RECONNAISSANCE OF GROUND-WATER RESOURCES IN THE MOUNTAIN HOME PLATEAU AREA, SOUTHWEST IDAHO

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations 77-108
Open-File Report

Prepared in cooperation with the
Idaho Department of Water Resources

U.S. DEPARTMENT OF THE INTERIOR
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UNITED STATES DEPARTMENT OF THE INTERIOR

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GEOLOGICAL SURVEY

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CONVERSION FACTORS

The following conversion table is included for the convenience of those who prefer to use International System (SI) Units rather than English units. Chemical data for concentrations are given in milligrams per liter (mg/L), which are (within the range of values presented) numerically equal to parts per million.

Multiply English Units	By	To Obtain SI Units
	Length	
inches (in)	25.40	millimeters (mm)
feet (ft)	0.3048	meters (m)
miles (mi)	1.609	kilometers (km)
	Area	
acres	4047	square meters (m^2)
square miles (mi^2)	2.590	square kilometers (km^2)
	Volume	
acre-feet (acre-ft)	1233	cubic meters (m^3)
gallons (gal)	3.785	liters (L)
	Flow	
gallons per minute (gal/min)	0.06309	liters per second (L/s)

The following table shows the relation between °C (degrees Celsius) and °F (degrees Fahrenheit).

°C	°F	°C	°F	°C	°F
-2	28.4	9	48.2	20	68.0
-1	30.2	10	50.0	21	69.8
0	32.0	11	51.8	22	71.6
+1	33.8	12	53.6	23	73.4
2	35.6	13	55.4	24	75.2
3	37.4	14	57.2	25	77.0
4	39.2	15	59.0	26	78.8
5	41.0	16	60.8	27	80.6
6	42.8	17	62.6	28	82.4
7	44.6	18	64.4	29	84.2
8	46.4	19	66.2	30	86.0

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By H. W. Young

ABSTRACT

The Mountain Home plateau area occupies approximately 1,220 square miles of the western Snake River Plain in southwestern Idaho. About 40,000 acres are presently (1977) irrigated with ground water, about 30,000 acres with surface water. An estimated 450,000 acres are potentially irrigable, if water is available. Development of ground-water resources has caused water-level declines in several places. Largest declines are south of Mountain Home, where water levels dropped more than 20 feet in the last 9 years.

Ground water in the area occurs primarily under water-table conditions. Perched-water zones are present in several locations. The most productive aquifer in the eastern part of the plateau is basalt of the Bruneau Formation of the Idaho Group. In the western part, the most productive aquifers are sand and gravel of the older terrace gravel lithologic unit and the Idaho Group.

Recharge to the ground-water system is water from the Boise River drainage basin, precipitation on the plateau and adjacent mountains, and leakage from irrigation structures. Ground-water movement is generally south or southwest. Natural ground-water discharge from the plateau is about 18,000 acre-feet annually.

The chemical composition of the ground water generally reflects water characteristics in the area of the source of recharge and, for the most part, is good. Deuterium and oxygen-18 isotope analyses suggest that the water at the lower end of the ground-water flow system underlying the plateau was recharged a long time ago, although climatic conditions then were similar to current conditions in the Boise River basin.

Additional large-scale ground-water development will probably result in economically prohibitive pumping lifts, which also would consume excessive amounts of energy. Therefore, large-scale new agricultural development would depend heavily on the availability of surface water. However, one or several deep test holes, in selected places, could help answer some questions about the occurrence of

ground water and perhaps encourage further exploration for untapped deep artesian aquifers.

The occurrence of perched-water zones beneath lands irrigated by surface water suggests that more zones of this type could develop if water is imported into the area to irrigate additional lands, and if the efficiency of the present distribution systems remains unchanged.

INTRODUCTION

The Mountain Home plateau area occupies approximately 1,220 mi^2 in southwestern Idaho (fig. 1). The plateau has long been recognized as a potential area for increased agricultural development. However, plans for increased development are limited by the availability of water.

Potential sources of additional water for irrigation are importation of water from the Boise River drainage basin, diversion of Snake River water, and increased pumping from aquifers underlying the plateau.

The major objectives of this study are to (1) describe, on a reconnaissance level, the geologic conditions and hydrologic systems underlying the Mountain Home plateau; (2) indicate any potential for additional ground-water development; (3) make preliminary estimates of the probable effects that irrigation-return flows may have on the ground-water system; and (4) indicate needs for further study to fully assess the ground-water resources.

To meet these objectives, this report includes (1) descriptions of aquifer systems, (2) documentation of changes in ground-water storage caused by water-supply development, (3) mapping of the water-table and perched-water zones and determination of direction of ground-water flow, and (4) definition of ground-water recharge and discharge areas.

Work accomplished during this 1-year investigation included an inventory of 260 wells and 14 springs; monthly water-level measurements at 27 wells; collection of water samples for chemical analyses from 37 wells and 10 springs; collection of water samples for isotopic analyses from 15 wells and 10 springs; and collection of borehole geophysical logs from 5 wells. In addition, many geologic and hydrologic data from previous studies were used in this report.

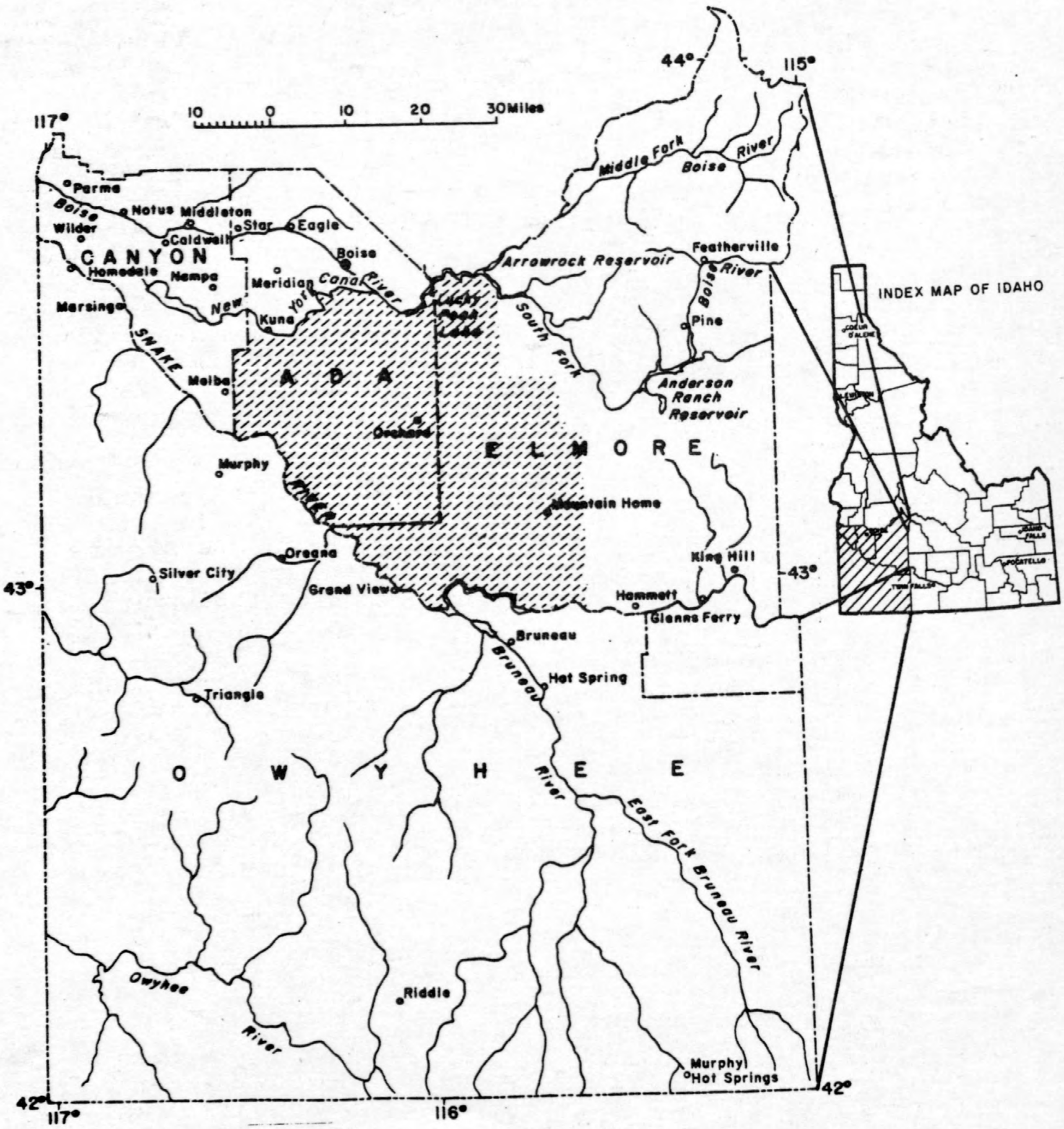

Figure 1. Area covered by this report

Location and General Features

The Mountain Home plateau area is on the western Snake River Plain in southwestern Elmore and southern Ada Counties, Idaho (fig. 1). The broad, flat surface of the plateau is interrupted at a few places by cinder cones and shield volcanoes. It extends northeastward from the Snake River to the mountains that form its northern boundary. The plateau generally is above 3,000 ft in altitude, except in the extreme western part. The mountains that form the northern boundary rise to a maximum altitude of 6,694 ft at Danskin Peak.

The climate of the area ranges from arid on the plateau to semiarid on the higher mountain ranges. Mean annual precipitation ranges from about 7 in on the plateau to slightly more than 20 in at the higher altitudes. Generally, the climate of the plateau is characterized by hot, dry summers and cold winters.

No perennial streams cross the plateau. Only intermittent streams drain the bordering mountains. In the central and southeastern part of the plateau, the streams flow southward to the Snake River. Northwest of a divide in the vicinity of Orchard, the streams flow northwestward to the Boise River.

Present agricultural development on the plateau generally is centered along the western and northwestern margin and in the area adjacent to and south of Mountain Home. About 70,000 acres of land are irrigated. Surface water from the Snake River and Boise River basin and streams draining to the plateau supplies about 30,000 acres; the remaining 40,000 acres are irrigated with ground water. An estimated 450,000 acres are potentially irrigable if water is available.

Previous Studies

Several hydrologic studies have been made of parts of the Mountaim Home plateau area. Nace, West, and Mower (1957) included part of the area in a study of the feasibility of exchanging ground-water from Boise River valley for Boise River water, which could then be used on the plateau. However, because of limited data, little reference was made to the plateau. The study addressed primarily the adequacy of the water supply in the Boise River basin to irrigate both Boise River valley and the plateau. More recent studies of the ground-water resources of the area were made by Ralston and Chapman (1968, 1970). These two studies described general hydrologic and geologic conditions as ascertained from available data. Dion (1972) studied the Boise River valley, including the northwestern part of the plateau, but dealt mainly with a shallow ground-water system adjacent to Boise River.

Acknowledgments

The author expresses gratitude to Mr. John Black of the Simplot Livestock Company, Grand View, Idaho, for his help in supplying spring-discharge records, and to the many residents of the Mountain Home plateau for supplying pertinent information on their wells and for allowing access to their property.

Well- and Spring-Numbering System

The numbering system used by the Geological Survey in Idaho indicates the location of wells or springs within the official rectangular subdivision of the public lands, with reference to the Boise base line and meridian. The first two segments of the number designate the township and range. The third segment gives the section number, followed by three letters and a numeral, which indicate the quarter section, the 40-acre tract, the 10-acre tract, and the serial number of the well within the tract, respectively. Quarter sections are lettered A, B, C, and D in counter-clockwise order from the northeast quarter of each section (fig. 2). Within the quarter sections, 40-acre and 10-acre tracts are lettered in the same manner. Well 1S-1E-6CCD1 is in the SE¼SW¼SW¼ sec. 6, T. 1 S., R. 1 E., and is the first well inventoried in that tract. Springs are designated by the letter "S" following the last numeral; for example, 4S-3E-35CAD1S.

GEOLOGY

The rocks exposed within the Mountain Home plateau area range in age from Cretaceous to Holocene. The areal extent of the rock units is shown in figure 3; their descriptions and water-bearing characteristics are given in table 1.

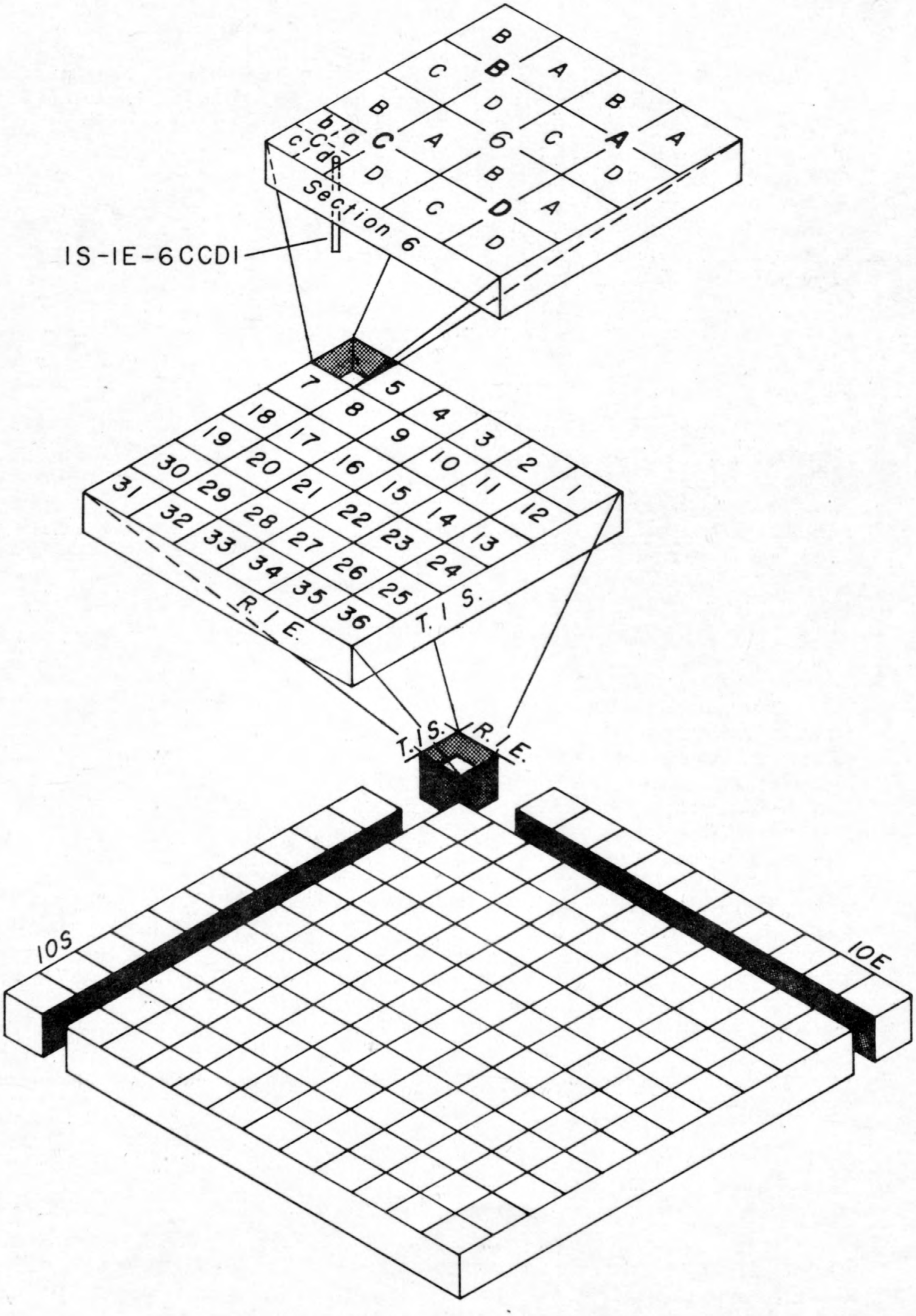

Figure 2. Well- and spring-numbering system

Table 1. Description and water-bearing characteristics of geologic units in the Mountain Home plateau area

Period	Epoch	Geologic unit	Description	Water-bearing characteristics
Quaternary	Holocene	Alluvium	Unconsolidated clay, silt, sand, and gravel occurring beneath flood plains of Boise and Snake Rivers. Crops out in narrow belts along major tributaries and in a broad belt near Mountain Home. Thickness probably does not exceed 70 ft.	Hydraulic conductivity generally high; however, because of thinness and irregularity of beds, yields to wells are generally small to moderate. Most important along Boise River flood plain where well yields of 2,500 gal/min are reported.
	Holocene and Pleistocene	Younger terrace gravel	Unconsolidated clay, silt, sand, and fine to very coarse gravel. Mapped only along Holocene alluvium near Boise River and western part of study area. Thickness probably does not exceed 100 ft.	Hydraulic conductivity generally high; however, unit is almost entirely above water table in study area.
	Holocene and Pleistocene	Basalt of Snake River Group	Vesicular olivine basalt, light to dark gray, irregular to columnar jointing. Crops out on much of Mountain Home plateau and in Boise Valley. Intercalated in places with older terrace gravels. Thickness of flows probably does not exceed 550 ft.	Hydraulic conductivity variable. Where saturated, reported well yields range from 20 to 3,100 gal/min; however, the basalt is above water table in most of study area.
	Pleistocene	Older terrace gravel	Unconsolidated clay, sand, and fine to coarse gravel. Occurs only in western part of study area where thickness does not exceed 150 ft.	Hydraulic conductivity generally high. Reported well yields range from 20 to 2,700 gal/min.
Quaternary and Tertiary	Pleistocene and Pliocene	Idaho Group, undifferentiated	Poorly to well-stratified fluvial and lake deposits of unconsolidated to consolidated silt, sand, and gravel, with layers of ash and intercalated basaltic lava flows. Thickness unknown.	Hydraulic conductivity generally high. Reported well yields range from 15 to 3,000 gal/min.
Quaternary	Pleistocene	Bruneau Formation of Idaho Group	Includes fan deposits consisting largely of coarse sands derived from decayed granitic rocks. Thickness of fan deposits does not exceed 300 ft. Also includes vesicular olivine basalt, dark gray to black, weathers to reddish-gray-brown. Thickness of basaltic flows is about 800 ft in study area. Unit also includes detrital material, dominated by massive lake beds of white-weathering fine silt, clay, diatomite, and minor amounts of sand.	Fan deposits are generally above water table. Basalt composes principal aquifer in Mountain Home area. Reported well yields from basalt range from 10 to 3,500 gal/min. Detrital material generally has low hydraulic conductivity.
Quaternary and Tertiary	Pleistocene and Pliocene	Glenns Ferry Formation of Idaho Group	Poorly consolidated detrital material and minor flows of olivine basalt. Includes lake and stream deposits consisting of massive silt layers, cemented sand beds, thin beds of dark clay, olive silt, and granitic sand and fine pebble gravel. Maximum thickness is about 2,000 ft.	Hydraulic conductivity generally low. Reported well yields range from 3 to 350 gal/min.
Tertiary	Miocene	Idavada Volcanics	Silicic latite; chiefly thick layers of devitrified welded tuff, but includes some vitric tuff and lava flows. Maximum thickness is about 2,000 ft.	Hydraulic conductivity variable.
Cretaceous		Idaho batholith	Quartz monzonite and granodiorite, light to medium gray.	Hydraulic conductivity low. Yields to wells small.

In figure 3, basalt of the Snake River Group is hatchured where mapped by Malde and others (1963). Some of the remainder of the basalt (not hatchured) shown as Snake River Group may correlate with flows that were assigned to the Bruneau Formation of the Idaho Group, as mapped by Malde and others (1963). In addition, fan gravel, assigned to the Bruneau Formation by Malde and others (1963), may be equivalent to some of the younger terrace gravel in the western part of the plateau, as mapped by Ross and Forrester (1947) and Savage (1958).

To gain more information about subsurface conditions, geophysical logs were made of five wells that provided areal coverage and data on representative geologic units. These logs are shown in figure 4, along with the lithologic logs obtained from the drillers.

Geologic data derived from geophysical and drillers' logs show that the plateau is underlain by basalt flows or sedimentary rocks to at least 1,128 ft. Indirect data, such as gravity measurements (Hill, 1963), suggest that the basement complex, thought to be granitic rocks of the Idaho batholith, is overlain by at least 10,000 ft of material. This suggests that deeply buried, thick, untapped aquifers may underlie the plateau.

The hydrogeologic sections shown in figure 5 illustrate the stratigraphic relation of geologic units to known occurrence of ground water within the study area. The sections were drawn using drillers' logs and data from wells having geophysical logs (fig. 4). The sections indicate geologic and hydrologic conditions that may be encountered in wells drilled near the section traverses.

GROUND WATER

Occurrence

Ground water occurs in virtually every geologic unit within the study area, as described in table 1. The aquifers primarily consist of basalt, sand and gravel, and crystalline rocks. Water is contained in voids, fractures, joints, and interflow zones in basalt; in intergranular spaces in sand and gravel; and in fractures and weathered zones in crystalline rocks.

In the eastern part of the area, the more productive aquifers are basalt flows of the Bruneau Formation of the Idaho Group and in the western part, sand and gravel of the older terrace gravel and the Idaho Group. The Snake River Group also is a source of water in the western part; however, it is above the water table in most places.

Water in the aquifers is mostly under water-table conditions. Localized perched-water zones occur in several places (figs. 5 and 6); the most extensive one is near Mountain Home. Water can also be under artesian conditions where clay, silt, or cemented sand beds constitute confining layers. Water-level data are insufficient, however, to discern or map any extensive potentiometric (pressure) surfaces.

Source and Recharge

The main sources of recharge to the area are water from the Boise River drainage basin, infiltration of local runoff, and precipitation on the Idavada Volcanics.

The ground-water system underlying the western part of the area is recharged with water from the Boise River. This recharge results from leakage from the many irrigation canals, laterals, and ditches that cross the area and from downward percolation of applied irrigation water. Leakage directly from the channel of the Boise River between Lucky Peak and Barber Dams also recharges the ground-water system (Ralston and Chapman, 1970). Some recharge may also result from leakage directly from Lucky Peak Reservoir.

Recharge to the ground-water system adjacent to the mountains that are composed of granitic rocks of the Idaho batholith (fig. 3) is derived from precipitation within the drainage basin. This recharge results from infiltration of water from the many intermittent streams draining the area.

The ground-water systems underlying the eastern part of the area are recharged with water derived from precipitation both within and outside the drainage basin. This recharge occurs in several ways. Recharge directly to the regional water table results from precipitation on the Idavada Volcanics (fig. 3) and downward percolation from perched-water zones. Recharge to the perched-water zones results from leakage from Canyon and Rattlesnake Creeks, Mountain Home Reservoir, and canals and laterals. Imported irrigation water from Little Camas Reservoir, about 20 mi northeast of Mountain Home, to Mountain Home Reservoir increases the amount of water available to recharge the aquifers.

Because of the generally low amounts of precipitation and the high potential for evaporation and plant transpiration, direct precipitation on the lowlands of the plateau contributes little recharge.

Movement

The general direction of regional ground-water movement can be inferred from the water-table map (fig. 6). Movement is down the hydraulic gradient and roughly perpendicular to the water-table contours, from areas of recharge to areas of discharge. The position of the water table in fall 1976 is shown in figure 6. Depth-to-water measurements in wells are shown in table 2.

Ground-water movement is generally to the south and southwest. Irregularities in the general pattern may be caused by localized recharge, such as that which occurs from the New York Canal east of Kuna (fig. 6).

Contours on the perched-water zones near Mountain Home are also shown in figure 6 (see insert). Water in these zones generally moves to the south, where some percolates downward to the regional water table and some discharges at Rattlesnake Springs (see fig. 5, hydrogeologic sections C-C' and D-D').

Discharge

Water is discharged from the aquifers by springs, underflow, and pumping. Principal discharge is by pumping for irrigation.

Discharge through springs is estimated to be about 3,000 acre-ft/yr. The springs are in the Snake River Canyon and issue generally from the contact between basalt and underlying fine-grained sediments of the Bruneau Formation. Main areas of spring discharge are in T. 4 S., R. 3 E., sec. 35, and T. 5 S., R. 4 E., secs. 11, 12, and 14 (see fig. 9 for spring locations). Surface-water gaging-station records indicate no detectable amount of ground-water discharge directly to the Snake River (C. A. Thomas, oral commun., 1977).

Table 2. Records of wells in the Mountain Home plateau area

Altitude: From topographic map

Well finish: F - gravel packed and perforated;
G - gravel packed and screened;
O - open end;
P - perforated;
S - screened;
X - open hole

Water level: P - pumping;
R - recently pumped;
S - nearby well pumping

Aquifer: Qal - alluvium;
Qytg - younger terrace gravel;
Qsb - basalt of Snake River Group;
Qotg - older terrace gravel;
QTi - Idaho Group;
Qb - Bruneau Formation of Idaho Group;
QTg - Glenns Ferry Formation of Idaho Group;
Tiv - Idavada Volcanics;
Ki - Idaho batholith

Use of water: C - commercial;
D - dewater;
H - domestic;
I - irrigation;
N - industrial;
P - public supply;
S - stock;
U - unused

Remarks: A - anode; hole drilled for gasline ground;
C - currently being drilled (1976);
GL - geophysical log available;
log - driller's log available;
QW - chemical analysis of water available (table 3);
WLR - water level reported by driller

Well number	Altitude of land surface (feet above mean sea level)	Reported depth of well (feet below land surface)	Casing: Diameter (in)	Casing: Feet below land surface to first perforation	Well finish	Water level: Feet below land surface	Water level: Date measured	Major aquifer	Depth to major aquifer (feet below land surface)	Minor aquifer	Depth to minor aquifer (feet below land surface)	Reported discharge (gal/min)	Reported specific capacity (gal/min)/ft of drawdown	Use of water	Remarks
3N-1E-36ADA1	2,820	330	4	276	P	119.52 S	09-23-76	Qotg	106					H	Log
3N-2E-21BCC1	2,751	58	14		P	9.63	09-21-76	Qytg				550		D	
25BBB1	2,746	65	18	42	P	9.40	09-21-76	Qal				1,650	52	D	Log
27ABD1	2,776	79	4	79	O	47.50 R	09-21-76	Qytg	43					H	Log
28BDB1	2,830	280	6	275	S	126.61 R	09-21-76	Qotg	125			20	1	N	Log
29CAB1	2,805					116.36	09-20-76	Qotg						H	
30CBC1	2,768	157	6	157	O	62.40	09-20-76	Qotg	157					H	Log
3N-3E-29CDC1	2,825	147	8			72.32 S	09-23-76	Qytg						U	
31ABD1	2,856		10			177.86	09-20-76							I	
2N-1W-11ADA1	2,685	130	16	64	P	65.72	09-23-76	Qotg	98					I	Log; QW
33CAA1	2,725		4			116.80	09-30-76							H	
34CCD1	2,810	350	12	349.5	O	217.36	09-29-76	Qotg	236					H	Log; QW
34DAD1	2,790	353	14	258	F	175.39	10-04-76	Qotg				1,500	38	I	Log
35BDC1	2,790	218	12	155	P	174.62	04-28-76	Qotg	189			1,120	93	I	Log
2N-1E-01BDD1	2,754	115	6	115	O	53.87	09-27-76	Qotg	103					H	Log
12CAB1	2,833	290	8	290	O	231.40	09-28-76	QTi	252					H	Log
15ABA1	2,766	243	6	240	X	128.35	09-27-76	QTi	143					H	Log
16DDC1	2,885	320	12	230	G	151.07	09-27-76	QTi	151					I	Log
21DCB1	2,780					149.13	09-27-76							I	
22DCA1	2,836	444	16	420	P	211.70	10-05-76	QTi				3,000	100	I	Log
23BAD1	2,910	386	12	332	P	277.68	04-27-76	Qotg	223			2,000	200	I	Log
26DAA1	2,871	315	16	268	P	252.83	10-05-76	Qotg	250	QTi	267			I	Log
28ADD1	2,800	402	16	167	P	128.32	09-27-76	Qsb	142	QTi	168			I	Log
28BBC1	2,770	202	4			134.60	10-06-76	Qotg	156					H	Log
29DCA1	2,742	130	8	19	X	46.15 R	09-28-76	Qsb	130			20	2	H	Log; QW
31DDC1	2,748	248	6	225	X	129.96	09-28-76	Qotg	145			20	1.3	H	Log
32BCC1	2,738	112	8	23	X	30.64 R	09-28-76	Qsb				20	2	H	Log
33CAC1	2,758	224	8	16	X	141.80 R	10-06-76	QTi	220			15		H	Log
34CCB1	2,782	335	12	10	X	171.20	04-26-76	QTi	315					I	Log
35BBC1	2,825	340	16	230	P	213.39	10-01-76	Qotg	215			2,700	180	I	Log
36BBB1	2,867	305	6	300	O	256.02	09-23-76	QTi						U	

2N-2E-01DAD1	3,042	381	8	360	P	354.60 R	09-21-76	Qotg	352					H	Log
03AAA1	2,910	530	12	470	P	232.30	09-23-76	QTi	255			1,200	21	I	Log
04CBA1	2,884	400	16	300	P	198.89	09-21-76	QTi	225	Qotg	190	600	9.2	I	Log
05CCA1	2,840	333	12	210	P	162.51	04-23-76	QTi	235	Qotg				U	Log
06CCC2	2,770	195	6	185	X	87.40 R	09-21-76	Qotg	98					H	Log
08AAD1	2,873	640	12	362	P	198.88	09-21-76	QTi				100	0.6	I	Log
10BCB1	2,928	243	14			Dry	09-21-76								
17AAD1	3,150	880	16	537	P	492.02	09-21-76	QTi	490					I	Log
18DDC1	3,073	912	16	542	P	438.69	09-08-70	QTi	445			2,260	78	I	Log
19AAD1	3,082	870	16	618	P	460	06-15-68	QTi	465			1,980	28	I	Log; WLR
20BCA1	3,075	896	16	585	P	453.04	09-21-76	QTi	480					I	Log
21BAB1	3,140	800	16	523	P	481.31	09-07-70	QTi	495					I	Log
27DCD1	3,117	775	16	570	P	490.01	09-22-76	QTi				1,705	20	I	Log
29AAD1	2,980					350.45	09-22-76							I	
30DDA1	2,970					346.55	09-22-76							I	
31DCD1	2,932	440	14	368	P	321.04	10-07-76	QTi				2,000	100	I	Log
32DBA1	2,985	564	16	492	P	378.78	09-22-76	QTi	390			3,000	75	I	Log
34CCD1	3,045	504	8	484	P	442.65	09-22-76	QTi	420			22		H	Log; QW
2N-3E-06BCC1	3,000	520	8	420	P	329.49	05-10-76	Qsb	300					H	Log; QW
09ACC1	3,138	490				414.22	09-20-76							H	
10BCB1	3,182	471	8	431	P	397.28	09-20-76	QTi	382					H	Log; QW
11ACC1	2,838	100	8	39.5	X	13.10	10-01-76	Qsb	24			70	0.97	U	Log
12CCB1	3,180	275	8	26	X	32.71	05-04-76	Qsb	37			12		H	Log
18ACB1	3,095	470	6	470	O	401.70	09-20-76							H	
28CAC1	3,355	975	8	866	F	674.60	09-20-76	QTi						P	Log; QW
35BBC1	3,421	1,128	12	720	P	686.56	09-23-76	QTi	715					U	Log; CL
2N-4E-19CDC1	3,940	995	8	940	P	451.78	05-05-76	QTi	570			10		H	Log; QW
29ADB1	3,680	227	8	20	P	10.26	09-27-76	Ki	8			8	0.06	H	Log
34BCB1	3,700	260	6	135	P	87.34	06-30-76	Ki	168			80		I	Log
1N-1W-01ADD1	2,794	423	16	275	P	188	08-10-62	QTi				1,800	53	I	Log; WLR
01BDB1	2,794	401	16	183	P	188.60	10-04-76	QTi	180			1,800	35	I	Log
02ADC1	2,850	455	16	245	P	242.80	10-04-76	QTi	236			2,700	77	I	Log
05BCC1	2,695		6			121.90 R	09-30-76							H	Log
07ACC1	2,802	590	18	18	X	234.99	09-30-76	Qsb				930	52	I	Log
08BBC1	2,765	426	16	26	X	187	01-20-62	Qsb	180			1,300		I	Log; WLR
15DAA1	2,890	541	16	293	P	300.74	10-05-76	Qsb	306	QTi	505			I	Log; QW
16ADD1	2,900	450			X	326.28	10-05-76	Qsb	306					I	Log
16BCA1	2,996	374	23	22	X	218.00	10-05-76	Qsb				2,610	326	I	Log

Table 2. Records of wells in the Mountain Home plateau area (Continued)

Well number	Altitude of land surface (feet above mean sea level)	Reported depth of well (feet below land surface)	Casing: Diameter (in)	Casing: Feet below land surface to first perforation	Well finish	Water level: Feet below land surface	Water level: Date measured	Major aquifer	Depth to major aquifer (feet below land surface)	Minor aquifer	Depth to minor aquifer (feet below land surface)	Reported discharge (gal/min)	Reported specific capacity (gal/min)/ft of drawdown	Use of water	Remarks
17BCC1	2,738		8			168.73	09-30-76							H	
21ACD1	2,861	743	12	386	P	287.57	09-30-76	QTi	405			1,460	44	I	Log
22DDD1	2,888	502	12	345	P	302	4- -66	QTi	314			1,340		I	Log; WLR
24BDB1	2,880					303.11	10-05-76							I	
24CCB1	2,922	448	16	356	P	341.18	10-07-76	Qotg	333	Qsb	242	1,400	20	I	Log
27ADD1	2,904	500	16	500	O	348.70	09-23-76	Qotg	283	QTi	430	1,250	12	U	Log
27BBB1	2,875	365	16	18	X	297.75	04-06-76	Qsb	291			2,280	228	I	Log
30AAD1	2,800	360	20	21	X	252.43	10-05-76	Qsb	251			3,105	259	I	Log
31BCD1	2,755	350	16	125	X	276.65	09-29-76	Qsb	276			2,380		I	Log
1N-1E-01ADC1	2,875	480	16	280	P	264.10	10-01-76	Qotg	212	QTi	383	2,100	1,050	I	Log; QW
03CCC1	2,782	288				172.92	09-28-76							I	
04CCD1	2,792	302	16	200	P	189.30	10-05-76	Qotg	174	QTi	276			I	Log
05CCD1	2,817	440	16	279	G	218.56	09-28-76	QTi	214					I	Log
10ACC1	2,798	300				175.35	10-07-76							I	
16AAC1	2,805	335	20			196.42	09-30-76							I	Log
19ADB1	2,880	440	16	18	X	292.85	10-05-76	Qsb	290	Qotg	353	2,700		I	Log
23CDA1	2,824					239.00	10-07-76							I	
25DBA1	2,852	530	20	35.5	X	257.55	10-04-76	Qsb	272	QTi	484	2,700	64	I	Log; QW
26CDA1	2,828					249.59	09-30-76							I	
34BBB1	2,855	400	20			269.45	09-23-76							I	
36AAD1	2,862					263.30	10-06-76							I	
1N-2E-04BBA1	3,005	625	16	488	F	400.20	10-07-76	QTi	280			2,000		U	Log
05CDC1	2,930	390	6	388	X	324.95 R	10-01-76	QTi	360			12		H	Log
07CBB1	2,862	455	16	360	G	263.04	10-01-76	Qotg	285	QTi	364	1,200	86	N	Log
08ADA1	2,933	384	6	384	O	328.04 R	05-06-76	QTi	337			20		H	Log
15DCA1	2,970	600	6			364.11	09-23-76	QTi(?)						U	
1N-3E-03BAB1	3,320	700	6			645.75	09-27-76	QTi(?)						H	
18DCD1	3,118	401	10			Dry								U	Log; A
34ADD1	3,190	502	12	19	X	Dry								U	Log; A
1N-4E-12CAC1	3,590		4			21.78	09-27-76	Qal(?)						I	
23AAB1	3,500	68	18	25	F	20.64	09-29-76	Qal						I	
23DDC1	3,400	19	48			6.34	09-28-76	Qal						H	QW
27ACC1	3,425	200	16	18	F	8.68	09-28-76	QTi	10			200		U	Log
32AAB1	3,370	711	8	711	O	617.44 R	06-02-76	QTi	602			45	45	H	Log; QW
1N-5E-07BBB1	3,680		50			5.28	09-27-76							S	
17BBA1	3,640	82	8	53	S	12.33	04-30-76	Qal	25			25	1	U	Log
18DBD1	3,600					4.16	09-27-76	Qal						U	
21DDB1	3,760		6			25.29	09-28-76								
28ADC1	3,600	300	6	71	X	70.46 R	09-28-76	Qal	45					H	Log

1S-1W-05ABC1	2,750	370	20	9	X	272.84	09-29-76	Qsb	283	3,600		I	Log; QW
07CBB1	2,450	225	6	183.5	X	131.24	09-29-76	Qotg	130			H	Log; QW
18BCD1	2,597	400	12	169	F	150	03-08-73	QTi	165	700	11	I	Log; WLR
19AAB1	2,615	388	16	225	P	225.30	09-29-76	QTi				I	Log
29CBC1	2,575	285	16	200	P	193.40	10-06-76	Qotg	185	1,470	23	I	Log
29CBD1	2,590	300	10	259	G	207.06	10-07-76	Qotg	217			I	Log
36BBC1	2,800	550	8	13.8	X	425	04-27-69	Qsb	426			H	Log; QW; WLR
1S-1E-06CCD1	2,965	597	16	442	P	433.84	09-23-76	QTi	432	725	7	U	Log; GL
07CBA1	2,935		20			409.03	10-05-76	QTi				U	
1S-3E-14ADC1	3,156		3			494.57	09-29-76					U	
1S-4E-03ADB1	3,375	530	4	530	O	455.58	09-28-76					U	
07ADD1	3,214	695	6	673	P	512.02	10-14-76	QTi	570	25	2.1	S	Log
10DAD1	3,300	525	10	485	S	341.35	09-27-76	QTi	390			U	Log
17AAB1	3,235	570	10	508	X	450	04-30-73	QTi				U	Log; A; WLR
17CCC1	3,188	600	6			535.10	09-29-76	Qb				H	QW
20BBB1	3,188	682	6	676.5	X	557	01-25-51	Qb	560			H	Log; WLR
23BBB1	3,260	563	6	533	P	489.59	09-29-76	Qb				H	Log
30AAC1	3,150	637	12	550	X	484.45	09-27-76	Qb				U	Log
2S-1E-23ADD1	3,155	816	16	615	P	695.11	09-23-76	QTi		240	48	U	Log; GL
2S-4E-02BBD1	3,170	535	8	370	X	490.25	09-29-76	Qb	528			C	Log; QW
09DDD2	3,122	600	6	226	X	418.95	09-27-76	Qb				U	
11BCD1	3,148	660	20	181.5	X	450.43	09-27-76	Qb	450	1,150	10	U	Log
23DDB1	3,106	1,035	16			350.45	09-29-76	Qb	354			U	Log; GL
25BDD1	3,106	600	16	227	X	271.11	09-29-76	Qb	256			U	Log
27DDC1	3,080	540	16	140	X	248	09-20-74	Qb	265	1,200	9.8	I	Log; WLR
27DDD1	3,080	1,190	20	149	X	253.08	09-30-76	Qb	251	2,200	21	I	Log
28ABD1	3,082	621				285	10-08-76						C; WLR
34AAC1	3,078	1,100	16	40	P	247.86	09-30-76	Qb	304			I	Log
36DCC1	3,080	575	16	162	P	244.19	09-29-76	Qb	258	3,500		I	Log; QW
36DCC2	3,080	380	14	312	X	242.76	09-30-76	Qb	237	2,650	1,325	I	Log
2S-5E-01DDA1	3,360	295	14	31	X	187.30	09-28-76	Qb	242			U	Log
03BAB1	3,300		6			272.14	10-01-76					H	
11BAA1	3,300	388	6	388	O	349.49	09-30-76	Qb	323	30		H	Log; QW
11DAB1	3,315					325.80 R	09-30-76					I	
12BCD1	3,300		18			354.18	09-30-76					U	
12BDB1	3,332	865				300.70	04-30-76					I	
15ABA1	3,282	450	6	390	P	359.11	10-01-76	Qb	270	11		H	Log

Table 2. Records of wells in the Mountain Home plateau area (Continued)

Well number	Altitude of land surface (feet above mean sea level)	Reported depth of well (feet below land surface)	Casing: Diameter (in)	Casing: Feet below land surface to first perforation	Well finish	Water level: Feet below land surface	Water level: Date measured	Major aquifer	Depth to major aquifer (feet below land surface)	Minor aquifer	Depth to minor aquifer (feet below land surface)	Reported discharge (gal/min)	Reported specific capacity (gal/min)/ft of drawdown	Use of water	Remarks
18AAA1	3,190	625	10			145	08-10-66	Qb	506					U	Log; WLR
22BDA1	3,220	545	12	545	O	316.44	10-01-76	Qb	340					U	Log
23BBC1	3,245	421	8	421	O	324.32	10-01-76	Qb	300			15		H	Log; QW
24BCB1	3,381	430	14	13	X	329	07-09-68	Qb	376					U	Log; A; WLR
26BDB1	3,205	428	8			307.41	10-08-76							U	
29CCD1	3,120					278.61	09-29-76	Qb						H	QW
30DBC1	3,108	1,250	16	163	X	269.66	04-09-76	Qb	260			1,700	4.2	I	Log
31CDD1	3,090	300				251	09-30-76							I	C; WLR
36BBB1	3,190	356.9	6	50	X	281.71	09-29-76	Qb						U	
2S-6E-11DAC1	3,400	1,620	12	1,040	X	106.15	09-28-76	Qb						U	
23CDA1	3,400					7.20 P	05-03-76							S	
32BAD1	3,510	564	12	7	X	505	09-10-66	Qb						U	Log; A; WLR
2S-7E-13BCB1	4,720	364.9	6	130	P	165.20	10-01-76	Tiv	410					U	Log
3S-5E-06CBB1	3,080					242.24	09-30-76							I	
07BDD1	3,074	497	12	240	P	242.24	09-27-76	Qb	235			320		U	Log
07DBB1	3,074					240.88	10-01-76							U	
3S-6E-01DDD1	3,275	100	40	38	X	32.15	05-04-76	Qb	38					H	Log
02ACA1	3,275					62.22	09-30-76							I	
09DCD1	3,200	200	7	140	P	125.67	09-30-76	Qb	140			60		H	Log; QW
10CDD1	3,210		5			54.07	09-30-76							H	
10DBA1	3,225	394	16	50	P	37.90	10-05-76	Qal		Qb	146	720	3	I	Log
11ACB1	3,243	200	6	26	X	28.30	05-12-76	Qb				15		C	Log
11CBC1	3,230	28	14	8	P	14.63	09-30-76	Qal	24			50	120	I	Log
11DCD1	3,243	140	8	30	X	20.45	09-30-76	Qb	35					I	Log
12DBA1	3,262	370	14	21	X	40.08	10-01-76	Qb	57					I	Log
13AAD1	3,250	525	12	10	X	61.84 P	05-04-76	Qb	35			1,485		I	Log
13BBA1	3,240	150	12			29.30	09-28-76	Qb				270		U	
13BCC1	3,270		8			38.09	05-17-76							U	
14ABA1	3,235		13			106.41 P	05-10-76							S	
14CDD1	3,186	253	8	65	X	131.67	09-30-76	Qb	230					H	Log
15BCD1	3,195	402	8	175	X	168.06	09-30-76	Qb	246					U	Log
15DDA1	3,190	300	6	85	X	142.07	09-30-76	Qb	285			30		H	Log
24CDA1	3,150	550				400.96	10-05-76	QTg	420					U	Log
26ADA1	3,150	940	24	78	X	400.75	05-19-76	Qb				1,200		P	Log
27ACD1	3,163	475	8	79	X	197.38	10-05-76	Qb						U	Log
27CDD1	3,156	500	10	12	X	411.29	06-07-76	Qb	428					H	Log
33AAD1	3,145	500	6	18	X	395.75	05-21-76	Qb				30		H	Log; QW
34DDD1	3,135	350	8	18.5	X	149.60 R	05-21-76	Qb	153					H	Log
35ABB1	3,135	14.5	12	14.5	O	3.15	09-28-76	Qal						I	QW
35BCC1	3,145	902	12	6	P	398.14	09-28-76	Qb						U	Log; GL
36ADD1	3,122		24		X	9.40	10-06-76	Qal						U	

3S-7E-01ACA1	3,747	175	6			149.53		10-01-76					H	QW
03CDC1	3,460	411	6			36.53		09-29-76	Qb				H	
07BDD1	3,280	200	6	22.5	X	41.56		10-01-76	Qb	50	30		H	Log
08DBB1	3,313	225	6		X	70.00		10-01-76	Qb	76	20		H	Log
18CAA1	3,270	250	6	20	X	49.67		10-01-76	Qb	76	35		H	Log; QW
19BBB1	3,230	261	8	19	X	113.62	R	09-29-76	Qb	90	30		S	Log
20BCC1	3,295	360	12	6	X	196		07-17-67	Qb	203			U	Log; A; WLR
30BBB1	3,172					73.16		10-04-76					I	
31ADA1	3,182	130	12	4.6	X	95		06-01-55	Qb	94			U	Log; WLR
4S-3E-23CDD1	2,917	600	20	65.5	X	243.28		09-28-76	Qb	287	270	0.9	U	Log
4S-4E-30DDB1	2,902	500	16	200	F	238.19		09-22-76	Qb	225	1,800	26	I	Log
31DDA1	2,890	387	16	226	P	222		07-10-74	Qb	172	1,300	13	I	Log; WLR
32DDC1	2,925	395	12	275	P	269.27		09-30-76					I	
4S-5E-09DCB1	3,045	500	8	20	X	365.40	P	09-22-76	Qb		20		H	Log; QW
10CAC1	3,080	706	20	18	X	403.60	R	09-22-76	Qb	388			I	Log
10DDA1	3,075	735	20	70	X	393.87	R	09-22-76	Qb	341			I	Log
13DDA1	3,100	578	20	10	X	422.33		09-21-76	Qb	398			I	Log
15BBC1	3,058	500	6	20	X	387.18		09-22-76	Qb		40		H	Log
19ABC1	3,002	485	18	8	X	336.55	P	05-17-76	Qb		2,250	250	I	Log
19CBA1	3,000	490	18	4	X	344.80		10-08-76	Qb	321			I	Log
21CAD1	2,995	588	8	299	P	316		10-04-53	Qb				P	Log; WLR
22CAA1	3,019	610	10	425	F	361.70		09-23-76	Qb				P	Log
24AAB1	3,092	553	8	6	X	412.28		09-22-76	Qb				U	Log
25BBC1	3,048	530				384.54		09-28-76	Qb				I	Log; QW
25DDD1	3,059		8			399.98		04-15-76	Qb				U	
27BCD1	2,999	409	8	330	P	330		-42	Qb	330	300	150	P	Log; WLR
27BDB1	2,998	425	8		P	330		-43	Qb				P	Log; WLR
28BAD1	2,992	604	16	337	P	324.75		09-23-76	Qb	323	1,950	98	P	Log
33CDC1	2,996	422				326		-53	Qb	330			P	Log; WLR
36CAD1	3,038	460				378.30		09-22-76					I	
4S-6E-02DAA1	3,112	420	8	27	X	327.30		06-16-76	Qb	350			H	Log
07CBB1	3,129	504	6	18.8	X	420.55		09-27-76	Qb	417	30	6		Log
10DBC1	3,131	510	6	19	X	426.07		09-27-76	Qb				H	Log
11CDC1	3,094	291	8	20	X	151.97		09-27-76	Qb	160			H	Log
12DAA1	3,096	400	10	50	X	298		03-31-72	Qb	225	30		H	Log; WLR
13ABA1	3,088	416	16	39	X	132.90		04-22-76	Qb	101	2,700	68	I	Log
14ACA1	3,084					360.30		09-27-76						
14CCB1	3,073	525	6	22	X	362		03-19-74	Qb	305	30		H	Log; WLR
15BCB1	3,103	500	6	18	X	382		04-21-76	Qb				H	Log; WLR
19BAC1	3,085	537	18	19	X	403.00		09-28-76	Qb	400			I	Log

Table 2. Records of wells in the Mountain Home plateau area (Continued)

Well number	Altitude of land surface (feet above mean sea level)	Reported depth of well (feet below land surface)	Casing: Diameter (in)	Casing: Feet below land surface to first perforation	Well finish	Water level: Feet below land surface	Water level: Date measured	Major aquifer	Depth to major aquifer (feet below land surface)	Minor aquifer	Depth to minor aquifer (feet below land surface)	Reported discharge (gal/min)	Reported specific capacity (gal/min)/ft of drawdown	Use of water	Remarks
19CAC1	3,070	610	12	526	P	406.21	09-28-76	Qb	385			2,300	70	I	Log
20ACA1	3,095	625	10	400	X	411.65	04-16-76	Qb	485			1,780	178	I	Log
22CCC1	3,080	500	6	159	X	392.93	09-28-76	Qb	478			30		H	Log; QW
24CCB1	3,065	760	16	308	P	366.45	04-22-76	Qb	432			2,800	140	I	Log
25DDB1	3,058	596	16	216	P	355.47	04-22-76	Qb	431			2,630	50	I	Log
35BBD1	3,058	455	6	428	P	397.40	09-29-76	Qb	340					H	Log
35DCA1	3,048	730	16	380	P	361.80	04-21-76	Qb	360	QTg	533	1,100	18	I	Log
36DCB1	3,053	615	16	347	P	370.51	09-29-76	Qb	360					U	Log
4S-7E-06AAA1	3,128	535	12	14	X	221.05	10-04-76	Qb	432			1,800	360	I	Log
06BCB1	3,100	610	18	230	X	303.30	09-20-76	Qb	310			2,360	21	I	Log
06DAA1	3,140					333.50	09-20-76	Qb						I	
07DBA1	3,095	660	12	190	P	314.10	09-20-76	Qb	305	QTg	520	586	7	I	Log
09DCC1	3,152	862	20	630	X	383.35	09-28-76	Qb	351			1,350	15	I	Log
16BBB1	3,106	569	20	12	X	320.35	09-20-76	Qb	311			3,200	145	I	Log
17CAB1	3,088	383	8	20	X	309.26	09-20-76	Qb	305			20		H	Log
19BDB1	3,080	605	20	50	X	378.39	10-04-76	Qb	325					I	Log; QW
20CAA1	3,075	456	16	4	X	350.70	09-21-76	Qb	301					I	Log
21CCB1	3,080	460	6	460	O	365	04-12-75	QTg	430			30		H	Log; WLR
28BBA1	3,075	464	6	456	X	372.89	09-20-76	QTg	342			30		H	Log
30ADA1	3,055	170	6	42	X	111.37 R	09-20-76	Qb	123			20		N	Log
5S-4E-05BBA1	2,885	360	16	180	P	239.04	10-04-76	Qb	184	QTg	220	1,800	26	I	Log
05CAA1	2,850	600	14	225	P	202.27	10-04-76	Qb	185	QTg	226	2,250	30	I	Log; QW
06ADA1	2,855	354	12	280	S	211.40	10-08-76	QTg	184					I	Log
28ABB1	2,750	405	8	366	X	325	04- -65	Qb	330					H	Log; WLR
5S-6E-01AAA1	3,065	435	10	135	X	381.20	09-20-76	QTg	385					H	Log
04EBC1	3,035	492	16	167	X	379.15	09-30-76	Qb						I	Log
05ABC1	3,037	407	18	407	O	379.17	09-30-76	Qb	346			2,600	1,300	I	Log
06CAA1	3,030	412	16	390	X	369.90	10-04-76	Qb	360			2,700	270	U	Log
14BAA1	3,030	408	8	30	X	380.97	09-19-76	QTg				20	4	H	Log
15BCD1	3,022	570	26	330	P	377.13	09-28-76	QTg	376			350	4	H	Log; QW
5S-7E-03ADB1	3,090	890	8	580	P	411.33	09-20-76	QTg	441			21	1	U	Log
16ABD1	3,025	450	6	440	X	395.80	09-21-76	QTg	449					H	Log; QW
24DDC1	2,944	560	6	378	X	345	01-13-72	QTg	325			3		H	Log; WLR

Ground-water discharges as underflow beneath the western part of the area, near Kuna. The amount leaving along the Ada-Canyon County line in T. 1 N and T. 1 S (fig. 6) was estimated using available data and the following equations:

$$T \simeq 0.134 \times SC \times 2{,}000 \qquad (1)$$

(Thomasson and others, 1960), and

$$Q = TIL \times \sin\theta \qquad (2)$$

(Ferris and others, 1962), where:

T = transmissivity, in feet squared per day;
SC = specific capacity, in gallons per minute per foot of drawdown;
Q = discharge, in cubic feet per day;
I = hydraulic gradient, in feet per mile;
L = width, in miles, of section through which discharge occurs; and
sinθ = angle correction for flow crossing section.

The underflow for each township was estimated as follows:

T. 1 N--Assuming an average SC of 180 (gal/min)/ft of drawdown (from drillers' logs), a T of 48,200 ft^2/d is calculated using equation 1. Using equation 2 and a T of 48,200 ft^2/d, an I of 10 ft/mi, an L of 6 mi, and a sinθ of 0.5, the subsurface underflow through T. 1 N is 1,446,000 ft^3/d, or 12,000 acre-ft annually.

T. 1 S--Using the same equations and a sinθ of 0.5, an SC of 20 (gal/min)/ft of drawdown, an I of 25 ft/mi, and an L of 5.5 mi, underflow through T. 1 S is 3,000 acre-ft annually.

Total underflow crossing the study area boundary to the west is thus about 15,000 acre-ft annually.

An estimate of ground-water pumpage was not made in this reconnaissance; however, as discussed in the following section on water-level fluctuations, local ground-water pumpage, based on a long-term decline of ground-water levels, has exceeded recharge in several parts of the plateau.

Water-Level Fluctuations

Ground-water levels fall in response to discharge from an aquifer and rise in response to recharge. For purposes of analysis, fluctuations are important on both short-term (minutes, days, months) and long-term (years) bases. Hydrographs of water-level fluctuations can reveal the kind of stresses working in an aquifer and whether water in storage is either gaining or losing over the long term.

The character of the fluctuations in agricultural areas depends on whether ground water or surface water is the principal source for irrigation. Where surface water is the source, ground-water levels start to rise after the beginning of an irrigation season, as some of the applied water percolates to the saturated zone. A decline in levels is generally observed shortly after the end of the season. This decline normally continues until the start of the next season. Where ground water is the principal source, water levels start to decline at the beginning of the irrigation season. The decline continues through the season until pumping ceases. Levels then generally recover gradually.

Water levels in areas not influenced by irrigation are either relatively stable or start to rise in early spring in response to snowmelt. This rise peaks in late spring or early summer when it reverts to a gradual decline. The decline continues through fall and winter until spring snowmelt again recharges the aquifers.

Hydrographs of water levels in selected wells are shown in figures 7 and 8. The well locations are shown in figure 6. The hydrographs in figure 7 indicate seasonal fluctuations, whereas those in figure 8 indicate long-term trends, in addition to seasonal fluctuations.

Fluctuations in the western part of the plateau generally reflect the source of irrigation water. Well 2N-1W-11ADA1 (fig. 7) shows fluctuations typical of an area of predominantly surface-water irrigation, where pumping effects are more or less overshadowed by recharge. Well 1N-1W-27ADD1 shows fluctuations typical of an area of ground-water irrigation.

Water levels in the central part of the plateau, as shown by well 1S-4E-10DAD1 (fig. 7), show no direct influence by irrigation. However, well 3S-5E-7BDD1, in an area of new agricultural development using ground water, shows a decline corresponding to the irrigation season. A longer period of record would more fully evaluate this response.

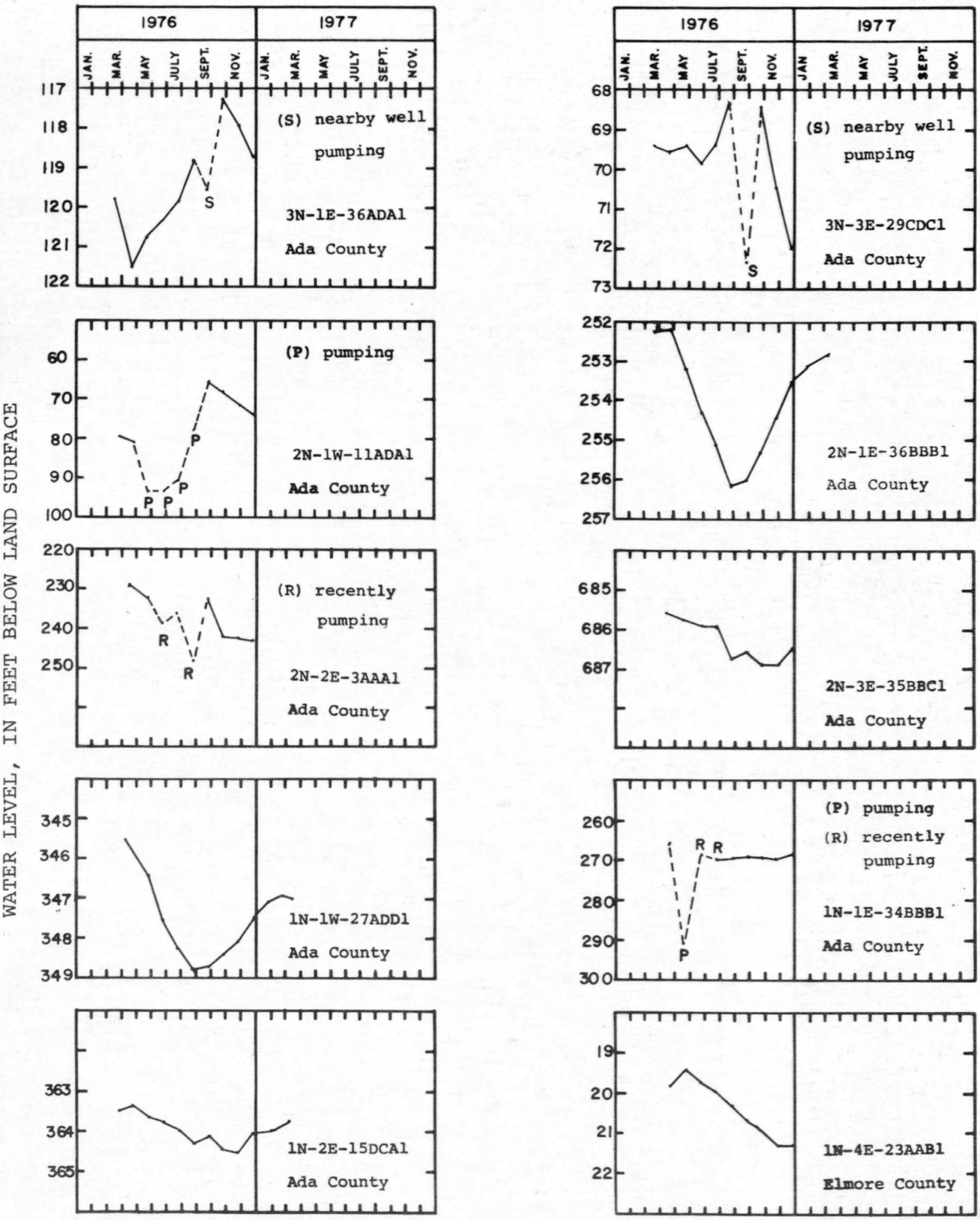

Figure 7. Ground-water levels showing short-term fluctuations in selected wells

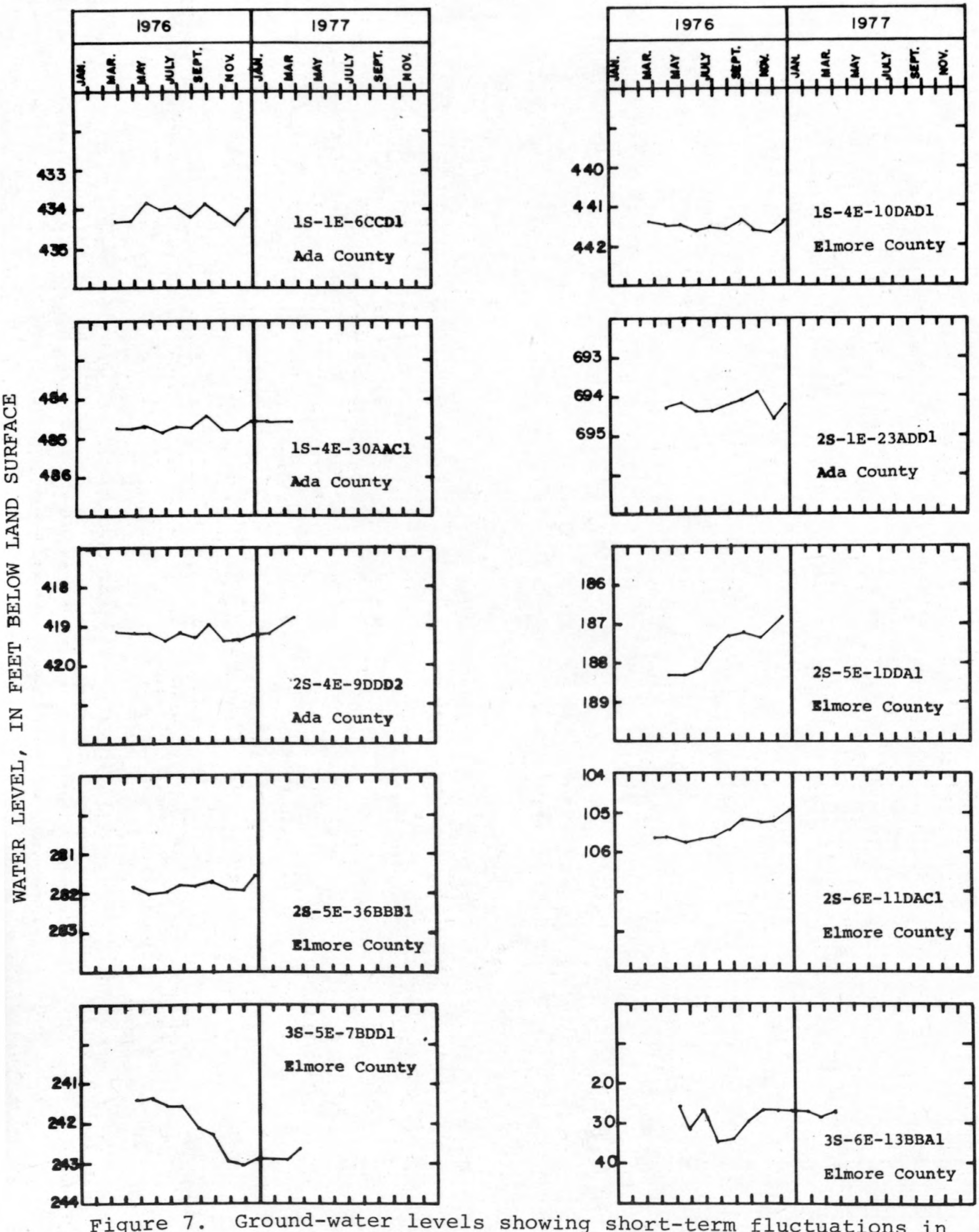

Figure 7. Ground-water levels showing short-term fluctuations in selected wells (Continued).

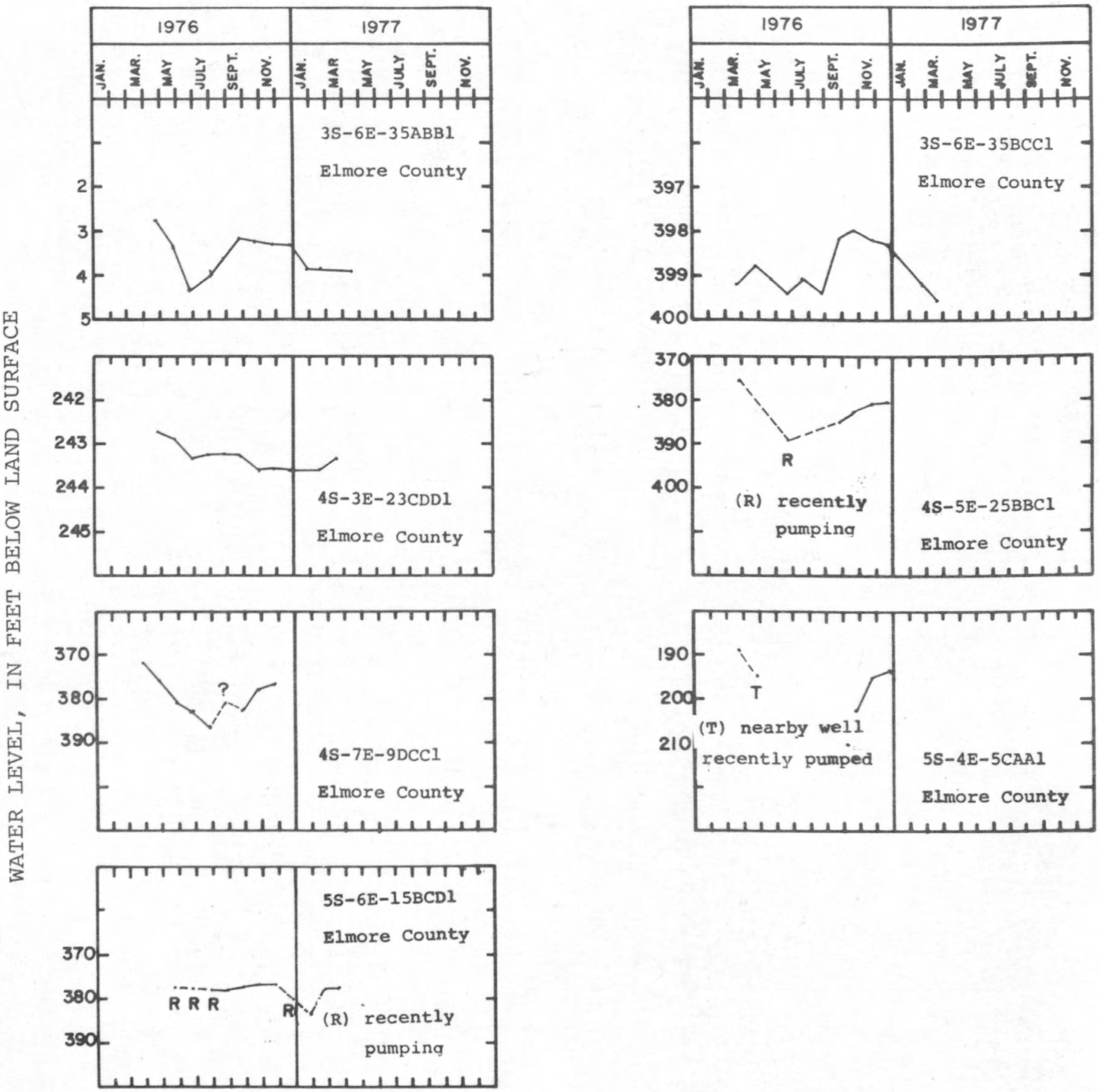

Figure 7. Ground-water levels showing short-term fluctuations in selected wells (Continued)

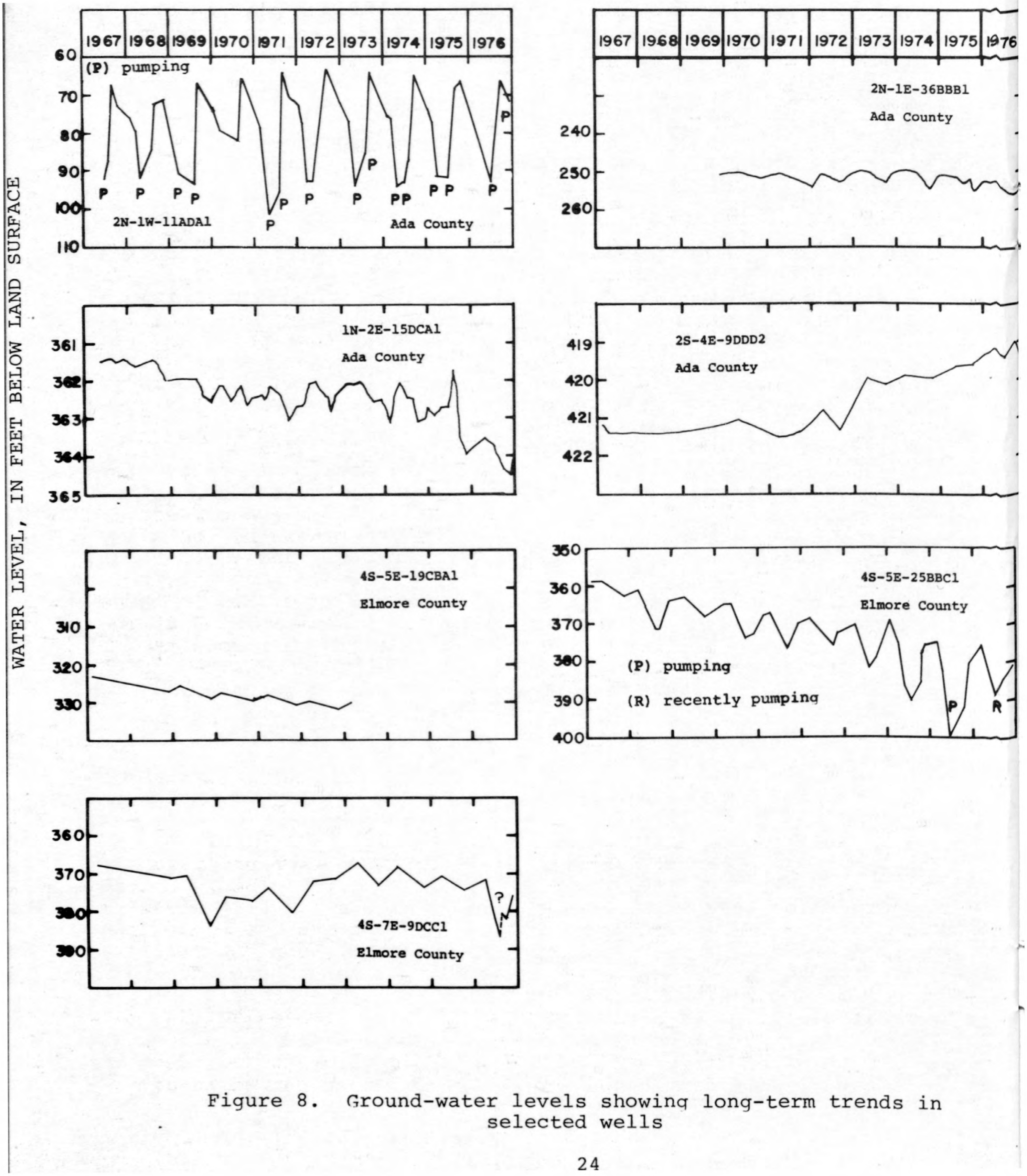

Figure 8. Ground-water levels showing long-term trends in selected wells

Fluctuations in the eastern part of the plateau are generally influenced by ground-water pumping, as shown by well 4S-7E-9DCC1 (fig. 7). The slight rise in water level in August is apparently due to a brief shutdown of nearby irrigation wells.

Water levels in perched-water zones also generally fluctuate in response to ground-water irrigation. Hydrographs for wells 3S-6E-13BBA1 and 35ABB1 both show effects of irrigation pumping.

Hydrographs in figure 8 show several years of record in selected wells. The hydrograph for well 2N-1W-11ADA1, located in an area of extensive surface-water irrigation, presently shows a slight downward trend (based on peaks), indicating no buildup in the water table that could lead to water logging. Water levels in several wells near and in heavy ground-water pumping areas also show slight declines. For example, water levels in wells 2N-1E-36BBB1 and 1N-2E-15DCA1, south of Boise, have dropped in the last several years. Although these declines are small (½ to 2 ft/yr), they may indicate that pumpage in the area is exceeding recharge, or that the aquifers are adjusting to increasing withdrawals. Declines of about 2 to 4 ft/yr are evident south and southeast of Mountain Home, as shown by the hydrographs of wells 4S-5E-19CBA1, 4S-5E-25BBC1, and 4S-7E-9DCC1.

The hydrograph for well 2S-4E-9DDD2 (fig. 8), in the central part of the plateau, shows a rise of about 2 ft in the last 5 years, which could be due to above-normal recharge. However, new agricultural development using ground water has occurred in the area, which could reverse the rising trend.

WATER QUALITY

Chemical Composition

The chemical similarities of ground water underlying parts of the study area make it possible to identify probable recharge sources. Water derived from the Idavada Volcanics is a sodium calcium bicarbonate type and has low concentrations of dissolved solids. Ground water whose source is thought to be leakage from the Boise River between Lucky Peak and Barber Dams and possibly from Lucky Peak Reservoir is a calcium bicarbonate type, having dissolved-solids concentrations slightly lower than the calcium bicarbonate type water that is derived from runoff from the adjacent mountains (Idaho batholith). Ground water pumped in areas where excess surface-water irrigation recharges the aquifers is mostly a sodium or calcium bicarbonate type, having dissolved-solids concentrations (900 mg/L) that are higher than the other waters (generally less than 500 mg/L).

Chemical analyses of water from 37 wells and 10 springs are listed in table 3. The locations of the sampling sites are shown in figure 9.

The cation balance of ground water in the eastern part of the plateau is shown on the trilinear plot in figure 9 (see insert A). The plot shows an orderly increase in percentage of calcium and magnesium ions and a decrease in sodium potassium ions, from the recharge area, through the ground-water system, to the discharge area. As expected, dissolved-solids concentrations (table 3) of these samples also increase as the water moves through the system. Thus, it seems that much of the ground-water recharge in the eastern plateau area is derived from precipitation on Idavada Volcanics.

The analyses of water in springs (1N-6E-35CBA1S, 1N-7E-20BBB1S, and 1S-8E-32CCD1S) issuing from the Idavada Volcanics suggest that spring water is chemically similar to precipitation, particularly in having low dissolved-solids concentration and low pH. The major difference is in the ratio of silica to bicarbonate. In the spring water, silica concentrations are appreciable and approximately twice those of bicarbonate, whereas in precipitation, the bicarbonate concentrations exceed those of silica. High concentrations of silica in ground water are commonly associated with rocks that contain abundant feldspar (Idavada Volcanics) and that have been leached by carbon dioxide-rich water, such as rain (or snowmelt).

Calcium versus sulfate concentrations for ground water in the area and water from silicic volcanics and quartz monzonite, as reported by White, Hem, and Waring (p. F14, 1963), are shown in figure 10. Water from silicic volcanic rocks and quartz monzonite are considered to be representative of water from the Idavada Volcanics and the Idaho batholith, respectively. The majority of water samples shown fall near a line drawn between the silicic volcanics and quartz monzonite. This suggests that most of the ground water underlying the plateau originated as precipitation on outcrops of the Idavada Volcanics and Idaho batholith.

Ground water whose source is probably leakage from the Boise River between Lucky Peak and Barber Dams and possibly Lucky Peak Reservoir shows an increase in concentrations of dissolved solids as the water moves to the southwest (figs.

Table 3. Chemical analyses of water from selected wells and springs in the Mountain Home plateau area

WELL LOCATION NUMBER	TOTAL DEPTH OF WELL (FT)	DATE OF SAMPLE	DIS-SOLVED SILICA (SIO2) (MG/L)	DIS-SOLVED CAL-CIUM (CA) (MG/L)	DIS-SOLVED MAG-NE-SIUM (MG) (MG/L)	DIS-SOLVED SODIUM (NA) (MG/L)	DIS-SOLVED PO-TAS-SIUM (K) (MG/L)	BICAR-BONATE (HCO3) (MG/L)	DIS-SOLVED SULFATE (SO4) (MG/L)	DIS-SOLVED CHLO-RIDE (CL) (MG/L)	DIS-SOLVED FLUO-RIDE (F) (MG/L)	DIS-SOLVED NITRITE PLUS NITRATE (N) (MG/L)	TOTAL PHOS-PHORUS (P) (MG/L)	DIS-SOLVED SOLIDS (SUM OF CONSTI-TUENTS) (MG/L)	DIS-SOLVED SOLIDS (TONS PER AC-FT)	HARD-NESS (CA,MG) (MG/L)	NON-CAR-BONATE HARD-NESS (MG/L)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	SPE-CIFIC CON-DUCT-ANCE (µMHOS/CM AT 25°C)[1]	PH (UNITS)	TEMPER-ATURE (DEG C)
01N 01E 01ADC1	480	76-08-12	31	22	5.8	48	2.6	149	33	17	.7	1.0	.02	238	.30	79	0	56	2.4	347	8.1	25.0
01N 01E 25DBA1	530	76-08-02	38	17	2.6	30	2.3	119	15	6.8	.4	.76	.01	174	.22	53	0	54	1.8	287	7.9	25.0
01N 01W 07ACC1	590	76-08-12	45	52	20	50	6.8	171	100	43	.2	4.2	.00	420	.54	210	70	33	1.5	656	8.0	21.0
01N 01W 15DAA1	541	76-08-12	47	20	7.0	39	4.9	130	37	15	.3	1.2	.01	240	.30	79	0	50	1.9	331	8.1	22.5
01N 04E 12BDB1S	--	76-08-04	54	28	5.7	17	2.0	146	7.2	4.3	.4	.08	.79	191	.23	93	0	28	.8	255	6.7	16.5
01N 04E 23DDC1	19	76-08-11	45	20	4.0	14	9.1	99	12	4.9	.2	1.8	.77	166	.21	66	0	28	.7	229	7.0	13.5
01N 04E 32AAB1	711	76-08-03	46	22	4.9	15	2.0	122	8.2	3.6	.3	.31	.02	163	.20	75	0	30	.8	222	7.5	21.0
01N 05E 35DAB1S	--	76-08-05	46	30	5.1	18	1.8	141	13	4.4	.4	.10	.22	189	.23	96	0	29	.8	255	8.0	--
01N 06E 35CBA1S	--	76-08-05	43	4.7	1.1	4.5	1.5	29	3.5	1.0	.1	.12	.10	74	.10	16	0	35	.5	56	6.1	13.0
01N 07E 20BBB1S	--	76-08-05	57	2.5	.3	3.8	3.0	20	1.9	1.2	.1	.28	.02	81	.10	7	0	42	.6	40	5.9	14.0
01S 01W 05ABC1	370	76-08-13	43	16	6.9	49	4.7	133	41	15	.5	1.4	.01	247	.31	68	0	58	2.5	346	8.2	25.5
01S 01W 07CBB1	225	76-08-04	26	67	24	68	5.6	286	120	17	.2	8.9	.01	508	.65	270	35	35	1.8	776	7.5	17.0
01S 01W 32AAD1S	--	76-08-12	32	36	25	70	4.9	334	38	13	.4	6.2	.03	411	.50	190	0	43	2.2	654	8.1	16.5
01S 01W 36BBC1	550	76-08-04	32	19	5.7	54	4.6	114	62	20	.5	3.2	.01	268	.34	71	0	60	2.8	386	8.1	23.0
01S 02W 28ABB1S	--	76-08-12	38	27	12	130	6.7	376	71	11	.5	3.1	.02	495	.61	120	0	69	5.2	770	7.8	16.0
01S 04E 17CCC1	600	76-08-06	56	23	6.3	13	3.7	115	10	5.9	.3	.81	.03	178	.22	83	0	24	.6	226	7.7	17.5
01S 08E 32CCD1S	--	76-08-13	25	3.5	.7	2.9	1.2	14	2.8	.8	.1	1.9	.01	52	.07	12	1	32	.4	44	6.9	12.0
02N 01E 29DCA1	130	76-08-02	56	77	31	69	6.1	398	84	13	.5	8.6	.21	571	.71	320	0	31	1.7	844	7.3	14.5
02N 01W 11ADA1	130	76-08-02	46	63	37	190	9.1	381	280	67	.7	5.3	.02	904	1.17	310	0	56	4.7	1428	7.5	14.5
02N 01W 34CCD1	350	76-08-12	31	15	1.2	38	2.0	127	14	6.8	.5	.60	.00	174	.22	42	0	65	2.5	252	--	25.0
02N 02E 04CBA1	400	76-08-03	34	46	10	27	1.7	160	62	12	.4	1.0	.02	276	.35	160	29	27	.9	418	7.1	19.0
02N 02E 34CCD1	504	76-08-02	21	17	1.0	61	1.1	129	35	24	.8	2.3	.00	235	.30	47	0	73	3.9	381	8.2	22.5
02N 03E 06BCC1	520	76-08-03	30	20	4.4	21	1.5	180	15	7.6	.4	2.4	.03	199	.20	68	0	40	1.1	241	7.7	19.0
02N 03E 10BCB1	471	76-08-03	32	17	4.2	14	1.2	77	16	7.3	.3	1.3	.01	136	.17	60	0	33	.8	193	7.9	20.0
02N 03E 28CAC1	975	76-08-03	44	23	4.9	19	1.6	119	7.6	4.6	.3	2.0	.05	172	.21	78	0	34	.9	232	7.4	22.0
02N 04E 19CDC1	995	76-08-03	46	22	5.7	12	1.1	75	12	8.9	.7	5.0	.06	167	.21	78	16	25	.6	241	8.0	17.0
02S 04E 02BBD1	535	76-08-06	52	16	4.3	18	4.2	101	9.3	4.9	.4	.80	.03	162	.20	58	0	38	1.0	199	8.1	22.5
02S 04E 36DCC1	575	76-08-06	40	10	5.0	11	3.0	77	6.9	2.9	.3	1.4	.04	123	.15	46	0	33	.7	149	8.0	16.5
02S 05E 11BAA1	338	76-08-10	48	25	7.3	33	7.3	167	20	11	.9	.72	.01	238	.30	93	0	41	1.5	339	8.0	18.0
02S 05E 23BBC1	421	76-08-10	48	17	6.9	34	6.5	139	19	8.3	.8	1.3	.01	215	.27	71	0	48	1.8	272	8.0	21.5
02S 05E 29CCD1	--	76-08-06	48	28	11	13	2.6	131	18	9.9	.3	2.7	.01	207	.26	120	13	19	.5	291	8.0	18.5
03S 06E 09DCD1	200	76-08-09	30	34	11	35	5.4	176	34	17	.1	3.8	.02	270	.34	130	0	36	1.3	443	6.9	16.5
03S 06E 33AAD1	500	76-08-09	42	7.9	4.0	7.5	2.0	58	5.7	2.5	.2	.92	.02	104	.13	36	0	30	.5	112	8.3	16.5
03S 06E 35ABB1	14	76-08-09	37	49	11	42	5.7	245	24	13	.4	5.8	.06	328	.41	170	0	34	1.4	508	7.0	12.5
03S 07E 01ACA1	175	76-08-13	59	26	5.6	18	5.8	108	15	14	.7	2.6	.07	209	.27	88	0	29	.8	273	7.5	20.0
03S 07E 18CAA1	250	76-08-09	39	22	7.7	15	3.0	125	10	3.5	.4	1.2	.04	167	.21	87	0	27	.7	249	7.9	16.0
04S 02E 11CAA1S	--	76-08-19	43	22	5.7	20	5.7	138	9.9	4.9	.4	.25	.04	181	.22	78	0	34	1.0	248	7.8	17.0
04S 03E 15CAD1S	--	76-08-16	39	13	3.8	12	3.5	82	6.0	2.1	.3	.69	.01	123	.15	48	0	33	.8	148	8.2	19.5
04S 05E 09DCB1	500	76-08-10	35	15	4.9	13	3.1	81	11	4.9	.2	1.4	.05	133	.17	58	0	31	.7	182	7.8	17.5
04S 05E 25BBC1	530	76-08-16	41	13	2.8	9.4	3.0	72	6.6	2.3	.2	.63	.03	117	.15	44	0	30	.6	178	8.2	24.0
04S 06E 22CCC1	500	76-08-11	41	30	11	15	3.4	111	29	17	.2	1.7	.02	209	.27	120	29	21	.6	309	8.2	17.5
04S 07E 19BDB1	605	76-08-10	65	23	8.1	27	5.6	144	19	9.3	1.0	1.1	.01	234	.30	91	0	38	1.2	306	8.0	26.0
05S 04E 05CAA1	600	76-08-11	37	11	3.5	12	4.1	81	6.0	2.1	.3	.78	.01	120	.15	42	0	36	.8	148	8.4	21.0
05S 04E 11DCB1S	--	76-08-19	36	14	3.8	11	3.0	79	6.9	3.1	.3	.87	.02	121	.15	51	0	31	.7	150	8.2	19.0
05S 04E 28ABB1	405	76-08-11		30	7.9	16	6.8	141	28	3.3	.3	.35	.01	168	.20	110	0	23	.7	292	8.0	22.5
05S 06E 15BCD1	570	76-08-11	51	58	18	19	5.2	170	68	45	.3	1.0	.03	353	.45	220	81	16	.6	545	8.2	22.0
05S 07E 16ABD1	450	76-08-10	73	51	14	33	7.8	202	77	12	1.2	.15	.02	369	.46	190	24	27	1.1	515	7.8	20.5

Note: In all analyses, carbonate (CO_3) concentrations were zero (0), except in well 05S 04E 05CAA1, where it was 1 mg/L.

[1]Micromhos per centimeter at 25°C

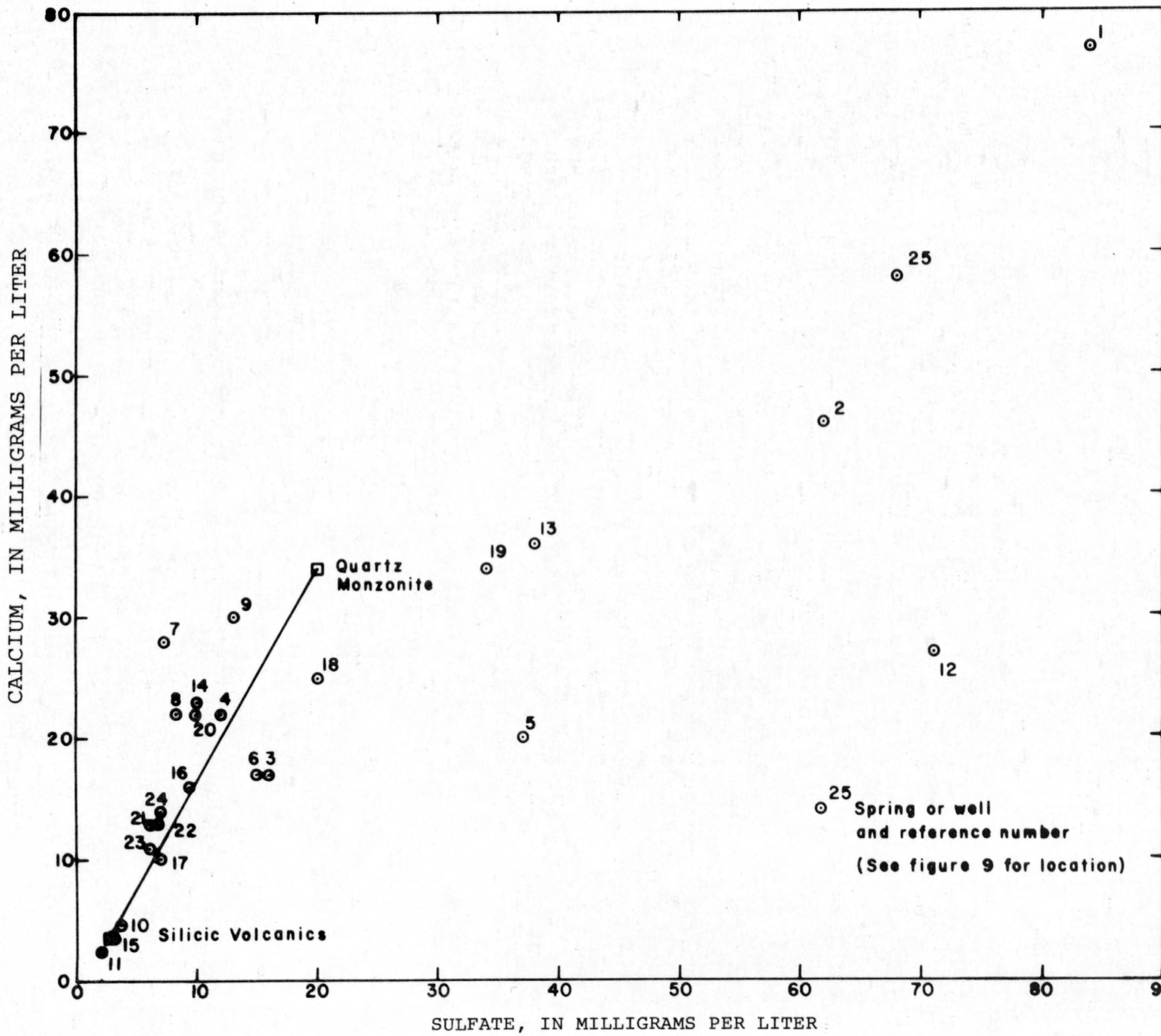

FIGURE 10.--Calcium and sulfate concentrations in selected waters

6 and 9 and table 3). However, ground water near the recharge source (well 2N-3E-10BCB1) is a calcium bicarbonate type, whereas water downgradient tends toward a sodium bicarbonate type.

The chemical quality of water derived from areas where surface-water-irrigation excess recharges the aquifers in the western and northwestern margins of the study area is probably similar to that issuing from spring 1S-2W-28ABB1S (just outside the study area, to the west).

Waters in the perched-water zones near Mountain Home vary in chemical composition. Generally, these waters are a sodium or calcium bicarbonate type having dissolved-solids concentrations higher than water in the regional aquifer.

The chemical quality of the ground water underlying the plateau, with few exceptions, is satisfactory for all present uses. However, in a few places, mostly along the extreme western margin of the plateau where excess surface-water-irrigation probably is the principal source of recharge, the chemical suitability for domestic use may be questionable. Concentrations of dissolved solids are somewhat high in wells 2N-1W-11ADA1 (north of Kuna, outside the study area), 2N-1E-29DCA1, and 1S-1W-7CBB1, being 904, 571, and 508 mg/L, respectively. More importantly, perhaps, nitrite plus nitrate as nitrogen concentrations of these waters approach 10 mg/L, indicating contamination from land-surface sources. Nitrogen concentrations in excess of 10 mg/L may cause blood disorders in infants (National Academy of Sciences - National Academy of Engineering, 1973).

Isotopic Composition

The stable isotopes, deuterium (D), and oxygen-18 (^{18}O), can yield valuable information about the source, age, and environment of ground water. Basically, all other factors considered, the ^{18}O and D composition of water decreases with decreasing temperature at the time of condensation (precipitation). Thus, waters can be compared with respect to their isotopic composition as to source area, and inferences can be drawn as to climatic conditions (warm or cold) at the time of their precipitation (see Rightmire and others, 1976, p. 57). Water samples for D and ^{18}O analyses were collected from the aquifers as an aid toward understanding the flow system. Specifically, the following questions are significant: (1) Are the aquifers filled with fossil water? (2) Is a deep-circulating system feeding the aquifers from a distant source, such as the Bruneau-Grand View area south of the plateau? and (3) Is the isotopic composition of the ground water compatible with local meteoric (atmospheric) water?

Stable isotopic variations are expressed in delta units (δ), defined as:

$$\delta = \left[\frac{R\ \text{sample} - R\ \text{standard}}{R\ \text{standard}}\right] \times 1{,}000 \qquad \text{where}$$

δ = reporting unit in o/oo (parts per mil, which is per 1,000),

R sample = ratio of isotopic concentration, for example, $^{18}O/^{16}O$, or D/H (deuterium/hydrogen), of the sample, and

R standard = ratio of isotopic concentration of the standard SMOW (Standard Mean Ocean Water) (Craig, 1961a).

Reported values of D and ^{18}O in this report are accurate to $\pm$0.5 o/oo and $\pm$0.1 o/oo, respectively.

Isotope ratios were determined for samples taken from 15 wells and 10 springs at various points in the flow system, including the suspected recharge areas, to enable comparison of meteoric water with water in the aquifers. The isotopic analyses are given in table 4; the locations of the sample sites are shown in figure 9. Comparison of waters as to isotopic compositions is shown in figure 11.

As shown in figure 11, all samples cluster near the meteoric line (Craig, 1961b) and differ only in their position up or downslope. The more depleted the sample in ^{18}O and D, the further downslope the plot (to the left in figure 11). Water from springs thought to represent current recharge water (samples 7, 9, 10, 15, and 11) show an orderly depletion in ^{18}O and D with increased altitude (see fig. 9), consequently, decreased temperature at the time of condensation.

The isotopic composition of sample 11 is comparable with the downgradient spring samples 12, 13, 20, 21, and 24, and perched-water sample 1. Sample 1 is thought to be leakage from the New York Canal, hence, the Boise River. Samples 12 and 13 also represent water from Boise River drainage basin. As the Boise River basin is higher (peak altitude 9,867 ft) and cooler than the Mountain Home plateau, the river water would be expected to be depleted in ^{18}O and D relative to present-day precipitation on the plateau. No sample of Boise River water was collected to verify this.

Table 4. Isotopic analyses of water from selected wells and springs in the Mountain Home plateau area

Well or spring location number	δD SMOW (o/oo)	$\delta^{18}O$ SMOW (o/oo)	$\Delta^{18}O$ [1] (o/oo)	Reference number (fig. 9)
2N-1E-29DCA1	-126.8	-17.6	- .50	1
2N-2E-04CBA1	-123.6	-15.2	+1.50	2
2N-3E-10BCB1	-126.0	-17.5	- .50	3
2N-4E-19CDC1	-120.4	-14.8	+1.50	4
1N-1W-15DAA1	-132.9	-16.9	+ .96	5
1N-1E-25DBA1	-128.8	-16.7	+ .65	6
1N-4E-12BDB1S	-115.5	-15.4	+ .29	7
32AAB1	-125.0	-16.6	+ .28	8
1N-5E-35DAB1S	-117.8	-15.4	+ .58	9
1N-6E-35CBA1S	-119.9	-15.7	+ .54	10
1N-7E-20BBB1S	-126.1	-17.6	- .59	11
1S-2W-28ABB1S	-125.6	-17.8	- .85	12
1S-1W-32AAD1S	-129.5	-17.6	- .16	13
1S-4E-17CCC1	-128.4	-17.4	- .10	14
1S-8E-32CCD1S	-124.6	-16.6	+ .23	15
2S-4E-02BBD1	-129.1	-17.3	+ .09	16
36DCC1	-127.1	-16.4	+ .74	17
2S-5E-11BAA1	-129.4	-16.4	+1.03	18
3S-6E-09DCD1	-118.2	-16.2	- .17	19
4S-2E-11CAA1S	-130.8	-17.4	+ .20	20
4S-3E-35CAD1S	-128.8	-17.3	+ .05	21
4S-5E-25BBC1	-128.5	-17.3	+ .01	22
5S-4E-05CAA1	-127.8	-16.6	+ .63	23
11DCB1S	-130.2	-17.8	- .27	24
5S-6E-15BCD1	-125.0	-16.7	+ .18	25
Average	-125.9	-16.8		

[1]Deviation from meteoric water line shown in figure 11; (-) to left of line, (+) to right.

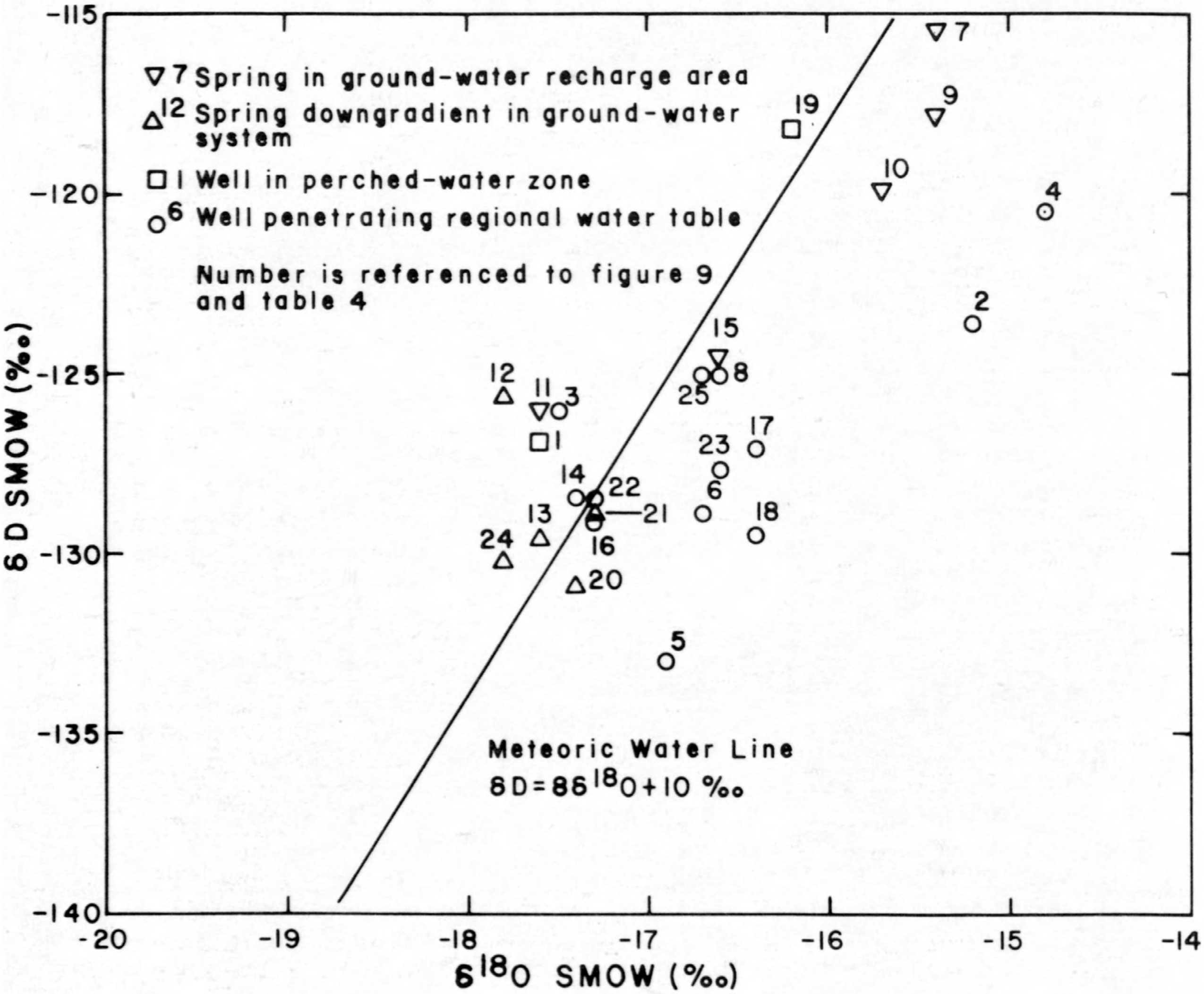

FIGURE 11.--Isotope variations in water from selected wells and springs

Compatibility of the isotopic composition of spring sample 11 with spring samples 20, 21, and 24 suggests that downgradient ground water at the eastern end of the flow system is fossil water, which was recharged at an earlier time, although under climatic conditions similar to current conditions in the Boise River basin. As the regional climate moderated, water of the isotopic composition of spring samples 7, 9, and 10 recharged the eastern part of the plateau, possibly represented by sample 19 from the perched-water zone. At the same time, Boise River water, slightly enriched in ^{18}O and D, continued to recharge the western part of the plateau. Well samples 5 and 6, which are depleted in ^{18}O and D, may represent residual Boise River recharge at a time comparable to the time of recharge to the downgradient water in the eastern part of the plateau.

No data suggest recharge from a distant, deep-circulating system to the south.

EFFECTS OF IRRIGATION-RETURN FLOWS

Irrigation-return flows have influenced the ground-water systems in the Mountain Home plateau area. Recharge to aquifers underlying the western part of the plateau is principally from adjacent surface-water-irrigated tracts. The perched water in and north of Mountain Home is partly derived from leakage from the irrigation system which stores and conveys surface water.

Three potential effects of irrigation-return flows on the land and ground-water resources are (1) water logging of agricultural land, caused by a rise of the water table; (2) deterioration of ground-water quality; and (3) development of perched-water zones. Although water logging and water-quality deterioration are undesirable, development of perched-water zones can be beneficial under certain conditions.

Water-logging problems have not developed in the plateau area. However, an apparent deterioration of ground-water quality is evident in some places that are adjacent to surface-water-irrigated lands, principally along the western and northwestern margins of the plateau.

The potential for developing perched-water zones is related to local subsurface conditions. At some places, strata (probably clay) of low vertical hydraulic conductivity can restrict downward movement of water. However, more important than occurrence is the areal extent of these strata. If the low-conductivity beds are localized and discontinuous, they will not develop large perched-water bodies. An extensive bed could develop a large perched zone, if a prolific source of recharge water were available.

The perched water in and north of Mountain Home (see fig. 6) occurs in sufficient quantities so that at least part of it is recoverable for domestic use and limited irrigation in most of that area. The source of water is partly leakage from surface-irrigation-water storage and conveyance systems and partly from runoff and recharge from adjacent highlands. The perching material seems to be clay beds in interflow zones of the basalt.

As the perched water moves southward and downward toward the regional water table south of Mountain Home, it enters an unsaturated zone and is not recoverable. Subsurface information from the geophysical and driller's logs for well 3S-6E-35BCC1 (fig. 4) does not indicate any large perched-water zones.

Several perched-water zones occur northwest of Mountain Home, along the mountain front. Geophysical and driller's logs (fig. 4) for well 2N-3E-35BBC1 near Blacks Creek indicate a perched zone at a depth of about 400 ft. The perching material seems to be a sandy clay bed about 20 ft thick. The other perched-water zones along the mountain front probably result from similar geologic conditions. The source of water in all places is probably runoff and recharge from adjacent uplands.

Perched water east of Kuna (fig. 6) is probably caused by intercalated clay beds in underlying basalt flows or in sand and gravel deposits. The source of water is leakage from irrigation canals and downward percolation of applied surface water.

Geophysical and drillers' logs (fig. 4) indicate two other perched-water zones in the western part of the plateau (see fig. 6 for locations). Perched water in well 1S-1E-6CCD1 south of Kuna occurs at a depth of about 380 ft. The perching material seems to be a sandy clay bed about 30 ft thick. Two perched-water zones occur in well 2S-1E-23ADD1 east of Swan Falls. The first zone seems to be in basalt at a depth of about 220 ft. The second is at about 530 ft, at the contact between fine-grained sediments of the Idaho Group and overlying basalt of the Snake River Group. The source of water in these two areas is probably natural runoff and recharge; however, some perched water in well 1S-1E-6CCD1 could be from irrigation-return flows from the irrigated area to the northeast.

Several perched-water zones have developed in different parts of the area, despite the limited source of water. This suggests that additional perched zones may develop, even if only moderate amounts of imported water are available for new irrigation growth.

SUGGESTIONS FOR MONITORING

To provide data for management of the ground-water resources in the Mountain Home plateau area, the following network to monitor ground-water-level fluctuations and water-quality changes is suggested:

1. To monitor the effects of ground-water development; (a) initiate monthly water-level measurements in wells 1N-1W-27ADD1, 2S-5E-26BDB1, 3S-5E-7BDD1, 4S-3E-23CDD1, and 4S-5E-24AAB1; (b) continue bimonthly measurements in State observation-network wells 2N-1E-36BBB1, 1N-2E-15DCA1, and 2S-4E-9DDD2; and (c) continue semiannual measurements in State observation-network wells 1S-1E-6CCD1, 4S-5E-25BBC1, 4S-7E-9DCC1, and 5S-4E-5CAA1.

2. To monitor the effects of surface-water irrigation, (a) initiate monthly water-level measurements in wells 3S-6E-13BBA1, 3S-6E-35ABB1, and 5S-6E-15BCD1; (b) continue bimonthly measurements in State observation-network well 3S-6E-35BCC1; and (c) continue semiannual measurements in State observation-network wells 3N-1E-36ADA1 and 2N-1W-11ADA1.

3. To monitor water-quality changes, initiate yearly water-quality sampling in wells 2N-1E-29DCA1, 2N-2E-34CCD1, 1S-1W-5ABC1, 2S-4E-36DCC1, 3S-6E-35ABB1, 4S-5E-25BBC1, 4S-7E-19BDB1, and spring 4S-3E-35CAD1S.

The semiannual water-level measurements should be made in mid-April (before irrigation begins) and mid-October (after irrigation ends). Water-quality samples should be collected in August when most irrigation wells are likely to be pumping.

POTENTIAL FOR GROUND-WATER DEVELOPMENT AND FOCUSES FOR FUTURE STUDY

Considering the great potential thickness of saturated sediments and basalts underlying the plateau area (see p. 9 and fig. 5), it seems that much ground water remains in storage both above and below the level of the Snake River (altitude 2,300 ft). This storage could be available for additional irrigation on the plateau, providing the deeper rocks are porous and permeable. The deepest known irrigation well in the area is well 2S-5E-30DBC1 (table 2), which was drilled to an altitude of 1,858 ft (1,250 ft below land surface) and penetrated the Bruneau Formation of the Idaho Group (table 2). Because the well is completed mostly as open hole (reported to have 163 ft of casing), it is not known which rocks along the well bore are contributing the most water.

In places, ground-water withdrawals in the area are causing water levels to decline to where pumping lifts may become prohibitive from an economic, as well as an energy-expenditure standpoint (see figs. 7 and 8). But the distribution of heads (ground-water pressures) in untapped deep-lying aquifers is unknown. If Idavada Volcanics underlie the deepest known aquifers, if they are in hydraulic connection with the rocks in their outcrop area, and if the contained water is under artesian pressure, then a potential exists for that water to rise to levels that may be near land surface. However, depending on depth of circulation, such water could be much warmer than the water now being pumped--it may even be thermal water. Using presently available knowledge of the geology and hydrology, this set of conditions can only be postulated.

Again, considering the potential thickness of saturated sediments and basalts and the number of test holes that would be needed to describe the geology and evaluate the hydrology, it is impractical to assume that enough funds would be available to fully assess the ground-water resources in the plateau area. However, one or several deep test holes, in selected places, could help answer some questions about the occurrence of ground water and perhaps encourage further exploration for untapped deep aquifers.

Estimates made during this reconnaissance show that about 18,000 acre-ft of water discharges by natural means from the ground-water system annually. At least part of this natural discharge could be captured by strategically placed wells and used for irrigation. Assuming that two-thirds could be captured, then 12,000 acre-ft of additional water would be available for development, a small but useful amount in relation to the 450,000 potentially irrigable acres.

Large-scale new agricultural development in the Mountain Home plateau area, because of an apparent limitation of ground-water resources, would depend heavily on importation of surface water. Evaluation of the efficiency of present surface-water-irrigation systems would be beneficial, for excessive use and leakage from the irrigation systems has resulted in the formation of perched-water zones in the subsurface. More efficient systems would allow for more acres to be irrigated.

When water rights and other legal constraints are satisfied and proposed irrigation areas are selected, plans for additional study could be formulated. Test drilling and geophysical logging at sites where increased irrigation is planned would provide information for predicting potential effects of new development.

However, until additional water is available for large-scale development, it would be helpful to focus future work on management of the ground-water resources. In addition to water-level and water-quality monitoring, a ground-water-pumpage inventory would be desirable. After an initial inventory is completed and total withdrawals in the area are known, selected wells could be monitored for continuing determination of annual ground-water withdrawals. Using data derived from these wells, the annual effects of variations in precipitation, increased development, and crop rotation on ground-water withdrawals could be assessed.

SUMMARY AND CONCLUSIONS

Development of the ground-water resources in the Mountain Home plateau area has caused water-level declines in several places, the largest of which are south of Mountain Home, where ground-water levels have declined more than 20 ft in the past 9 years. Although the total amount of water in storage in the aquifers may be considerable, it has not yet been determined. Present well-hydrograph data indicate that additional large-scale ground-water development will probably result in increased long-term water-level declines, which may result in economically prohibitive pumping lifts and the use of excessive amounts of energy. Therefore, it seems that large-scale new agricultural development on the plateau would depend heavily on the availability of surface water.

Sources of recharge to the ground-water systems are water from the Boise River basin, runoff from adjacent mountains, and precipitation on outcrops of the Idavada Volcanics. Ground-water movement is generally to the south and southwest. Ground-water discharge is by pumping, subsurface outflow, and spring discharge. Estimated annual discharge in springs and subsurface outflow is about 18,000 acre-ft. Part of this discharge could be captured for irrigation within the area.

The chemical composition of ground water generally reflects water characteristics in the area of the source of recharge. Higher concentrations of dissolved solids are associated with recharge from surface-water-irrigated areas; low concentrations of dissolved solids are associated with recharge from the Idavada Volcanics. In several places, dissolved solids and nitrate plus nitrite as N concentrations make the chemical suitability of ground water for domestic use questionable.

Deuterium and ^{18}O isotope data suggest that the aquifers at the lower end of the flow system underlying the plateau contain fossil water, although recharge occurred at an earlier time when climatic conditions were similar to current conditions in the Boise River basin.

The rocks underlying the plateau are composed mainly of basalt and unconsolidated clay, sand, and gravel. Several perched-water zones have developed near surface-water-irrigated areas, which suggests that present surface-water-irrigation systems may be inefficient. Additional agricultural development using imported surface water could lead to the development of additional perched-water zones if the efficiency of the present distribution systems remains unchanged.

Future work could focus mainly on (1) test drilling to determine the occurrence of deep, untapped aquifers containing water under high head, and (2) better ground-water-resource management aided by monitoring of water-level fluctuations, water quality, and annual pumpage.

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