INTRODUCTION

This atlas presents data on ground-water quality for the Winnemucca 1° x 2° quadrangle. The basic data were compiled as part of the Great Basin Regional Aquifer-Systems Analysis of the U.S. Geological Survey (Harrill and others, 1983).

The data herein were obtained from various sources, including published reports and computerized data files. The computer files accessed for this effort are: (1) WATSTORE, the National Water-Data Storage and Retrieval system maintained by the Water Resources Division of the U.S. Geological Survey; (2) WADS, a system created by the Desert Research Institute, University of Nevada; and (3) RASS, a system maintained by the Geologic Division of the U.S. Geological Survey. Other potential major sources of data are: the National Uranium Resource Evaluation (NURE), a U.S. Department of Energy project; reports of sampling efforts begun in 1980 by the U.S. Bureau of Land Management; and U.S. Geological Survey reports on various hydrographic areas. Only those analyses that pass certain quality-control criteria are included herein. A chemical analysis is excluded if (1) determinations do not exist for all of the principal ions, or (2) the analytical results do not meet the following criterion for electrical balance: total cations and total anions must agree within 10 percent, using the formula:

$$\text{imbalance (in percent)} = \frac{(\text{cations} - \text{anions})}{(\text{cations} + \text{anions})} \times 100 ,$$

where the concentrations are expressed in milliequivalents per liter. This electrical imbalance should be small for comprehensive analyses and it therefore serves as a check on the quality of the analytical results.

Where sample sites are closely spaced, or where more than one analysis is available for a single site, areal averaging is applied to prevent overprinting of information on the map (see side 1). Furthermore, if data for a deep well or for a thermal water are available within an area containing other data (shallow or nonthermal), the other data are not included in the averaging. Finally, if data for both a deep well (1,000 feet or greater) and a thermal water (30 °C or greater) are available, only the deep data are used. The averaging is done over a map area of 0.5 inch by 0.5 inch at a scale of 1:250,000, which is equivalent to about 4 square miles. One consequence of this procedure is that the actual map location corresponding to the sampling site does not necessarily coincide exactly with the computer-plotted location on the map (which is at the center of the 4-square-mile averaging area). Thus, the plotted data for springs may be offset from the spring locations shown on the topographic base map.

The general chemical character of each water (that is, the relative proportions of principal cations and anions) is shown in the trilinear diagrams (side 1) and indicated by a letter code on the map (see "Explanation"). The characteristics and uses of trilinear diagrams are discussed by Hem (1970, p. 264-270). Both the map and the trilinear diagrams used the same depth-and-temperature symbols. The bar graph (side 1) indicates the relative proportion of major cations and anions for the indicated ranges of dissolved-solids concentration.

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CONVERSION FACTORS AND ABBREVIATIONS

"Inch-pound" units of measure used in this report may be converted to International System (metric) units by using the following factors:

Multiply	*By*	*To obtain*
Feet (ft)	0.3048	Meters (m)
Inch (in.)	25.40	Millimeters (mm)
Square miles (mi^2)	2.590	Square kilometers (km^2)

For temperature, degrees Celsius (°C) can be converted to degrees Fahrenheit (°F) by using the formula °F = [(1.8)(°C)] + 32.

Site designation	Latitude, longitude (deg-min-sec) [1]		Type of site	Temperature (degrees Celsius)	pH (units)	Specific conductance (microsiemens per centimeter at 25°C)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Bicarbonate (mg/L)	Carbonate (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Silica (mg/L)	Dissolved solids [2] (mg/L)	Cation-anion balance [3]	Sampling date (year-month-day)	Well depth (feet)	Source of data [4]
HYDER CONE HOT SPRINGS	400011	1174305	Spring	72	7.2	--	43	10	330	20	870	0	110	48	8.1	69	1,100	0	--	--	Ghusn, 1981
UNN HOT SP LOWER RANCH	400205	1173611	Spring	40	8.1	850	31	15	140	12	460	0	63	29	--	42	560	-3	--	--	Mariner and others, 1974
BRUFFEY'S HOT SPRINGS	400309	1160406	Spring	66	7.0	540	52	16	39	8.7	290	0	27	14	0.7	0.6	380	1	54-07-23	--	Bliss, 1983
McCOY RANCH HOT SPRINGS	400449	1173612	Spring	50	7.3	--	94	37	220	10	310	0	220	290	1.4	32	1,000	-1	--	--	Ghusn, 1981
SOU (SEVEN DEVILS, GILBERT'S)	400524	1172830	Spring	70	7.3	1,410	110	20	170	26	320	0	350	77	5.5	64	980	2	74-02-20	--	Bliss, 1983
SOU HOT SPRINGS	400524	1174324	Spring	73	8.1	1,410	110	22	160	26	310	0	370	75	--	65	990	0	--	--	Mariner and others, 1974
UNN HOT SPRING JERSEY VY	401041	1172924	Spring	29	7.1	1,040	36	4.4	180	20	370	<1	150	40	7.8	110	730	1	--	--	Mariner and others, 1974
UNN HOT SP VLLY OF MOON	401128	1170620	Spring	53	8.0	700	20	9.0	120	21	330	0	64	21	--	40	460	1	--	--	Mariner and others, 1974
HENRY FILIPPINI WELL	401155	1170622	Spring	51	7.9	825	52	7.3	120	20	430	0	62	21	3.9	39	520	0	65-05-04	--	Bliss, 1983
PINE V AMOCO BLACKBRN #3	401352	1160817	Well	>69	7.9	3,400	29	9.2	570	40	580	0	250	510	4.0	110	1,800	-2	82-12-15	7,230	WATSTORE
RANCH, J.S.	401436	1173649	Well	--	8.0	1,290	79	17	180	11	410	0	150	130	1.9	58	830	0	63-07-23	107	WATSTORE
MOUND SPRING	401844	1170410	Spring	30	7.1	1,100	70	25	110	29	490	0	87	18	3.0	19	600	3	--	--	Ghusn, 1981
DANN HOT SPRING	401858	1162558	Spring	85	7.8	1,100	12	1.3	260	53	510	0	130	85	11	99	890	0	--	--	Ghusn, 1981
DANN RANCH WELL	401926	1162453	Well	28	7.2	420	44	14	39	2.7	230	0	28	16	0.4	20	270	3	--	--	Ghusn, 1981
UNNAMED HOT SPRING HOTCR	401929	1160331	Spring	26	7.3	408	46	24	10	2.1	230	1	27	4.6	<0.1	20	250	3	--	--	Mariner and others, 1974
NOT SPECIFIED	402202	1171946	Spring	66	7.1	1,480	48	4.6	290	34	820	0	100	28	5.5	74	980	0	77-05-06	--	WATSTORE
BUFFALO HOT SPRING	402205	1171935	Spring	49	6.5	1,530	45	4.9	250	34	810	<1	110	29	4.8	80	950	-7	--	--	Mariner and others, 1974
BUFFALO HOT SPRING	402205	1171935	Spring	53	6.8	--	44	8.8	300	38	700	0	83	29	--	190	1,000	9	65-06-01	--	WATSTORE
HOT SPRINGS POINT	402423	1163056	Spring	54	6.6	1,730	53	35	230	58	910	<1	7.0	1.0	6.6	67	900	6	--	--	Mariner and others, 1974
HOT SPRINGS POINT	402424	1163100	Spring	50	6.5	1,790	63	42	280	54	1,000	0	120	48	4.9	52	1,200	0	52-09-16	--	Bliss, 1983
HOT SPRINGS POINT	402424	1163118	Spring	59	6.8	1,710	54	38	280	51	930	0	120	49	6.9	72	1,100	0	52-09-16	--	Bliss, 1983
ST SPRING IN FENCE	402425	1175259	Spring	66	6.9	3,500	95	22	540	82	490	0	66	790	5.7	110	1,900	1	77-05-08	--	WATSTORE
KYLE HOT SPRINGS	402425	1175302	Spring	77	6.5	3,220	95	25	540	80	540	<1	51	770	5.7	150	2,000	1	--	--	Mariner and others, 1974
KYLE HOT SPRINGS	402430	1175306	Spring	96	7.0	3,310	97	20	520	80	540	0	48	780	6.3	160	2,000	-1	74-02-20	--	Bliss, 1983
COYOTE SPRING	402505	1173823	Spring	22	7.0	959	73	17	130	8.2	480	0	65	70	1.4	40	640	-1	77-06	--	Welch and others, 1981
PARIS ARNOLD	402652	1174025	Well	70	7.6	842	47	19	98	6.5	200	0	71	130	0.3	36	500	-1	52-05-01	382	WATSTORE
PARIS ARNOLD	402652	1174025	Well	72	7.9	853	46	19	100	6.4	210	0	69	120	0.5	39	510	1	63-07-24	382	WATSTORE
MR. SIARD	402849	1173951	Well	58	7.6	1,070	58	25	130	4.4	310	0	94	130	0.3	46	640	0	61-08-15	20	WATSTORE
SP SOUTH SPAULDING CYN	403135	1174753	Spring	13	7.2	962	99	32	65	3.8	290	0	150	86	1.0	19	600	1	77-06	--	Welch and others, 1981
MUD SPRING	403145	1173651	Spring	14	7.3	619	66	18	32	1.8	200	0	59	56	0.2	22	350	1	77-06	--	Welch and others, 1981
WELL NORTH OF MUD SPRING	403149	1173643	Well	15	7.7	675	68	19	38	2.3	190	0	53	81	0.1	20	370	1	77-06	--	Welch and others, 1981
PETAIN SPRING	403248	1173122	Spring	12	7.6	541	67	9.1	29	4.6	210	0	38	39	0.3	58	350	1	77-06	--	Welch and others, 1981
PETAIN SPRING	403248	1173122	Spring	16	7.8	515	65	9.6	29	4.2	220	0	39	36	0.2	54	340	0	78-08-22	--	Welch and others, 1981
QH13B LBL	403260	1173425	Well	18	8.3	535	47	12	52	3.0	210	2	48	39	0.8	21	330	1	78-08-30	187	Welch and others, 1981
BEOWAWE STEAM WELL	403341	1163000	Well	--	9.4	1,490	1.3	0.2	250	38	500	81	64	70	<0.0	500	1,300	-9	--	--	Mariner and others, 1974
QH3B LBL	403342	1174003	Well	24	6.1	388	14	2.0	57	3.5	82	0	41	59	1.5	16	230	-6	78-08-29	509	Welch and others, 1981
QH3D USGS	403342	1174006	Well	58	8.3	803	11	1.8	180	11	460	4	30	24	3.9	16	500	-1	78-08-29	1,340	Welch and others, 1981
QH3D USGS	403342	1174006	Well	58	8.1	825	13	2.1	180	12	460	3	26	23	4.3	8.3	490	1	78-09-15	1,340	Welch and others, 1981
SPRING SW GRASS VALLEY	403357	1174332	Spring	20	7.6	1,220	91	32	110	4.7	180	0	190	180	0.7	26	720	0	77-06	--	Welch and others, 1981
NOT SPECIFIED	403359	1163520	Spring	90	9.4	1,170	0.8	0.1	270	27	220	2	140	65	14.0	270	1,100	-9	77-05-04	--	WATSTORE
BEOWAWE HOT SPRING	403410	1163000	Spring	98	9.0	1,020	1.0	<0.1	230	16	320	32	130	69	17.0	320	960	-2	--	--	Mariner and others, 1974
DH1 USGS	403515	1173910	Well	16	8.4	474	45	12	38	3.2	170	2	43	39	0.4	25	290	1	78-08-24	147	WATSTORE
LEACH HOT SP ORIFICE 1	403536	1173928	Spring	85	7.2	827	9.7	0.8	170	12	390	0	53	26	8.2	120	580	0	77-06	--	Welch and others, 1981
LEACH HOT SP ORIFICE 1	403536	1173928	Spring	86	6.7	810	11	1.1	180	13	380	0	56	26	9.0	100	580	4	78-09-14	--	Welch and others, 1981
LEACH HOT SP ORIFICE 1	403536	1173928	Spring	86	6.9	780	9.5	0.9	160	11	370	0	52	31	8.5	110	560	-2	83-12-28	--	WATSTORE
LEACH HOT SP ORIFICE 12	403536	1173928	Spring	92	9.0	842	9.6	0.1	180	16	320	3	57	32	2.7	120	570	8	79-03-20	--	Welch and others, 1981
LEACH HOT SP HOT OR 13	403536	1173928	Spring	92	7.4	811	8.8	0.5	160	13	370	0	53	29	7.8	135	580	-1	--	--	Mariner and others 1974
LEACH HOT SP HOT OR 13	403536	1173928	Spring	95	7.1	770	8.5	0.6	160	12	360	0	53	30	8.5	130	570	-1	83-12-28	--	Welch and others, 1974
LEACH HOT SP ORIFICE 15	403536	1173928	Spring	92	5.9	578	8.6	0.2	85	12	3.0	0	200	13	2.7	180	500	-1	78-12-13	--	Welch and others, 1981
LEACH HOT SPR ORIFICE22	403536	1173928	Spring	81	7.0	825	10	1.0	170	12	390	0	50	28	8.5	100	560	0	77-06	--	Welch and others, 1981
LEACH HOT SPR ORIFICE22	403536	1173928	Spring	81	6.6	802	11	1.2	170	11	370	0	52	25	9.0	95	550	3	78-09-14	--	Welch and others, 1981
LEACH HOT SPR ORIFICE 15	403536	1173938	Spring	92	5.9	--	8.6	0.2	85	12	3.0	0	200	13	2.7	180	500	-1	78-12-13	--	Welch and others, 1981
QH7B LBL	403540	1174107	Well	16	8.6	376	18	6.2	53	4.5	140	3	15	39	0.6	4.6	210	0	78-08-23	241	Welch and others, 1981
HORSESHOE RANCH HOT SPRINGS	403606	1162736	Spring	58	7.0	832	22	5.8	140	17	380	0	62	27	5.0	58	530	-1	57-09-01	--	Bliss, 1983
DH-8	403609	1174003	Well	15	8.3	542	56	12	39	3.1	200	2	53	36	0.3	19	320	1	78-08-23	148	Welch and others, 1981
DH 13A USGS	403613	1173844	Well	52	8.6	1,250	8.5	2.0	270	14	360	8	110	140	6.2	17	750	1	78-08-23	172	Welch and others, 1981
LEACH HOT SPRINGS	403618	1173930	Spring	96	7.0	3,310	97	20	520	80	540	0	48	780	6.3	160	2,000	-1	74-02-20	--	Bliss, 1983
DH 10 USGS	403624	1173844	Well	86	8.5	815	11	1.5	180	12	380	7	43	27	8.8	49	520	4	78-09-14	55	Welch and others, 1981
DH14A USGS	403634	1173902	Well	29	8.5	810	12	2.3	180	11	400	6	49	24	8.1	79	560	3	78-08-30	151	Welch and others, 1981
POINT SPRING	403749	1174758	Spring	10	7.5	1,250	150	61	65	6.5	300	0	350	110	0.5	19	910	1	77-06-01	--	Welch and others, 1981
SHEEP RANCH SPRING	403828	1173647	Spring	13	7.7	720	72	32	29	2.5	210	0	110	59	0.2	21	430	1	77-06	--	Welch and others, 1981
QH5BLBL	403853	1174014	Well	17	9.8	750	3.3	1.6	170	9.2	270	86	19	38	16	1.3	460	-5	78-08-31	420	WATSTORE
HOT SPRINGS RANCH	404541	1172932	Spring	85	8.4	1,060	16	0.9	200	18	390	0	140	41	--	130	730	-2	--	--	Mariner and others, 1974
UNNAMED	404818	1173550	Well	52	7.7	460	49	8.9	32	2.8	170	0	35	41	0.3	44	290	0	63-07-24	--	WATSTORE
BROOKS HOT SPRING	404944	1171820	Spring	34	7.1	1,020	59	17	160	14	500	0	91	36	1.7	35	660	2	77-05-05	--	WATSTORE
ROSE CREEK SPRING	405224	1175612	Spring	22	6.4	2,690	62	27	570	19	1,280	0	100	240	5.5	70	1,700	1	57-05-22	--	Bliss, 1983
NORTHERN EAST RANGE AREA	405230	1175606	Spring	28	8.3	2,640	61	12	550	51	1,270	10	100	240	6.0	73	1,700	-1	61-07-18	--	Bliss, 1983
NOT SPECIFIED	405307	1175530	Well	28	7.8	3,030	120	48	510	60	1,610	0	59	230	4.8	52	1,900	-1	61-07-19	--	Cohen, 1962
NOT SPECIFIED	405406	1174549	Well	--	8.0	428	59	12	13	1.2	180	0	51	19	0.4	16	260	0	61-07-25	--	Cohen, 1962
NOT SPECIFIED	405455	1174951	Well	18	8.2	394	46	9.2	20	3.3	180	0	28	13	0.3	50	260	1	61-07-25	--	Cohen, 1962
NOT SPECIFIED	405502	1174958	Well	--	--	513	56	15	31	3.3	190	0	76	21	0.3	43	340	2	54-09-21	--	Cohen, 1962
NOT SPECIFIED	405502	1174959	Well	14	8.2	469	54	11	30	2.2	200	0	41	20	0.1	39	300	3	61-08-07	--	Cohen, 1964
HOT POT	405521	1170634	Spring	58	8.0	1,400	29	5.0	290	33	820	0	60	28	--	80	930	-1	--	--	Mariner and others, 1974
NOT SPECIFIED	405616	1172746	Well	--	7.5	547	44	10	51	5.3	200	0	51	31	0.2	70	360	1	61-08-08	--	Cohen, 1962
NOT SPECIFIED	405637	1174658	Well	13	8.3	706	44	13	90	11	290	5	68	40	0.8	44	460	0	61-11-30	--	Cohen, 1962
NOT SPECIFIED	405658	1174531	Well	--	8.1	589	43	12	60	6.1	190	0	60	57	0.3	35	370	-1	61-07-24	--	Cohen, 1962
NOT SPECIFIED	405711	1174508	Well	--	7.9	792	68	20	59	2.2	240	0	75	82	0.1	29	450	-1	61-07-24	--	Cohen, 1962
NOT SPECIFIED	405712	1174634	Well	16	7.9	821	76	15	78	6.8	340	0	74	57	0.5	32	510	-1	61-07-20	--	Cohen, 1962
GOLCONDA HOT SPRINGS	405715	1172924	Spring	42	6.8	-	43	9.8	150	26	520	0	54	24	2.5	20	580	-1	--	--	Flynn, 1981
GOLCONDA HOT SPRINGS	405718	1172900	Spring	43	7.0	942	47	7.8	160	24	530	0	57	27	2.9	40	630	0	74-02-20	--	Bliss, 1983
SEGERSTROM WELL (2)	405718	1172936	Well	42	6.6	-	40	9.3	130	23	470	0	51	21	2.1	22	530	-2	--	--	Flynn, 1981
NOT SPECIFIED	405725	1172530	Well	15	8.4	2,830	26	11	690	5.0	1,210	18	280	180	1.8	44	1,900	2	61-08-07	--	Cohen, 1962
SEGERSTRON WELL (1)	405730	1172918	Well	67	6.9	-	36	7.8	130	22	380	0	49	19	1.9	31	480	5	--	--	Flynn, 1981
NOT SPECIFIED	405730	1173909	Well	11	7.8	778	94	21	34	2.5	250	0	140	45	--	24	480	-2	61-07-27	--	Cohen, 1962
CALIFORNIA PACIFIC UTILITIES CO.	405736	1174436	Well	23	7.9	728	56	19	60	6.5	260	0	72	58	0.3	51	450	-2	61-07-24	--	Bliss, 1983
UNN HOT SPRING NEAR GOLC	405740	1172936	Spring	74	6.5	810	33	6.8	130	22	430	<1	56	18	1.8	66	540	-2	--	--	Mariner and others, 1974
SEGERSTROM (5) SPRING	405740	1172937	Spring	61	7.4	-	36	8.4	150	24	450	0	53	22	2.1	30	540	3	--	--	Flynn, 1981
SEGERSTROM (1) SPRING	405740	1172937	Spring	71	7.1	-	37	7.7	130	22	430	0	48	17	1.8	32	500	1	--	--	Flynn, 1981
NOT SPECIFIED	405742	1172950	Spring	64	8.2	845	35	8.4	150	23	450	0	56	20	2.0	59	570	2	61-12-02	--	Cohen, 1962
NOT SPECIFIED	405744	1172926	Spring	60	7.0	870	36	7.6	150	23	440	0	60	23	2.3	57	570	2	77-05-05	--	WATSTORE
GOLCONDA AREA WELL	405745	1172957	Well	27	7.7	811	40	6.8	130	22	430	0	50	20	--	80	480	1	61-08-07	--	Bliss, 1983
NOT SPECIFIED	405753	1173936	Well	23	8.0	1,020	100	30	42	3.5	170	0	85	180	0.3	10	530	-1	61-07-27	--	Cohen, 1962
NOT SPECIFIED	405803	1174251	Well	16	7.9	1,210	140	41	30	1.5	130	0	110	230	0.2	21	640	3	61-07-27	--	Cohen, 1962
NOT SPECIFIED	405814	1173002	Well	--	7.4	375	43	6.9	20	2.0	140	0	25	23	--	36	220	2	61-08-18	--	Cohen, 1962
NOT SPECIFIED	405820	1175808	Well	16	7.5	618	45	4.3	76	4.2	270	0	3	50	0.1	15	330	1	61-07-20	--	Cohen, 1962
NOT SPECIFIED	405832	1174408	Well	14	7.9	748	66	16	66	5.7	270	0	73	58	0.3	43	460	0	61-07-24	--	Cohen, 1962
NOT SPECIFIED	405855	1172426	Spring	16	7.1	1,090	100	24	110	10	530	0	150	13	1.1	15	680	-1	58-10-20	--	Cohen, 1962
NOT SPECIFIED	405857	1172838	Well	16	8.4	939	20	6.3	200	9.2	390	10	83	55	1.1	35	610	2	61-07-31	--	Cohen, 1962
NOT SPECIFIED	405937	1174550	Spring	34	7.7	1,540	180	58	74	2.0	210	0	390	190	0.3	25	1,000	0	61-07-20	--	Cohen, 1962

[1] Data are listed in order of increasing latitude and, for identical latitudes, increasing longitude.

[2] Computed sum (with bicarbonate multiplied by 0.492 to make results comparable with residue-on-evaporation values).

[3] Computed as described in introductory text. Negative value indicates that anions exceed cations.

[4] WATSTORE is U.S. Geological Survey's National Water Data Storage and Retrieval System. Citations for other sources are listed under "References Cited."