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WATER FACT SHEET

U.S. GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR

NATIONAL WATER-QUALITY ASSESSMENT PROGRAM—The San Joaquin-Tulare Basins

In 1991, the U.S. Geological Survey (USGS) began to implement a full-scale National Water-Quality Assessment (NAWQA) program. The long-term goals of the NAWQA program are to describe the status and trends in the quality of a large, representative part of the Nation's surface- and ground-water resources and to provide a sound, scientific understanding of the primary natural and human factors affecting the quality of these resources. In meeting these goals, the program will produce a wealth of water-quality information that will be useful to policy makers and managers at the National, State, and local levels.

A major feature of the NAWQA program will be the integration of water-quality information at different areal scales. The primary building blocks of the program are the study-unit investigations, which provide the basis for national-level assessments. The 60 study-unit investigations that make up the program are hydrologic systems that include parts of most major river basins and aquifer systems. These study units cover areas of 1,200 to more than 65,000 square miles and incorporate about 60 to 70 percent of the Nation's water use and population served by public water supply. In 1991, the San Joaquin-Tulare basins area was among the first 20 NAWQA study units selected for study under the full-scale implementation plan.

DESCRIPTION OF THE SAN JOAQUIN-TULARE STUDY UNIT

The San Joaquin-Tulare study unit occupies 28,500 square miles in central California. In 1988, the population of the study unit was 2,610,000; about 30 percent reside in the four largest cities, Fresno, Stockton, Bakersfield, and Modesto. The study area is composed primarily of two physiographic units, the Sierra Nevada to the east and the Central Valley to the west. The section of the Central Valley under study can be separated into the San Joaquin Basin to the north, and the hydrologically closed Tulare Basin to the south, which together constitute the San Joaquin Valley. The Sierra Nevada attain a maximum elevation of 14,495 feet at Mount Whitney, the highest point in the conterminous United States. In contrast, the San Joaquin Valley is a flat structural basin bound by the Sierra Nevada on the east, the Coast Ranges to the west, the Tehachapi Mountains to the south, and the Sacramento-San Joaquin Delta to the north. Land-surface elevations of the valley rise from several feet above sea level in the north to 1,000 feet in the southeast. The valley floor is arid to semiarid, with mean annual precipitation ranging from 5 inches in the south to 15 inches in the north. Almost all precipitation occurs in winter. Average annual precipitation in the Sierra Nevada, most of which is snow, reaches 80 inches in some areas. Temperature in the valley is extremely variable, with mean daily temperature ranging from about 35 to 102 degrees Fahrenheit.

The Sierra Nevada is composed primarily of pre-Tertiary granitic rocks. The Coast Ranges consist of marine and continental sediments of Late Jurassic to Quaternary age, Mesozoic ultramafic rocks, and some Tertiary volcanics. The sediments of the San Joaquin Valley consist of interlayered gravel, sand, silt, and clay derived from the adjacent mountains. Sediments derived from the Coast Ranges tend to be finer grained than those derived from the Sierra Nevada.

In order support a growing population and supply irrigated agriculture, about 17 billion gallons of water per day (1985) are consumed, about 90 percent for irrigation. Similar proportions

of the total amount used come from surface- and ground-water sources. One or more reservoirs have been built on every major river entering the valley from the Sierra Nevada, and the total reservoir storage capacity on the Stanislaus, Tuolumne, Merced, San Joaquin, Kings, and Kern Rivers is about 7.5 million acre-feet (10 acre-feet equals about 3.3 million gallons). In contrast, most of the streams that drain the Coast Ranges are intermittent or ephemeral and contribute an insignificant volume of water to the valley. Ground water is withdrawn from the regional aquifer system in the San Joaquin Valley, which averages about 1,400 feet in thickness. About 7.3 billion gallons per day are pumped annually. The large rate of ground-water pumping in the 1950's and 1960's led to declining water levels, which caused subsidence of the land surface in areas on the west side of the valley. The availability of imported water from northern California following the construction of canals in 1951 (Delta-Mendota Canal) and 1968 (California Aqueduct), which together provide irrigation to about 1 million acres, resulted in a decrease in ground-water pumpage. This shift in water use caused a rise in ground-water levels that has resulted in a water table within 5 feet of the land surface in 0.8 million acres in the valley. Most of this area requires subsurface drainage to sufficiently lower the water table to prevent buildup of salts in the soils.

The proportions of different land uses in the study area are 35 percent forest, 30 percent cropland, 20 percent pasture or rangeland, 10 percent barren land, and less than 5 percent each of wetlands and urban land. Almost the entire valley floor, about 10 million acres, is agricultural land, whereas most of the Sierra Nevada is forested. About 70 percent of the agricultural land is irrigated. The combination of abundant water and the long growing season results in an exceptionally productive agricultural economy in the San Joaquin Valley. In 1987, California produced 10.2 percent of the total value of agricultural production in the United States, of which 49 percent, or $6.82 billion, was generated in the San Joaquin Valley. Major products include livestock and livestock products (35 percent), fruits and nuts (33 percent), cotton (13 percent), vegetables (6.5 percent), and hay and grains (6 percent).

MAJOR WATER-QUALITY ISSUES

The study will focus on the quality of ground- and surface-water resources in the San Joaquin Valley because most of the total population, agriculture, and water use is in this part of the study area. Information for the Sierra Nevada, Yosemite and Sequoia National Parks in particular, will be used primarily to establish background water-quality conditions. The major water-quality issues of concern in the San Joaquin-Tulare Study are:

- Increasing salinity of the lower San Joaquin River—Considered by most agencies to be the most serious water-quality issue in the study unit, the increase is attributed partly to a decrease in the volume of low-salinity runoff from the Sierra Nevada entering the San Joaquin River and partly to an increase in saline water from agricultural areas.
- Elevated concentrations of naturally occurring trace elements—Primary concerns are concentrations of arsenic, boron, molybdenum, uranium, and vanadium in shallow ground water in the Tulare Basin; chromium, boron, molybdenum, selenium, uranium, and vanadium in the San Joaquin River; and accumulation of trace elements in waterfowl and aquatic organisms. The distribution of and processes affecting selenium in ground water of the west side of the San Joaquin Valley have already been studied in detail.
- Pesticide contamination of ground water in the eastern San Joaquin Valley and in surface water in the San Joaquin River and its major tributaries—More than 10 percent of the total pesticide use nationwide occurs in the San Joaquin Valley. Ground water in the eastern part of the valley is susceptible to contamination because of the coarse texture and low organic content of the soils. Pesticides enter the San Joaquin River either in solution or attached to suspended sediments.
- Nitrate in ground water—This mineral is a natural component of soils in the western part of the valley and has leached into the ground-water system. Fertilizers and septic systems throughout the valley are additional sources of nitrate in ground water.
- Low concentrations of dissolved oxygen in the San Joaquin River—Low dissolved-oxygen concentrations, which have been attributed to discharge of wastewater from municipal treatment plants, are detrimental to fisheries and other aquatic resources.

Degradation of water quality in the San Joaquin-Tulare study unit affects not only the 2.6 million people in the study unit, but also has the potential to affect about 15 million people in southern California who are served by the California Aqueduct. With the loss of about 85 percent of the original wetland habitat in the San Joaquin Valley, waterfowl and aquatic life are affected adversely by the degradation of water quality. Of the issues listed, water resources contaminated by pesticides, nutrients, and sediment are problems of national scope and will be the first issues addressed by national-level assessments.

COMMUNICATION AND COORDINATION

Communication and coordination between USGS personnel and other interested scientists, water-management organizations, and public and private interest groups are critical components of the NAWQA program. Each of the study-unit investigations will have a local liaison committee consisting of representatives who have water-resources responsibilities from Federal, State, and local agencies, universities, environmental groups, and the private sector. Specific activities of each liaison committee will include the exchange of information about water-quality issues of regional and local interest; the identification of sources of data and information; assistance in the design and scope of project products; and the review of project planning documents and reports. The liaison committee for the San Joaquin-Tulare study unit will be formed in 1991.

Information on technical reports and hydrologic data related to the NAWQA program can be obtained from:

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