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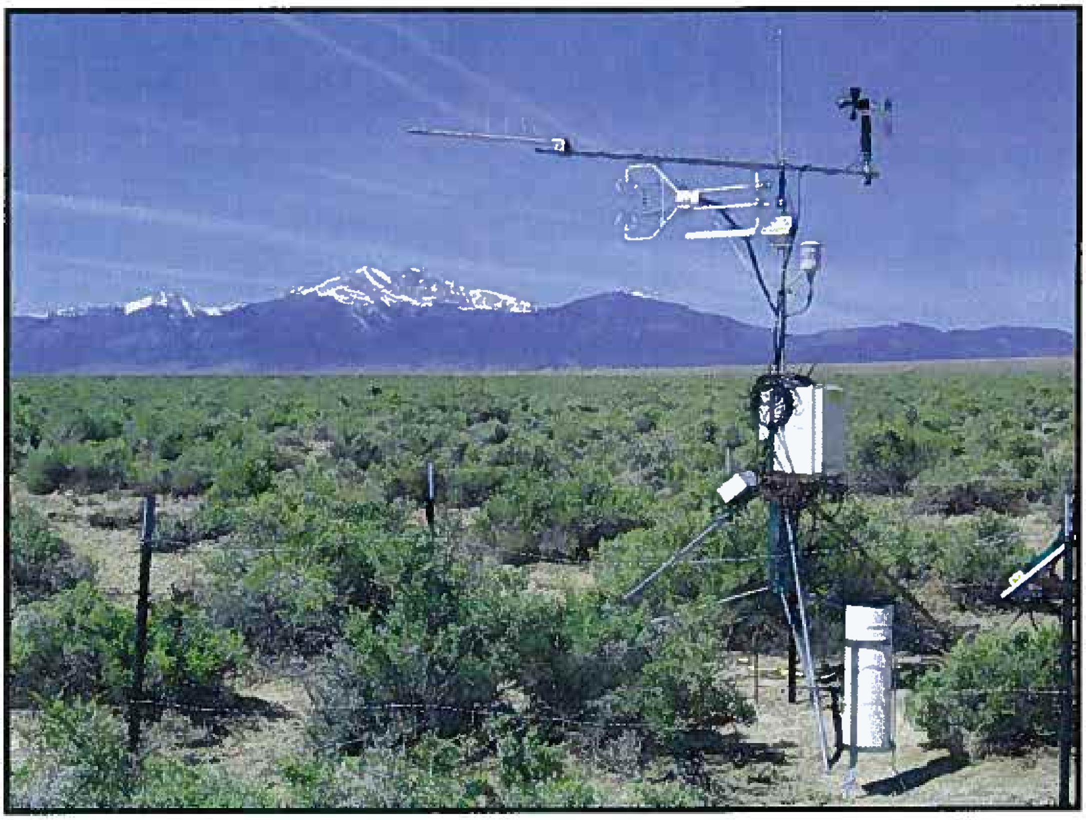
Evapotranspiration Rate Measurements of Vegetation Typical of Ground-Water Discharge Areas in the Basin and Range Carbonate-Rock Aquifer System, White Pine County, Nevada and Adjacent Areas in Nevada and Utah, September 2005–August 2006



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Measurement Results

Total ET includes water originating from precipitation, ground water, and surface water. Ground-water ET (ET*g*) is the water lost to the atmosphere through ET of ground water. ET*g* was calculated by subtracting precipitation measured from mesured ET at each ET site. Local surface-water run-on, defined as surface water occurring within the source area for turbulent-flux measurements, may increase total ET. Local surface-water run-on was not observed, nor were there any nearby major surface-water drainages; therefore, the contribution of local surface-water run-on to the total ET computed during the reporting period is considered negligible. As computed, total ET does include mountain-front surface-water runoff outside the source area for turbulent-flux measurements that infiltrates and contributes to regional ground-water recharge estimated for the BARCAS study (Flint and Flint, 2007).

Precipitation

Measured precipitation ranged from 6.03 to 11.08 in. at ET sites SNV-1 and WRV-2, respectively (table 7). Measured precipitation at each ET site was compared to the 30-year mean (1970–2000) as generated by the Parameter-Elevation Regressions on Independent Slopes Model (PRISM) computer program (Daly and others, 1994). PRISM interpolates the 30-year mean from precipitation measured at maintained climate stations. The spatial resolution was enhanced by downscaling the model grid size from 4,000 to 270 m (Flint and Flint, 2007). Annual precipitation measured at each ET site was within 20 percent of the PRISM computed long-term mean. Above-mean precipitation was measured only at the ET site WRV-2, which received about 29 percent more precipitation than the ET site WRV-1 located about 15 mi south-southeast.

Measured precipitation corrected for under catch ranged from 6.21 to 11.41 (table 7). All rain gages underestimate precipitation catch. The primary cause for underestimation in the volumetric rain gages used in this study is wind. Wind-induced catch deficiencies are high when wind speeds are high. Extrapolating the average wind speed (about 5 mi/h) following a semi-logarithmic wind profile from the wind monitor to the rain gage, the wind speed at the collection funnel is estimated as 3 mi/h (Campbell and Norman, 1998). Based on an average wind speed of 3 mi/h, underestimation of measured precipitation due to wind is estimated as 3 percent (Larsen and Peck, 1974).

Table 7. Measured evapotranspiration and precipitation at evapotranspiration (ET) sites and average annual precipitation computed by PRISM, Basin and Range carbonate-rock aquifer system study area, Nevada and Utah, September 1, 2005, to August 31, 2006.

[**ET site:** SNV is Snake Valley; SPV is Spring Valley, WRV is White River Valley. Location of ET sites is shown in figure 4. PRISM, Parameter-Elevation Regressions on Independent Slopes Model]

ET site	Evapotranspiration, in inches		Precipitation, in inches		
	Measured	Computed ground water	Measured	Corrected	Mean annual computed by PRISM
SNV-1	10.03	3.82	6.03	6.21	6.37
SPV-1	10.02	1.44	8.33	8.58	9.56
SPV-2	12.07	2.90	8.90	9.17	9.45
SPV-3	26.94	18.97	7.74	7.97	9.34
WRV-1	12.77	3.89	8.62	8.88	8.94
WRV-2	12.18	.77	11.08	11.41	9.51

Evapotranspiration

Typically, ET is highest from mid-spring through mid-summer when net radiation is high and lowest during winter when net radiation is low. Net radiation is the energy that drives the ET process; however, in addition to energy, there also must be an available water source for any ET to take place.

Daily ET at the shrubland sites peaks significantly at two different times during the collection period (fig. 11). The first peaking period begins in early March and extends through about mid-April or mid-May, depending on spring precipitation and local soil moisture (fig. 12). Following the early spring rainy period, soil moisture begins to decrease and ET abruptly decreases. ET does not decrease as abruptly at ET site WRV-2 most likely because this site received more precipitation (monthly precipitation totals in appendix A), or less likely because values for latent-heat flux were estimated during this period (table 6). The second peaking period, from about mid-June to mid-August, coincides with increased net radiation, depleted soil moisture, and declining water levels. Ground-water levels declined at a nearly constant rate through most of the growing season (fig. 13). Greasewood leaves were bright green and the plant vigorous during the first peaking period when the source of water was primarily soil moisture elevated