

ESTIMATES OF CONSUMPTIVE USE AND GROUND-WATER RETURN FLOW USING WATER BUDGETS IN PARKER VALLEY, ARIZONA AND CALIFORNIA, 1981-84

By Sandra J. Owen-Joyce

Abstract

Annual water budgets were used to estimate consumptive use by vegetation (crops and phreatophytes) and ground-water return flow from 1981 to 1984 in Parker Valley, Arizona and California. Consumptive use by vegetation was estimated to be 482,800 acre-feet in 1981, 432,000 acre-feet in 1982, 413,500 acre-feet in 1983, and 420,900 acre-feet in 1984 on the Arizona side of the Colorado River. Consumptive use by vegetation was estimated to be 45,400 acre-feet in 1984 on the California side of the river. Ground-water return flow from the area north of Tyson Wash in Arizona was estimated to be 0 acre-feet in 1981, 1983, 1984 and 1,900 acre-feet in 1982. No ground-water return flow occurred from the area south of Tyson Wash and on the California side of the river; consumptive use by vegetation in these areas exceeded the measured diversion of river water to croplands because of the additional evapotranspiration by phreatophytes.

Water-budget estimates of consumptive use by vegetation were compared to estimates of evapotranspiration and estimates of consumptive use of Colorado River water calculated as measured diversions minus surface-water and ground-water return flows. Evapotranspiration was calculated as the sum of products of areas of vegetation types and water-use rates. Estimates of evapotranspiration were from 1 percent less to 9 percent higher than estimates of consumptive use by vegetation in the area north of Tyson Wash. The percentage differences in the two estimates were within the measurement errors of the two major measured components in the water budget, regardless of differences in year-to-year conditions.

Estimates of consumptive use of Colorado River water calculated as measured diversions minus return flows were consistently lower than estimates of consumptive use by vegetation. Variations in tributary inflow and river stage are not accounted for in the calculation of measured diversions minus return flows, and induced seepage from the river to replace ground water transpired by phreatophytes is not accounted for as a diversion. Estimates of consumptive use of Colorado River water were from 18 to 37 percent lower than estimates of consumptive use by vegetation.