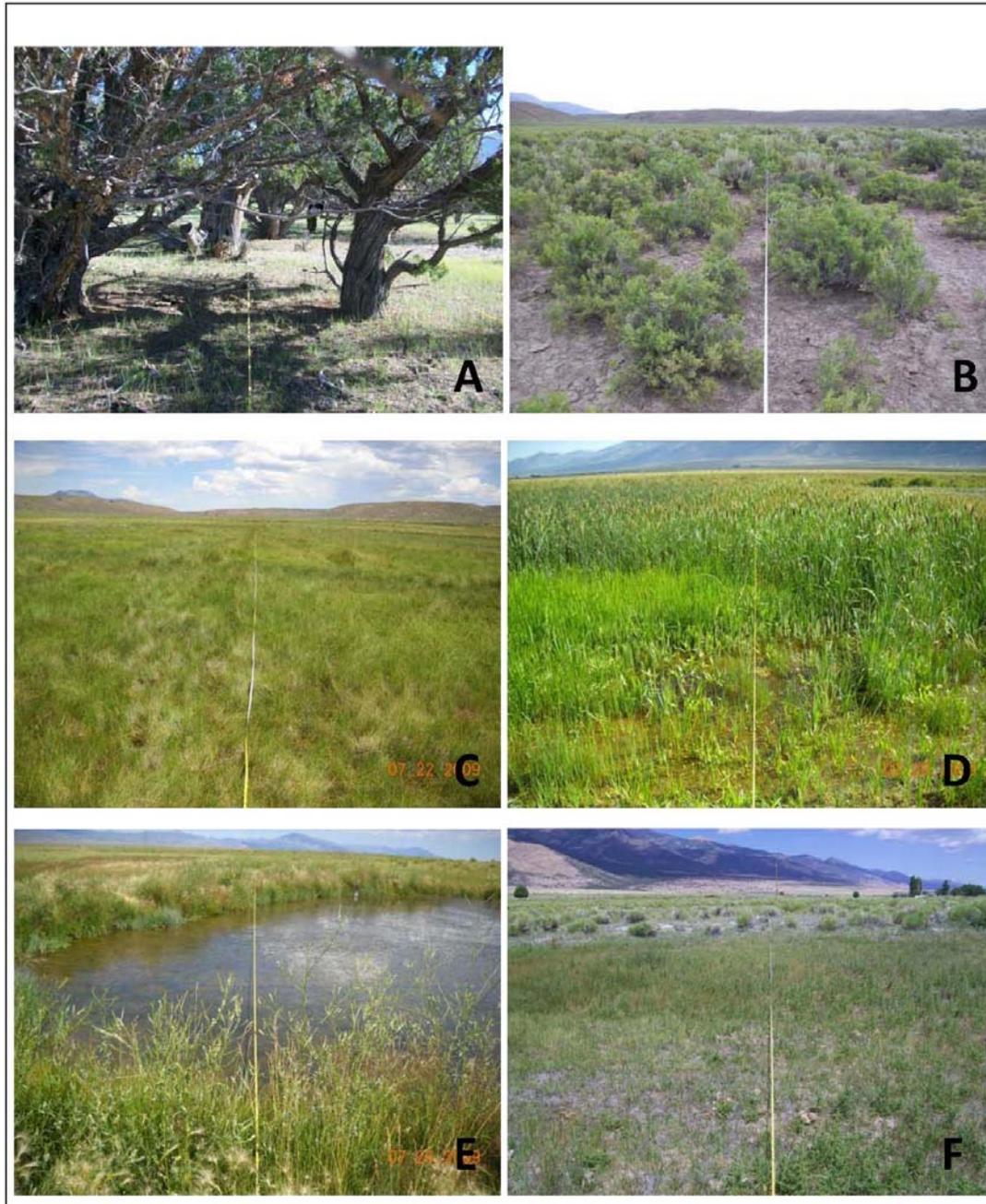


Expert Witness Slide Presentation for the Long Now Foundation

Clay Robinson, PhD

SNWA Hearing: Spring, Cave, Dry
Lake, and Delamar Valleys
November 17, 2011

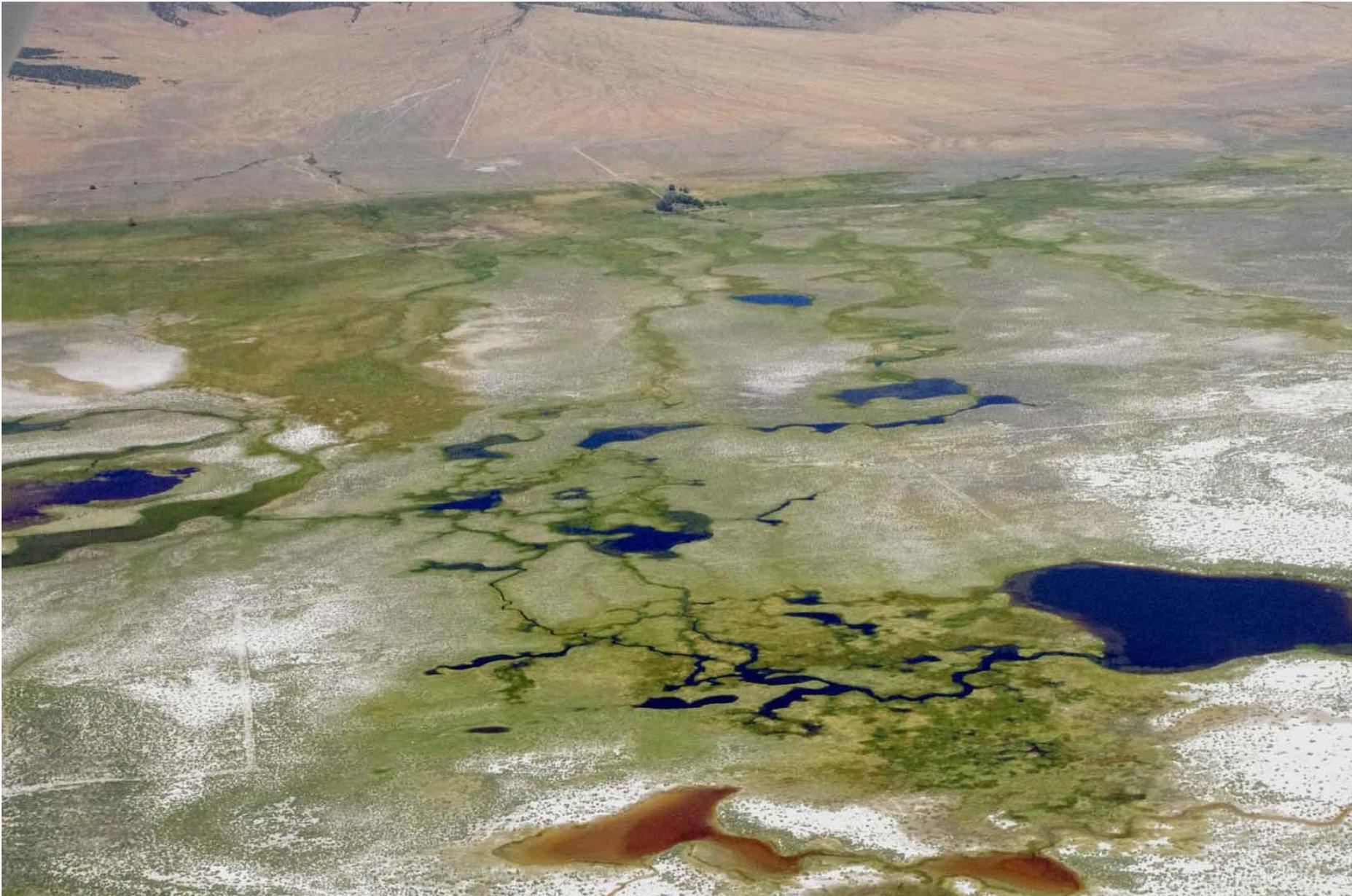


Note: (A) woodland, (B) shrubland, (C) grassland, (D) wetland, (E) aquatic, (F) early-seral

Figure 2-1
Spring Valley Examples of the Six Biomes

Table 3-2
Estimated Change in Plant Cover (%) in a
Typical Greasewood Communities in Spring Valley, Nevada
in Relation to Increase in DTW in Years of Average Precipitation

Mean DTW (m)																	
1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	>9
30	35	28	28	28	28	25	22	22	20	20	15	15	10	10	5	5	5



CPB_016 (IMGP9008)

TABLE 6 TABLE OF SELECTED SOIL ATTRIBUTES, P. 6

Spring Valley Nevada, NRCS Soil Survey Area 779, White Pine County, Nevada, East Part

<u>Map Unit</u>	<u>Total</u>		<u>% of</u>	<u>Acres of</u>	<u>Wetness</u>	<u>Pre Development</u>			<u>Post Development</u>		
	<u>Acres in</u>	<u>Name of MU</u>				<u>Component</u>	<u>Wetness</u>	<u>Ecological Site</u>	<u>Production</u>	<u>Ecological</u>	<u>Production</u>
	<u>MU</u>	<u>Component</u>	<u>MU</u>	<u>Component</u>	<u>Category</u>	<u>ECe</u>	<u>SAR</u>	<u>Ecological Site</u>	<u>(lbs/acre)</u>	<u>Site</u>	<u>(lbs/acre)</u>
3614	3,023	Little Spring	45	1,360	3	2-4	5-13	Sodic Terrace	400		240
		Big Spring	40	1,209	3	2-4	8-12	Sodic Terrace	600		360
		Playas	5	151	1	0-4	--	--	--		
3616	3,583	Sycomat	35	1,254	3	2-4	0-5	Sodic Terrace	400		240
		Kunzler	30	1,075	3	4-16	40-60	Sodic Terrace	600		360
3700	10,765	Kolda	55	5,921	2	4-8	1-12	Wet Meadow	2000	Dry Meadow	1300
		Duffer	30	3,230	3	8-32	13-90	Saline Meadow	1000	Dry Saline	400
3702	1,664	Kolda	45	749	2	4-8	0	Wet Meadow	2000	Dry Meadow	1300
		Biji	30	499	3	4-8	46-90	Saline Bottom	1500		1050
		Kolda	15	250	2	4-8	1-5	Wetland	2800	Dry Meadow	1300
3715	1,101	Ewelac	50	551	3	8-16	46-90	Saline Bottom	400		280
		Kolda	20	220	2	4-8	0	Wet Meadow	2000	Dry Meadow	1300
		Big Spring	15	165	3	8-16	46-90	Sodic Terrace	600		360
3721	1,568	Katelana	30	470	3	16-32	90-180	Sodic Terrace	400		240
3723	6,527	Katelana	45	2,937	3	16-32	90-180	Coarse Gravelly Loam	500		300
3751	2,583	Katelana	85	2,196	3	16-32	90-180	Sodic Terrace	400		240
3752	5,459	Raph	40	2,184	3	0-4	13-45	Sodic Terrace	400		240
		Benin	35	1,911	3	8-16	13-50	Sodic Terrace	400		240
		Gravier	15	819	3	0-2	13-30	Sodic Terrace	400		240
3770	1,294	Ewelac	35	453	3	8-16	46-90	Saline Bottom	400		280
		Kawich	30	388	3	4-8	1-5	Sodic Dune	500		500
		Biji	20	259	3	4-8	46-90	Saline Bottom	1500		1050
		Kolda	4	52	2	4-8	0	Wet Meadow	2000	Dry Meadow	1300

Percolation rate through soil is a function of the soil texture, bulk density, and water content. Water flows through unsaturated sands rapidly (2-20 cm per hour), but very slowly through clay (< 0.2 cm per hour) (Kohnke 1968:31). A higher bulk density (e.g., compacted clay) results in a slower percolation rate. Muck (combination of organic matter and fine mineral particles) accumulations at the bottom of ponds slow the percolation rate because these materials fill the larger cracks and pore spaces and they form a dense mat covering the underlying mineral surface. The slower the rate of water movement through the wetland system, the more likely there is for muck to accumulate. Water loss from percolation through a muck-covered pond bottom overlying a saturated clay substrate is likely to approach zero. Conversely, water loss from percolation through a sand-gravel bottom overlying a relatively thick gravel-sand substrate may be on the order of 2-3 m per day until the substrate becomes saturated.

The BWG shall consider whether to include monitoring and research on the following parameters in its recommendations to the Executive Committee:

1. vegetation community extent and composition, diversity, density, structure, and/or vigor, including tracking non-native, invasive species;
2. faunal community composition, diversity, density, health (body condition, disease, parasitism, reproductive success, etc.), potentially including monitoring of the following taxonomic groups: invertebrates; migratory, wintering, and breeding birds; bats; rodents; medium and large mammals; amphibians; and/or fish;
3. forage and prey base extent and condition;
4. nesting, wintering, and migratory area extent and condition;
5. competition and predation;
6. aquatic habitat structure (water depth and velocity; substrate; spawning, nursery, and hiding places; stream cover and shading; stream diversity, i.e., pools, runs, and riffles; woody debris input; etc.)
7. soil stability, erosion, sedimentation; and
8. physical and chemical water quality parameters.

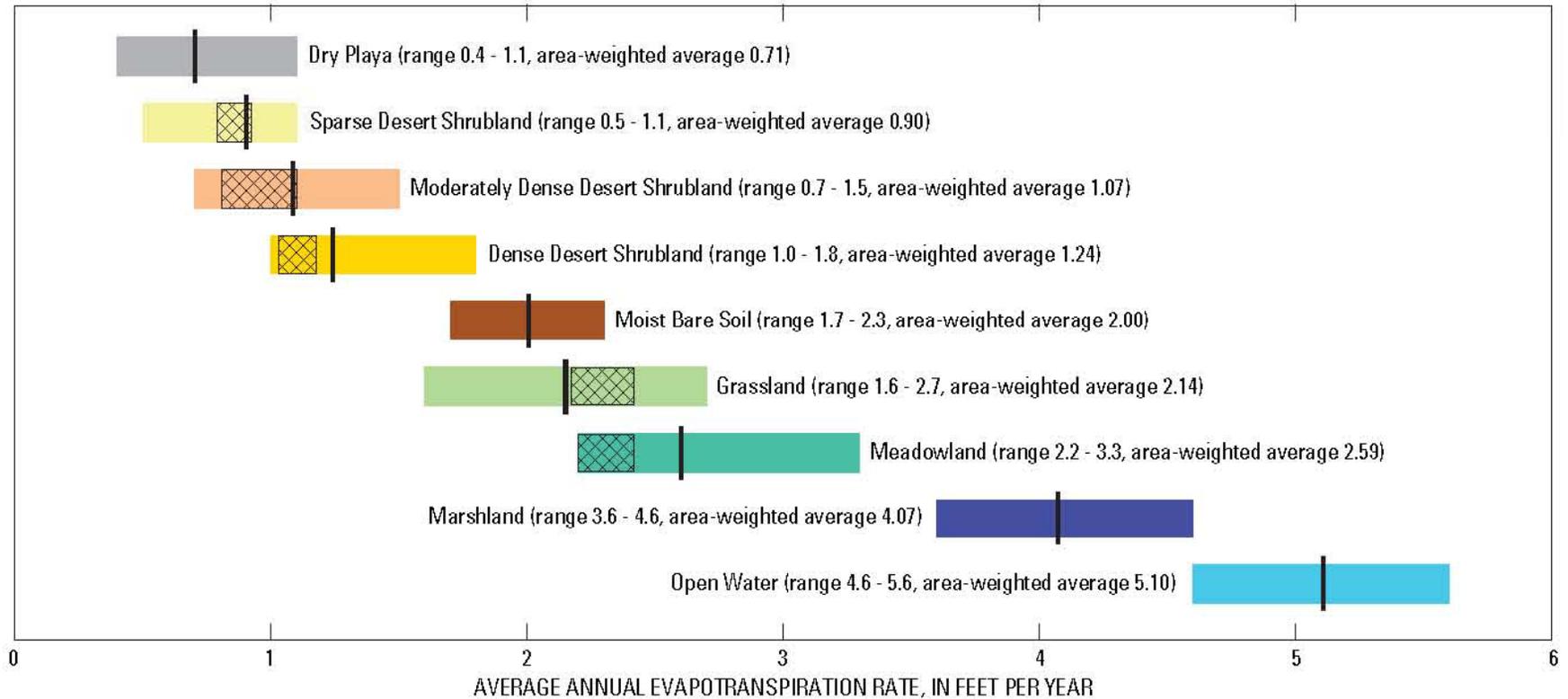
TABLE 7 TABLE OF SELECTED SOIL ATTRIBUTES, P. 7

Spring Valley Nevada, NRCS Soil Survey Area 779, White Pine County, Nevada, East Part

<u>Map Unit</u>	<u>Total</u>		<u>% of</u>	<u>Acres of</u>	<u>Wetness</u>	<u>Pre Development</u>			<u>Post Development</u>		
	<u>Acres in</u>	<u>Name of MU</u>				<u>MU</u>	<u>Component</u>	<u>Category</u>	<u>ECe</u>	<u>SAR</u>	<u>Ecological Site</u>
	<u>MU</u>	<u>Component</u>							<u>(lbs/acre)</u>	<u>Site</u>	<u>(lbs/acre)</u>
3780	716	Benin	90	644	3	8-16	13-50	Sodic Terrace	400		240
3785	503	Ewelac	60	302	3	8-16	46-90	Saline Bottom	400		280
		Ewelac	30	151	3	8-16	46-90	Sodic Flat	400		240
4050	15,548	Playas	5	777	1	0-4	--	--	--		
4051	3,569	Playas	5	178	1	0-4	--	--	--		
4052	16,719	Kolda	5	836	2	4-8	0	Wet Meadow	2000	Dry Meadow	1300
		Playas	5	836	1	0-4	--	--	--		
4053	867	Katelana	30	260	3	16-32	90-180	Sodic Terrace	400		240
4055	2,613	Izamatsh	40	1,045	3	0-4	13-30	Sodic Terrace	400		240
		Katelana	30	784	3	16-32	90-180	Sodic Terrace	400		240
		Gravier	20	523	3	0-2	13-30	Sodic Terrace	400		240
4060	7,054	Ocala	45	3,174	3	4-8	31-90	Saline Bottom	1500		1050
		Duffer	25	1,764	3	16-32	46-90	Saline Meadow	1000	Dry Saline Meadow	400
		Kolda	15	1,058	2	4-8	0	Wet Meadow	2000	Dry Meadow	1300
4112	1,783	Playas	5	89	1	0-4	--	--	--		
4113	753	Raph	25	188	3	0-4	13-45	Sodic Terrace	400		240
4121	10,520	Katelana	40	4,208	3	16-32	90-180	Sodic Terrace	500		300
		Biji	15	1,578	3	4-8	46-90	Saline Bottom	1500		1050
5000	7,270	Playas	100	7,270	1	0-4	--	--	--		
5010	6,322	Biji	30	1,897	3	4-8	46-90	Saline Bottom	1500		1050
		Hogum	3	190	2	2-8	0-12	Wet Clay Basin	100		100
5020	12,815	Kunzler	40	5,126	3	4-16	40-60	Sodic Terrace	700		420

Table 7. Evapotranspiration (ET) units identified, delineated, and mapped for different vegetation and soil conditions in potential areas of ground-water discharge in the Basin and Range carbonate-rock aquifer system study area, Nevada and Utah, September 2005–August 2006.

ET-unit name	ET-unit description	Photograph
Xerophytic	Area of no substantial ground-water evaporation. Area dominated by bare dry soil and/or sparse, non-phreatophytic vegetation.	
Open Water	Area of open water including reservoirs, ponds, and spring pools.	
Marshland	Area dominated by dense wetland vegetation, primarily tall reeds and rushes, and some grasses. Vegetation cover typically is greater than 50 percent. Open water is present but typically less than 25 percent. Perennially flooded. Water at or very near surface. Depth to water typically is less than 1 foot.	
Meadowland	Area dominated by short, dense perennial grasses, primarily marsh and meadow grasses. Unit includes occasional desert shrubs and trees, primarily Rocky Mountain junipers and cottonwoods. Vegetation cover typically is greater than 50 percent. Soil typically is moist except in later summer and autumn. Depth to water table typically is less than 5 feet.	
Grassland	Area dominated by short, sparse, perennial grasses, including salt grass, and sod and pasture grasses typically a mix of vegetation types. Unit includes sparse desert shrubs and occasional trees, primarily Rocky Mountain junipers or cottonwoods. Vegetation cover is between 10 and 100 percent. Soil typically is damp to dry. Depth to water table typically is less than 8 feet.	
Moist Bare Soil	Area dominated by moist playa. Near surface soil is damp throughout much of the year. Water table is near or below land surface. Depth to water typically is less than 10 feet.	
Dense Desert Shrubland	Area dominated by sparse desert shrubs, including greasewood, rabbitbrush, shadscale, big sagebrush, and saltbush. Shrubs typically are mixed. Vegetation cover typically is greater than 25 percent. Depth to water can range from about 3 to 50 feet.	
Moderately Dense Desert Shrubland	Area dominated by sparse desert shrubs, including greasewood, rabbitbrush, shadscale, big sagebrush, and saltbush. Shrubs typically are mixed. Vegetation cover typically ranges from 10 to 30 percent. Depth to water can range from about 3 to 50 feet.	
Sparse Desert Shrubland	Area dominated by sparse desert shrubs, including greasewood, rabbitbrush, shadscale, big sagebrush, and saltbush. Shrubs typically are mixed. Vegetation cover typically ranges from 5 to 15 percent. Depth to water can range from about 3 to 50 feet.	
Dry Playa	Area dominated by dry playa. Soil typically dry year round. Water table below land surface. Depth to water typically is greater than 10 feet. This unit may not contribute to ground-water discharge.	
Recently Irrigated Cropland—Historically Mixed Phreatophyte	Area dominated by irrigated cropland. Soil moisture varies with irrigation practice. Water table is below land surface. Depth to water table typically is greater than 5 feet. Prior to irrigation, the unit likely was dominated by sparse desert shrubs to grassland.	



EXPLANATION

-  Range of average-annual evapotranspiration rates developed from published values for similar vegetation and soil conditions, and from field measurements made in the Basin and Range carbonate-rock aquifer system study area
-  Evapotranspiration rates calculated from field measurements made in the Basin and Range carbonate-rock aquifer system study area from September 1, 2005, to August 31, 2006. Range represents uncertainties in measurement or multiple ET sites per ET unit
-  Area-weighted average-annual evapotranspiration rate calculated for each ET unit in the Basin and Range carbonate-rock aquifer system study area

Figure 27. Estimated average annual ET-rate range for ET units identified, Basin and Range carbonate-rock aquifer system study area, Nevada and Utah.

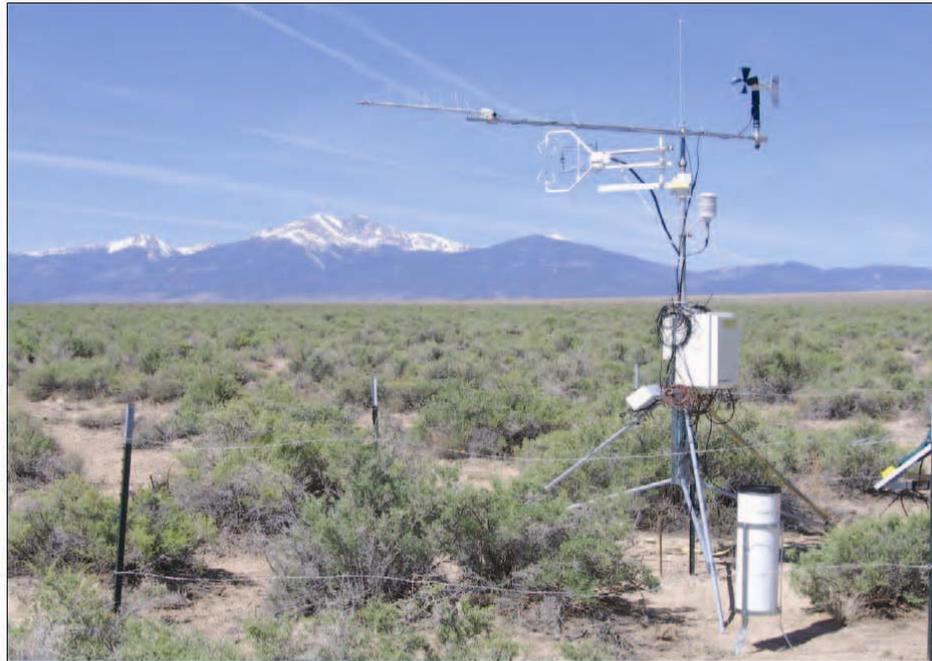


Figure 28. Eddy-correlation site used for measuring evapotranspiration in greasewood dominated shrubland in Snake Valley, Nevada. Northeast flank of southern Snake Range visible in background. Photograph taken by Michael T. Moreo, U.S. Geological Survey, June 1, 2006.

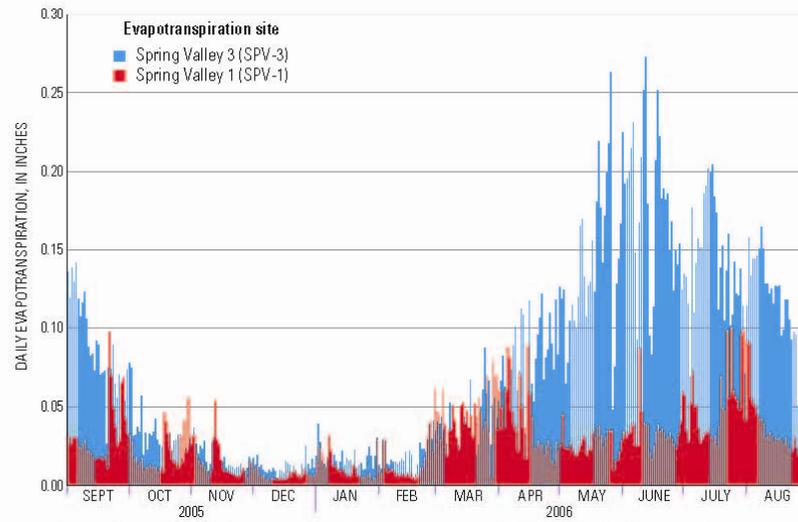


Figure 29. Daily ET from grassland/meadowland site (SPV-3) in Spring Valley, and a greasewood dominated shrubland site (SPV-1) also in Spring Valley, Basin and Range carbonate-rock aquifer system study area, Nevada and Utah, September 1, 2005, to August 31, 2006.