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GROUND WATER IN WHITE RIVER VALLEY, WHITE PINE, NYE, AND LINCOLN COUNTIES, NEVADA

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SOURCE AND AMOUNT OF RECHARGE

As has been mentioned previously, the area enclosed by the ɔainage boundary of White River Valley can be considered an ıclosed ground-water basin, except that it probably receives ɔme underflow from Jakes Valley to the north and loses water y surface flow and underflow at the south end. There are no .rge areas of natural discharge in Jakes Valley. The valley is ɔpographically separated from White River Valley by an alluvial ivide at the head of Jakes Wash. It is believed that ground 'ater moves south from Jakes Valley into White River Valley ı the vicinity of Jakes Wash. Thus the ultimate source of the round water is believed to be the precipitation within the White .iver Valley drainage boundary and the drainage boundary of akes Valley. However, only a small part of the water that falls s rain and snow on the drainage area reaches the ground-water eservoir. Large quantities are lost by transpiration and evapo- ation before the water has deeply penetrated the soil and rocks. n appreciable fraction of the precipitation probably never eaches the soil but falls on trees and other vegetation and vaporates following storms.

The average annual amount of recharge to ground water in White River Valley can be estimated from the precipitation and rom the results of recharge studies in comparable areas. This equires a determination or estimate of average annual precipita- ion for the drainage area, from which the recharge is calculated s a percentage. An estimate for the precipitation in the White ɔiver Valley was made from a precipitation map[4] for the State f Nevada in which zones of average range of precipitation are .esignated. The zones are divided into the following ranges: ess than 8 inches; 8 to 12 inches; 12 to 15 inches; 15 to 20 nches; and over 20 inches. The amount of water from the uccessive zones that reaches the ground-water reservoir is esti- nated as, 0, 3, 7, 15, and 25 percent of the precipitation in the espective zones. The percentages are adapted for this area from ɔreliminary recharge studies in east-central Nevada. These tudies consisted of estimating the ground-water discharge by ıatural losses from 13 valleys in east-central Nevada. The echarge for each valley was also estimated, using the rainfall- one map as a basis. The recharge estimates were then balanced

[4]Hardman, George, Nevada precipitation and acreages of land by rainfall ones, Univ. Nevada Agr. Exper. Sta., mimeographed report and map, 10 pp., une 1936.

by trial-and-error with the discharge estimates. They also compare favorably with percentages determined in Las Vegas Valley[5] by means of precipitation gages maintained at different altitudes in the Spring Mountains. The average annual ground-water recharge estimated on this basis is about 40,000 acre-feet for White River Valley, and about 13,000 acre-feet for Jakes Valley. This represents an approximation of the total recharge to ground water. The amount of ground water available to wells is estimated to be about 55 percent of the total recharge. (See page 46.)

MOVEMENT

Water from precipitation that enters the ground-water reservoir moves toward the axis of the valley. This is shown by the difference in altitude of the water levels in wells and mines high in the recharge areas and in wells in the lower part of the valley. For example, the altitude of the water level in the Alpha Mine near Kimberly is approximately 6,100 feet, the altitude of the water level in the Jakes Wash well (14/61–9C1, unsurveyed) is about 5,800 feet, and the altitude of the water table in the vicinity of Preston and Lund, as determined from measurements in many wells, ranges from 5,550 to 5,500 feet. Thus the slope of the water table and movement of the ground water are toward the valley axis.

The slope, and hence the movement of the ground water, and the shape of the water table in the vicinity of Lund and Preston are shown by water-level contours on Plate 2. The main ditch from Lund Spring extends north for about 1 mile to the north part of Lund. Most of the spring water is carried through this ditch for about 9 months of the year. During the remaining 3 months most of the spring discharge is diverted to the natural channel, which extends west from the spring. A ground-water ɔidge extends west from the north part of Lund, indicating that water in the main ditch recharges the ground-water reservoir in that vicinity. A smaller inflection of the water-level contours suggest ground-water recharge from the natural channel of Lund Spring, and from the tributary irrigation ditches in the area. White River and the main ditches from the springs near Preston also apparently contribute water to the ground-water reservoir. However, the water-level contours outside the immediate vicinity

[5]Maxey, G. B., and Robinson, T. W., Ground water in Las Vegas, Pahrump, and Indian Spring Valleys, Nevada (A summary): State of Nevada, Office of the State Engineer Water Resources Bull. No. 6, p. 16, 1947.

lata from studies made near Chino, California, by Blaney, Taylor, and Young.[10]

It is believed that most phreatophytes discharge only small, probably negligible amounts of water from the ground-water reservoir where the water table is more than 15 feet below the and surface. Salt grass, the most common phreatophyte in the area of transpiration apparently does not grow where the water table is more than 10 feet below the land surface and grows lensely only where the water table is within 6 feet of the surface. n White River Valley few other phreatophytes grow even where he water table is within 15 feet of the land surface, and it is believed that they discharge very little water. Therefore, allowing for the distribution of phreatophytes and on the basis described in the preceding paragraph, it is estimated that the annual rate of evapo-transpiration is 0.8 foot in the area of transpiration in White River Valley. This estimate includes allowances for plant density, depth to the water table, and evaporation from small tracts of free-water surfaces.

The transpiration area (see pl. 1) comprises about 36,000 acres ying between the banks of White River channel and extending outh from Lund to the south end of the valley. The area of rrigated land on which alfalfa, cereals, and meadow hay are grown is about 4,000 acres. Most of this land is in the vicinity of Preston and Lund and only small tracts lie in other parts of he valley (see pl. 1).

The estimated total annual discharge by evapo-transpiration s given below:

	Annual rate of discharge (feet)	Area (acres)	Annual discharge (acre-feet)
Native phreatophytes	0.8	36,000	28,800
Cultivated plants	1.25	4,000	5,000
Total discharge (approximate)			34,000

The quantity of water discharged by stream flow from the outh end of White River Valley was estimated in February 948 to be about 3 second-feet. Observations made during 1947 nd 1948 indicate that the discharge might average 3 second-eet during the 6 months of the year when there is little irrigation in the valley. Possibly 1.5 second-feet flows during the early

[10]Blaney, H. F., Taylor, C. A., and Young, A. A., Rainfall penetration and consumptive use of water in Santa Ana River Valley and coastal plains: California Dept. Public Works, Water Resources Div. Bull. 33, pp. 85, 86, 1930.

spring and fall, and no water is discharged by the stream during the 3 summer months. From these data it is estimated that the average annual discharge by streams from White River Valley into White River Wash is about 1,500 acre-feet.

Ground water is also discharged from the south end of the valley as underflow in White River Wash. It is possible to estimate this discharge by subtracting from the total recharge to White River Valley the combined discharge by evaporation and stream flow. The total recharge, assuming that the Jakes Valley drainage basin is tributary to White River Valley, is estimated to be 53,000 acre-feet, and discharge by evapo-transpiration and streams totals about 35,500 acre-feet. On this basis it is estimated that as much as 17,500 acre-feet of water leaves the valley as underflow. Of course, all errors in other factors are thrown into this figure.

Evaluation of ground-water discharge by underflow at the south end of White River Valley cannot be made by other methods because the thickness and permeability of the water-bearing materials in that area are unknown.

Hot Creek Spring annually discharges 11,000 acre-feet of water. Of this amount about 4,000 acre-feet may be accounted for by evapo-transpiration losses between the spring orifice and the south end of the valley. It is recognized that not all of this 4,000 acre-feet loss is supplied by Hot Creek Spring, as there is substantial underflow from White River and the springs to the north. Also, about 700 acre-feet of water from Hot Creek Spring probably is discharged from the valley as stream flow. According to these figures not less than 6,300 acre-feet of water from Hot Creek Spring alone must leave the valley as underflow. Consequently, the estimate of 17,500 acre-feet for the entire underflow out of the valley is believed not to be unreasonable.

The estimated total annual discharge of ground water from White River Valley is summarized below:

Process	Acre-feet
Evapo-transpiration	34,000
Underflow from south end of valley	17,500
Stream flow from south end of valley	1,500
Total discharge	53,000

UTILIZATION

Present — The principal use of the ground-water discharge from wells and springs is for irrigation in the vicinity of Lund