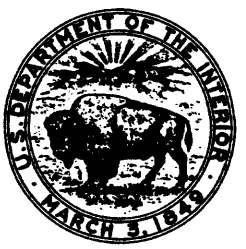
LARGE SPRINGS IN THE VALLEY AND RIDGE PHYSIOGRAPHIC PROVINCE OF PENNSYLVANIA

A Contribution to the Appalachian Valleys--Piedmont Regional Aquifer-System Analysis Study

by David A. Saad and Daniel J. Hippe

U.S. GEOLOGICAL SURVEY

Open-File Report 90-164



Harrisburg, Pennsylvania

1990

DEPARTMENT OF THE INTERIOR
MANUEL LUJAN, JR., *Secretary*

U.S. GEOLOGICAL SURVEY
Dallas L. Peck, *Director*

For additional information
write to:

District Chief
U.S. Geological Survey, WRD
4th Floor, Federal Building
P.O. Box 1107
Harrisburg, Pennsylvania 17108-1107

Copies of this report can be
purchased from:

U.S. Geological Survey
Books and Open-File Reports Section
Federal Center
Box 25425
Denver, Colorado 80225

CONTENTS

ILLUSTRATIONS

TABLES

CONVERSION FACTORS AND ABBREVIATIONS

For the convenience of readers who may prefer metric (International system) units rather than the inch-pound units used in this report, the following conversion factors may be used:

Multiply Inch-Pound Unit	By	To obtain Metric Unit
	Length	
mile (mi)	1.609	kilometer (km)
	Flow	
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
gallon per minute (gal/min)	0.06308	liter per second (L/s)

LARGE SPRINGS IN THE VALLEY AND RIDGE PHYSIOGRAPHIC PROVINCE OF PENNSYLVANIA

by David A. Saad and Daniel J. Hippe

ABSTRACT

In the Valley and Ridge physiographic province of Pennsylvania, 137 springs have a single or median discharge value equal to or greater than 100 gallons per minute. Information for these large springs has been tabulated to summarize the data useful to the U.S. Geological Survey's Appalachian Valleys--Piedmont Regional Aquifer-System Analysis study. Among the springs measured or estimated to date (1989), 39 are of the fourth magnitude (100 to 449 gallons per minute), 83 of the third magnitude (449 to 4,490 gallons per minute), 15 of the second magnitude (4,490 to 44,900 gallons per minute), and none of the first magnitude (greater than 44,900 gallons per minute). There are 123 springs that discharge from carbonate rocks, 9 from clean sandstone, 3 from shale and other interbedded rock types, and 2 from unconsolidated material.

INTRODUCTION

This report presents discharge data and other information on 137 large springs in the Valley and Ridge physiographic province. This information will be used for the U.S. Geological Survey's Appalachian Valleys--Piedmont Regional Aquifer-System Analysis (APRASA) study, an investigation of the quantity and quality of ground-water resources in the Valley and Ridge, Blue Ridge, and Piedmont physiographic provinces (fig. 1). The data available from these springs provide insight into the ground-water systems with which they are associated. The types of flow systems, size of drainage areas, and types of rock are some of the information about the ground-water systems associated with springs that may be hypothesized using the available data.

Large springs are defined in this report as those springs with a discharge equal to or greater than 100 gal/min (gallons per minute). Most of the large springs in Pennsylvania are in the Valley and Ridge physiographic province (fig. 2). This province extends northeastward from the south-central to the east-central borders of Pennsylvania in an arc that is about 70 mi (miles) wide.

Water from springs has been, and is, used for a wide variety of purposes. These include fish hatcheries, stock supply, industry, irrigation, cooling, and recreation. Many springs are used either as the primary or supplemental source of water for municipal supplies.

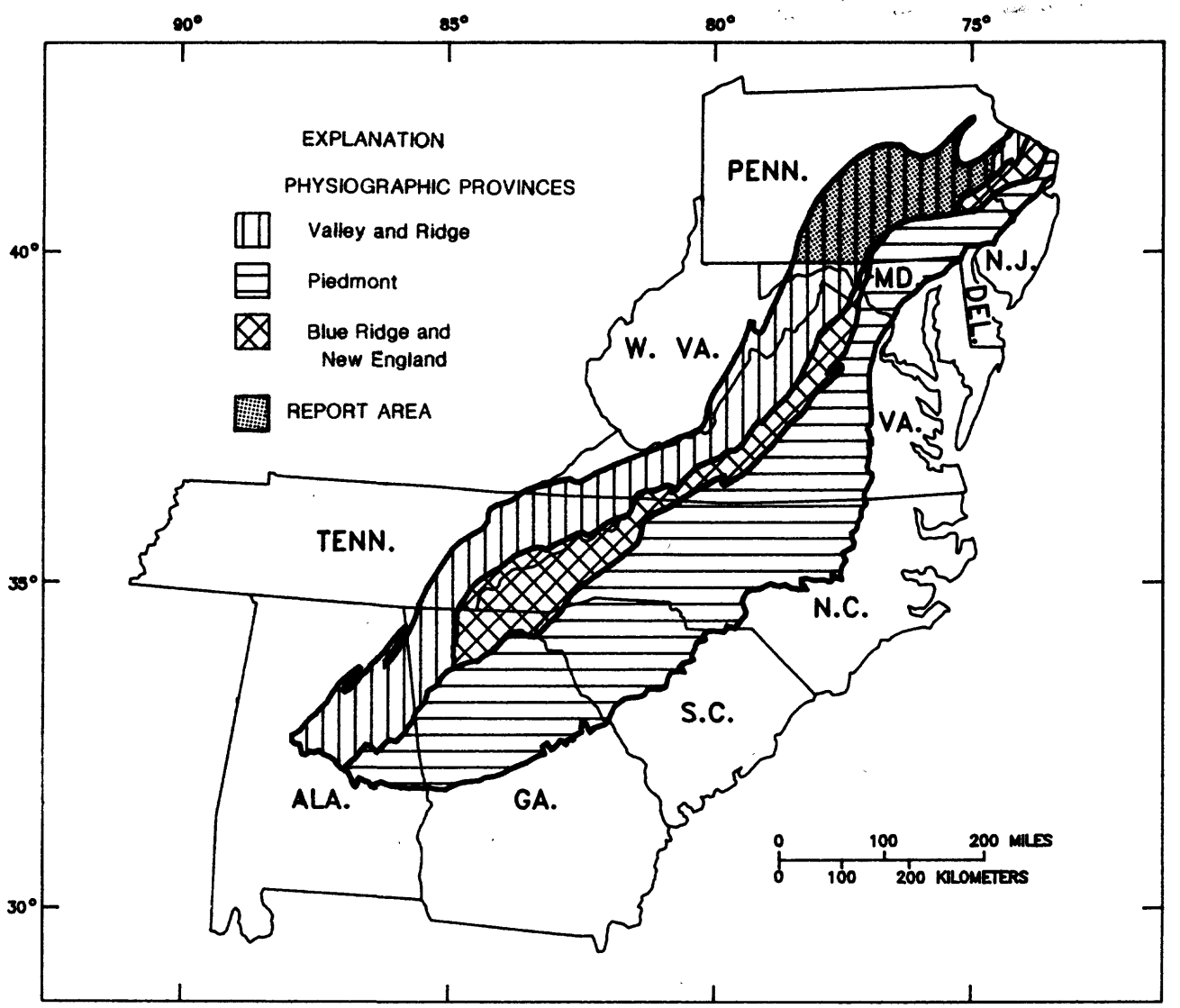


Figure 1.--The Appalachian Valleys-Piedmont Regional Aquifer-System Analysis study area, physiographic provinces, and area studied in this report.

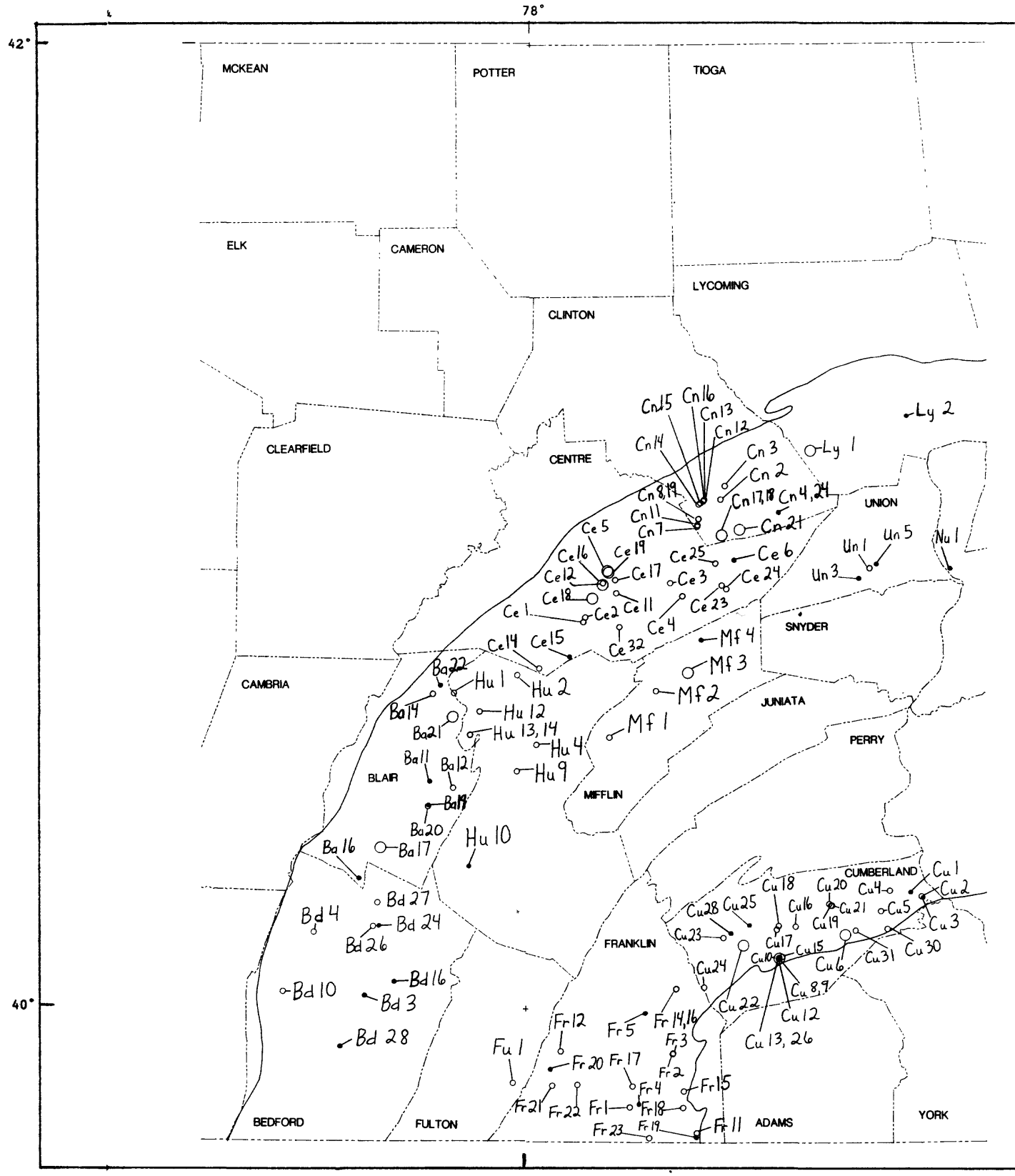
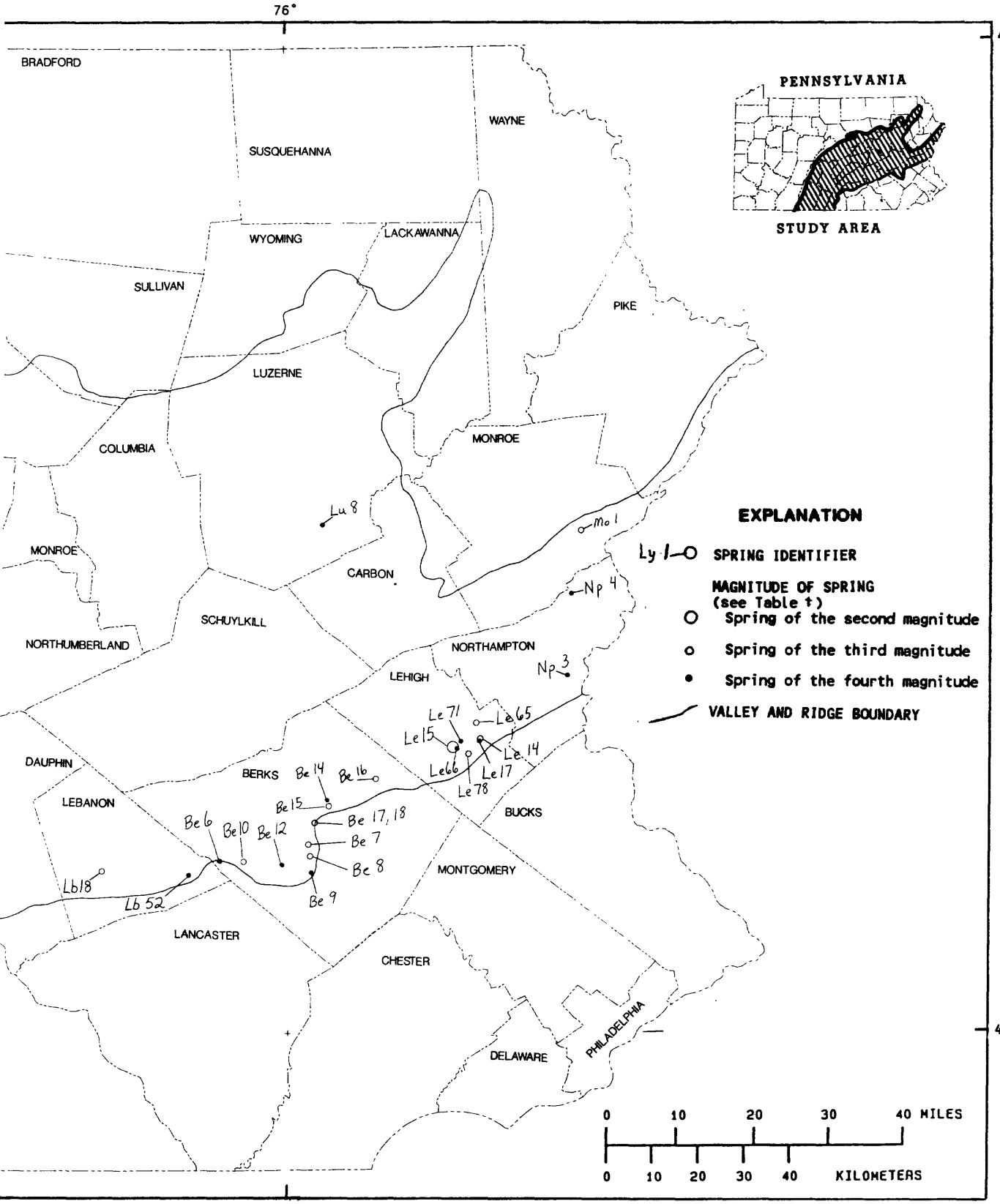


Figure 2.--Location and magnitude of large springs in the



lley and Ridge physiographic province of Pennsylvania.

MAGNITUDE AND VARIABILITY OF SPRINGS

Discharge from springs of the Valley and Ridge physiographic province of Pennsylvania range in size from less than 1 gal/min to greater than 10,000 gal/min. Discharges of individual springs vary both daily and seasonally. This report contains information on springs that have a single or median discharge equal to or greater than 100 gal/min. According to the classifications of Meinzer (1927), only springs of the fourth, third, and second magnitude are included (table 1).

The location and magnitude of the large springs in the Valley and Ridge physiographic province of Pennsylvania are shown in figure 2. Figure 3 is a frequency distribution of the size of springs in the Valley and Ridge physiographic province of Pennsylvania.

Pennsylvania has no springs of the first magnitude on the basis of median discharge. Discharges of some of the larger springs in the Valley and Ridge physiographic province do vary greatly however, and some instantaneous discharges greater than 44,900 gal/min have been reported. Nippono Spring (Ly 1) in Lycoming County, which has a median discharge of 18,000 gal/min (Flippo, 1974), has a reported instantaneous discharge of 66,300 gal/min. Large variations in discharge are characteristic of conduit flow systems and are discussed in detail in the next section. Large variations in discharge also are characteristic of surface streams that enter the subsurface through sinkholes or caves. A conduit spring, such as Arch Spring (Ba 21) in Blair County, that receives recharge from such streams also will have large variations in discharge.

There are 15 springs of the second magnitude in the Valley and Ridge physiographic province. Of these, Boiling Springs (Cu 6) in Cumberland County has been reported by Meinzer (1927) to be the largest spring in Pennsylvania. However, on the basis of median discharge, Flippo (1974) reported Nippono Spring (Ly 1), in Lycoming County, to be the largest spring in Pennsylvania. There are 83 springs of the third magnitude in the Valley and Ridge physiographic province of Pennsylvania and 39 springs of the fourth magnitude.

All springs exhibit some seasonal variability. Some springs have relatively little variance; however, others, such as Rock Spring (Ce 14), have discharges that vary from 225 gal/min to possibly 11,200 gal/min. Most of the springs in Pennsylvania do not have continuous records of discharge; therefore, seasonal variability poses a problem when categorizing springs into groups if limited numbers of discharge measurements are available. A single instantaneous discharge measurement probably will not accurately represent the average discharge of a spring and gives no clue to its variability. Additionally, multiple instantaneous discharge measurements also may not be representative of the average discharge and variability in discharge. Multiple measurements made at a spring under non-normal climatic conditions may not be representative of the discharge and variability under normal conditions.

Table 1.--Classification of springs with respect to discharge
[modified from Meinzer, 1927; gal/min, gallons per minute]

Magnitude	Range of discharge (median values)[1]
First	44,900 gal/min or more
Second	4,490 to 44,900 gal/min
Third	449 to 4,490 gal/min
Fourth	100 to 449 gal/min
Fifth	10 to 100 gal/min
Sixth	1 to 10 gal/min
Seventh	0.125 to 1 gal/min
Eighth	Less than 0.125 gal/min

[1]Meinzer defined spring magnitudes based upon an average (mean) value for discharge measurements. For this report the classifications have been applied to single or median discharge values of more than one instantaneous discharge measurement.

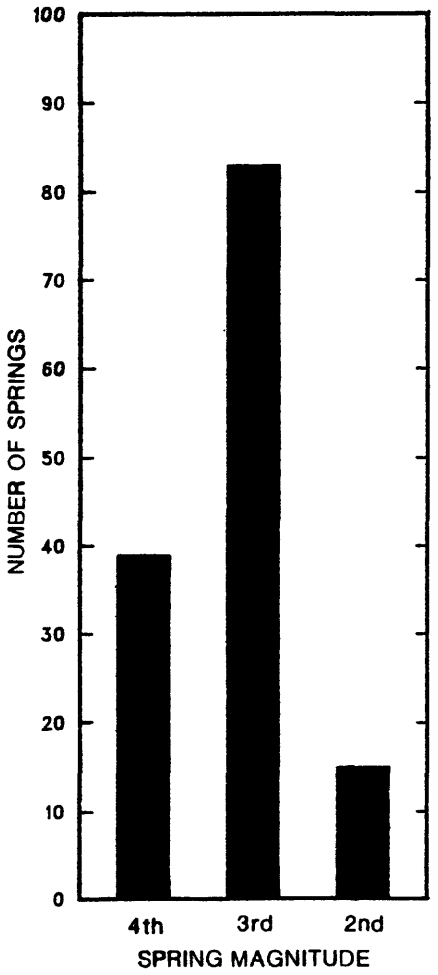


Figure 3.--Histogram of the magnitude of springs in the Valley and Ridge physiographic province of Pennsylvania for springs with single or median discharge values greater than 100 gallons per minute.

TYPES OF SPRINGS

The two end-member types of flow systems important in describing the springs of the Valley and Ridge physiographic province are "diffuse" and "conduit". Most springs have characteristics of both flow systems (Shuster and White, 1971; White, 1969). Diffuse flow systems are characterized by a network of interconnected openings, typically only a fraction of an inch wide, that transmit water slowly. Conduit flow systems are characterized by a few large interconnected openings, such as those that develop in solution-enlarged openings in carbonate rocks. The enlarged openings may be connected to smaller openings. Conduits receive and transmit water freely. Diffuse flow systems respond slowly to precipitation events, whereas conduit flow systems respond quickly (Shuster and White, 1972).

The type of rock from which a spring discharges can sometimes be used to infer the lithology in which the ground-water reservoir, that feeds the spring, has developed. For many springs, most of the water may be coming from an overlying or underlying aquifer that may have a lithology different from that from which the spring discharges. Most of the large springs in the Valley and Ridge physiographic province of Pennsylvania discharge from carbonate rocks. These springs account for 90 percent (123 out of 137) of the springs reported in table 2 (at back of report). Diffuse or conduit flow systems can form in carbonate rocks, but the largest springs are associated with the conduit type of flow system. Some of the largest springs in the Valley and Ridge physiographic province are associated with very large conduits in the form of caves. Because caves are mostly above the water table, they are the extreme end-member and last, highly modified, stage in the development of a conduit flow system. Penn's Cave Spring (Ce 3) in Centre County is a good example of conduit flow in a cave. Penn's Cave Spring discharges about 4,000 gal/min and flows through a cavern that is large enough to be toured by boat.

Noncarbonate rocks, such as sandstone and shale, also can be the source of some fairly large springs. Diffuse flow systems are the dominant type in this kind of rock. Nine of the large springs in the Valley and Ridge physiographic province discharge from clean sandstone and three from shale and other interbedded rock types. The largest measured discharge for a spring discharging from a clean sandstone is 1,800 gal/min for Spring Meadow Spring (Bd 4) in Bedford County, and the largest measured discharge for a spring discharging from shale or other interbedded rock types is 530 gal/min for an unnamed spring (Fr 12) in Franklin County.

Two of the large springs in the Valley and Ridge physiographic province of Pennsylvania discharge from unconsolidated materials. An unnamed spring in Monroe County (Mo 1) issues from glacial drift and discharges 650 gal/min. Muffley Spring (Np 4) in Northampton County discharges from a glacial moraine at 200 gal/min. These two springs account for slightly more than 1 percent of the large springs reported.

SOURCE OF DATA

Data selected for this report were compiled from published and unpublished reports of the U.S. Geological Survey. Additional data not included in this report are stored in the Ground-Water Site Inventory data base of the U.S. Geological Survey in Pennsylvania. Information on all of the springs in the Pennsylvania data base is available from the Pennsylvania district offices of the U.S. Geological Survey, Water Resources Division.

SUMMARY

Information for 137 large springs in the Valley and Ridge physiographic province of Pennsylvania has been tabulated to summarize the data useful to the U.S. Geological Survey's APRASA (Appalachian Valleys--Piedmont Regional Aquifer-System Analysis) study. This information includes spring number, latitude, longitude, spring name, owner, aquifer, water use, date of discharge measurement, method of discharge measurement, and individual discharge values. The springs have been classified into magnitudes on the basis of the value of a single instantaneous discharge measurement or the median value for multiple instantaneous discharge measurements. A frequency distribution of the magnitude of springs has been determined. Among the springs measured or estimated to date (1989), 39 springs are fourth magnitude, 83 are third magnitude, 15 are second magnitude, and none are first magnitude in the Valley and Ridge physiographic province of Pennsylvania. The largest of the second-magnitude springs include Big Spring (Cumberland County), Boiling Spring, Forked Spring, Mammoth Spring (Mifflin County), and Nippono Spring. Most of the large springs discharge from carbonate rocks (123 out of 137), 9 discharge from clean sandstone, 3 from shale and other interbedded rock types, and 2 from unconsolidated material.

SELECTED REFERENCES

Flippo, H.N. Jr., 1974, Springs of Pennsylvania: Pennsylvania Department of Environmental Resources, Water Resources Bulletin 10, 46 p.

Koester, H.E., and Miller, D.R., 1982, Ground-water quality and data on wells and springs in Pennsylvania, Volume II--Susquehanna and Potomac River Basins: U.S. Geological Survey Open-File Report 81-329, 131 p.

Lloyd, O.B., and Carswell, L.D., 1981, Groundwater resources of the Williamsport region, Lycoming County, Pennsylvania: Pennsylvania Geological Survey, 4th ser., Water Resources Report 51, 68 p.

Lohman, S.W., 1937, Ground water in Northeastern Pennsylvania: Pennsylvania Geological Survey, 4th ser., Water Resources Report 4, 312 p.

----- 1938, Ground water in south-central Pennsylvania: Pennsylvania Geological Survey, 4th ser., Water Resources Report 5, 315 p.

Meinzer, O.E., 1927, Large springs in the United States: U.S. Geological Survey Water-Supply Paper 557, 94 p.

Royer, D.W., 1983, Summary groundwater resources of Lebanon County, Pennsylvania: Pennsylvania Geological Survey, 4th ser., Water Resources Report 55, 84 p.

Shuster, E.T., and White, W.B., 1971, Seasonal fluctuations in the chemistry of limestone springs--A possible means for characterizing carbonate aquifers: Journal of Hydrology, v. 14, p. 93-128.

----- 1972, Source areas and climatic effects in carbonate groundwaters determined by saturation indices and carbon dioxide pressures: Water Resources Research, v. 8, no. 4, p. 1067-1073.

Taylor, L.E., Groundwater resources of the upper Susquehanna River basin, Pennsylvania: Pennsylvania Geological Survey, 4th ser., Water Resources Report 58, 136 p.

Taylor, L.E., and Werkheiser, W.H., 1984, Groundwater resources of the lower Susquehanna River basin, Pennsylvania: Pennsylvania Geological Survey, 4th ser., Water Resources Report 57, 130 p.

Taylor, L.E., Werkheiser, W.H., duPont, N.S., and Kriz, M.L., 1982, Groundwater resources of the Juniata River basin, Pennsylvania: Pennsylvania Geological Survey, 4th ser., Water Resources Report 54, 131 p.

Taylor, L.E., Werkheiser, W.H., and Kriz, M.L., 1983, Groundwater resources of the West Branch Susquehanna River basin, Pennsylvania: Pennsylvania Geological Survey, 4th ser., Water Resources Report 56, 143 p.

SELECTED REFERENCES--Continued

White, W.B., 1969, Conceptual models for carbonate aquifers: Ground Water, v. 7, no. 3, p. 15-21.

Wood, C.R., and MacLachlan, D.B., 1978, Geology and groundwater resources of northern Berks County, Pennsylvania: Pennsylvania Geological Survey, 4th ser., Water Resources Report 44, 91 p.

Table 2.--Records of the large springs in the Valley and Ridge physiographic province of Pennsylvania

[Discharge in gallons per minute; --, no data available]

Spring no.	Latitude	Longitude	Spring name	Owner	Hydrogeologic unit[1]	Water use[2]	Date of discharge measurement	Method of measurement[3]	Discharge
				BEDFORD COUNTY					
Bd 3	400130	782629	Bubbling Spring	Hartley, O.C.	341CSKL	H	09-30-33	E	100
Bd 4	400926	783451	Spring Meadow Spring	Reynoldsdale Hatchery	341CSKL	Q	09-18-33	R	1,800
							11-10-71	R	1,600
Bd 10	400201	783949	Living Water Spring	United Church of Christ	344ODOP	R	11-11-71	R	1,310
Bd 16	400317	782147	--	--	354CLNN	--	01-29-69	R	210
Bd 24	401015	782410	--	Ferry, Richard	367NNLK	--	07-31-85	C	258
Bd 26	401010	782509	--	Beach, R.	367NNLK	--	07-31-85	C	1,010
Bd 27	401307	782428	Maria Spring	Claycomb, Clyde D.	371GBRG	--	08-01-85	C	653
Bd 28	395514	783022	--	--	367NNLK	--	08-05-85	C	263
				BERKS COUNTY					
Be 6	402101	761055	--	Bethany Childrens Home	371SZCK	T	11-18-70	E	700
							11-10-71	C	68
Be 7	402258	755639	Mammoth Springs	Snyder, Paul	371MLBG	U	11-09-71	C	890
Be 8	402132	755620	--	Carpenter Technology Corp.	371MDCK	N	00-00-66	R	560
Be 9	401934	755606	--	Hopper Paper Co.	374BSPG	N	00-00-65	R	250
Be 10	402055	760700	Big Spring	Thompson, F.B.	367EPLR	H	11-10-71	C	2,640
Be 12	402035	760056	--	Reedy, Laura	364ONLN	U	11-10-71	C	342
Be 14	402823	755339	--	Allentown Portland Cement Co.	364JKBG	J	08-10-71	R	150
Be 15	402741	755318	Peters Creek Spring	City of Reading	367EPLR	P	11-08-71	C	2,270
Be 16	403058	754545	--	Borough of Kutztown	367EPLR	U	11-08-71	C	910
Be 17	402536	755538	--	Geiles, Cecilia	371TCKR	U	03-17-72	E	900
Be 18	402537	755534	--	Myers Canning Co.	371TCKR	U	03-17-72	E	900
				BLAIR COUNTY					
Ba 11	402816	781609	Flowing Spring	Penn Central Railroad	351TNLY	H	10-10-33	E	200
Ba 12	402730	781210	Big Springs	West Virginia Pulp and Paper Co.	371GBRG	N	00-00-08	R	3,640
							00-00-33	R	4,150
							08-16-49	R	2,330
							11-10-71	E	3,700
Ba 14	403912	781539	Cold Spring	West Virginia Pulp and Paper Co.	347KRTL	H	00-00-33	E	1,500
							11-08-71	Z	396
Ba 16	401605	782737	--	General Refractories Co.	347KRTL	P	00-00-33	E	100
Ba 17	401959	782404	Roaring Spring	Roaring Springs Blank Book Co.	367NTTN	N	00-00-08	R	5,500
							07-03-44	R	4,680
							11-10-71	E	4,280
Ba 19	402521	781615	--	Hartman, R.C.	367BFAX	H	00-00-33	E	250
Ba 20	402511	781618	--	McAllister, Ida	367BFAX	H	10-00-33	R	1,500
							11-10-71	E	1,410
Ba 21	403621	781218	Arch Spring	Means, H.C.	367LBRG	U	10-00-33	E	2,000
							06-20-44	R	7,430
							11-09-71	R	13,500
Ba 22	404013	781431	Big Spring	City of Tyrone	347KRTL	U	06-23-44	R	415
							11-09-71	R	104
				CENTRE COUNTY					
Ce 1	404808	775049	Thompson Spring	Penn State University	367AXMN	T	06-19-44	R	3,750
							11-09-71	R	2,700
Ce 2	404844	775031	O.H. Bathgate Spring	Bathgate, J.W. and D.H.	367NTTN	S	00-00-04	R	520
							11-09-71	R	540
Ce 3	405300	773631	Penns Cave Spring	Campbell, W.P.	364NLMN	C	08-13-44	R	4,700
							11-15-71	R	3,420
Ce 4	405121	773431	Rising Spring	--	364BSHL	P	07-07-34	E	3,000
							11-16-71	R	5,400
Ce 5	405432	774654	Bellefonte (Big) Spring	Bellefonte Borough Water Dept.	367BLFN	P	04-06-28	R	8,000
							06-16-44	R	7,900
							11-11-71	R	7,500
Ce 6	405551	772611	--	Rebersburg Water Co.	361BDEG	P	07-11-34	E	200
							07-23-62	E	30
Ce 11	405145	774526	Blue (Shutgart) Spring	Bellefonte Fish Hatchery	364BSHL	Q	00-00-34	E	3,500
							07-03-44	R	5,180
							11-09-71	R	2,270
Ce 12	405300	774737	--	Bellefonte Fish Hatchery	371GBRG	Q	00-00-33	R	3,000

Table 2.--Records of the large springs in the Valley and Ridge physiographic province of Pennsylvania

[Discharge in gallons per minute; --, no data available]

Spring no.	Latitude	Longitude	Spring name	Owner	Hydrogeologic unit[1]	Water use[2]	Date of discharge measurement	Method of measurement[3]	Discharge
				CENTRE COUNTY--Continued					
Ce 14	404221	775805	Rock Spring	Fry Estate	367BLFN	H	07-16-34	E	1,000
							04-10-67	R	5,400
							04-27-67	R	9,450
							05-15-67	R	4,810
							05-25-67	R	5,400
							06-15-67	R	1,750
							06-29-67	R	900
							07-13-67	R	1,530
							07-26-67	R	3,150
							08-11-67	R	1,800
							08-24-67	R	900
							09-06-67	R	315
							10-07-67	R	225
							10-20-67	R	2,650
							11-21-67	R	1,120
							12-05-67	R	1,480
							12-15-67	R	11,200
							01-18-68	R	3,370
							07-02-68	R	1,350
							11-09-71	R	1,710
							08-07-85	R	333
Ce 15	404348	775307	--	--	361BDEG	P	07-00-34	E	120
Ce 16	405248	774740	Forked (Paradise) Spring	Bellefonte Fish Hatchery	371GBRG	Q	07-03-44	R	2,580
							04-19-67	R	18,000
							05-04-67	R	16,600
							05-18-67	R	18,400
							06-15-67	R	13,900
							06-27-67	R	13,500
							07-12-67	R	13,000
							07-27-67	R	13,900
							08-10-67	R	13,900
							08-23-67	R	13,000
							09-08-67	R	10,800
							10-03-67	R	12,100
							10-26-67	R	13,500
							11-15-67	R	12,600
							11-29-67	R	12,600
							12-16-67	R	11,700
							01-20-68	R	11,200
							08-12-68	R	10,300
							11-10-71	C	3,930
Ce 17	405324	774537	Axemann Spring	White, B.C.	367NTTN	H	06-17-44	C	2,030
							08-08-85	C	943
Ce 18	405105	774921	Benner (Rock) Spring	Benner Research Station	371MINS	Q	07-03-44	C	7,300
							11-10-71	C	4,080
Ce 19	405420	774642	Kelly Spring	Titan Mfg. Co.	367NTTN	N	07-03-44	R	7,000
							11-10-71	R	8,600
Ce 23	405241	772802	Weaver Spring	--	364CBSN	U	04-20-67	R	3,150
							05-04-67	R	3,150
							05-18-67	R	4,950
							06-14-67	R	3,150
							06-27-67	R	1,350
							07-27-67	R	4,500
							08-10-67	R	5,400
							08-23-67	R	3,600
							09-09-67	R	1,350
							10-03-67	R	1,350
							10-26-67	R	13,500
							11-28-67	R	5,400
							12-14-67	R	8,100
							01-19-68	R	1,800
							08-14-68	R	900
							09-09-68	R	450
							08-14-85	C	392
Ce 24	405213	772716	Coburn Spring	--	364BSHL	U	04-20-67	R	788
							05-04-67	R	918
							05-18-67	R	932
							06-14-67	R	527
							06-27-67	R	450
							07-12-67	R	459
							07-27-67	R	279
							08-10-67	R	702

Table 2.--Records of the large springs in the Valley and Ridge physiographic province of Pennsylvania

[Discharge in gallons per minute; --, no data available]

Spring no.	Latitude	Longitude	Spring name	Owner	Hydrogeologic unit[1]	Water use[2]	Date of discharge measurement	Method of measurement[3]	Discharge
				CENTRE COUNTY--Continued					
Ce 24--Continued							08-23-67	R	374
							09-09-67	R	225
							10-03-67	R	608
							10-26-67	R	752
							11-14-67	R	2,400
							01-19-68	R	256
							06-21-68	R	383
							08-00-74	R	450
							08-15-85	R	126
Ce 25	405525	772904	Spring Bank	--	364CBSN	U	04-20-67	R	1,290
							05-04-67	R	1,200
							05-18-67	R	900
							06-14-67	R	563
							06-27-67	R	580
							07-12-67	R	405
							07-27-67	R	275
							08-10-67	R	738
							08-23-67	R	270
							09-09-67	R	383
							10-03-67	R	315
							10-26-67	R	2,070
							11-14-67	R	1,800
							11-28-67	R	900
							12-14-67	R	1,260
							01-19-68	R	414
							05-30-68	R	1,030
Ce 32	404730	774454	--	Bickle, Cindy	364CBSN	--	08-07-85	C	2,490
				CLINTON COUNTY					
Cn 2	410324	772811	--	Valley Dairy	367BLFN	H	07-25-34	E	2,000
							11-11-71	R	4,000
							08-13-85	C	2,060
Cn 3	410504	772728	Big Spring	Cedar Spring Fish Hatcheries	367BLFN	U	07-30-34	E	1,000
Cn 4	410145	771840	Kemmerer Spring	Kemmerer, John	367BLFN	S	07-20-34	E	300
Cn 7	410002	773203	Steel Spring	U.S. Bureau of Fisheries	364BSHL	Q	00-00-33	E	2,000
Cn 8	410059	773150	--	Gribe, C.B.	367BLFN	H	08-13-85	C	1,450
Cn 11	410013	773201	Washington Furnace Spring	U.S. Bureau of Fisheries	367BLFN	Q	07-04-44	C	1,760
							11-09-71	C	1,870
Cn 12	410258	773132	Cedar Spring	Tomalomis	367AXMN	Z	07-04-44	C	1,000
							11-10-71	E	1,440
							08-12-85	C	1,070
Cn 13	410248	773148	--	Long, J.F.	367BLFN	Q	11-10-71	C	570
Cn 14	410312	773103	Lamey Spring	Lamey, John	367AXMN	U	11-10-71	C	980
Cn 15	410317	773058	Crystal Spring	Pa. Fish Commission	367AXMN	Q	07-04-44	C	4,170
							11-10-71	C	3,700
							08-12-85	C	2,940
Cn 16	410322	773055	McLane Spring	--	367AXMN	U	07-04-44	C	890
							11-10-71	R	670
							08-12-85	C	500
Cn 17	405857	772800	Ruhl Spring	U.S. Bureau of Fisheries	364CBSN	Q	07-04-44	C	5,100
Cn 18	405857	772800	Seven Springs	U.S. Bureau of Fisheries	364CBSN	Q	07-04-44	C	5,900
Cn 19	410058	773152	Lamar Spring	--	367BLFN	U	08-13-44	C	1,440
							11-09-71	C	1,100
Cn 21	405938	772503	--	--	364BSHL	U	11-10-71	C	13,000
							08-14-85	C	1,290
Cn 24	410145	771844	--	--	367BLFN	U	08-15-85	E	100
				CUMBERLAND COUNTY					
Cu 1	401419	765708	--	Hampden Township	361MRBG	U	04-13-70	E	450
							11-12-71	R	350
Cu 2	401344	765514	Eichelberger Spring	Toray Investment Co.	364STPL	U	11-05-70	C	1,450
							11-12-71	R	990
Cu 3	401339	765507	Spring Lake Spring	Weaver, Marlin	364STPL	I	11-06-70	R	420
							11-12-71	R	290
Cu 4	401428	770025	Silver Spring	Silver Spring Prsbytrn. Church	367RCKR	U	11-06-70	C	1,690
							11-11-71	C	1,890

Table 2.--Records of the large springs in the Valley and Ridge physiographic province of Pennsylvania

[Discharge in gallons per minute; --, no data available]

Spring no.	Latitude	Longitude	Spring name	Owner	Hydrogeologic unit[1]	Water use[2]	Date of discharge measurement	Method of measurement[3]	Discharge
Cu 5	401158	770153	Trindle Spring	Weber, Robert	371SDGV	I	11-06-70	C	960
							11-11-71	C	730
Cu 6	400901	770745	Boiling Springs	Bucher, J.B.	371ELBK	P	06-10-44	R	18,300[a]
							07-07-44	C	15,700
							02-12-52	R	17,000
							08-20-65	R	12,200
							01-17-67	R	10,500
							12-08-67	R	11,300
							11-08-71	R	10,800
Cu 8	400607	771843	Huntsdale Hatchery Spring	Pa. Fish Commission	377TMSN	Z	07-07-44	C	320
							11-18-71	R	250
Cu 9	400609	771845	Huntsdale Hatchery Spring No. 2	Pa. Fish Commission	377TMSN	Z	07-07-44	C	490
							11-09-71	R	275
Cu 10	400606	771835	Huntsdale Hatchery Spring No. 3	Pa. Fish Commission	377TMSN	Z	07-07-44	C	5,100[b]
Cu 12	400611	771836	Huntsdale Hatchery Spring No. 5	Pa. Fish Commission	377TMSN	Z	07-07-44	C	560
Cu 13	400604	771837	Huntsdale Hatchery Spring No. 6	Pa. Fish Commission	377TMSN	Z	07-07-44	C	2,450[c]
Cu 15	400618	771806	Huntsdale Hatchery Spring No. 8	Pa. Fish Commission	377TMSN	Z	07-07-44	C	1,480
							11-17-71	R	720
Cu 16	401003	771553	Alexander Spring	Wyrick, Raul E.	367SNNG	U	11-13-70	C	1,350
							11-12-71	R	910
Cu 17	400941	771859	Mountrock Spring	Capon, Sidney A.	367SNNG	U	11-13-70	E	1,500
							11-12-71	R	840
Cu 18	401009	771840	--	--	367SNNG	U	11-13-70	C	800
							11-11-71	R	660
Cu 19	401241	771005	--	U.S. Government	364STPL	P	11-16-70	C	1,740
							11-08-71	R	1,180
Cu 20	401252	771023	--	U.S. Government	364STPL	U	11-16-70	E	1,800
Cu 21	401240	770955	--	Keim, G. Richard	364STPL	U	11-08-71	R	1,000
Cu 22	400744	772429	Big Spring	Pa. Fish Commission	371SDGV	Z	06-09-44	R	13,900
							07-07-44	R	12,900
							08-17-49	R	12,000
							08-20-65	R	10,800
							01-13-67	R	7,500
							01-17-67	R	8,200
							10-16-67	R	10,300
							10-05-71	C	12,000
							11-11-71	R	11,400
Cu 23	400841	772745	Green Spring	Strohm, Robert	364CBBG	Z	10-28-70	E	1,400
							11-17-70	E	2,500
							11-11-71	R	900
Cu 24	400231	773056	Dykeman Spring	Borough of Shippensburg	371ELBK	P	07-06-44	R	1,450
							11-10-71	R	690
Cu 25	401018	772338	Cool Spring	Borough of Newville	364STPL	P	08-11-71	E	320
Cu 26	400603	771840	Huntsdale Hatchery Spring No. 9	Pa. Fish Commission	377TMSN	Q	09-22-71	C	850
							11-09-71	R	775
Cu 28	400918	772637	--	Hostetter, John	364STPL	H	08-17-71	E	200
Cu 30	400943	770050	--	LaFond, Edward	371ELBK	U	11-11-71	R	1,460
Cu 31	400933	770603	--	--	371ELBK	U	07-13-75	R	2,160
				FRANKLIN COUNTY					
Fr 1	394731	774301	Moss Spring	Borough of Greencastle	367RCKR	P	07-06-44	R	710
							11-10-71	C	560
Fr 2	395412	773602	Falling Springs	Mico Corporation	371ELBK	U	07-06-44	C	1,880
							11-10-71	C	1,680
Fr 3	395417	773558	Falling Springs	Lesher, Chester	371ELBK	U	07-06-49	C	890
							11-10-71	C	850
Fr 4	394758	774133	Oak Spring	--	367SNNG	H	09-05-68	C	330
							03-13-69	C	280
Fr 5	395920	774039	Rocky Spring	U.S. Government	364CBBG	T	08-19-50	W	175
Fr 11	394417	773208	Hoover Spring	Rouzerville Water Co.	377TMSN	P	--	R	500
							10-13-77	E	530
Fr 12	395434	775416	--	--	361MRBGL	U	10-13-77	E	530
Fr 14	400222	773528	--	--	364STPL	U	10-18-78	C	620
Fr 15	394929	773414	--	Barkdoll, Paul	377WSBR	N	09-25-78	E	450
Fr 16	400220	773530	--	--	364STPL	U	10-18-78	C	1,040
Fr 17	395008	774235	--	Gibble, Ray	364STPL	U	09-27-78	E	600
Fr 18	394725	773421	Nunnery Spring	Noll, John	377WSBR	I	10-04-78	C	1,190
Fr 19	394346	773213	Lecron Spring	Lecron, Abram	377TMSN	H	11-06-78	C	258

Table 2.--Records of the large springs in the Valley and Ridge physiographic province of Pennsylvania

[Discharge in gallons per minute; --, no data available]

Spring no.	Latitude	Longitude	Spring name	Owner	Hydrogeologic unit[1]	Water use[2]	Date of discharge measurement	Method of measurement[3]	Discharge
				FRANKLIN COUNTY--Continued					
Fr 20	395222	775605	--	Rice, Richard	367PBGS	Z	06-19-79	C	430
Fr 21	395014	775538	--	Johnston, Thomas H.	364CBBG	U	06-19-79	M	525
Fr 22	395021	775132	--	--	367PBGS	U	06-19-79	C	1,300
Fr 23	394342	773950	Big Spring	--	367SFRS	U	06-22-79	C	2,500
				FULTON COUNTY					
Fu 1	395036	780205	Big Spring	Norton, D.M.	364BKMN	U	10-13-33	E	500
				HUNTINGDON COUNTY					
Hu 1	403919	781210	Hundred Springs	Grier Waterworks	367MNLK	P	08-00-37	E	2,800
Hu 2	404132	780143	Double Spring	Grier Waterworks	367NTTN	P	09-05-33	R	500
							11-08-71	R	420
Hu 4	403252	775827	Warm Spring	Layne, Dr. A.	347RDGL	U	09-11-37	E	750
							11-09-71	R	243
Hu 9	402935	780140	Prices Spring	State of Pa.	347RDGL	T	12-05-32	C	585
							02-16-33	C	690
Hu 10	401743	780933	--	--	327MCCK	--	06-20-72	E	25
							05-31-73	E	185
Hu 12	403702	780754	Spruce Creek Spring	--	367NNLK	C	04-10-67	R	99
							06-15-67	R	338
							08-11-67	R	449
							08-24-67	R	225
							09-06-67	R	788
							10-07-67	R	900
							10-20-67	R	563
							01-18-68	R	1,350
Hu 13	403408	780924	Tippery Cave Spring	--	367BFAX	U	04-10-67	R	2,290
							04-27-67	R	2,700
							05-15-67	R	3,730
							06-15-67	R	2,340
							07-26-67	R	2,110
							08-24-67	R	1,750
							09-06-67	R	1,930
							10-07-67	R	1,750
							10-20-67	R	585
							11-02-67	R	1,260
							11-21-67	R	1,080
							12-05-67	R	1,480
							12-15-67	R	2,110
							01-18-68	R	1,350
Hu 14	403406	780924	Near Tippery Spring	--	367BFAX	U	04-10-67	R	720
							04-27-67	R	1,300
							05-15-67	R	1,350
							07-26-67	R	1,710
							12-15-67	R	1,300
				LEBANON COUNTY					
Lb 18	401948	762945	Penryth Spring	Annville Water Co.	367EPLR	--	07-11-61	E	1,000
							11-10-71	R	525
Lb 52	401924	761551	--	Zimmerman, Abraham	371SZCK	H	07-30-57	E	100
				LEHIGH COUNTY					
Le 14	403543	752853	Crystal Spring	City of Allentown	371ALNN	P	10-18-51	E	1,400
Le 15	403447	753318	Schantz Spring	City of Allentown	364BKMN	P	04-00-68	C	5,000
Le 17	403526	752908	15th Street Spring	City of Allentown	371ALNN	U	11-20-51	E	50
							09-17-68	R	470
Le 65	403741	752929	Helfrich's Spring	McCready, Horace	367EPLR	H	12-23-54	E	800
							09-05-68	R	975
Le 66	403440	753238	Poorhouse Spring	Lehigh County	371ALNN	U	04-26-67	E	170
Le 71	403533	753203	Trexler Spring	Lehigh County	371ALNN	R	04-18-67	E	125
Le 78	403353	753049	Fish Hatchery Spring	City of Allentown	371ALNN	R	09-04-68	R	1,200
				LUZERNE COUNTY					
Lu 8	410200	755419	--	Freeland Water Co.	327MCCK	P	09-08-30	R	300

Table 2.--Records of the large springs in the Valley and Ridge physiographic province of Pennsylvania

[Discharge in gallons per minute; --, no data available]

Spring no.	Latitude	Longitude	Spring name	Owner	Hydrogeologic unit[1]	Water use[2]	Date of discharge measurement	Method of measurement[3]	Discharge
				LYCOMING COUNTY					
Ly 1	410925	771313	Nippono (Enchanted) Spring	Carpenter, Clyde	364RDMN	U	10-01-32	R	2,300
							11-12-71	C	20,000
							03-00-77	R	66,300
Ly 2	411336	765718	Gibson Hollow Spring	Montoursville Municipal Water Co.	357TCRR	P	02-00-59	E	200
				MIFFLIN COUNTY					
Mf 1	403347	774627	Swarey Spring	Bender, Iddo W.	367BLFN	H	00-00-34	E	750
							11-11-71	R	1,130
Mf 2	403933	773851	Yoder Spring	Reed, James	367AXMN	H	00-00-34	E	500
							11-08-71	Z	1,230
Mf 3	404147	773336	Mammoth Springs	--	364BSHL	U	11-11-71	R	14,600
Mf 4	404547	773132	--	--	361RDVL	U	11-16-71	R	107
				MONROE COUNTY					
Mo 1	410101	751211	--	Stroudsburg Water Supply Co.	112DRFT	P	08-19-30	C	650
				NORTHAMPTON COUNTY					
Np 3	404325	751450	--	Johnson, Leona	364BKMN	--	10-04-25	R	150
Np 4	405325	751400	Muffley Spring	Banger Water Co.	112MORN	P	10-03-25	R	200
				NORTHUMBERLAND COUNTY					
Nu 1	405440	765025	--	Penn Central Railroad	347KRTL	N	10-27-30	E	350
				UNION COUNTY					
Un 1	405445	770330	Chambers Spring	Mifflinburg Municipal Water Co.	347KRTL	P	00-00-34	E	1,500
							06-00-57	R	270
Un 3	405329	770522	--	Chambers Estate	347KRTL	H	00-00-34	E	250
Un 5	405518	770231	Thompson Spring	Thompson and Bogenrief	347KRTL	U	00-00-34	E	200

[1]Hydrogeologic unit, as used herein, is the geologic unit from which the spring issues. Hydrogeologic unit codes as defined for the Ground-Water Site Inventory database of the U.S. Geological Survey, Pennsylvania district: 112DRFT=drift; 112MORN=moraine deposits; 327MCCK=Mauch Chunk Formation; 341CSKL=Catskill Formation; 344ODOP=Onondaga, Old Port Formations, undifferentiated; 347KRTL=Keyser, Tonoloway Formations, undifferentiated; 347RDGL=Ridgeley Sandstone; 351TNLY=Tonoloway Limestone; 354CLNN=Clinton Formation; 357TCRR=Tuscarora Sandstone; 361BDEG=Bald Eagle Formation; 361MRBG=Martinsburg Shale; 361MRBGL=Martinsburg Shale, lower member; 361RDVL=Reedsville Formation; 364BKMN=Beekmantown Group; 364BSHL=Benner, Snyder, Hatter, Loysburg Formations, undifferentiated; 364CBBG=Chambersburg Formation; 364CBSN=Coburn, Salona, Nealmont Formations, undifferentiated; 364JKBG=Jacksonburg Formation; 364NLMN=Nealmont Formation; 364ONLN=Ontelaunee Formation; 364RDMN=Rodman Limestone; 364STPL=St. Paul Group; 367AXMN=Axemann Formation; 367BFAX=Axemann, Bellefonte Formations, undifferentiated; 367BLFN=Bellefonte Formation; 367EPLR=Epler Formation; 367LBRG=Loysburg Formation; 367NNLK=Nittany, Larke Formations, undifferentiated; 367NTTN=Nittany Formation; 367PBGS=Pinesburg Station Dolomite; 367RCKR=Rockdale Run Formation; 367SFRS=Stoufferstown Formation; 367SNNG=Stonehenge Formation; 371ALNN=Allentown Formation; 371ELBK=Elbrook Formation; 371GBRG=Gatesburg Formation; 371MDCK=Allentown Formation, Maiden Creek Member; 371MINS=Mines Formation; 371MLBG=Allentown Formation, Muhlenberg Member; 371SDGV=Shadygrove Formation; 371SZCK=Snitz Creek Formation; 371TCKR=Allentown Formation, Tuckerton Member; 374BSPG=Buffalo Springs Formation; 377TMSN=Tomstown Formation; 377WSBR=Waynesboro Formation.

[2]Water use codes as defined for the Ground-Water Site Inventory database of the U.S. Geological Survey, Pennsylvania district: C=Commercial, H=Domestic, I=Irrigation, J=Cooling, N=Industrial, P=Public Supply, Q=Aquaculture, R=Recreation, S=Stock supply, T=Institutional, U=Unused, Z=Other.

[3]Method of discharge measurement codes as defined for the Ground-Water Site Inventory database of the U.S. Geological Survey, Pennsylvania district: C=Current meter, E=Estimated, M=Totaling meter, R=Reported, W=Weir, Z=Other.

[a]Reported discharge includes flow from Cu 7 (Boiling Springs).

[b]Reported discharge includes flow from Cu 11 (Huntsdale Hatchery Spring No. 4).

[c]Reported discharge includes flow from Cu 14 (Huntsdale Hatchery Spring No. 7).