



# WATER FACT SHEET

U.S. GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR

## NATIONAL WATER-QUALITY ASSESSMENT PROGRAM—Nevada Basin and Range

In 1991, the U.S. Geological Survey (USGS) began a full-scale National Water-Quality Assessment (NAWQA) program to describe the status of and trends in the quality of the Nation's water resources, and to provide a scientific understanding of the primary natural and human factors that affect water quality. The NAWQA program consists of 60 study units, representing more than 60 percent of the Nation's water use and population served by public supplies. In 1991, the Nevada Basin and Range was among the first 20 NAWQA study units selected for study under the full-scale implementation plan. These studies will provide nationally consistent information that can be integrated to describe the quality of the Nation's water resources, define the conditions and trends in water quality, and identify, describe, and explain the major factors that affect observed water-quality conditions and trends.

### NEVADA BASIN AND RANGE STUDY UNIT

The Nevada Basin and Range study unit consists of three drainage basins, the Truckee and Carson River basins in northwest Nevada and northeast California and the Las Vegas Valley basin in southeast Nevada. These basins were selected because they contain about 85 percent of Nevada's population; the geology, climate, vegetation, and hydrology are representative of basin and range physiography; rapid urban and suburban population growth are increasing competition for limited water supplies; and a variety of natural and human-caused water-quality problems are present.

### PHYSICAL SETTING

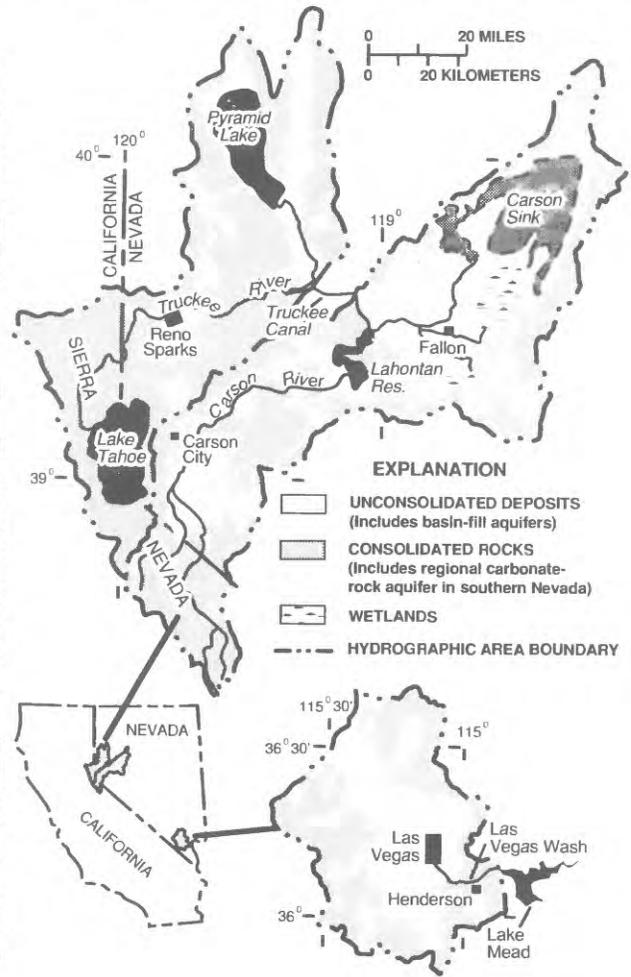
The Truckee and Carson River basins encompass about 7,260 square miles in northwest Nevada and northeast California. Altitudes range from about 10,900 feet in the consolidated granitic- and volcanic-rock headwater areas of the Sierra Nevada, to about 3,900 feet in the unconsolidated basin-fill deposits in the Carson Sink. The climate varies with altitude: it is classified as humid and subhumid continental in headwater areas where average annual precipitation approaches 30 inches, and as mid-latitude steppe and desert in the lower altitudes where average annual precipitation is less than 5 inches and average annual evaporation exceeds 50 inches from impoundments. Conifer forests dominate the headwater areas whereas sagebrush, grasses, and greasewood are the principal flora at lower altitudes.

The Las Vegas Valley basin encompasses about 1,580 square miles in southeast Nevada. Altitudes range from about 11,900 feet in consolidated sedimentary- and volcanic-rock headwater areas to about 1,600 feet in unconsolidated basin-fill deposits in Las Vegas Valley. The climate ranges from subhumid in higher altitudes of headwater areas where average annual precipitation approaches 16 inches, to low-latitude desert in lower altitudes of the valley where average annual precipitation is less than 5 inches and average annual evaporation exceeds

60 inches from impoundments. Forests of conifers grow in some of the areas of highest altitude; creosote is the principal flora in the valley.

### HYDROLOGIC SETTING

The Truckee and Carson Rivers are characterized by perennial streamflow into closed basins. Unconsolidated basin-fill deposits are the principal aquifers; however, a local volcanic-rock aquifer near Fallon is used extensively for public supplies. In the headwater areas where most of the precipitation occurs, the streams gain flow from surface runoff and shallow groundwater discharge. Dissolved-solids concentrations generally are less than 200 milligrams per liter in surface water. The major ions in solution are calcium, sodium plus potassium, magnesium, bicarbonate, and carbonate. Numerous alpine lakes and



reservoirs—including Lake Tahoe, the source of the Truckee River—are located in the headwater areas. Flow in the Truckee River is controlled by releases from Lake Tahoe and six other reservoirs, whereas flow in the Carson River is unregulated except for small irrigation reservoirs and diversions.

In the mid-basin areas, depth to ground water is relatively shallow and the streams either gain or lose flow as ground-water levels rise and fall. Concentrations of dissolved solids generally are less than 500 milligrams per liter in ground water and less than 200 milligrams per liter in surface water. The principal ions in solution are calcium, sodium plus potassium, bicarbonate, and sulfate.

In downstream reaches of the basins, the streams lose flow to ground-water systems, and concentrations of dissolved solids increase in response to evaporation, transpiration, and longer ground-water flow paths. Concentrations of dissolved solids generally are less than 1,000 milligrams per liter in ground water and less than 300 milligrams per liter in surface water. The principal ions in solution are calcium, sodium plus potassium, magnesium, bicarbonate, sulfate, and chloride. The Truckee Canal diverts water from the Truckee River to Lahontan Reservoir on the Carson River where it is stored to irrigate land in the U.S. Bureau of Reclamation (BOR) Newlands Irrigation Project near Fallon.

In the terminal areas of the basins (Pyramid Lake for the Truckee River; wetlands and the Carson Sink for the Carson River), evaporation, transpiration, irrigation return flow, and long ground-water flow paths cause increased dissolved-solids concentrations that generally range from 1,000 to greater than 10,000 milligrams per liter in ground water and from 300 to greater than 5,000 milligrams per liter in surface water. Sodium and chloride are the principal ions in solution.

Las Vegas Valley streams are generally characterized by intermittent flow. Las Vegas Wash downstream from Las Vegas has become a perennial stream because of sewage-treatment-plant effluent and the discharge of shallow ground water from landscape irrigation in the Las Vegas area. Concentrations of dissolved solids in Las Vegas Wash generally exceed 1,500 milligrams per liter. The principal ions in solution are sodium, calcium, sulfate, and chloride.

Precipitation in headwater areas, principally the Spring Mountains along the western edge of the basin, recharges the carbonate-rock and basin-fill aquifers. In the northwest part of the valley where most of the recharge occurs, the concentrations of dissolved solids in ground water range from 200 to 400 milligrams per liter. Calcium and bicarbonate are the principal ions in solution.

As ground water flows to the southeast, longer flow paths and the presence of evaporite deposits result in dissolved-solids concentrations that range between 700 and 1,500 milligrams per liter. Calcium, magnesium, bicarbonate, and sulfate are the principal ions in solution. The quality of shallow ground water in the southeast end of the valley is degraded by secondary recharge from landscape irrigation, urban runoff, sewage disposal, and the natural effects of long ground-water flow paths, dissolution of evaporite deposits, and evapotranspiration. Concentrations of dissolved solids range from 2,000 to greater than 10,000 milligrams per liter. The principal ions in solution are sodium, calcium, magnesium, chloride, and sulfate.

## CULTURAL SETTING

The Truckee and Carson River basins have a combined population of about 300,000. The largest population centers are the Reno and Sparks area (about 185,000); the Carson City area

(about 40,000); and the Stateline, Nev., and South Lake Tahoe, Calif., areas on the south shore of Lake Tahoe (about 40,000). The principal economic activities are commerce, gaming and recreation related to tourism, warehousing, and light industry in support of mining activities. Carson City is the State capital and has light industry in support of governmental activities. Ranching and irrigated agriculture are important in the Carson River valley south of Carson City and in the BOR Newlands Irrigation Project near Fallon where 60,000 acres are irrigated. Land use in the Truckee and Carson River basins is 64 percent barren land and rangeland, 24 percent forest, 8 percent water and wetlands, 3 percent irrigated pasture and cropland, and 1 percent urban. Water use is about 449 million gallons per day for irrigation (98 percent surface water), 71 million gallons per day for public supplies (66 percent surface water), 5 million gallons per day for self-supplied domestic use (100 percent ground water), and 1 million gallons per day for self-supplied commercial and industrial use (100 percent surface water).

The Las Vegas Valley basin has a population of about 720,000. Most of the people reside in the southeast part of the valley where the two largest cities, Las Vegas (257,000 people) and Henderson (60,000 people), and Nellis Air Force Base (northeast of Las Vegas) are located. The principal economic activity is gaming and recreation related to tourism. Commerce, warehousing, light industry, and manufacturing are also important. Land use is 87 percent barren land and rangeland, 9 percent urban, 4 percent forest, less than 1 percent pasture and cropland, and less than 1 percent wetlands and open water. Water use is about 258 million gallons per day for public supplies (87 percent surface water from Lake Mead on the Colorado River), 8 million gallons per day for irrigation (100 percent ground water), 8 million gallons per day for self-supplied commercial and industrial use (100 percent ground water), and 6 million gallons per day for self-supplied domestic use (100 percent ground water).

## WATER QUALITY ISSUES

Water-quality issues to be addressed during the Nevada Basin and Range study include effects of urbanization (sewage disposal, industrial waste, landscape fertilizer and pesticide use, and erosion); effects of agriculture (grazing and irrigation runoff, drainage, and return flow); effects of mining (trace metals and sediment); and naturally occurring but elevated local concentrations of dissolved solids (sodium, chloride, and sulfate), nitrate, fluoride, arsenic, selenium, boron, and radionuclides (radon and uranium).

## COORDINATION AND COMMUNICATION

To ensure that relevant water-quality issues are addressed by this study, that scientific studies within the study-unit basins are coordinated, and that sources of water-quality and ancillary data are readily determined, a liaison committee will be formed during spring 1991. The liaison committee will consist of representatives who have water-resources responsibilities from local, State, regional, and national organizations in the public and private sectors.

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

District Chief, Water Resources Division  
U.S. Geological Survey  
705 North Plaza Street, Room 224  
Carson City, Nevada 89701

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