or visit www.lungusa.org for more information about cars and air pollution.

Reactive Organic Gas (Hydrocarbon) Emissions
Sacramento Valley Air Basin 1985-1995



Reactive Organic Gas (Hydrocarbon) Emissions
San Joaquin Valley Air Basin, 1985-1995



California Air Resources Board, 1999 Almanac of Emissions and Air Quality

WATER

An Integral Part of the Valley's History and Future

It supports agricultural production and urban settlement, connects communities though shared sources and common watersheds, and provides important habitat. Water is a vital resource and an integral part of the history and the future of the Central Valley. From the air, some of the connections are apparent. The canals of the Central Valley Project water distribution system impose a human-constructed order while meandering tributaries feed into the San Joaquin and Sacramento Rivers. The two rivers in turn merge at the San Francisco Bay Delta, where the structured lines of levees and Delta agriculture juxtapose the complex web of waterways. A host of California water demands also converge at the Bay Delta.

Not all of the water supply system is visible however. Subterranean aquifers fed by rivers, runoff and rainfall also provide water for drinking and irrigation in the Valley.

WATERSHEDS

Healthiest Valley watersheds are in the Sacramento Valley

What are they?

A watershed is the area of land that is drained by a particular stream or river system. While the San Joaquin and Sacramento Rivers are popularly seen as creating two watersheds in the Valley, there are 70 watersheds defined by the Environmental Protection Agency (EPA) around other rivers and tributaries.

Why are they important?

Watersheds define a geographic area through the structure of a natural system and frame resource issues in the context of a particular resource shared by everyone: water. The watershed is seen as a scale for managing natural resources that generally reaches beyond the boundaries of one jurisdiction.

The EPA has taken a lead role in gathering information on our nation's watersheds, compiling state reports and assigning each watershed an index combining its current condition and vulnerability to continued pollution. The index includes data on fish and wildlife populations, concentrations of contaminants, drinking water status, wetlands status, proximity to urban or agricultural runoff, population changes, hydrologic modification, and atmospheric deposition.

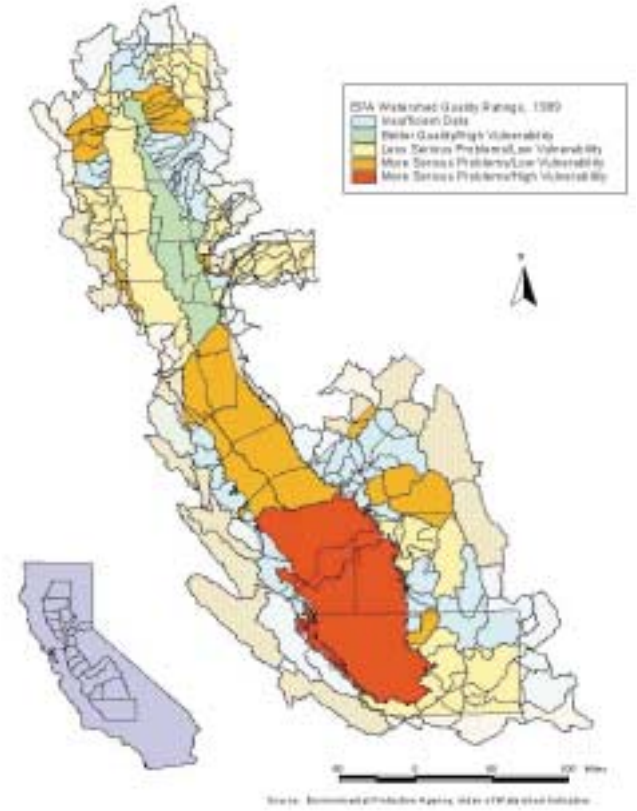
Since watersheds commonly overlap county boundaries (in many cases rivers are used as the dividing line between counties), effective management of the watersheds in the Valley must begin with cooperation and collaboration between local jurisdictions and regulatory agencies.

How are we doing?

As a general trend, watersheds are healthier in the Sacramento Valley. There are problems in the Northern San Joaquin Valley and more serious problems in the Southern San Joaquin Valley.

Of the 70 watersheds in the Valley, 1% (3) have Better Water Quality, 30% (21) have Less Serious Water Quality problems with low vulnerability to continued pollution, 29% (20) have More Serious Water Quality problems with low vulnerability to continued pollution, while 1 watershed, Tulare-Buena Vista Lakes, has More Serious Water Quality problems with high vulnerability to continued pollution. Not all information is available however: 36% (25) of the Valley's watersheds lack sufficient data to create an indicator index.

EPA Watershed Quality Ratings Map



Source: U.S. Environmental Protection Agency, Watershed Quality Ratings, 1999

CALFED and the San Francisco Bay-Delta

The CALFED Bay-Delta Program, a cooperative effort among state and federal agencies and California's environmental, urban and agricultural communities was created in 1995 to restore the ecological health and improve water management of the largest estuary on the west coasts of North and South America.

The Bay-Delta system provides water for California's industries, agriculture and growing population. It provides some or all or the drinking water for more than 22 million Californians and supplies irrigation water to millions of acres farmed in the state's $27-billion agricultural industry, according to CALFED.

It also plays a vital ecological role. Millions of birds migrate through, or live in, the Bay-Delta, which is also home to 53 species of fish, and includes one of the most productive natural salmon fisheries on the West Coast

For more information on the Bay-Delta and the CALFED Bay-Delta Program visit the web site at http://calfed.ca.gov/.

RIVERS AND STREAMS

Agriculture and resource extraction impact Valley waterways.

What are they?

Rivers and streams serve as the backbone of the watershed system. Impairment levels are one measure used in assessing watershed quality. Impaired means that the body of water does not support all of its appropriate beneficial uses such as providing drinking water or fish habitat (Good fish habitat is pollutant-free and contains oxygen and nutrients.)

Why are they important?

Impairments can affect drinking water and habitat, and can result in serious downstream water pollution problems in the Delta. Studying the water quality and quantity in the rivers and streams can bring light to broader trends of watershed health.

Level of Impaired Streams, 1998

Source: U.S. Enironmental Protection Agency and California State Water Resources Control Board, Region 5 Water Body Sysytem 303 (d) lists, 1998

How are we doing?

While human impacts on rivers are decreasing due to higher regulatory standards and the improved practices of agriculture and mining, the two major rivers (the Sacramento and San Joaquin)—shared by 11 of the 18 Valley counties—are highly impacted by past practices.

In the Sacramento Valley, including Sacramento and the nine counties to its north, there are approximately 16,459 kilometers of rivers and streams, of which approximately 13.8% (2,271km) are impaired—largely because of past agriculture and resource extraction practices. Heavy metals like copper, zinc, lead, cadmium, and mercury from active and abandoned mines have caused fish declines and in some cases have polluted of drinking water sources. The Sacramento and Lower Feather rivers are the most impaired and together account for 1,308 km of highly impaired waters. The Sacramento Valley has a high number of rivers with a moderate impairment status.

In the San Joaquin Valley, including the San Joaquin County and the seven counties to its south, the sources of impairment that affect some of its 12,718 total kilometers of rivers and streams are predominantly agricultural. Pesticides, grazing lands, and dairy farms contribute non-point-source pollutants that have collectively impaired 11% (1,427km) of river and stream lengths, including the major thoroughfares of the Lower Stanislaus, San Joaquin, Lower Tuolumne, Lower Merced, Salt Slough, and Mud Slough. Water quality control programs are being implemented to reverse the current levels of impairment.

Measuring Impairments in Streams and Rivers

Approximately 1,756 rivers and streams in the Valley are recognized by the State Water Resources Control Board (SWRCB) in what it designates as Region 5. Shasta County has the most rivers and streams, with about 303, while Sutter County has the least with about 10. Six Valley counties have more than 100 rivers and streams, while 60% (11) have more than 50. It is important to note the following:

Every two years, the SWRCB, under requirements of the Clean Water Act, submits to the U.S. EPA a list of waters in poor quality conditions and a list of high-priority watersheds. Not all of the rivers and streams in the Valley (i.e. region 5) have been assessed to a degree appropriate for reporting. Nonetheless, the existing list is a starting point that can serve as a baseline for continued and expanded monitoring and assessment as budget allows and priority directs.

Lengths of Impairment by Source (km)

Sacramento Valley	Primary Impairment Source	Secondary Impairment Source	Tertiary Impairment Source	Totals
Agriculture	454.34	1358.02	0	1812.36
Resource Extraction	1759.7	0	0	1759.7
Dairies	0	0	0	0
Urban Point Sources	0	0	26.34	26.34
Urban Runoff	49.56	198.66	254.53	502.75
Grazing	0	177.74	0	177.74
Silviculture	0	72.84	0	72.84
Construction	0	0	72.84	72.84
Unknown	0	177.68	140.22	317.9

San Joaquin Valley	Primary Impairment Source	Secondary Impairment Source	Tertiary Impairment Source	Totals
Agriculture	1086.08	14.25	0	1100.33
Resource Extraction	253.25	40.88	0	294.13
Dairies	56.21	0	0	56.21
Urban Point Sources	10.75	25.57	0	36.32
Urban Runoff	20.3	0	0	20.3
Grazing	0	0	0	0
Silviculture	0	0	0	0
Construction	0	0	0	0
Unknown	0	889.94	0	889.94

GROUNDWATER AND DRINKING WATER QUALITY

Groundwater resources at risk.

What is this?

Groundwater is part of the intricate natural system that supplies water for residential and agricultural uses.

Why is it important?

Recharged by rivers and streams and drainage from the soil above them, underground aquifers can collect contaminants with the water. Groundwater often serves as a major source for drinking.

How are we doing?

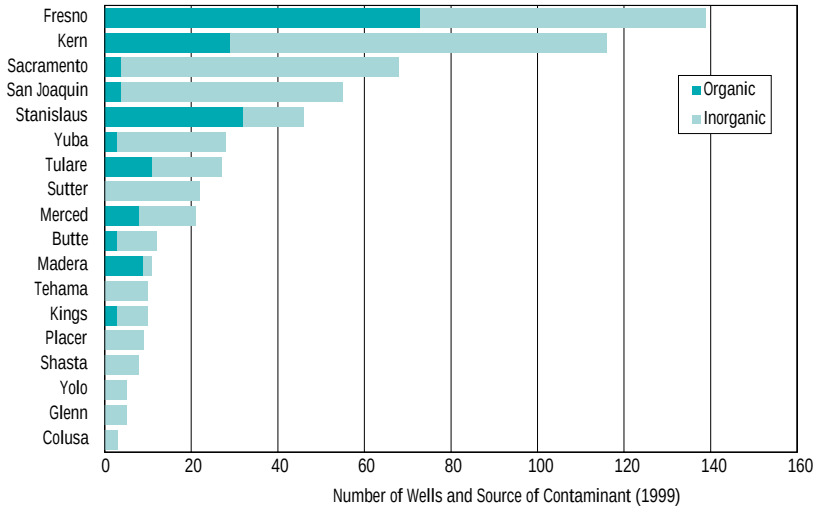
A 1999 Congressional report describes California's groundwater resources as "threatened" due to human activities that have generated large numbers of contaminants from both point and non-point sources. These contaminants include industrial chemicals like solvents, pesticides, nitrates, and heavy metals, and are usually localized to the well site. The report also identified broad regional trends in the San Joaquin Valley, in which nitrates from chemical fertilizers, animal-feeding operations, and septic systems "have caused the shutdown of more public supply wells than any other contaminant."

This data does not mean that individuals should be alarmed that the water they are consuming is unsafe. Water providers are required to meet public water standards and to notify users when the levels are exceeded. The data indicates that it is possible to prevent further well closures by reducing the introduction of contaminants to groundwater.

Under the Safe Drinking Water Act Amendments of 1996, a maximum contaminant level (MCL) is set by law for a variety of both organic and inorganic pollutants.

A query of the State's database for all the maximum-contaminant level violations for public wells in the Valley over the last 10 years revealed that of the 30 compounds found in exceedence, concentrations for organics, pesticides, and radioactives, the most common were dibromochloropropane (DBCP), ethylene dibromide (EDB), gross alpha particle activity (a radioactive measurement), trichloroethylene, tetrachloroethylene, uranium, and benzene. In the past ten years, these compounds were found to exceed maximum contaminant levels in a total of 562 different wells in the Valley. The situation is not stable, with 168 wells exceeding maximum levels in 1990, 155 in 1995, and 181 between 1999-2000.

Number of Active Wells with MCL exceedences since 1997 that are either untreated or were treated after measuring



The most common inorganic compounds (non carbon-based substances) include aluminum, flouride, iron, manganese, and nitrates, which have also been responsible for a trend of increasing contamination, yielding 134 cases in 1990, 201 in 1995, and 195 between 1999-2000). Fifteen different inorganic compounds were found in excess of the MCL levels in primary drinking sources.

Concentrations of some contaminants warrant more attention than others. The gasoline additive MTBE, for example, is commonly known to be a risk, but was found in only eight Valley wells. State and local governments react to contaminated wells on a case-by-case basis depending on the substances level of toxicity and the determined effect on public health.

California Department of Water Resources, California Division of Drinking Water and Environmental Management, Department of Health Services
Ground Water Protection Council, Association of State Drinking Water Administrators, and Association of State and Interstate Water Pollution Control Administrators. 1999. Ground Water Report to Congress. Summaries of State Water Conditions. California Section handled by the State Water Resources Control Board, Regional Water Quality Control Boards, California Department of Health Services, and California Department of Water Resources.

Land

A Central Valley Asset

The foundation of important ecosystems, Central Valley land supports habitat for wildlife as well as for productive agriculture, growing cities, the creation of new homes, and the creation of commercial ventures. It also provides corridors for transportation and recreational areas for residents and visitors. Daily, land-use decisions are made that permanently alter the landscape. Accurate information regarding commercial markets, population projections, soil quality, drainage, and habitat helps local officials make informed decisions to better achieve balance among goals. The charts and maps describe characteristics of Valley lands, portray ways that unique lands are important to society and the natural world, and begin to identify trends. This information, along with other data reflecting the breadth of community goals, can provide a larger context for local decisions. When important natural resources are identified early, conflicts between the needs of development and the environment may be avoided.

URBANIZATION

Urbanization rates increasing in most Central Valley growth areas.

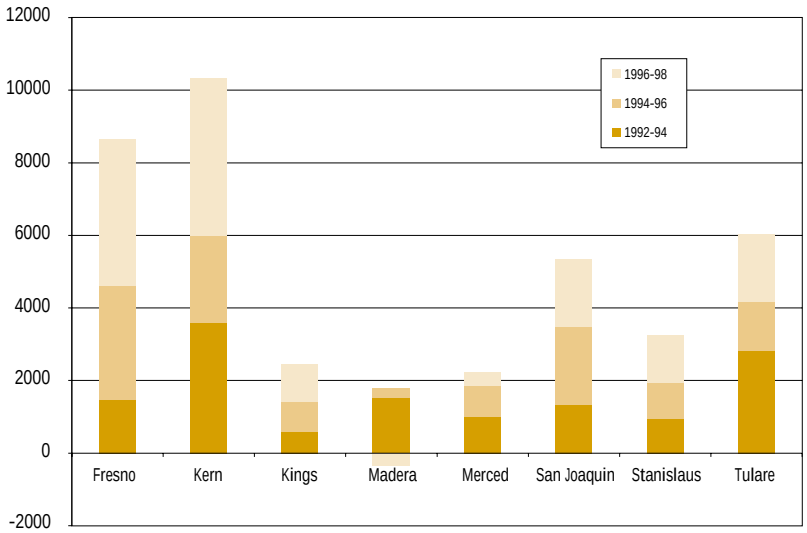
What does this mean?

Urbanization is the conversion of land that was previously undeveloped and in a natural state, existing as open space, or used for farmland or grazing land. For the purposes of this report, "urban and built-up land" is occupied by structures at a building density of at least one unit to each 1.5 acres or approximately six structures to a ten-acre parcel. This is the definition used by the Farmland Mapping and Monitoring Program (FMMP), which inventories and maps farmlands, identifying them as urbanized, grazing, or important (farmland of local or state importance or prime or unique agricultural lands). Released biennially, the newest FMMP report updates the information to 1998 and emphasizes the changes since 1996.

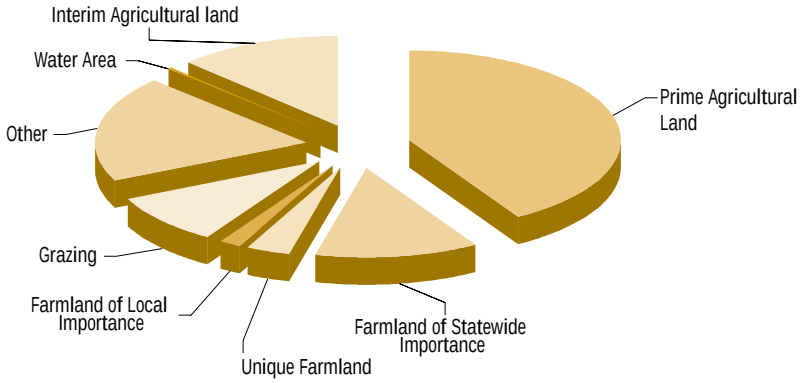
Why is it important?

Land is one of the greatest resources available in the Central Valley. However, land. Knowing what land is best suited for agriculture or as species habitat (see species section) can inform land-use choices, directing urbanization away from the most important or unique areas.

San Joaquin Valley Urbanization (in Acres) (1992-1998)



Sources of Net Urbanized Land in the San Joaquin Valley (in Acres) (1996-1998)

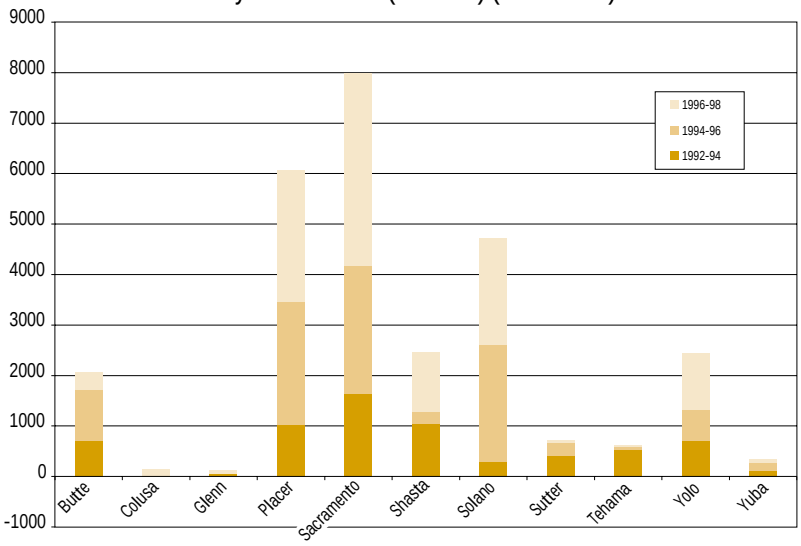


The apparent "loss" of urban land in Madera County is actually due to a change in the way the FMMP is measuring. The revised, more accurate method uses scanned aerial photography as a backdrop to the land-use information to draw the boundaries. Most of the "loss" of urban land occurred in the foothill areas of the county and is not actually a loss, but rather a correction. Urban land in Madera County actually increased, but due to the boundary changes, it is difficult to determine by how much. For more information on the Farmland Mapping and Monitoring Program's process, visit www.ca.gov/dlrp/fmmp.

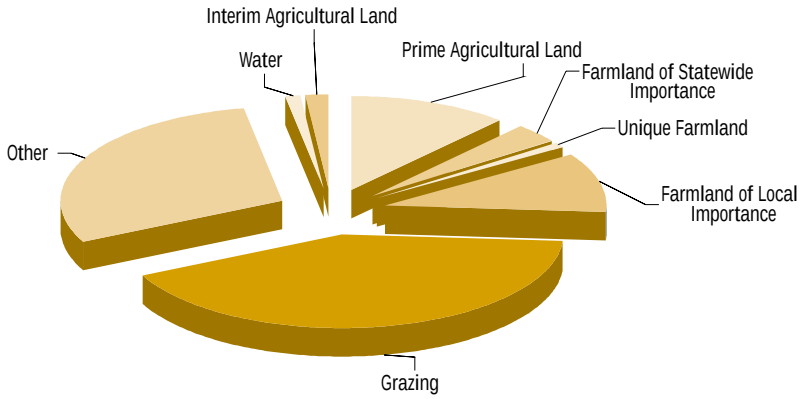
How are we doing?

Rates of change slowed in the early 1990s when the economy was in decline and population growth slowed. The rate of land conversion has increased since 1996. The FMMP found that during the two-year period from 1996-1998, the statewide urbanization rate rose by 25% over the previous two-year period. From 1996-1998, the San Joaquin Valley led the state's regions in conversion of irrigated farmland to urban land (9,505 acres). The Central Valley contains eight of the state's top 10 counties with the largest net losses of irrigated farmland from 1996-1998. The Sacramento Valley led the state's regions in loss of irrigated farmland due to land being left idle, ranchette development, establishment of wetland and wildlife areas, and urban development.

Sacramento Valley Urbanization (in Acres) (1992-1998)



Sources of Net Urbanization in the Sacramento Valley (1996-1998) (in Acres)



Source: California Department of Conservation, Farmland Mapping and Monitoring Program, California Farmland Conversion Report 1996-98 June 2000; California Farmland Conversion Report 1994-96 June 1998; California Farmland Conversion Report 1992-94, June 1996

Farmland Mapping and Monitoring Project Land Classifications

PRIME FARMLAND
Farmland with the best combination of physical and chemical features able to sustain long-term production of agricultural crops. This land has the soil quality, growing season, and moisture supply needed to produce sustained high yields. Land must have been used for production of irrigated crops at some time during the four years prior to the mapping date.

FARMLAND OF STATEWIDE IMPORTANCE
Farmland similar to Prime Farmland but with minor shortcomings, such as greater slopes or less ability to store soil moisture. Land must have been used for production of irrigated crops at some time during the four years prior to the mapping date.

UNIQUE FARMLAND
Farmland of lesser quality soils used for the production of the state's leading agricultural crops. This land is usually irrigated, but may include nonirrigated orchards or vineyards as found in some climatic zones in California. Land must have been cropped at some time during the four years prior to the mapping date.

FARMLAND OF LOCAL IMPORTANCE
Land of importance to the local agricultural economy as determined by each county's board of supervisors and a local advisory committee.

INTERIM FARMLAND
For farmed areas lacking modern soil survey information and for which there is expressed local concern on the status of farmland.

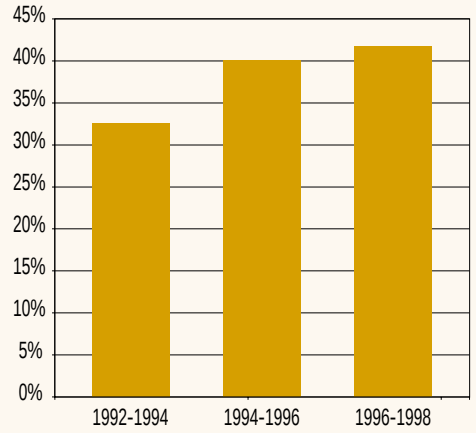
GRAZING LAND
Land on which the existing vegetation is suited to the grazing of livestock. This category was developed in cooperation with the California Cattlemen's Association, University of California Cooperative Extension, and other groups interested in the extent of grazing activities. The minimum mapping unit for Grazing Land is 40 acres.

URBAN AND BUILT-UP LAND
Land occupied by structures with a building density of at least 1 unit to 1.5 acres, or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial, commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures, and other developed purposes.

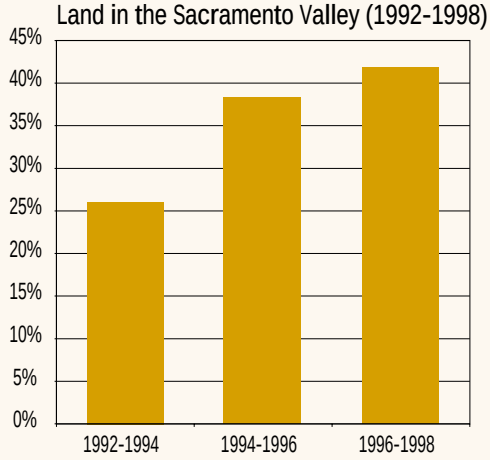
OTHER LAND
Land not included in any other mapping category. Common examples include low density rural developments; brush, timber, wetland, and riparian areas not suitable for livestock grazing; vacant and nonagricultural land surrounded on all sides by urban development; confined livestock, poultry or aquaculture facilities; strip mines, burrow pits; and water bodies smaller than 40 acres.

WATER
Perennial water bodies with an extent of at least 40 acres.

Prime Farmland as a Source of Urbanized Land in the San Joaquin Valley (1992-1998)



Grazing Land as a Source of Urbanized Land in the Sacramento Valley (1992-1998)



Source: California Department of Conservation, Farmland Mapping and Monitoring Program, California Farmland Conversion Report 1996-98 June 2000

SOIL DRAINAGE

Salinity remains a consideration in determining land use and agricultural practices.

What is this?

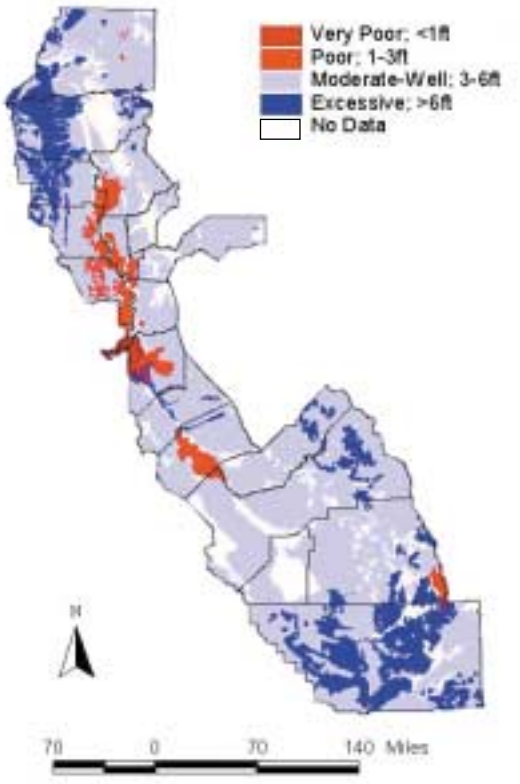
Soil drainage is the ability of soil to allow water to pass through it.

Why is it important?

Soil drainage is closely connected to salinity. While irrigation allows agricultural land to be much more productive, the irrigation water naturally carries salts from the geologic materials with which it has come in contact. These salts, while important in low concentrations, are harmful for plants when present in excessive quantities, can be hazardous to birds in drainage ponds, and, in large concentrations, can make land useless.

Land salinization can be mitigated or even reversed when enough water is applied to flush salts down through the soil. Areas of poor soil drainage, however, are at risk of insoluble salinization problems because flushing land with large amounts of water only causes flooding of the soil and does not lessen salt concentrations. As a result, measurements of soil drainage are important tools for indicating areas at risk of increasing salinization. If irrigated soil does not allow water to drain, the excess water will evaporate, leaving behind the salts it carried. As salts accumulate, they reduce productivity of the soil and if enough salts build up, they can create a barren, desert-like environment.

Drainage Capacity and Depth to Water Tables



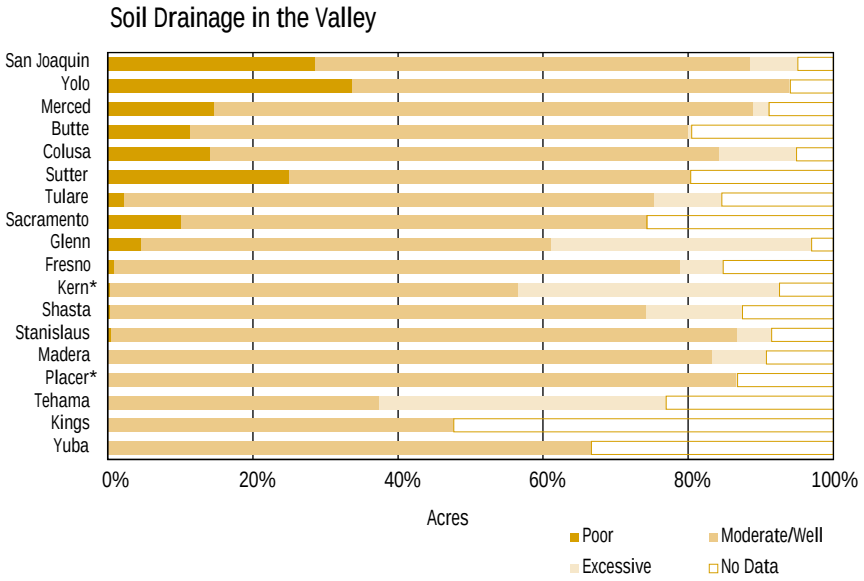
Source: U.S. Department of Agriculture, Soil Conservation Service: State Geographic database for California.

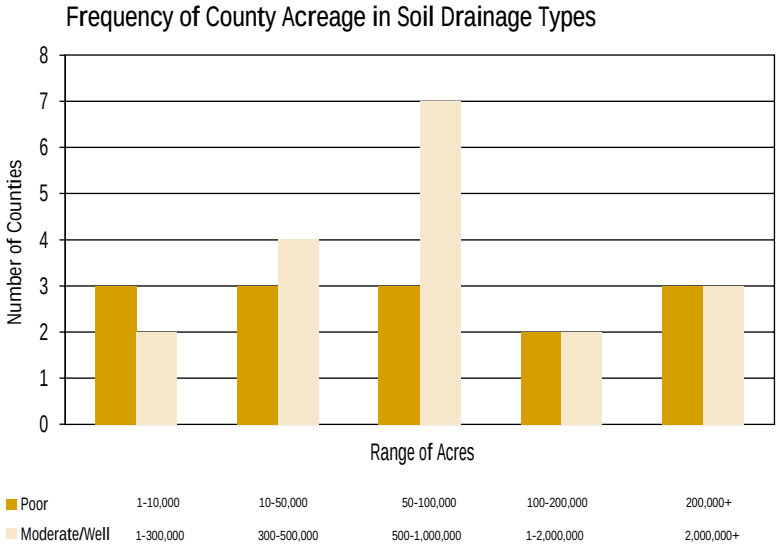
How are we doing?

Some of the poorer drainage areas of the Valley have been retired from agricultural production because of excess salinity.

The U.S. Department of Agriculture's State Soil Geographic Database (STATSGO), published in 1990, has depth to water table measurements for most of the land in the Great Valley. Areas of poor drainage seem to be more prevalent in San Joaquin, Yolo, Merced, Butte, Colusa, Sutter, Tulare and Sacramento counties. While in most counties more than half the acreage is moderate to well drained, San Joaquin, Yolo, and Sutter counties have a high proportion of their soils classified as poorly drained (~25, 30, and 24% respectively).

As new agricultural best-practices such as drip irrigation reduce the amount of water used, salinity problems may be avoided without reducing crop yield.





Source: U.S. Department of Agriculture, Soil Conservation Service: State Soil Geographic data base

WETLANDS

Central Valley ecosystems rely on a variety of wetland types.

What does this mean?

A wetland is land that is covered or saturated by water frequently enough or long enough to support vegetation that generally grows in saturated soils. State and Federal agencies monitor wetlands to ensure that their biological importance is considered in the land-use decision-making process.

Why are they important?

Wetlands collect water, moderate seasonal flooding, recharge the water table, and filter contaminants before water enters streams, rivers, or aquifers. In the Valley, wetlands are an important part of the Pacific Flyway and support a number of threatened and endangered species. Land conversion or urbanization of wetlands can affect flood control and reduce habitat for a variety of species. They are important for human health and for wildlife.

Wetlands are also being restored. As wetland loss slows, is stabilized, or reversed over time, the number of acres of wetlands in the region may increase.

How are we doing?

It is difficult to measure trends regarding wetland gain or loss.

This November 1998 snapshot of the Central Valley wetlands and riparian areas was developed by Ducks Unlimited, Inc. with the support of several federal and state agencies. Learn more about the collaborative efforts at www.ducks.org.

Through collaborative efforts such as the one that created this map and the use of Geographic Information Systems (GIS), graphically represented data is becoming more readily available. This helps inform land-use decisions and monitor the effects of policy and the progress of conservation efforts.

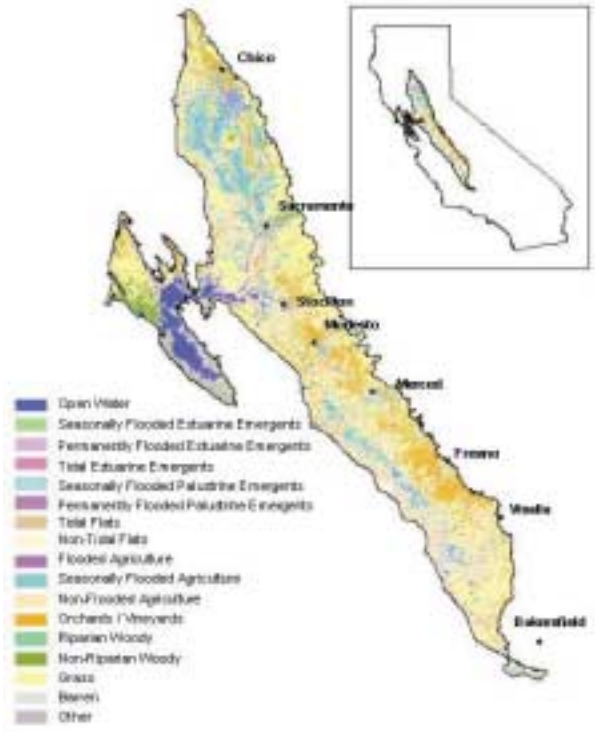
Wetland restoration

The U.S. Environmental Protection Agency defines wetland restoration as "the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to former or degraded wetland." This can mean working to adjust soil and water conditions of a location and reintroducing plants and animals that once inhabited the area.

Current federal initiatives call for a net increase of 100,000 acres of wetlands each year nationally and California's policy calls for "no net loss in the short-term and an increase in wetlands in the long-term. CERES, The California Environmental Resource Evaluation System, tracks California's wetland gains at http://www.ceres.ca.gov/wetlands/.

For more information on wetland restoration, visit the U.S. Environmental Protection Agency (E.P.A.) Office of Water at http://www.epa.gov/owow/wetlands.

California Central Valley Wetlands & Riparian Inventory, Nov. 1998



Source: developed through a cooperative grant from the Department of Fish & Game (using funds from the US EPA), the Wildlife Conservation Board, the Resources Agency of California, and the U.S. Bureau of Reclamation funded the development of this GIS database by Ducks Unlimited, Inc. and their subcontractor Pacific Meridian Resources in cooperation with DFG, WCB, and BOR staff.

ORGANIC AGRICULTURAL PRODUCTION

While still an extremely small percentage of agricultural production, a growing number of producers are using organic methods.

What is this?

Organic agricultural producers grow and process foods by relying on natural processes rather than synthetic fertilizers, pesticides, and herbicides. Pests and weeds are managed using non-synthetic means such as beneficial insects and mechanical controls. Also farmers work to build natural nutrients in the soil which help fertilize plants without reliance on synthetic fertilizers.

Why is it important?

Finding ways to reduce chemicals applied in agricultural processes can benefit the long-term ecological health of the region, reducing the amount of pesticides, herbicides and fertilizers that leach into soils, drain into aquifers, and run off into rivers and streams. This might be accomplished through a number of methods, including Integrated Pest Management (IPM) and precision agricultural techniques. Organic production is one method.

Some Valley Growers Are Reducing Pesticide Use

Integrated Pest Management (IPM), precision agriculture, and Biologically Integrated Farming Systems (BIFS) are a few methods being explored in the Valley to develop strategies for the long-term prevention of pests and related crop damage.

Using these ecosystem-based approaches, pesticides are specifically targeted to needed areas. Beneficial insect populations are encouraged and soil-building practices, such as the planting of nitrogen-generating cover crops, are used. Working in conjunction with natural processes, these efforts are being pursued to maintain high yields without the use of unnecessary pesticides.

Through IPM, pesticides are used only after the monitoring of natural efforts indicates that application is needed. Pesticides are then used with the goal of removing only the target organism to minimize risks to human health, beneficial and non-target organisms, and the environment.

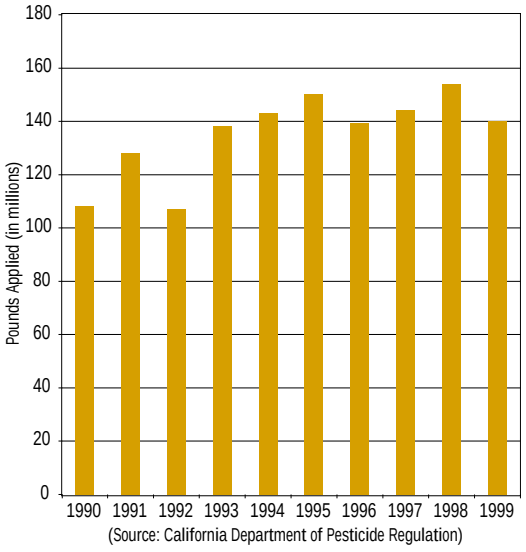
The Lodi-Woodbridge Winegrape Commission has incorporated IPM into their unique Integrated Farming Program (IFP) – an effort to promote the use of sustainable agricultural practices to address environmental, social and economic development concerns. Through efforts such as monitoring pest populations, planting cover crops, mechanically controlling weeds, enhancing beneficial insect activity, and maintaining habitat for wildlife in and around vineyards, the growers are trying to work with nature in a long-term approach to reducing synthetic chemical applications. For more information visit www.lodiwine.com.

How are we doing?

Organic production remains an extremely small portion—far less than 1%—of the region's agricultural product sales. By and large, organic production is on the rise. Responding in part to the California Organic Food Act of 1990, increased market demand for organic products and an increase in informational resources for organic farmers, more growers are growing some or all of their produce organically.

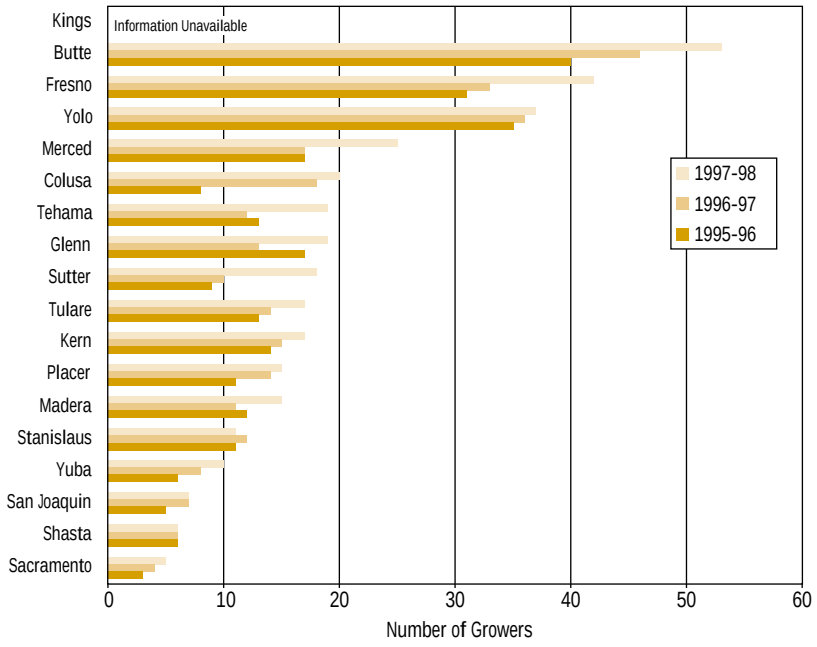
Organic production is perhaps not the best proxy for pesticide reduction. The pesticide use chart shown gives raw data gathered by the California Department of Pesticide Regulation, which it has been required to do since 1990. There are a great number of variables that contribute to year-to-year variation in pesticide use, including crop changes and weather. A decade is not long enough to measure long-term trends, but this information may establish a baseline for future measurements.

Pesticide Use in California's Central Valley

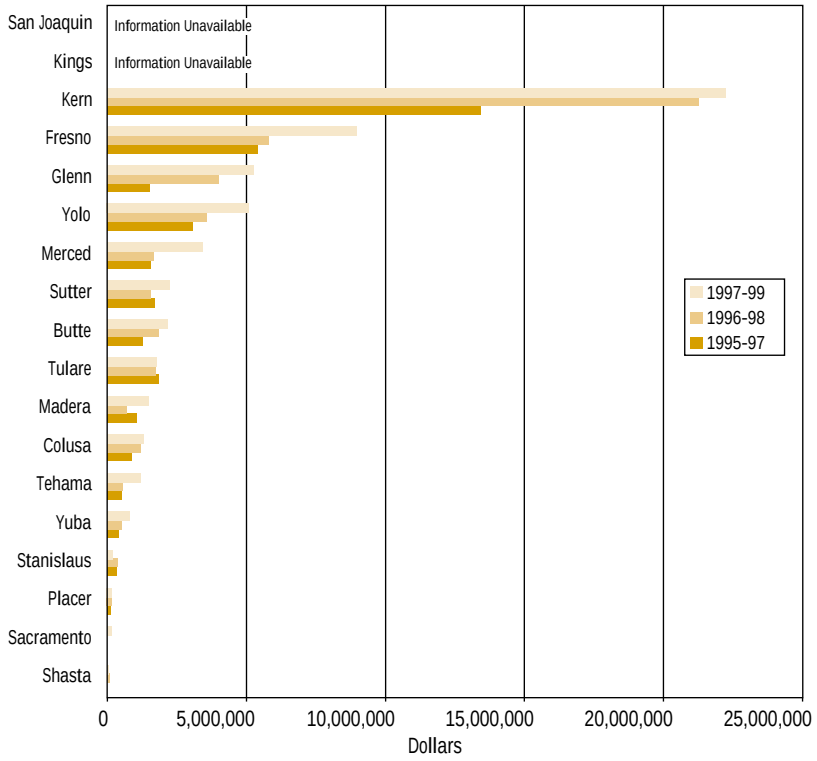


(Source: California Department of Pesticide Regulation)

Number of Organic Growers 1995-1998



Gross Sales in Organic Production 1995-1998



Source: Klonsky, Karen and Laura Tourte. 1998.
Statistical Review of California's Organic Agriculture, 1992—1995.
Davis, CA: UC Davis Agriculture Issues Center.

Klonsky, Karen, et al. forthcoming.
Statistical Review of California's Organic Agriculture, 1995-1998 Davis, CA: UC Davis Agriculture Issues Center.

Richard Darby, The Fresno Bee

What is a Vernal Pool?

Vernal pools are low spots on the landscape that fill with rain during the winter. Impermeable soils such as hardpan, claypan, and volcanic basalt keep water from draining and create distinct ecosystems. The depressions are remnants of an ancient sea.

In the small, dynamic ecosystem of a vernal pool live plants and animals that have adapted to annual cycles. Winter rains fill the pools with water, reviving activity. Crustaceans, invertebrates, amphibians, and underwater plants emerge from the rain-softened soil. Migrating waterfowl rely on the pools as feeding grounds. When the pool dries up late in the summer, the plants and animals either retreat into the soil or die after producing seeds that set in the pool's bottom and remain dormant until the pool is wet enough to provide their needed habitat.

Vernal pools have received a good deal of attention recently because they are habitat for the endangered fairy shrimp and have raised endangered species issues in rural areas. Minimizing the loss of vernal pools influenced the placement and configuration of the new University of California campus at Merced.

To learn more about vernal pools, visit the Wetlands Information System of CERES, the California Environmental Resource Evaluation System at http://www.ceres.ca.gov/wetlands/.

SPECIES

Critical to Central Valley Ecosystems

Habitat is the space in which plants and animals live. Vernal pools, grasslands, riparian cooridors, fresh water marshes, and certain agricultural lands such as rice fields and orchards can provide important habitats. Threats to habitat are the greatest concern for a number of species. The species in a particular habitat are often mutally dependent. These species form the food chain that sustains life.

California is home to over 179 plant and 66 animal species that are listed on the U.S. endangered species list—that's more than any other state except Hawaii. An additional 28 plant and 29 animal species are listed as endangered or threatened by the State Department of Fish and Game. Over 50 of the listed threatened and endangered plants and animals are found in the Valley.

THREATENED AND ENDANGERED SPECIES

Valley provides important habitat, supporting a diversity of interdependent species.

What does this mean?

Natural rates of extinction are accelerated by human action, primarily through the development of land and the cultivation of new agricultural areas, both of which reduce habitat. Add past overhunting, pollution, erosion from overgrazing, crop conversion, and the introduction of non-native species, and humans can have quite a collective impact on the natural environment.

Why is this important?

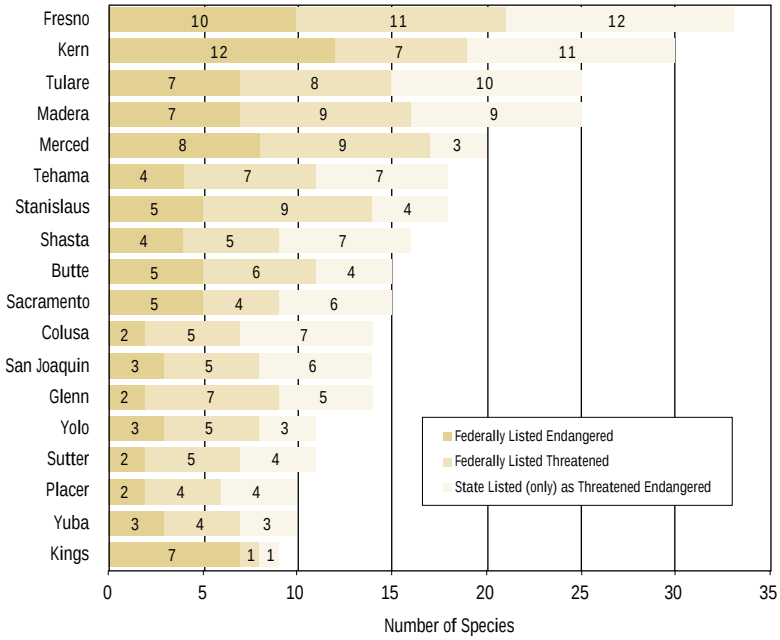
Losing one type plant or animal can have serious impacts that are not immediately apparent due to the intricate interdependence of all living things. For example, the San Joaquin antelope squirrel is the prey of the San Joaquin kit fox. The kit fox also often enlarges squirrel burrows to create its own shelter. Both species are listed as endangered or threatened on the national or state listings. Loss of the squirrel could affect the kit fox's chances of survival.

How are we doing?

Three-quarters of Valley lands are home to at least seven threatened and endangered species. Except for the region's urban areas, the entire Valley is home to at least one or more threatened and / or endangered animal species. The number of listed threatened and endangered animal species found in the Valley ranges from a high of 33 in Fresno County, to a low of 9 in Kings County.

The information presented regarding listed endangered and threatened species is a snapshot of current conditions. No trend or indication of performance in conservation efforts is presented due to the dynamic nature of the species listings and the varying stages of Habitat Conservation Plans, in which habitat and animal populations are more thoroughly identified.

Number of Threatened or Endangered Species in the Great Valley, by County, 1999



Source: California Department of Fish and Game, Natural Diversity Database, 1999, 2000

Assessing Habitat

Assessing animal populations is difficult. The most comprehensive information on California plant communities and animal habitats comes from the Gap Analysis Project, administered at the University of California at Santa Barbara. Gap data includes information on land cover and vegetation type, as well as a complete listing of the vertebrate species associated with different vegetation layers. For each species, habitat quality is rated on a 1-to-5 scale (with 5 being the highest quality habitat).

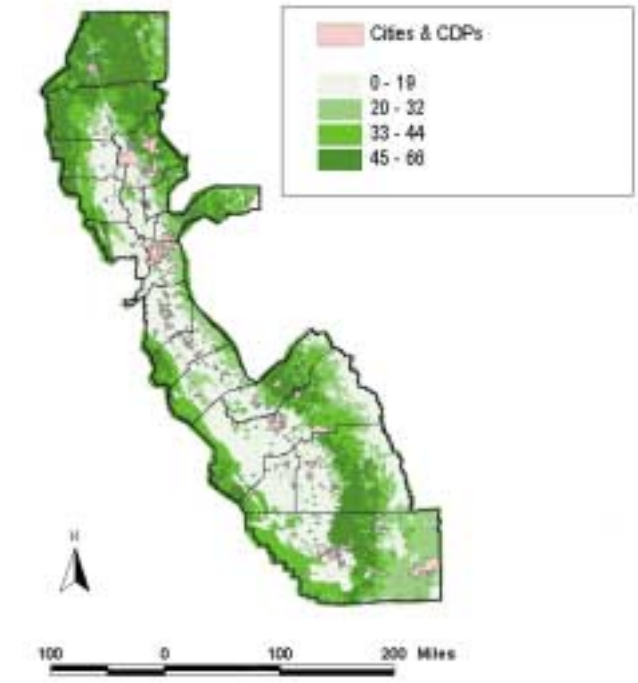
By multiplying each Threatened and Endangered species present in the Great Valley by its respective habitat quality rating, and then summing the result over all Threatened and Endangered animal species, it is possible to calculate a single multi-species index of habitat quality. This index measures the quality of local vegetation as a summary indicator of multi-species habitat quality. However, the indices—which were calculated at UC Berkeley for this report—do not, indicate habitat quality for an individual species, or the probability that a particular animal species will actually be found on site.

BIRDS

The Central Valley offers a third of California's highest quality threatened and endangered species habitat.

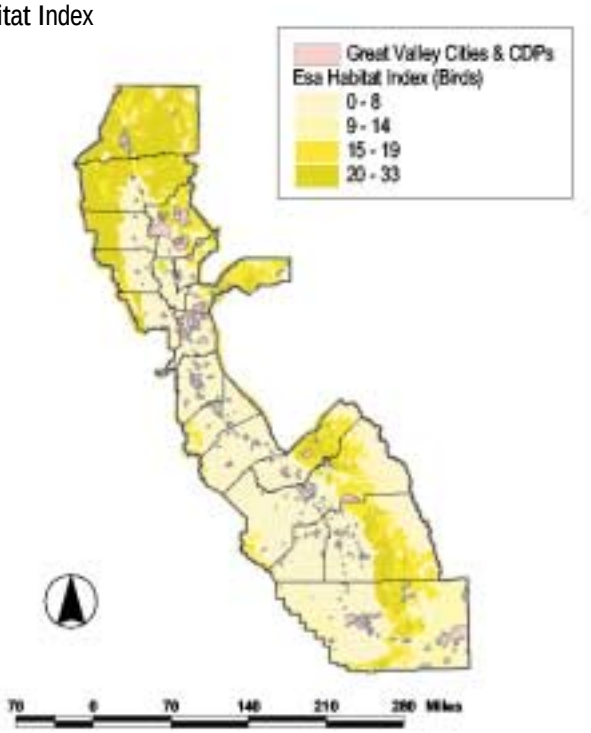
Home to 13 threatened and endangered bird species, the Valley includes about a third of the state's highest-quartile quality habitat. Nearly nine million acres (out of a total of 27.6 million acres) in the Valley are rated good-quality habitat for three or more threatened and endangered bird species. Within the Great Valley, the highest quality multi-species habitat for threatened and endangered birds is in Shasta and Tehama counties and in eastern Kern, Madera, and Tulare counties.

Total Number Of Endangered, Threatened and Special Status Species in the Great Valley



Source: California Department of Fish and Game, Natural Diversity Database, 1999,2000

Threatened and Endangered Birds Habitat Index



Source: UC Berkeley, from GAP Analysis Project data

Aleutian Canada Goose Delisting: An Endangered Species Act Success Story

Ed Sclarini, The Modesto Bee

The Aleutian Canada Goose, a species previously listed under the Endangered Species Act has reached a fully recovered status and is being delisted. This is a success story for the Fish and Wildlife Service and for the Valley, which provides important wintering grounds for the bird.

During the 19th Century, arctic and red foxes introduced in the Aleutian Islands caused severe declines in the species' population. In fact, the goose was even thought to be extinct for a large part of the 20th Century, until the 1960s, when a biologist found a remnant population of between 200 and 300 geese on a remote Island and the Fish and Wildlife Service began their efforts to assist the species' recovery. A few years later, the goose was listed as threatened under the Endangered Species Protection Act (the Endangered Species Act predecessor).

Through the issuance of protected status, the propagation of a captive flock, and the restoration of predator-free habitat including hunting closures on breeding and nesting grounds, the population climbed to over 30,000. An important element of the recovery of the goose population is the sanctuary of two Stanislaus County ranches used by the birds for wintering grounds.

The Cattle-ranching operations of the Lyons family's Mapes Ranch and the Faith Ranch, owned by Bob Gallo provide important water, feed and habitat, demonstrating how agricultural activity can work in partnership with nature.

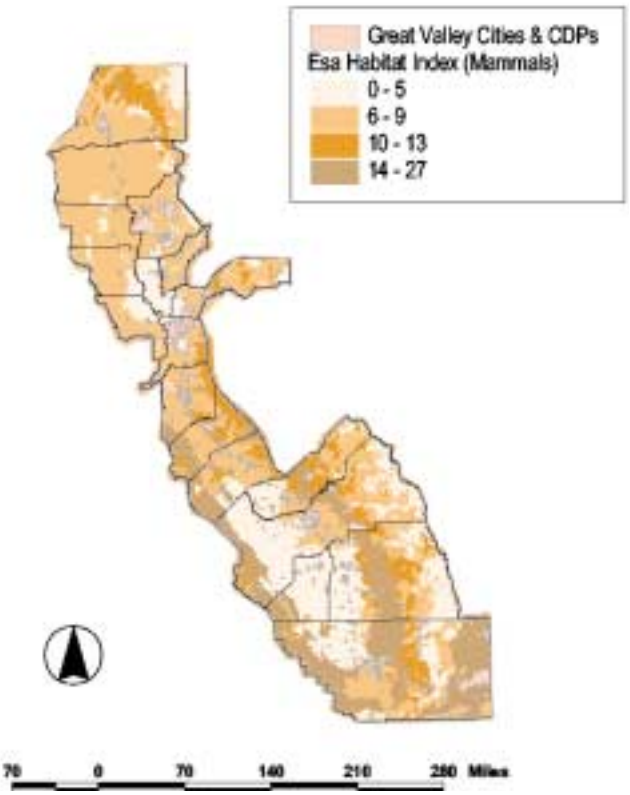
Fish and Wildlife Service biologists will continue to monitor Aleutian Canada Goose populations in the Aleutian Islands and in the Valley to ensure stabilization.

For more information on threatened and endangered species, visit http://endangered.fws.gov.

MAMMALS

11 threatened and endangered mammal species are supported by Valley habitat

The Valley is home to 11 threatened and endangered mammal species and about 21% of the state's highest-quartile habitat quality for threatened and endangered mammals. Eight million acres are rated good-quality habitat for three or more threatened and endangered mammal species. The highest quality multi-species habitat for threatened and endangered mammals is in Kern, Kings, Fresno, Tulare, Merced, and Stanislaus counties, along the eastern slope of the coastal range, and the Sierra foothills



Source:UC Berkely, from GAP Analysis Project Data Source

Habitat Conservation Plans (HCPs)

Habitat Conservation Plans are large-scale planning processes that incorporate vulnerable plants and animals into the land-use planning process. Through the HCP process, assessment of threatened and endangered species as well as proposed and candidate species moves from a site level to a more regional or ecosystem level. By establishing a blueprint for important conservation lands and development areas, the process provides greater regulatory certainty for landowners and planners and streamlines the Endangered Species Act compliance process for small landowners.

According to the U.S. Fish and Wildlife Service, there were 313 approved Habitat Conservation Plans in the country as of August 2000. In the Valley, there are 2 approved HCP areas and 8 more currently in development.

APPROVED
Metropolitan Bakersfield HCP
Natomas Basin HCP

IN DEVELOPMENT
Eastern Merced HCP
Kern County Valley Floor HCP
Natomas Basin HCP
Placer County HCP
San Joaquin County Multi Species Habitat and Open Space Plan
South Sacramento HCP
Tejon Ranch HCP
Yolo County HCP

For more information on the HCP process, contact the U.S. Fish and Wildlife Service, or visit www.fws.gov.

Most Frequently Found Endangered or Threatened Plants of the Central Valley

NAME	# of Counties
Greene's Tuctoria	9
Boggs Lake Hedge-Hyssop	7
Hairy Orcutt Grass	6
Palmate-Bracted Bird's Beak	5
Succulent Owl's Clover	5
San Joaquin Valley Orcutt Grass	5
Hartweg's Golden Sunburst	5
Hoover's Spurge	4
Colusa Grass	4
California Jewel-Flower	4

Most Frequently Found Endangered or Threatened Birds of the Central Valley

NAME	# of Counties
Swainson's Hawk	15
Western Yellow-billed Cuckoo	13
Bank Swallow	11
Willow Flycatcher	9
Bald Eagle	6
Western Snowy Plover	4
California Condor	2

Most Frequently Found Endangered or Threatened Mammals of the Central Valley

NAME	# of Counties
San Joaquin Kit Fox	8
San Joaquin Antelope Squirrel	5
Giant Kangaroo Rat	4
Fresno Kangaroo Rat	3
Tipton Kangaroo Rat	3
Riparian Brush Rabbit	2

Source: California Department of Fish and Game, Natural Diversity Database, 1999,2000

RESOURCES

Increasing efficiency can support environmental, economic quality-of-life goals.

The long-term success of the region may depend upon the efficient use of limited resources. This section establishes a baseline from which the region's water, land, and energy use might be measured against future years. As the Central Valley population grows, it may be necessary to do more with less. As advanced technologies and best practices are demonstrating, there are ways to provide for the variety of the region's needs more efficiently. Efficiency is not just an environmental concern, but can make the region more competitive economically as well.

DISPOSED AND DIVERTED WASTE

Waste diversion rates vary in the region.

What does this mean?

Diversion is the reduction of waste disposed at landfills and waste transformation facilities. It includes practices such as waste reduction, recycling, reuse and composting.

Why is it important?

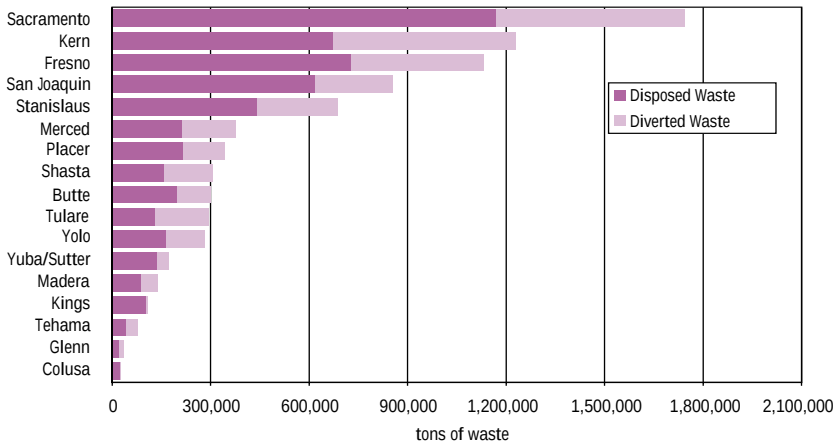
Waste is inefficient. Reusing used items, recycling items that cannot be reused, and reducing the amount of waste extends resources and can be cost-effective.

How are we doing?

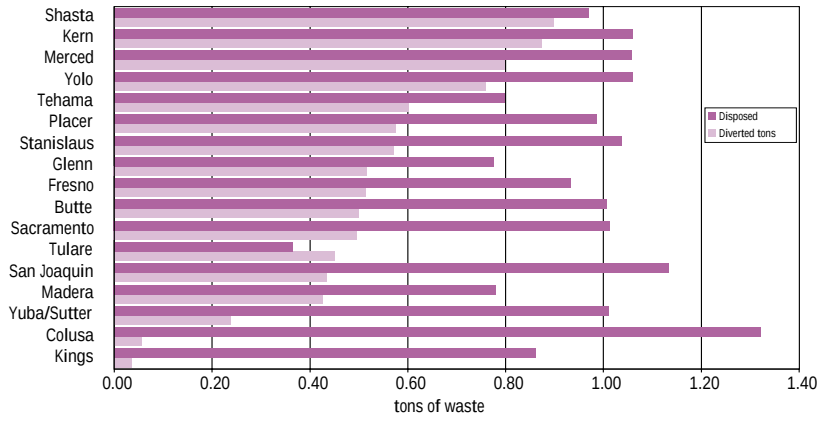
The region exceeded the statewide 25% diversion goal for solid waste in 1995, achieving an estimated 32%. Statewide, California diverted waste at a 28% rate. The California Integrated Waste Management Board is currently working with the 87 Valley waste jurisdictions to achieve the 50% waste diversion goal for 2000. While the rate has improved, the 2000 performance is still undetermined. Because compliance to AB 939 requires CIWMB acceptance of calculations, many Valley jurisdictions are still under review for 1997 and 1998 and some are still working to improve data collection to report their accurate status.

Jurisdictions vary widely in the degree to which they have been successful at diverting waste. Yet as a region, more cooperation between producers, consumers, and collectors is necessary in order to reduce the waste stream.

Total Disposed and Diverted Waste 1998



Per Capita Diverted and Disposed Tons of Waste, 1998



Source: California Integrated Waste Management Board, Diversion Data, 1998

Things you can do to reduce waste

In the office:

- Make double-sided copies when possible
- Reuse envelopes and use two-way envelopes
- Recycle paper for use on the second side or make scratch pads from used paper
- Proofread documents on the screen before printing
- Allow hand-corrections for in-house documents
- Donate un-served food from parties to a food bank or mission

At home:

- Set up a used-item exchange with friends or neighbors
- Compost or send yard trimmings to a composting facility
- Use reusable coffee filters or unbleached disposable filters
- Reuse grocery bags or use your own shopping tote
- Contact originators of bulk mail that you don't want and ask to be taken off of their list
- Buy items in bulk or concentrate
- Reuse packaging materials

More information on ways you can reduce waste is available from the California Integrated Waste Management Board at www.ciwmb.ca.gov.

ENERGY USE

Higher electricity and lower gas usage rates found in the Valley.

What does this mean?

Energy use provides a higher standard of living, economic activity, and mobility. However, energy consumption can also have negative environmental impacts.

Why is it important?

The burning of fossil fuels contributes to air pollution. Increased energy efficiency can improve air quality, conserve resources, bolster economic competitiveness, and save money. Recent concerns regarding heightened energy costs due to deregulation and reduced access to inexpensive petroleum also point to the importance of efficiency as a strategy. As costs increase with changes in energy supply and distribution, it is important to address differences in usage levels.

How are we doing?

The Sacramento metropolitan area leads the region in residential energy use, both in the use of electricity and natural gas.

Residential Gas Usage

Residential gas usage has decreased over the past decade due to gains in efficiency. Lack of availability in parts of the region typically keeps Central Valley residential gas usage below state levels. While there is still an environmental cost, using natural gas is less polluting than the burning of fossil fuels.

Electricity Usage

More than half of the electricity used in California is generated by burning fossil fuels.

Residential electricity usage per capita in the Central Valley has consistently been about a third higher than in the state as a whole, partially due to the need for climate control, especially in the heat of Valley summers. Also, parts of the Valley, such as Shasta, Tehama, Glenn, and El Dorado counties, have less access to natural gas as a substitute for electricity use.

With increased use of computers, internet access devices, personal digital assistants, and cell phones come increased energy needs. An increased role of technology in the lives of Valley residents will cause per capita electricity use to rise despite efficiency gains.

California Energy Commission Energy Conservation Tips

FAST AND FREE

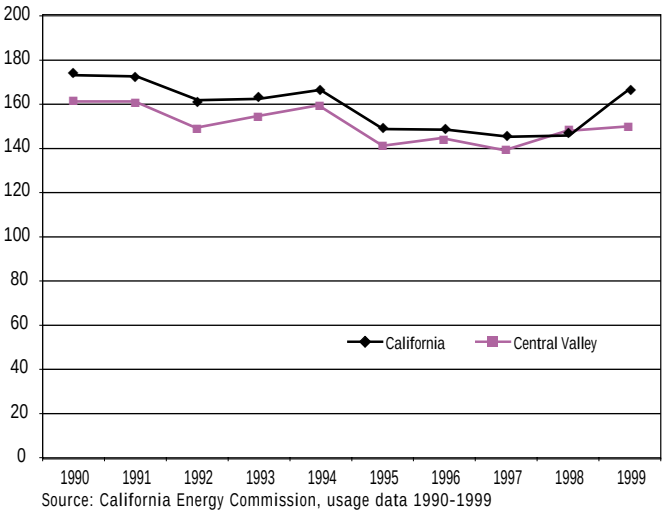
The California Energy Commission provides a wealth of energy-related information at www.consumerenergycenter.org, including the following tips for energy conservation.

Eliminate wasted energy. Turn off lights in unoccupied rooms. Unplug that spare refrigerator in the garage if you don't truly need it-this seemingly convenient way to keep extra drinks cold adds 10-25% to your electric bill. Turn off kitchen and bath-ventilating fans after they've done their job—these fans can blow out a house-full of heated air if inadvertently left on. Keep your fireplace damper closed unless a fire is burning to prevent up to 8% of your furnace-heated air from going up the chimney.

Reduce hot water temperature. Set your water heater to the "normal" setting or 120˚, unless the owner's manual for your dishwasher requires a higher setting. Savings are 7-11% of water heating costs.

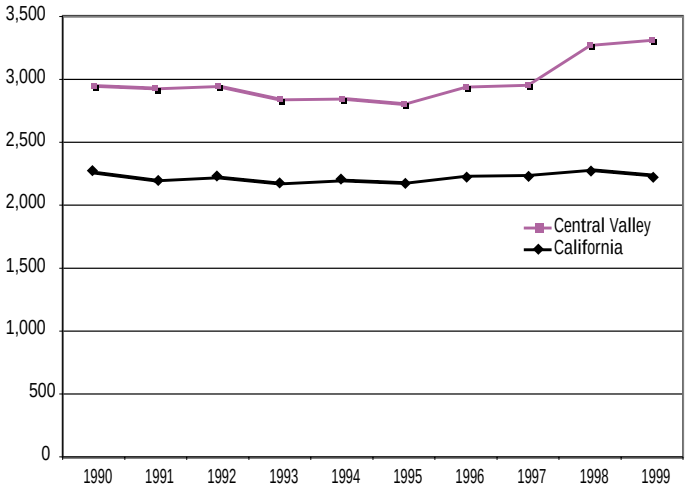
Shorten showers. Simply reducing that lingering time by a few minutes can save hundreds of gallons of hot water per month for a family of four. Showers account for 2/3 of your water heating costs. Cutting your showers in half will reduce your water heating costs by 33 percent.

Residential Gas Usage Per Capita (Therms) in the Central Valley Subregions



Source: California Energy Commission, usage data 1990-1999

Residential Electricity Usage Per Capita (kWh) in the Central Valley and the State



Use appliances efficiently. Do only full loads when using your dishwasher and clothes washer. Use the cold water setting on your clothes washer when you can. Using cold water reduces your washer's energy use by 75%. Be sure to clean your clothes dryer's lint trap after each use. Use the moisture-sensing automatic drying setting on your dryer if you have one.

Plug "leaking energy" in electronics. Many new TVs, VCRs, chargers, computer peripherals and other electronics use electricity even when they are switched "off." Although these "standby losses" are only a few watts each, they add up to over 50 watts in a typical home that is consumed all the time. If possible, unplug electronic devices and chargers that have a block-shaped transformer on the plug when they are not in use. For computer scanners, printers and other devices that are plugged into a power strip, simply switch off the power strip after shutting down you computer. The best way to minimize these losses of electricity is to purchase Energy Star® products.

INEXPENSIVE ENERGY SOLUTIONS

Replace furnace filters once a month. Dirty filters restrict airflow and increase energy use. Keep your furnace clean, lubricated and properly adjusted. Savings up to 5% of heating costs.

Choose Energy Star® Products. Replace incandescent light bulbs with Energy Star® compact fluorescent light bulbs, especially in high-use light fixtures. Compact fluorescent lights use 75% less energy than incandescent lights.

Install a programmable thermostat. If you have a heat pump, select a model designed for heat pumps. Setback thermostats can save up to 15% on energy costs.

Plug your home's leaks. Install weather-stripping or caulk leaky doors and windows and install gaskets behind outlet covers. Savings up to 10% on energy costs.

Install low flow showerheads. If you do not already have them, low flow showerheads and faucets can drastically cut your hot water expenses. Savings of 10-16% of water heating costs.

Wrap the hot water tank with jacket insulation. This is especially valuable for older water heaters with little internal insulation. Be sure to leave the air intake vent uncovered when insulating a gas water heater. Savings up to 10% on water heating costs.

For more tips visit www.consumerenergycenter.org.

AGRICULTURAL WATER USE

Water use varies throughout the region. Increased demand on a limited supply demands water-use innovation and conservation.

What does this mean?

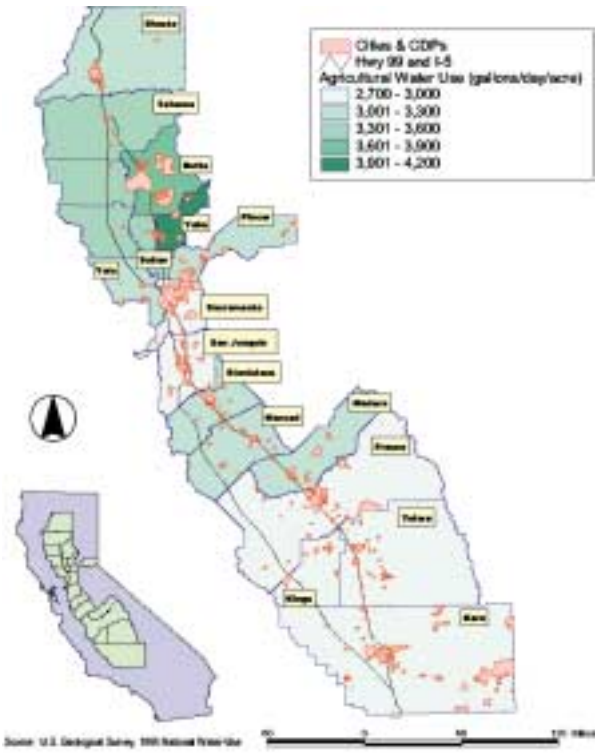
Water is necessary to support the production of crops. Agricultural water comes from two sources: groundwater and delivered surface water. Throughout California, about 30% of both agricultural and urban water comes from the ground. These maps measure surface deliveries. Water can be measured in acre-feet (1 acre foot = approximately 325,900 gallons of water), however to further distinguish differences between areas, the following U.S. Geological Survey data is presented in gallons used per day for one acre (gallons / day / acre).

Why is it important?

The Sierra Nevada endows the Valley with water captured from rainfall and snowmelt for agricultural and domestic uses. According to the California Department of Water Resources, over 60% of the water that once flowed from the Sierra to the Bay has been diverted for irrigation in the Valley and for municipal use in Southern California. About 42.2% of the captured runoff is used for agriculture. However, this figure is subject to change. According to the California Department of Water Resources Water Plan, by 2020, the water available for agricultural purposes from all sources may drop from the 1995 level of 43% to 39% in the year 2020.

This reduced water supply for agriculture is driven by the state's population growth and habitat needs. It requires continued innovation in areas such as irrigation systems, conservation strategies, and water storage.

Agricultural Water Use



Source: U.S. Geological Survey
Domestic, Irrigation, Public-Supply, Industrial, Commercial Water Use in the U.S. 1990
Total Water Use in the U.S. 1995

Department of Water Resources, November 1998
California Water Plan Update, Bulletin 160

Water Recycling

Water recycling, or water reclamation, is one way to make water supplies go further. Instead of discharging wastewater to rivers or the ocean, it is treated and stored until it is needed. Then the reclaimed water is delivered to various points of use for everything from irrigating crops, golf courses and other landscaped areas to feeding cooling towers in power plants, recharging aquifers and providing additional water for habitat.

According to a May 2000 report released by the California State Water Resources Control Board, the Central Valley is responsible for almost 25% of the reclaimed-water use in the State.

That's over 32.7 billion gallons of reclaimed water being put to work, largely for irrigation of agriculture in the southern San Joaquin Valley.

Source: California Municipal Wastewater Reclamation Survey; California State Water Resources Control Board, Office of Water Recycling; May 24, 2000

Great Valley Center

How are we doing?

Agricultural water use is a complex issue and it's tough to measure. A variety of factors such as crop type, soil type, rainfall, irrigation method, and water availability determine the amount of water used on any given acre of agricultural land. The data presented in the map points to differences throughout the region in level of water use but it may be used only as a proxy to benchmark efficiency gains or losses under future measurements.

When measuring agricultural water use, however, it is also important to acknowledge that irrigation techniques that use more water than water-efficient drip irrigation have some benefits that are not always measured. Encompassing border strip, basin and furrow methods, gravity irrigation provides benefits for migratory waterfowl such as feeding, breeding and wintering habitats. In addition, gravity irrigation is an effective means of groundwater recharge.

Irrigation Efficiency

According to the Department of Water Resources, irrigation efficiency statewide improved, on average, from 60% to 70% between 1980 and 1990. However, some Valley water agencies are beating that. For instance, by utilizing a completely closed pipeline system, the Westlands Water District achieves a 92% efficiency rating average.

DOMESTIC WATER USE

Water use varies throughout the region, with room for improvement everywhere.

What does this mean?

Per Capita Daily Domestic Water Use is the measurement of water deliveries for domestic per person in each county.

Why is it important?

As the region's population grows, reducing the amount of water used by each individual will be one of the primary ways the region will be able to stretch the available water supply to meet the demands placed upon it.

How are we doing?

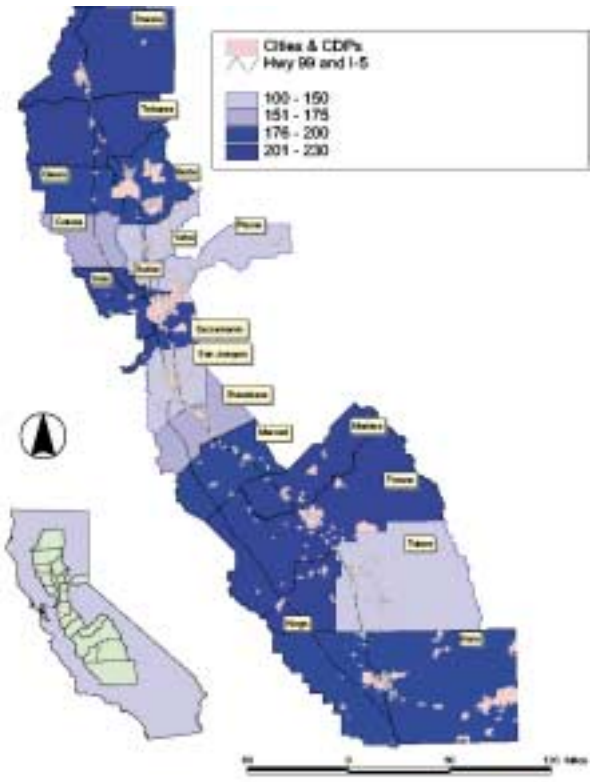
On the whole, households in the region, like those throughout California, could use water more efficiently. According to the Association of California Water Agencies (ACWA) Central Valley residents use up to 300 gallons per person per day, while some Central Coast residents use as little as 50 gallons per day.

Despite a move toward metering water usage in communities throughout California, a number of Valley Communities, including some of the region's major population centers such as Sacramento, Fresno, and Modesto continue to deliver water on a flat rate to urban users. Metering is one technique available, along with efforts such public education and outreach and the retrofitting of plumbing fixtures, that can support reduction in water use.

Without metering urban users, measuring water use is difficult given ambiguities between residential and agricultural users in the Valley. Better data is needed to more accurately target conservation strategies.

As a proxy, the U.S. Geological Survey's Water Use Data Files demonstrate that Valley communities vary in their per capita water use levels. This data, however, does not demonstrate recent gains made via water-use reduction policies.

Per capita Daily Domestic Water Use (gallons/day)



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