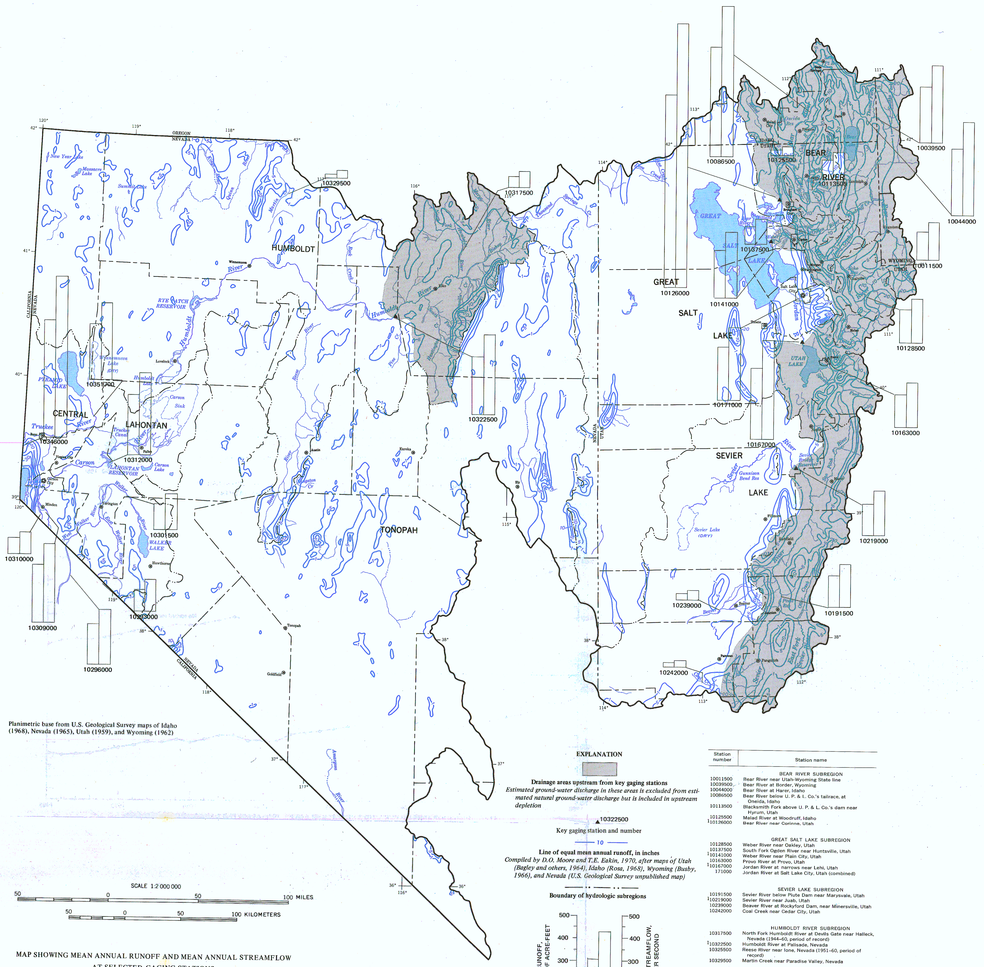
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH THE
STATES OF IDAHO, NEVADA, UTAH, AND WYOMING

UNIVERSITY OF UTAH
RESEARCH INSTITUTE
EARTH SCIENCE LAB.

HYDROLOGIC INVESTIGATIONS
ATLAS HA-487 (SHEET 2 OF 3)

SURFACE WATER



Planimetric base from U.S. Geological Survey maps of Idaho (1968), Nevada (1965), Utah (1959), and Wyoming (1962)

EXPLANATION

Drainage areas upstream from key gaging stations

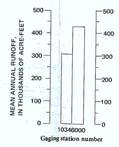
Estimated ground-water discharge in these areas is excluded from estimated natural ground-water discharge but is included in upstream depletion

10322500 — Key gaging station and number

10 — Line of equal mean annual runoff, in inches

Compiled by D.O. Moore and T.E. Eakin, 1970, after maps of Utah (Bagley and others, 1964), Idaho (Ross, 1968), Wyoming (Busby, 1966), and Nevada (U.S. Geological Survey unpublished map)

Boundary of hydrologic subregions

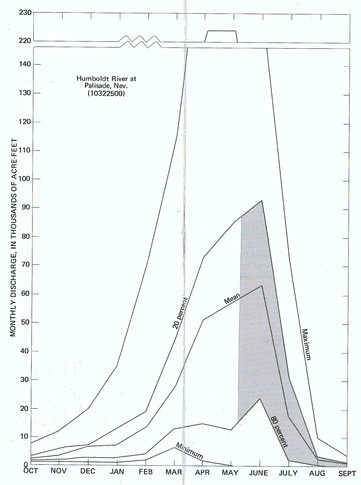


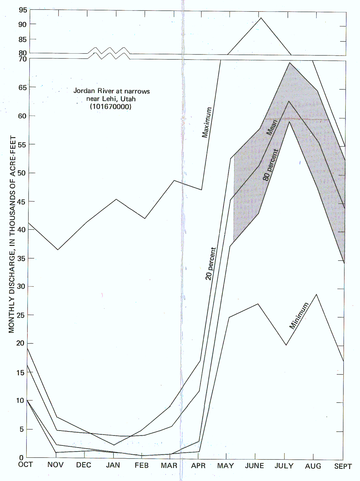
Station number	Station name
	BEAR RIVER SUBREGION
10011500	Bear River near Utah-Wyoming State line
10039500	Bear River at Harer, Wyoming
10044000	Bear River at Honeyville, Utah
10086500	Bear River below U. P. & L. Co.'s tailrace, at Oneida, Idaho
10119000	Blacksmith Fork above U. P. & L. Co.'s dam near Hyrum, Utah
10126000	Malad River at Woodruff, Idaho
†10126000	Bear River near Corinne, Utah
	GREAT SALT LAKE SUBREGION
10128500	Weber River near Oakley, Utah
10167500	South Fork Ogden River near Huntsville, Utah
†10141000	Provo River at Provo Power Plant, Utah
10163000	Provo River at Provo, Utah
†10167000	Jordan River at narrows near Lehi, Utah
171000	Jordan River at Salt Lake City, Utah (combined)
	SEVIER LAKE SUBREGION
10191500	Sevier River below Piute Dam near Marysvale, Utah
10219000	Sevier River at Hatch, Utah
10239000	Beaver River at Rockyford Dam, near Minersville, Utah
10242000	Coal Creek near Cedar City, Utah
	HUMBOLDT RIVER SUBREGION
10317500	North Fork Humboldt River at Devils Gate near Halleck, Nevada (1944–60, period of record)
†10329500	Humboldt River near Elko, Nevada
10329500	Reese River near Lone, Nevada (1951–60, period of record)
10329500	Martin Creek near Paradise Valley, Nevada
	CENTRAL LAHONTAN SUBREGION
10293000	East Walker near Bridgeport, California
10296000	West Walker below Little Walker near Coleville, California
10301500	Walker River near Wabuska, Nevada
10310000	West Fork Carson River near Woodfords, California
10312000	West Fork Carson River at Woolfords, California
10312020	Carson River near Fort Churchill, Nevada
10336000	Truckee River at Farad, California
10351700	Truckee River near Nixon, Nevada

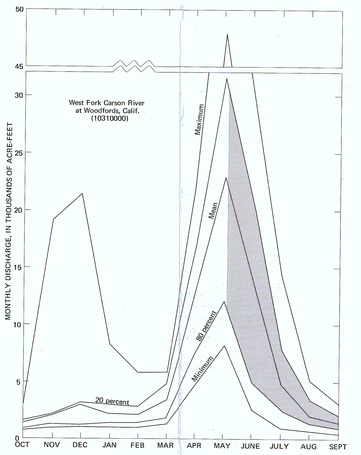
†Key gaging station (lowest point in area of upstream depletion)

SCALE 1:2 000 000
50 0 50 100 MILES
50 0 50 100 KILOMETERS

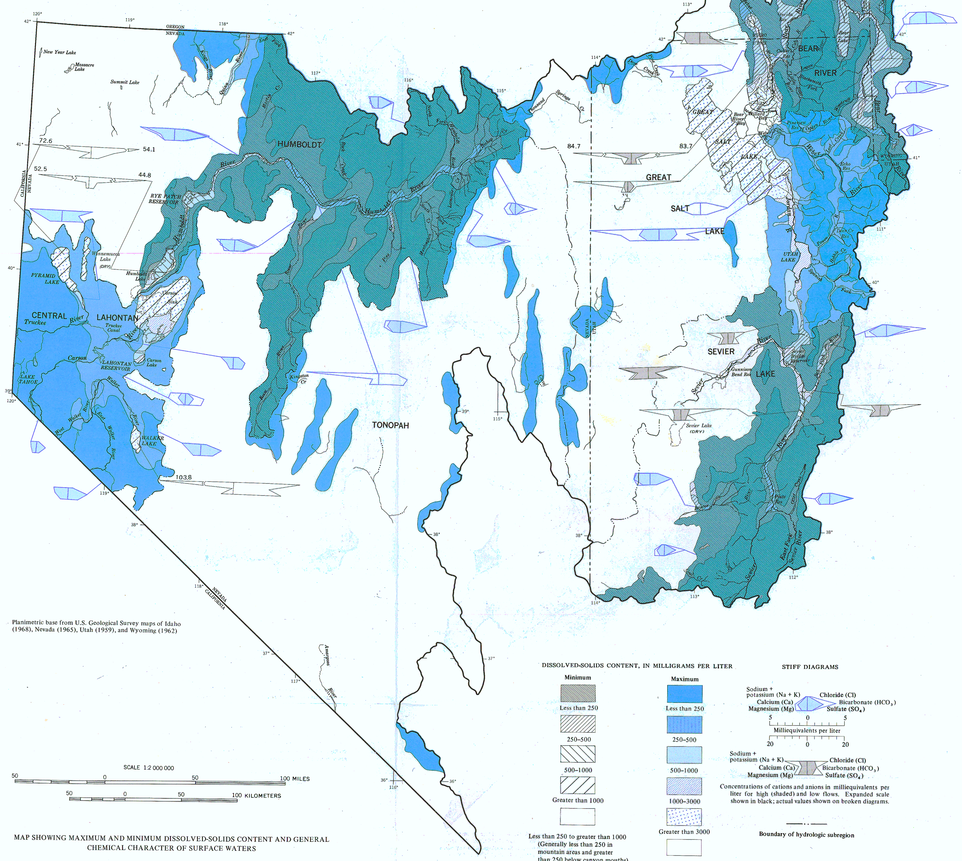
MAP SHOWING MEAN ANNUAL RUNOFF AND MEAN ANNUAL STREAMFLOW AT SELECTED GAGING STATIONS







MONTHLY FLOW FREQUENCY GRAPHS FOR THE 1931-60 REFERENCE PERIOD AT SELECTED GAGING STATIONS (MODIFIED FOR 1965 CONDITIONS)



Planimetric base from U.S. Geological Survey maps of Idaho (1968), Nevada (1965), Utah (1959), and Wyoming (1962)

SCALE 1:2 000 000
50 0 50 100 MILES
50 0 50 100 KILOMETERS

MAP SHOWING MAXIMUM AND MINIMUM DISSOLVED-SOLIDS CONTENT AND GENERAL CHEMICAL CHARACTER OF SURFACE WATERS

DISSOLVED-SOLIDS CONTENT, IN MILLIGRAMS PER LITER

Minimum	Maximum
Less than 250	Less than 250
250–500	250–500
500–1000	500–1000
Greater than 1000	1000–3000
	Greater than 3000

Less than 250 to greater than 1000 (Generally less than 250 in mountain areas and greater than 250 below canyon mouths)

Less than 250 to greater than 1000 (Generally less than 500 in mountain areas and greater than 500 below canyon mouths)

STIFF DIAGRAMS

Sodium + potassium ($Na + K$) — Chloride (Cl)
Calcium (Ca) — Bicarbonate (HCO_3)
Magnesium (Mg) — Sulfate (SO_4)
20 0 20
Milliequivalents per liter

Concentrations of cations and anions in milliequivalents per liter for high (shaded) and low flows. Expanded scale shown in black; actual values shown on broken diagrams.

Boundary of hydrologic subregion

DISSOLVED-SOLIDS CONTENT OF SURFACE WATER

There is a general downstream increase in the dissolved-solids content of the surface waters of the region. This increase results chiefly from ground-water inflow (including local highly saline springs), irrigation return flows, and inflow from municipal and industrial disposal systems. Evapotranspiration along drainage ways and evaporation from ponds, lakes, and reservoirs also increase the dissolved-solids content of the water. Because the terminal lakes have no outlets, their mineral content is concentrated as their volume is decreased by evaporation, and most of them are highly saline.

RUNOFF AND STREAMFLOW

Runoff and streamflow are unevenly distributed over the region. Runoff is defined as that part of precipitation that appears in streams; streamflow may be the same as runoff, but as a more general term, it includes flow affected by diversions and regulation. Mean annual runoff estimated from the runoff lines on the map is about 6.7 million acre-feet. Average annual runoff calculated from measured and estimated streamflow is about 6.2 million acre-feet; the difference between the two values (0.5 million acre-feet per year) probably represents unmeasured flash flow in small ephemeral streams. Most of the runoff that is available for development is in the eight principal river systems—the Bear, Weber, Jordan, Sevier, Humboldt, Truckee, Carson, and Walker—in the eastern and western parts of the region. Runoff in the central part of the region is in small, widely scattered perennial, intermittent, and ephemeral streams.

Estimated mean annual runoff by hydrologic subregion

[Based on a summation of streamflow of the gaging stations shown on the runoff map and other streams which are gaged or have otherwise identifiable flow estimates.]

Subregion	Estimated runoff (1,000 acre-feet)
Bear River	2,100
Great Salt Lake	1,900
Sevier Lake	910
Humboldt	850
Central Lahontan	100
Tonopah	290
Total (rounded)	6,200

REGULATED STORAGE

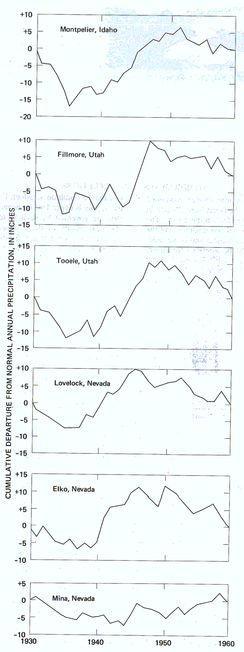
Regulated storage in upstream lakes and reservoirs provides a more uniform time distribution of the natural water supply. Fresh-water lakes and reservoirs in the region had about 4.3 million acre-feet of active storage capacity in 1965. The largest upstream lakes in the region include Lake Tahoe in the western part and Bear and Utah Lakes in the eastern part. Lake Tahoe has a total storage capacity of about 122 million acre-feet, of which about 745,000 acre-feet is active storage. Bear Lake has a total storage capacity of about 5.9 million acre-feet of which about 1.4 million acre-feet is considered active storage. Utah Lake has a total storage capacity of about 1.4 million acre-feet and usable storage of about 670,000 acre-feet. The largest capacity manmade reservoirs are Lahontan Reservoir and Sevier Bridge Reservoir which have capacities of about 273,600 and 236,000 acre-feet, respectively.

Estimated usable storage capacity in upstream lakes and reservoirs, 1965

[Areas in 1,000 acres; capacities in 1,000 acre-feet]

Subregion	Small lakes and reservoirs		Large lakes and reservoirs		Total	
	Surface area	Active capacity	Surface area	Active capacity	Surface area	Active capacity
Bear River	1	10	96	1,632	97	1,642
Great Salt Lake	2	20	107	1,133	109	1,153
Sevier Lake	2	15	16	522	18	537
Humboldt	2	12	24	281	26	293
Central Lahontan	3	10	[1]65	[2]656	68	666
Tonopah	1	2	1	2	2	4
Regional totals	11	69	309	4,226	320	4,295

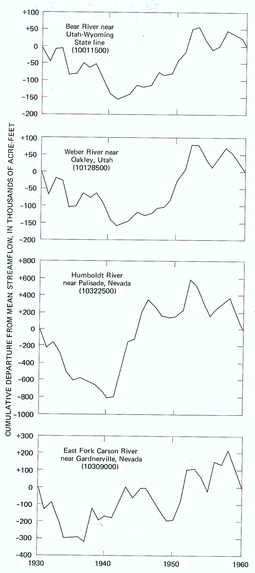
[1]Includes 41,000 acres of Lake Tahoe in Nevada which is about one-third the area of the lake.
[2]Includes 240,000 acre-feet of Lake Tahoe which is about one-third the active capacity of the lake.



GRAPHS SHOWING CUMULATIVE DEPARTURE FROM 1931-60 NORMAL ANNUAL PRECIPITATION AT SELECTED CLIMATOLOGICAL STATIONS

LONG-TERM RUNOFF

Long-term variations in natural runoff result from long-term variations in precipitation. Cumulative departure from mean annual streamflow at four stations where the flow is not greatly affected by upstream regulation reflect the drought of the 1930's.



GRAPHS SHOWING CUMULATIVE DEPARTURE FROM MEAN STREAMFLOW FOR THE 1931-60 REFERENCE PERIOD AT SELECTED STREAM GAGING STATIONS

SEASONAL RUNOFF

Runoff varies seasonally in response to precipitation and temperature distribution. Spring snowmelt provides most of the runoff to nearly all significant streams. The seasonal runoff usually begins in April or May in most of the region, but can begin as early as February in some parts in some years and as late as July in others. Normal spring runoff peaks are illustrated by the monthly flow-frequency graph of the Humboldt River at Palisade, Nev. The graph of the West Fork Carson River at Woodfords, Calif. shows a secondary early season peak. Late season high-flow periods reflect upstream regulation as illustrated by the graph for the Jordan River near Lehi, Utah.

Quality of surface water in the Great Basin region

[Compiled by K.M. Waddell, 1969]

Frequency of sampling or measurement: D, daily; I, intermittently (number in parentheses indicates number of times sampled during the indicated years); M, monthly during the indicated years.

Station	Suspended sediment (tons per day)			Milligrams per liter: Silica (SiO_2)			Iron (Fe)			Sulfate (SO_4)			Chloride (Cl)			Fluoride (F)			Nitrate (NO_3)			Boron (B)			Hardness as $CaCO_3$			Dissolved solids			Sodium-adsorption ratio			Temperature (°C)		Frequency of sampling or measurement		Period for which averages are computed (water years)
	Minimum	Maximum	Weighted average	Minimum	Maximum	Weighted average	Minimum	Maximum	Weighted average	Minimum	Maximum	Weighted average	Minimum	Maximum	Weighted average	Minimum	Maximum	Weighted average	Minimum	Maximum	Weighted average	Minimum	Maximum	Weighted average	Minimum	Maximum	Weighted average	Minimum	Maximum	Weighted average	Minimum	Maximum	Weighted average	Minimum	Average	Suspended sediment	Chemical quality	Temperature
BEAR RIVER SUBREGION																																					
10039500 Bear River at Border, Wyo.	.....	.....	.....	6.0	16	9.4	.....	.....	.....	29	85	55	14	53	25	0.2	1.0	0.3	0.0	3.4	0.5	0.00	0.19	0.09	198	295	232	268	472	343	0.4	1.4	0.7	0	22	8	.....	D	D	1966
10102250 Bear River near Smiths-ield, Utah	260	7,400	.....	.....	.....	.....	.....	.....	.....	28	149	.....	8.5	168	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	145	375	.....	224	687	.....	9	3.0	.....	.....	.....	.....	I (30) 1964–65	M	.....
10118000 Bear River near Collins-ton, Utah	4	2,850	.....	8.5	16	.....	.....	.....	.....	23	99	.....	31	410	.....	.....	.....	.....	.....	.....	.10	.86	.....	.....	160	388	.....	305	1,010	.....	.8	6.4	.....	.....	.....	.....	I (22) 1960–64	I (29) 1961–66	1964–66
10125600 Malad River near Tremonton, Utah	.....	.....	.....	.....	.....	.....	.....	.....	.....	98	294	.....	503	2,330	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	303	657	.....	1,240	4,570	.....	7.2	26	.....	.....	.....	.....	M 1964–65	M	.....
10126100 Bear River at Bear River Bird Refuge, near Brigham City, Utah.	.....	.....	.....	4.6	24	16	0.00	0.09	.....	37	261	64	100	1,950	286	.....	.....	.....	.2	6.1	2.9	.14	.49	.....	241	598	330	444	3,780	850	2.1	23	4.7	.....	.....	.....	.....	D	.....	1960–61
GREAT SALT LAKE SUBREGION																																						
South Arm Great Salt Lake	.....	.....	.....	.....	.....	.....	.....	.....	.....	19,000	31,000	23,000	122,000	180,000	145,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	230,000	350,000	290,000	.....	.....	.....	.....	.....	.....	.....	I	.....	1960–66
North Arm Great Salt Lake	.....	.....	.....	.....	.....	.....	.....	.....	.....	28,000	32,000	31,000	177,000	182,000	180,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	340,000	360,000	350,000	.....	.....	.....	.....	.....	.....	.....	I	.....	1960–66
10128500 Weber River near Oakley, Utah.	.....	.....	.....	3.6	6.0	4.2	.00	.01	.....	6.6	19	10	1.0	4.0	2.3	.....	.....	.....	.1	.5	.3	.01	.06	.03	80	178	111	98	220	124	.1	.2	.1	.....	.....	.....	.....	D, M	.....	1960–61
10141000 Weber River near Plain City, Utah	.....	.....	.....	4.9	15	10	.....	.....	.....	24	86	35	22	113	60	.3	.7	.....	1.0	18	5.1	.03	.19	.06	134	302	236	200	558	379	.6	3.1	1.2	.....	.....	.....	.....	D	.....	[1]1960–61
10167000 Jordan River at narrows, near Lehi, Utah.	.....	.....	.....	1.2	35	18	.....	.....	.....	223	549	362	161	376	257	.....	.....	.....	.0	3.8	1.7	.....	.....	.....	360	780	523	825	1,650	1,140	3.1	4.9	3.9	.....	.....	.....	.....	M	.....	1964–66
10167300 Jordan River at 5300 South, near Murray, Utah.	.....	.....	.....	12	30	21	.....	.....	.....	379	509	468	280	548	346	.....	.....	.....	.1	11	5.3	.....	.....	.....	356	800	726	1,060	1,360	1,470	3.3	5.3	3.8	.....	.....	.....	.....	M	.....	1966
10167500 Little Cottonwood Creek near Salt Lake City, Utah.	.....	.....	.....	3.0	11	5.6	.....	.....	.....	13	52	25	2.5	17	6.0	.....	.....	.....	.1	5.1	.4	.....	.....	.....	50	135	92	62	193	98	.1	.6	.2	.....	.....	.....	.....	M	.....	1964–66
10172580 Jordan River at Cudahy Lane, near Salt Lake City, Utah.	.....	.....	.....	.2	22	16	.....	.....	.....	99	491	310	71	425	239	.....	.....	.....	1.1	21	11	.....	.....	.....	242	672	515	403	1,430	1,040	1.4	5.0	3.0	.....	.....	.....	.....	M	.....	1964–66
SEVIER LAKE SUBREGION																																						
10174500 Sevier River at Hatch, Utah.	6.9	363	.....	5.7	13	.....	.....	.....	.....	6.2	8.4	.....	1.6	4.0	.....	.....	.....	.....	.2	.4	.....	.....	.....	.....	102	182	.....	116	190	.....	.2	.3	.....	.....	.....	.....	I (4) 1964	I (4) 1964	.....
10206080 Sevier River at Redmond, Utah.	4.6	704	.....	16	28	.....	.....	.....	.....	83	387	.....	69	535	.....	.3	.4	.....	1.2	22	.....	.17	.58	.....	49	284	.....	448	1,800	.....	2.1	7.6	.....	.....	.....	.....	I (4) 1964	I (4) 1964	.....
10208650 San Pitch River at Fairview, Utah.	.1	23	.....	6.2	13	.....	.....	.....	.....	14	35	.....	3.6	15	.....	.....	.....	.....	1.1	3.1	.....	.....	.....	.....	230	370	.....	281	406	.....	.2	.7	.....	.....	.....	.....	I (4) 1964	I (4) 1964	.....
10216350 San Pitch River near Sterling, Utah.	.....	.....	.....	11	18	.....	.....	.....	.....	238	390	.....	202	1,020	.....	.0	.5	.....	.5	1.7	.....	.21	.61	.....	542	780	.....	1,070	2,450	.....	2.9	12	.....	.....	.....	.....	I (4) 1964	I (4) 1964	.....
10224000 Sevier River near Lyndyl, Utah.	.....	.....	.....	9.4	24	.....	.....	.....	.....	39	1,660	357	23	1,770	383	.....	.....	.....	.0	6.5	3.4	.02	.54	.37	188	1,970	528	275	5,980	1,380	.8	13	5.5	0	28	14	.....	D	D	.....
10237000 Beaver River at Adamsville, Utah.	.2	314	.....	16	38	.....	.....	.....	.....	18	78	.....	15	50	.....	.3	1.6	.....	.2	3.1	.....	.04	.20	.....	74	280	.....	160	526	.....	.7	1.7	.....	.....	.....	.....	I (4) 1964	I (4) 1964	.....
CENTRAL LAHONTAN SUBREGION																																						
10293000 East Walker River near Bridgeport, Calif.	.....	.....	.....	5.0	27	.....	.....	.....	.....	8.2	25	.....	.2	21	.....	.1	.4	.....	.4	4.5	.....	.0	.5	.....	51	99	.....	98	179	.....	.5	2.5	.....	.....	.....	.....	M 1960–63	.....	.....
10296000 West Walker River below Little Walker River, near Coleville, Calif.	.....	.....	.....	4.9	17	.....	.....	.....	.....	.0	11	.....	.0	9.4	.....	.0	.1	.....	.0	1.4	.....	.0	.4	.....	13	64	.....	21	118	.....	.1	2.0	.....	.....	.....	.....	I (16) 1964–66 M 1960–63 I (16) 1964–65	.....	.....
10305500 East Fork Carson River near Markleeville, Calif.	.....	.....	.....	14	23	.....	.....	.....	.....	1.0	10	.....	.2	7.5	.....	.0	.2	.....	.0	1.2	.....	.0	.4	.....	19	94	.....	44	111	.....	.2	.9	.....	.....	.....	.....	M 1965–63	.....	.....
10310000 West Fork Carson River at Woodfords, Calif.	.....	.....	.....	13	23	.....	.....	.....	.....	.0	3.0	.....	.0	6.0	.....	.0	.2	.....	.1	1.9	.....	.0	.3	.....	16	39	.....	35	74	.....	.1	.5	.....	.....	.....	.....	I (6) 1965 M 1960–63	.....	.....
10312020 Carson River near Silver Springs, Nev.	.....	.....	.....	9.1	37	21	.00	.14	.06	11	157	33	1.7	16	5.2	.1	.7	.3	.0	2.7	1.5	.0	.5	.2	38	224	74	83	468	160	.5	1.9	.8	0	21	10	.....	I (16) 1964–66	D	D	1963–66
10337000 Lake Tahoe at Tahoe, Calif.	.....	.....	.....	11	16	.....	.....	.....	.....	.0	3.0	.....	.4	4.5	.....	.0	.2	.....	.0	1.8	.....	.0	.2	.....	32	52	.....	51	67	.....	.4	1.1	.....	.....	.....	.....	M 1960–63	.....	.....
10338000 Truckee River near Truckee, Calif.	.....	.....	.....	13	19	.....	.....	.....	.....	1.2	6.0	.....	.7	6.6	.....	.0	.2	.....	.0	1.0	.....	.0	.3	.....	19	60	.....	41	75	.....	.1	.6	.....	.....	.....	.....	I (16) 1964–66 M 1960–63 I (16) 1964–66	.....	.....
HUMBOLDT SUBREGION																																						
10322500 Humboldt River at Palisade, Nev.	.....	.....	.....	30	44	34	.00	.07	.02	15	52	29	6.0	26	12	.4	.8	.5	.4	2.7	1.6	.0	.5	.2	130	221	150	230	416	286	1.0	1.8	1.2	0	27	12	.....	I (4) 1962 D	D	[2]1963–65
10335000 Humboldt River near Rye Patch, Nev.	.....	.....	.....	30	47	37	.00	.05	.01	61	160	110	46	575	232	.4	1.1	.9	.2	2.7	.9	.3	1.5	.9	152	414	203	414	1,510	667	2.8	9.3	4.4	0	22	11	.....	D	D	[2]1960–61 1963–66

[1]Weighted averages for nitrate and boron computed for 1960 water year.
[2]Weighted averages for silica, iron, and fluoride computed for 1963 water year.
[3]Weighted averages for silica, sulfate, chloride, nitrate, and boron computed for 1960–61 and 1963 water years; weighted averages for iron and fluoride computed for 1963 water year.

WATER IN THE GREAT BASIN REGION; IDAHO, NEVADA, UTAH, AND WYOMING

By
Don Price, T. E. Eakin, and others
1974

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1974