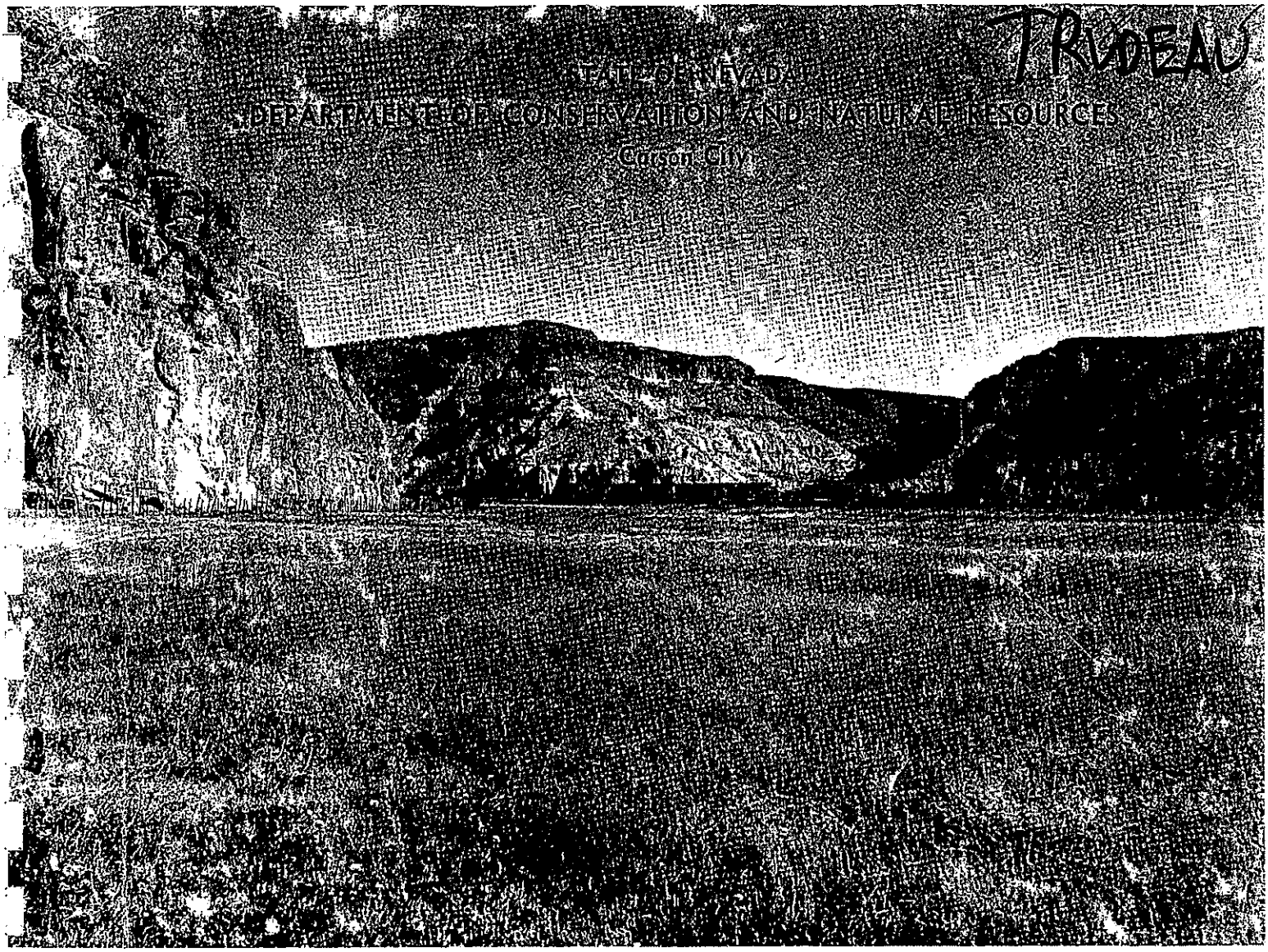


View of an irrigated field in lower Meadow Valley.

# GROUND-WATER RESOURCES – RECONNAISSANCE SERIES

# REPORT 27

## GROUND-WATER APPRAISAL OF THE MEADOW VALLEY AREA, LINCOLN AND CLARK COUNTIES, NEVADA

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Estimated Average Annual Recharge:

Precipitation in the drainage area and ground-water inflow from Lake Valley to Patterson Valley probably are the principal sources of the ground water in the area. A method described by Eakin and others (1951, p. 79-81) is used to estimate the recharge. This method assumes that a fixed percentage of the average annual precipitation recharges the ground-water reservoir. Hardman (1936) showed that in gross aspect the average annual precipitation in Nevada is related closely to altitude and that it can be estimated with a reasonable degree of accuracy by assigning precipitation rates to various altitude zones. Figure 4 shows this relationship for the precipitation stations in the Meadow Valley area.

The average annual precipitation distribution is delineated as follows: 8 inches at 6,000 feet, 12 inches at 7,000 feet, 15 inches at 8,000 feet, and 20 inches at 9,000 feet. Five precipitation zones are selected, using the above values. The zones, the estimated precipitation, and the estimated recharge are summarized in table 10. The estimated average annual precipitation over the entire area is about 1,000,000 acre-feet, and the estimated average annual recharge resulting from this precipitation is only 2.4 percent, or 24,000 acre-feet. The underflow from Lake Valley (Rush and Eakin, 1964, p. 13) adds an additional 3,000 acre-feet a year, making a total of 27,000 acre-feet a year of recharge from all sources. The highest rate of estimated recharge occurs in Spring Valley, where 5.6 percent of the estimated precipitation enters the ground-water system. In Patterson Valley the figure is 3.1 percent.

About two-thirds of the recharge from precipitation occurs in Patterson and Spring Valleys, which combined are only 40 percent of the Meadow Valley area. The highest mountains of the report area are in these two areas.

Estimated Average Annual Discharge:

Prior to development by man, all the ground water in the area was discharged by evaporation, transpiration, and subsurface and surface outflow to the Muddy River valley. With the advent of mining and agriculture, spring flow was diverted and wells were pumped to satisfy domestic, stock, and irrigation needs. The net result has been an increase in the draft on the ground-water reservoir.

Natural Discharge by Evapotranspiration: Much of the ground water discharged by evapotranspiration is consumed by native phreatophytes. These plants, prior to the development of agriculture, probably grew over most of the flood plains, except in Patterson Valley where the depth to water is generally more than 50 feet. Much of the flood plains in the several valleys have been cleared of these plants in recent years, and irrigated crops are grown in their place.

The principal phreatophytes are greasewood, rabbitbrush, meadow grass, and salt bush. Cottonwood, willow, and saltcedar are others, and occur

Table 10.--Estimated average annual precipitation and ground-water recharge in the Meadow Valley area

| Precipitation zone (feet) | Area (acres) | Estimated annual precipitation: Range (inches) | Average (inches) | Average (feet) | Average (acre-feet) | Estimated recharge from precipitation: Percentage of precipitation | (acre-feet per year) |
|---|---|---|---|---|---|---|---|
| | | | SPRING VALLEY | | | | |
| Above 9,000 | 0 | more than 20 | 21 | 1.75 | 0 | 25 | 0 |
| 8,000 to 9,000 | 10,600 | 15 to 20 | 17.5 | 1.46 | 15,500 | 15 | 2,300 |
| 7,000 to 8,000 | 69,000 | 12 to 15 | 13.5 | 1.12 | 77,300 | 7 | 5,400 |
| 6,000 to 7,000 | 101,000 | 8 to 12 | 10 | .83 | 83,800 | 3 | 2,500 |
| below 6,000 | 3,500 | less than 8 | 6 | .50 | 1,750 | 0 | 0 |
| Subtotal (rounded) | 184,000 | | | | 178,000 | | 10,000 |
| | | | PATTERSON VALLEY | | | | |
| Above 9,000 | 150 | more than 20 | 21 | 1.75 | 260 | 25 | 70 |
| 8,000 to 9,000 | 5,400 | 15 to 20 | 17.5 | 1.46 | 7,900 | 15 | 1,200 |
| 7,000 to 8,000 | 23,800 | 12 to 15 | 13.5 | 1.12 | 26,700 | 7 | 1,900 |
| 6,000 to 7,000 | 123,000 | 8 to 12 | 10 | .83 | 102,000 | 3 | 3,100 |
| below 6,000 | 114,000 | less than 8 | 6 | .50 | 57,000 | 0 | 0 |
| Subtotal (rounded) | 266,000 | | | | 194,000 | | 6,000 |
| | | | REMAINDER OF THE MEADOW VALLEY AREA | | | | |
| Above 9,000 | 350 | more than 20 | 21 | 1.75 | 610 | 25 | 150 |
| 8,000 to 9,000 | 4,500 | 15 to 20 | 17.5 | 1.46 | 6,600 | 15 | 990 |
| 7,000 to 8,000 | 20,200 | 12 to 15 | 13.5 | 1.12 | 22,600 | 7 | 1,600 |
| 6,000 to 7,000 | 202,000 | 8 to 12 | 10 | .83 | 168,000 | 3 | 5,000 |
| below 6,000 | 942,000 | less than 8 | 6 | .50 | 472,000 | 0 | 0 |
| Subtotal (rounded) | 1,170,000 | | | | 670,000 | | 8,000 |
| Total (rounded) | 1,620,000 | 2,530 mi$^2$ | | | 1,000,000 | | 24,000 |
| Estimated ground-water underflow from Lake Valley to Patterson Wash | | | | | | | 3,000 |
| Estimated average annual recharge from all sources to the Meadow Valley area | | | | | | | 27,000 |

along the banks of the wash in lower Meadow Valley.

Table 11 lists the estimated acreage of the phreatophytes for each valley in 1963 and summarizes the estimates of evapotranspiration. These estimates are based on rates of consumption of ground water by phreatophytes in other areas, and are derived largely from the work of Lee (1912), White (1932), Young and Blaney (1942), and Houston (1950). The estimated total evapotranspiration of ground water by phreatophytes in the Meadow Valley area is about 3,600 acre-feet per year.

During the nongrowing season, several areas become very wet and are partially covered by standing water. The principal areas of this kind are the wet and dry meadows of Spring Valley and fields northwest of Panaca in Panaca Valley. In early December 1963, standing water was observed in the latter area. The springs of the wet-meadow area of Spring Valley, Panaca Spring, and surface-water runoff are the principal sources of this water.

Evaporation from these wet areas during the nongrowing season possibly is large and may even be as large as the evapotranspiration of the phreatophytes. However, adequate data are not available on which to base an estimate.

Discharge of Wells and Springs: Most of the discharge of wells and springs is used to irrigate crops. Many wells are used for stock-watering and domestic supply, but their combined discharge in relation to that for irrigation purposes is very small; probably less than 100 acre-feet a year.

In 1963 there were 60 active irrigation wells and 5 public-supply wells in the report area. Forty of the irrigation wells were in Panaca Valley. The remaining wells were scattered throughout the several valleys (pl. 1). An inventory of pumpage was made for the area, based principally upon rates of electric-power or diesel-fuel consumption and the measured and estimated rates of discharge from the wells. A summary of the pumpage of the irrigation and public-supply wells is given in table 12, which shows that in 1963 the estimated total pumpage for the Meadow Valley area was 19,000 acre-feet. The single area of largest annual pumpage, about 7,500 acre-feet, was Panaca Valley. Lower Meadow Valley was next largest, having a pumpage of about 4,700 acre-feet.

It is estimated that about 40 percent of the irrigation water seeps back to the ground-water reservoir, the remaining amount being consumed by evapotranspiration. Therefore, in 1963 the estimated net draft on the ground-water reservoir resulting from the discharge of wells was on the order of 12,000 acre-feet.

There are several thermal springs in the area, the largest of which is Panaca Spring. Smaller thermal springs are at the Delmue Ranch in Dry Valley and at Caliente. The Delmue Springs (sec. 18, T. 1 S., R. 69 E.) flow only a fraction of a cubic foot per second; the spring at Caliente no longer flows. A nearby public-supply well pumps water that has a temperature of 104°F.