Records of Springs in the Snake River Valley Jerome and Gooding Counties, Idaho, 1899-1947

By R. L. NACE, I. S. McQUEEN, *and* ARTHUR VAN'T HUL

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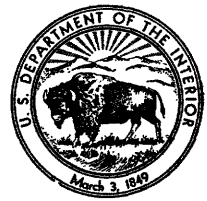

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By R. L. NACE, I. S. McQUEEN, and ARTHUR VAN'T HUL

ABSTRACT

Many springs and seeps discharge water from the north wall of the valley of the Snake River between Milner and Bliss, Idaho. These are fed by a large ground-water body lying east and north of the river, beneath the Snake River Plain. Much ground water is pumped on the plain, many irrigation wells having been drilled since 1946. Heavy withdrawal of ground water from wells may alter the discharge rates and regimens of the springs and may affect downstream flow of the river. For that reason, the historic record of discharge from the springs is an important part of the basis on which hydrologic changes can be determined. The records also would facilitate appraisal of the total ground-water resources of the Snake River Plain.

This report brings together in a single volume all obtainable records for the period 1899–1947. The report also includes descriptive data and a brief history of work done.

The springs occur in a 40-mile reach of the valley of the Snake River between Milner Dam and Bliss. Most are on the north side of the river but a few are on the south.

The earliest measurements of record were made by F. S. Shirley and N. S. Dils, of the U. S. Geological Survey, in 1899. The next were by J. D. Stannard for the Idaho State Engineer and by Dils in 1902. Few measurements were made from 1903 to 1916. Somewhat more systematic measurements were made by the Geological Survey and by local agencies in 1917–20, 1923–25, and 1931, and at several intervals thereafter. In 1950 the Geological Survey began continuous, systematic measurements by installing and operating gaging stations on four representative springs and by making yearly direct measurements of all large springs. The recent records are not included in this report; they have been published yearly in a series of reports on stream discharge.

The report includes lists of all published sources from which data were compiled, and cites many unpublished sources. The principal workers and agencies that have obtained records are listed also.

The quality and accuracy of the compiled records, as might be expected, are not uniform, as the records were collected under varying circumstances, by many individuals, and according to changing or differing standards. The continuity is generally poor. Nevertheless, the compilation represents the base from which further work must start and is an extremely valuable record. It represents about 30 large springs and groups of springs, having discharge rates ranging from a fraction of a cubic foot per second to well over 1,000 cfs. Many smaller springs and seeps never have been measured.

The fluctuation indexes for individual springs or groups range from 2 to 41 percent. The fluctuation index is the mean deviation of the discharge rate from the arithmetic mean, expressed as a percentage of the arithmetic mean. Although to some extent the indexes are a measure of the consistency of the record, they also seem to reflect actual differences in range of discharge, and they indicate that springs upstream in the Snake River valley fluctuate through a wider range than do those downstream. The fluctuations are rather slow, which reflects the equalizing influence of the large ground-water reservoir that supplies the springs.

INTRODUCTION

PURPOSE AND SCOPE OF REPORT

The scores of springs and seeps that discharge from the north wall of the valley of the Snake River between Milner and Bliss, Idaho, are fed by a large body of ground water that underlies the Snake River Plain east and north of the river. East of the springs area, ground water is pumped to irrigate many thousands of acres of farm land. Much of this land was brought under irrigation within the past 10 years, and extensive additional development is expected. Downstream from the springs, use of water in the Snake River is chiefly for generation of power and for irrigation. Heavy pumping on the Snake River Plain may alter the discharge rates or the regimens of the springs. The effects of pumping would be accurately determinable only from adequate long-term records, and the historical record of discharge from the springs is of basic importance in relation to current and future developments.

For most of the springs there are only a few miscellaneous discharge records, but the aggregate record is a large and useful fund of information. Much of the data has been published piecemeal in numerous earlier reports, many of which now are out of print. A substantial amount of the unpublished data is not generally available.

To provide a systematic and continuous record for what are believed to be representative large springs in the Snake River valley, the U. S. Geological Survey in 1950 established gaging stations on the outlets from four springs, for which continuous discharge records are obtained. Also, measurements of the discharge from most of the large springs are made once yearly. The records from gages and direct measurements are published annually in Geological Survey Water-Supply Papers in part 13 of the series "Surface Water Supply in the United States." The purpose of the present report is to make available in a single volume all known records of spring discharge for the period before 1948. The oldest available records are for 1899. Records from 1899 through 1947 are included in this report, together with pertinent descriptive data and a brief history of work done. No records have been found for the years 1948 and 1949.

The basic fact-finding studies and analyses of records will facilitate future appraisal of the total ground-water resources of the Snake River Plain. Some of the work was performed in cooperation with the Idaho State Department of Reclamation, and some was part of a Federal survey project. Cooperative ground-water investigations by the Geological Survey are directed jointly by A. N. Sayre, chief of the Ground Water Branch, Washington, D. C., and Mark R. Kulp, State Reclamation Engineer, Boise, Idaho. Ground-water work in Idaho was supervised by R. L. Nace, who was district geologist, Boise, from July 1946 through June 1956. Since that time the work has been under the direction of M. J. Mundorff, district geologist, Boise. T. R. Newell, district engineer, Surface Water Branch, U. S. Geological Survey, Boise, supervises surface-water investigations by the Geological Survey in Idaho.

LOCATION AND EXTENT OF AREA

The springs for which records are contained in this report are in a 40-mile reach of the main-stem valley of the Snake River between Milner Dam and Bliss, and in short tributary valleys (fig. 1). The valley of the Snake at most places in this reach is a gorge that has a maximum depth of about 650 feet below the general level of the adjoining lava plain. Some of the deepest reaches of the canyon are only a few hundred feet wide at the level of the rim. The springs occur at various altitudes, ranging from below the level of the water surface in the Snake River to several hundred feet above river level. Many of the larger springs issue at the heads and along the floors of spring alcoves, which are tributary canyons.

All the large springs recorded in this report are on the north side of the Snake River in Jerome and Gooding Counties, within Ts. 6 to 9 S., Rs. 13 to 18 E., Boise baseline and meridian. A few springs and seeps are present on the south side of the river, but little information about them is available. All authentic records of springs are included, with citations of the sources of the records and credit to persons or agencies who made the measurements.

ACKNOWLEDGMENTS

Most measurements of the discharge from springs in the valley of the Snake River were made by the Geological Survey, the Twin Falls North Side Canal Co. (formerly "Land & Water Co."), or the Idaho Power Co. The latter two agencies collaborated generously with the Geological Survey to make their records available to the public. C. E. Tappan, of the Idaho Power Co. (retired), was especially helpful. Lynn Crandall, Watermaster for Idaho Water District 36, whose knowledge of the springs spans nearly 40 years, made many sugges-

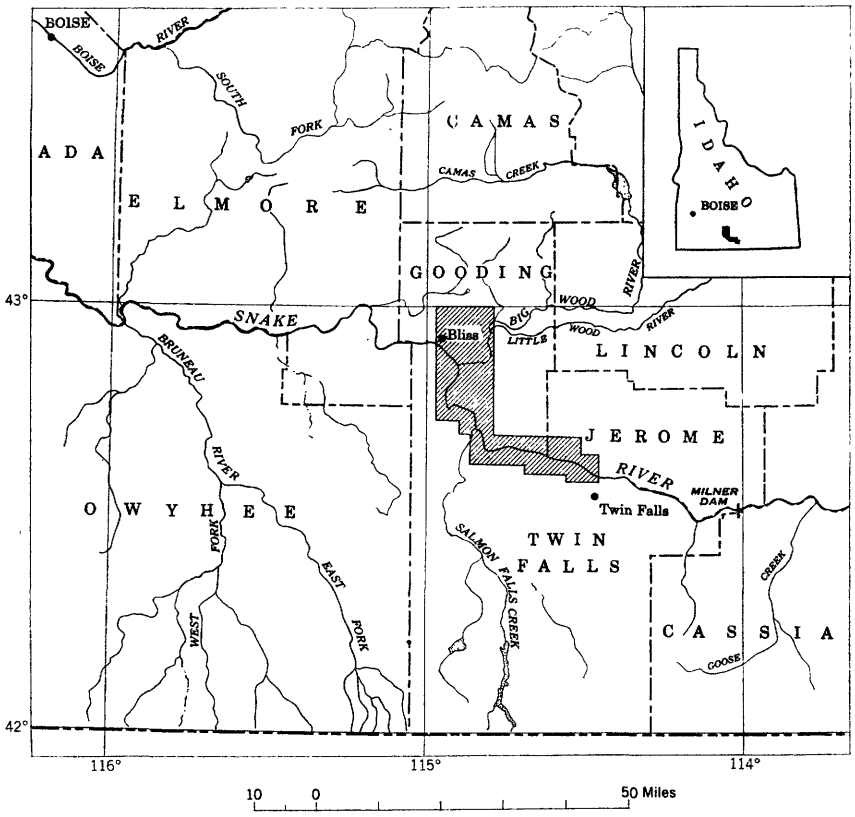

FIGURE 1.—Ind ex map of southern Idaho, showing area covered in this report.

tions and contributed useful miscellaneous information. Compilation of published and unpublished records was begun by R. L. Nace in 1947, continued intermittently by I. S. McQueen, in several later years, and completed by Nace and Van't Hul in 1956.

HISTORY OF INVESTIGATIONS

EARLY PERIOD

On March 27, 1899, Frank S. Shirley, a hydrographer of the U. S. Geological Survey, established a gage near the mouth of the Malad River. Several discharge measurements were made by Shirley and N. S. Dils in 1899, and daily staff-gage readings were made by a local observer. Concurrent measurements were made on the Little Wood and Big Wood Rivers at Toponis, a railroad stop near the present site of Gooding, Idaho, upstream from the Malad River gage.

In April 1902, J. D. Stannard, assistant in charge of irrigation investigations, Office of Experiment Stations, U. S. Department of

Agriculture, made a series of measurements of increments of the Snake River "between the point of diversion [Milner Dam] of the proposed Twin Falls canal system and the mouth of the Malad River." Those measurements were made under the direction of Prof. Elwood Mead at the request of D. W. Ross, Idaho State Engineer, and were published in a report (Ross, 1903, p. 159–162) to the Governor.

N. S. Dils, a hydrographer of the Geological Survey, made a series of measurements of the discharge from "springs above Shoshone Falls" on June 10 and 11, 1902. The sum of those measurements has been published (WSP 85, p. 216). Dils also measured the discharge of Blue Lakes Springs in August 1902.

Only a few measurements were made from 1903 to 1916. E. C. LaRue studied the increments of water to the reach of the Snake River between Milner Dam and Shoshone Falls during the low runoff period in November 1906; L. W. Jordan and L. W. Roush measured the discharge in the outlet of Blue Lakes in 1913 and 1914; and L. W. Jordan measured the discharge from Malad Springs in 1913. Records of several measurements between 1910 and 1914 were supplied by the Twin Falls North Side Land & Water Co., and were published in U. S. Geological Survey Water-Supply Paper 774.

From 1917 to 1920 a series of measurements was made by the Twin Falls North Side Land & Water Co. in collaboration with the Geological Survey. About 1921, W. G. Hoyt, of the Geological Survey, began a special investigation of the hydropower potential and possible power-generation sites in the Snake River basin. The work included measurements of the discharge of several springs. The Idaho Power Co., in collaboration with the Geological Survey, made a more intensive study of the springs from 1923 to 1925. The discharge at the outlet of Blue Lakes has been measured several times during most years since 1921 by the Geological Survey. All accessible measurable springs with acceptable measuring sections were measured in 1931 by J. A. Allis of the Geological Survey.

Table 1 is a list of workers whose names appear in the records of discharge measurements. The writers did not have access to many original records and some published records list only surnames, without initials. Some records also do not name the employing agency.

Systematic measurements of the rate of discharge through the outlet of Blue Lakes Springs were made by the following Geological Survey employes during the period 1928–47:

Allis, J. A.	1933
Androw, P. H.	1939
Bailey, E. G.	1931–41
Benedict, P. C.	1936–40
Boyer, M. C.	1929

Comer, A. E	1944–47
Cossey, W	1942
Craig, F. C	1934–36
Espy, Jr., C. J	1937–38
Fiske, C. C	1941–47
Iorns, W. V	1930
Koski, Leonard	1947
Krabler, W. H	1941–47
Miller, T. O	1935–47
Morken, P. G	1941
Newell, T. R	1937
Parsons, W. J	1928
Revell, R. W	1946
Sawyer, L. R	1933
Snell, L. J	1938–40
Spofford, J. R	1946
Thomas, C. A	1942–47
Thomason	1941
Throckmorton, J. R	1935–36
Travis, W. I	1933–47
Wark, E	1935

TABLE 1.—*Personnel and agencies responsible for early discharge measurements*

[ISDR Idaho State Department of Reclamation
IPC Idaho Power Co.
TFNSC Twin Falls North Side Land & Water Co.
USBR U. S. Bureau of Reclamation
USGS U. S. Geological Survey
USDA U. S. Department of Agriculture]

Name	Agency	Years	Name	Agency	Years
Allis, John	USGS	1931	Jensen	TFNSC	1917–20
Benedict, P. C	do	1941	Johnson, Berkely	do	1917–20
Brewer	TFNSC	1917–20	Johnson		1923–25
Bryan, L. L	USGS	1917–20, 1921	Jordan, L. W	USGS	1910–14
			Kief, C. W	do	1917–20
Burdick, L. T	TFNSC	1917–20, 1923–25, 1931	Maxwell		1917–20
			McCombs, John	USGS	1917–20
			McConnel, W. N	TFNSC	1917–20
Carter, G. N	do	1917–20	Newell, T. R	USGS	1941–46
Conover, J. B	do	1917–20	Paulsen, C. G	do	1921
Crandall, Lynn	do	1917–19	Roush, L. W	do	1910–14
Dibble, Barry	USBR	1926	Ryan, A. D	do	1917–20
Dils, N. S	USGS	1899, 1902	Shirley, F. S	do	1899
			Stannard, J. D	USDA	1902
Fiedler, A. G	do	1917–21	Tappan, C. E	IPC	1923–25
Fite, Jerry	IPC	1923–25	Tolman, F. A	ISDR	1927
Golden, A. D	do	1923–25	Vaksvik, K. N	USGS	1923–25
Hapeny	do	1924	Vance, S. E	TFNSC	1917–20
Howard, E. C	USGS	1917–20	Veatch, F. M	USGS	1923–25
Hoyt, W. G	do	1921			

RECENT PERIOD

The development in recent years of large tracts of land on the Snake River Plain, by irrigating with water pumped from wells, has focused attention on the importance of ground water in the economy of southern Idaho. Large additional irrigation developments may create conflicts of rights and interests, and the need for systematic records of the discharge from important springs is apparent. Accordingly, systematic measurements were begun by the Geological Survey in April 1950. Accordingly, four gaging stations are operated to record fluctuations in the discharge from selected springs, and a series of direct measurements is made each year of the discharges from all large springs.

The descriptions herein of measuring sections that are visited once yearly were prepared by W. I. Travis. The records of yearly measurements are published in the series of reports on stream discharge, beginning with the report for 1950.

Sites for the four gaging stations were chosen on the basis of their probable value as an index to variations in the total discharge from all springs in a given segment of the valley of the Snake River, the availability of suitable measuring sections, and the adaptability of the gage installations. Stations were established on outlet channels at Devils Washbowl Spring near Kimberly, Blue Lakes Springs near Twin Falls, Box Canyon Spring near Wendell, and Riley Springs near Hagerman. Records are available from April 1950. The station on Riley Creek was discontinued in June 1951 because construction and operation of a nearby fish hatchery interfered with the accuracy of the record. Two replacement stations were established, one on Riley Creek to gage undiverted water from the springs, and the other on Brailsford ditch to gage water diverted from one of the springs. Because the record was unsatisfactory, the station on Riley Creek was moved in 1955 to a new location on the creek.

REFERENCES AND SOURCES OF INFORMATION

Published basic data were checked against original records and field notes in the files of the Geological Survey. Original records of other agencies were not available, but a few private reports were checked against published records. The publications noted below were studied and applicable records contained in them are incorporated in this report. The principal published sources of information are credited herein, but the reference list does not cite all publications that contain measurement records, because some records are contained in more than one publication. Annual reports and water-supply papers

of the Geological Survey that contain records related to the discharge from the springs are included in the list below:

U. S. Geol. Survey 21st Ann. Rept. pt. 4, p. 406–409, 1901.

Operations at river stations, 1899, Part 4: Geol. Survey Water-Supply Paper 38, p. 353–355, 1900.

Operations at river stations, 1899, Part 5: Geol. Survey Water-Supply Paper 39, p. 453, 1900.

Report of progress of stream measurements, Part 4: Geological Survey Water-supply papers containing records for 1901 to 1906, inclusive:

Calendar year of records	*WSP No.*	*Page*	*Year of publication*
1901	75	202	1902
1902	85	216	1903
1906	214	75	1907

Surface-water supply of the United States, Part 12, North Pacific drainage basins. B, Snake River basin; 1913 to 1934, inclusive:

Water year of records	*WSP No.*	*Page*	*Year of publication*	*Water year of records*	*WSP No.*	*Page*	*Year of publication*
1913	362–b	285	1916	1926	633	257	1931
1914	393	241	1916	1927	653	225	1931
1919–20	513	193–310	1924	1928	673	167–168	1931
1921	533	156–165, 283–286	1925	1929	693	176	1931
				1930	708	183	1932
1922	553	288	1926	1931	723	199	1933
1923	573	252–253	1928	1932	738	192	1934
1924	593	255–257	1929	1933	753	192	1935
1925	613	263–264	1929	1934	768	196	1936

Surface-water supply of the United States, Part 13, Snake River basin; 1935 to 1947, inclusive:

Water year of records	*WSP No.*	*Page*	*Year of publication*	*Water year of records*	*WSP No.*	*Page*	*Year of publication*
1936	813	233	1937	1942	963	225	1944
1937	833	212	1938	1943	983	227	1945
1938	863	231	1939	1944	1013	221	1946
1939	883	264	1940	1945	1043	242	1947
1940	903	241	1941	1946	1063	256	1949
1941	933	240	1942	1947	1093	261	1950

Crandall, Lynn, 1919, The springs of the Snake River Canyon: Proceedings of the Joint Conference of the Irrigation, Engineering, and Agricultural Societies of Idaho, 1918–1919, p. 146–150.

Hoyt, W. G., 1935, Water utilization in the Snake River basin: U. S. Geol. Survey Water-Supply Paper 657, p. 204–205, 267–268.

Ross, D. W., 1903, Biennial report of the State Engineer to the Governor of Idaho for the years 1901–02, Boise, Idaho, p. 159–162.

Russell, I. C., 1902, Geology and water resources of the Snake River Plains of Idaho: U. S. Geol. Survey Bull. 199, 192 p., 25 pls., 6 figs.

Stearns, H. T., Crandall, L., and Steward, W. G., 1938, Geology and groundwater resources of the Snake River Plain in southeastern Idaho: U. S. Geol. Survey Water-Supply Paper 774, p. 154–166.

Tappan, C. E., 1925, Water resources of the Snake River, surface and subsurface, between Shoshone Falls and the Malad River: Idaho Power Co. (unpublished duplicated report), p. 9–14.

QUALITATIVE EVALUATION OF RECORDS

GENERAL BASIS OF EVALUATION

The records compiled in this report represent measurements and observations during 50 years by many individuals, for several organizations, and for several purposes. Quite naturally, the quality and accuracy of the records is not uniform. Some old records are excellent, but others are poor. Review and recomputation by subsequent investigators may have introduced a few errors or confused the identities and locations of some springs and measured sections. For the purpose of this report, the latest computation that appears on original note sheets is assumed to be correct. Where original notes are not available, the earliest published record of a given measurement is assumed to be correct. All available original field notes were studied carefully to glean information or clues that might explain discrepancies in the published records. In a few cases, discrepancies could not be resolved, and these are noted in the text of this report.

CONTINUITY OF RECORDS

Most of the measurements of discharge from the springs in the valley of the Snake River between Milner Dam and King Hill were made during periods of special study in 1902, 1917–20, 1921, 1923–25, and 1931. The discharge from Blue Lakes Spring was measured one or more times each year after 1916, but the continuity of all other records is poor. Many of the springs were measured only once or twice in 50 years. For Blue Lakes and Clear Lakes Springs the daily gage-height and discharge records cover a period of about 3½ years in 1917–20.

ACCURACY AND ADEQUACY OF MEASUREMENTS

Most of the direct measurements of discharge were made carefully and were as accurate as channel conditions and other factors allowed. Channel conditions were so poor in many of the measured sections, however, that high accuracy was difficult or impossible to attain. Channels through blocky basalt talus are rough and difficult to measure. Several measured sections are so low in the valley that backwater from the Snake River during periods of high runoff or artificial regulation interferes with the measurements. Aquatic

vegetation, which is abundant in some channels, interferes with the operation of current meters and affects the relations of stage to discharge at recording-gage installations.

Conditions at several of the springs make accurate measurement of the total flow impossible. Part or all of the water from many springs is discharged through talus, where it cannot be measured. In some spring coves there is substantial unmeasurable underflow through loose basalt. A few springs emerge below the water level in the channel of the Snake River.

Measuring problems at some of the springs are so complicated by irrigation diversions that accurate measurements are impossible during the irrigation season. Waste irrigation water is discharged into several of the spring channels at places where access to the waste channels is extremely difficult. The once-yearly measurements that have been made since 1949 are made in March and April, before irrigation begins, and when diversions and influx of waste water are at a minimum.

Early records did not describe accurately the locations of measured sections; subsequent workers chose different locations but applied the same descriptions, or used different descriptions for the same sections. Therefore, successive measurements, which supposedly represent a single spring at a single measured section, are commonly not comparable and do not indicate correctly changes in the discharge.

The records of spring discharges are fair to excellent as records of the surface flow past a given measured section at a given time. Some, however, are only fair to poor as a measure of the total discharge from a spring or group of springs, or of the trend in discharge fluctuations.

RECORDS OF DISCHARGE FROM SPRINGS

SUMMARY OF RECORDS

Subject to qualifying factors described on following pages, table 2 summarizes the records of measurements of the discharge from springs. The table covers only those springs whose discharge has been measured and recorded three or more times. It excludes single measurements that obviously were not made at the usual measuring section, or that seem to be inconsistent with other measurements.

Measuring sections for some springs did not contain the total ground-water discharge, whereas other measuring sections contained more than the total from a given spring or group. These variations were caused by one or more of the following factors: Unmeasured

irrigation diversions above the measured section; unmeasured inflow of waste surface water above the measured section; unavoidable errors in measurements, caused by channel conditions; and unmeasurable underflow past the measured section. Some factors that contributed to inadequacies in measurements were noted in the preceding section of this report. The principal inadequacies are inherent in the original records, cannot be removed, and could not be adjusted for the summary in table 2. Extreme values of some discharge rates probably reflect one or more of the factors noted above; hence, the tabulated values of maximum and minimum discharge do not necessarily represent actual variations.

The fluctuation index (table 2) affords a common base for comparing the relative amount of fluctuation in the different springs. The absolute values of fluctuation and the absolute departures from simple averages have little comparative value, because the springs range widely in discharge, not all of them are represented by the same number of measurements, and their times of measurement differ. Because of limitations in the adequacy of the basic data, only a few tentative conclusions may be drawn from the fluctuation indexes: (1) Springs from which there are no surface diversions, which receive no extraneous surface inflow, and for which good measuring sections have been maintained at a single location have low indexes; that is, the index indicates the degree of consistency in the measurements. (2) Springs upstream along the Snake River tend to have higher indexes than those downstream. This trend seems to be independent of the quality and constancy of the measuring sections. (3) Discharge rates change rather slowly, reflecting the equalizing influence of the large ground-water reservoir supplying the springs.

The largest recorded discharge rate from a group of springs is 1,804 cfs, from Malad Springs on June 21, 1899. The published figure was obtained by subtracting the combined flow of the Big Wood and Little Wood Rivers at Toponis from the flow of the Malad River at its mouth near Bliss. The increment between the two stations was presumed to be from discharged ground water. However, the discharge in 1899 has not been equaled during subsequent periods of records. Some factor such as ungaged surface inflow may have introduced an error, or there may have been inadequate adjustment for peak-flow travel time through the reach.

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TABLE 2.—*Summary of records of measurements of springs in the Snake River valley between Milner and Bliss*

Name of spring or measuring section	Number of measurements included	Measured discharge (cfs) [1]						Fluctuation index (percent, rounded) [2]
		Maximum	Date	Minimum	Date	Arithmetic mean	Range (max minus min)	
Malad River:								
Above upper dam	13	1,060	8-28-13	600	8-18-17	676	460	11
Do	11	694	7- 8-45	600	8-18-17	633	94	7
Near mouth	8	533	9-18-17	178	7-17-24	289	355	39
Calculated inflow, 1899	[3] 199	1,804	6-21-99	784	5-7, 8-99	1,143	1,020	10
Malad flume	8	1,020	7-17-24	649	9-26-19	892	413	12
King Hill ditch	6	301	8-13-24	[4] 201	8-28-13	260	100	11
Billingsly Creek:								
Curran Spring	3	91.8	9-17-17	50.7	10- 8-31	66	41	27
Near bridge on US Highway 30	[5] 8	234	9-17-17	87	7-10-24	138	147	25
Riley Creek:								
Bickel Springs	7	67.7	9- 6-24	42.2	10- 7-31	55	25.5	12
Near falls	7	137.3	4- ?-02	105	5-29-25	125	32.3	6
Total flow	[5] 5	166	8-26-25	153	10-29-24	159	13	3
Bickel Springs: [6]								
B	6	48.2	8-28-25	36.8	10-29-24	40.3	11.4	7
C	5	11.2	8-15-24	8.1	9-17-24	10.1	3.1	10
D	8	268 268	8-27-25 10- 7-31	157	9-17-17	230	111	15
E	6	120 120	9- 6-24 8-28-25	104	8-14-24	113	16	4
H	6	24.2	7-14-24	20 20	7-13-21 6- 1-25	21.8	4.2	7
I	6	24.0	7-14-24	21.4	8-15-24	22.9	2.6	4
J	3	.78	7-13-21	.74	8-15-24	.76	.04	9
K	5	16.6	8-28-25	11.3	9- 7-24	14.2	5.4	14
L	6	7.9	7-14-24	2.1	8-28-25	5.0	5.8	37
Thousand Springs:								
West channel	4	90.3	7-11-21	42	9-15-17	73.8	48.3	22
East channel	8	730	10- 7-31	478	7-13-21	578	252	9
Combined flow, both channels	[5] 4	656	9-19-18	515	9- 6-19	590	141	9

Sand Springs	[5] 18	100	8-27-25	52	5- 7-12	79.3	48	12
Blue Springs	4	65.6	10- 6-31	48.5	4-?-02	59.1	17.1	9
Box Canyon Spring:								
Below falls	11	356	7-13-21	264	9- 8-24	311	92	8
Near mouth	3	496	4-10-41	450	4-?-02	470	26	4
Banbury Springs	10	128	4-?-13	65.9	4-?-02	105	62.1	13
Clear Lakes Springs:								
Direct measurements	[5] 16	526	5-20-27	410	4-?-13	482	116	8
Staff-gage record	[3] 1,270	544	11-15-17	454	5- 2-18	487	90	2
Briggs Springs	13	181	4-?-13	77.2	4-?-02	124	104	12
Niagara Springs	[5] 7	242	9- 8-17	269	10- 6-31	252	27	3
Crystal Springs	[5] 8	603	8-29-25	374	10-5-31	480	229	10
Blue Lakes Springs:								
Direct measurements	[5] 152	257	10-14-44	80	8-27-02	204	177	6
Staff-gage record	[3] 1,315	230	10-26-20	185	11-15-19	204	45	4
Devils Corral, lower outlet	3	8.4	8 6-23	3.4	4-?-02	5.2	5	41
Devils Corral, upper outlet	7	43.6	9-12-24	14.5	4-?-02	33	29.1	28
Devils Washbowl Spring	4	19.7	8-20-23	12.7	9-17-17	16.1	7	13

[1] Discharge figures are as originally published.

[2] The fluctuation index is the mean deviation of the discharge rates from their arithmetic mean, computed for each spring and expressed as a rounded percentage of the arithmetic mean.

[3] From daily staff-gage record.

[4] Irrigation diversion; measured section may be dry during part of each year.

[5] Published discharge rates are sums of measurements at several sections and are not consistent as to number or locations of those sections.

[6] See figure 2 for location of measured sections.

MISCELLANEOUS EARLY DISCHARGE MEASUREMENTS

Along numerous reaches of the spring-fed channels where measurements were made, the flow of water changes substantially within a few yards. That being so, the spring openings that contribute to the flow at a given measured section can be identified only when the records define precisely the location of that section. Yet some early records define the measuring sections only approximately, or so vaguely that the contributing springs and measured sections cannot be identified with certainty. Accordingly, many of the older recorded measurements cannot be compared with assurance.

MEASUREMENTS OF MALAD, BIG WOOD, AND LITTLE WOOD RIVERS, 1899

Staff gages had been established in June 1896 on the Little Wood and Big Wood Rivers at Toponis, a railroad stop near the present site of Gooding. The Malad Springs contribute a large amount of water to the Malad River, and surveys had been made to determine the practicability of conducting water from the lower reach of the Malad across the Snake, for placer mining and irrigation. In order to determine the yield from the Malad Springs, and the amount of water available for projected new developments, a gage was established near the mouth of the Malad on March 27, 1899.

In published reports usage of the names Malad River and Big Wood River varies. A few examples are of interest:

> Malade River or Big Wood, as it is sometimes called, has its source in the high mountainous area north of Ketchum, Idaho, and flows southerly. (Water-Supply Paper 38, 1900 p. 354).
>
> Malade River, which is formed by the union of Big and Little Wood River . . . (Russell, 1902, p. 127).

Starting with Water-Supply Paper 443 in 1916, "Big Wood River" was used for the main stream from source to mouth, but "Malad" was retained for the power-diversion flume in the lower reach. Stearns and others (1938, p. 74), however, referred to the "Big Wood River, formerly and still locally called the 'Malad River' . . .," but they used "Malad Canyon" when referring to "the deep gorge at the mouth of the Big Wood River." "Little Wood River" has been used rather consistently for the tributary that joins the Big Wood near Gooding. In the present report, "Malad River" is applied to the main stream below the confluence of the two principal tributaries at Gooding; "Little Wood River" is applied to the smaller of the two tributaries above Gooding, and "Big Wood River" to the larger of the two.

Table 3 gives daily increments of discharge in the Malad River in 1899. The increments are assumed to be water discharged by

the Malad Springs. The daily increments were computed from records of discharge measurements and daily gage heights, published in Water-Supply Paper 38 (p. 354–355) and rating tables published in Water-Supply Paper 39 (p. 453). The discharge was computed as differences between the computed flow at Gooding ("Toponis") and Bliss.

TABLE 3.—*Discharge of the Malad Springs, 1899, computed as increments between stations on the Big Wood and Little Wood rivers at Shoshone ("Toponis") and Malad River ("at Bliss")*

[From U. S. Geol. Survey Water-Supply Paper 39, p. 453, 1900]

Day	Increments of discharge (cfs)							
	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.
1	----------	1,076	1,397	1,204	1,071	1,059	1,062	1,083
2	----------	1,395	1,241	1,175	1,069	1,080	1,062	1,080
3	----------	1,420	1,487	1,175	1,069	1,096	1,062	1,080
4	----------	1,240	1,117	1,064	1,099	1,096	1,050	1,077
5	----------	1,140	1,106	954	1,138	1,106	1,050	1,066
6	----------	1,265	899	1,068	1,269	1,055	1,058	1,066
7	----------	1,130	784	1,071	1,239	1,060	1,057	1,066
8	----------	1,120	784	1,069	1,131	1,060	1,059	1,066
9	----------	1,665	896	1,059	1,199	1,062	1,059	1,060
10	----------	1,655	971	1,270	1,219	1,060	1,060	1,058
11	----------	1,665	1,105	1,199	1,216	1,059	1,063	1,058
12	----------	1,575	1,159	1,209	1,097	1,054	1,063	1,058
13	----------	1,300	1,485	1,211	1,117	1,054	1,063	1,053
14	----------	1,110	1,362	1,361	1,068	1,056	1,061	1,053
15	----------	1,295	1,513	1,212	1,099	1,056	1,062	----------
16	----------	----------	987	1,063	1,044	1,056	1,062	----------
17	----------	970	1,139	994	1,114	1,056	1,065	----------
18	----------	1,505	1,284	884	1,153	1,056	1,064	----------
19	----------	995	1,202	1,444	1,083	1,057	1,062	----------
20	----------	1,225	1,122	1,594	1,114	1,057	1,059	----------
21	----------	1,335	----------	1,804	1,014	1,059	1,060	----------
22	----------	1,117	1,242	1,475	1,027	1,060	1,061	----------
23	----------	----------	1,092	1,463	1,041	1,058	1,061	----------
24	----------	1,267	1,152	1,434	1,039	1,056	1,052	----------
25	----------	1,581	1,002	1,290	1,066	1,058	1,043	----------
26	----------	1,438	1,152	1,370	1,089	1,062	1,937	----------
27	1,185	1,115	1,182	1,249	1,089	1,060	1,033	----------
28	1,095	1,375	1,183	1,399	1,025	1,060	1,083	----------
29	995	1,298	1,083	1,220	1,024	1,061	1,083	----------
30	1,005	1,433	1,104	1,221	1,045	1,062	1,083	----------
31	1,105	----------	1,134	----------	1,057	1,062	----------	----------
Max	1,185	1,665	1,513	1,804	1,269	1,106	1,083	1,083
Min	995	970	784	884	1,024	1,054	1,033	1,053
Mean	1,077	1,311	1,146	1,240	1,101	1,063	1,060	1,066

MEASUREMENTS BY J. D. STANNARD, 1902

D. W. Ross, the Idaho State Engineer in 1902, arranged for J. D. Stannard to determine the discharge of all springs "between the point of diversion of the proposed Twin Falls Canal System [Milner Dam]

and the mouth of the Malade River." Current-meter measurements were made wherever practical; elsewhere the discharge was estimated. The discharge figures are given below as published (Ross, 1903, p. 159–162); they are not rounded in accordance with their probable accuracy. The bracketed explanations are by the writers.

TABLE 4.—*Discharge from springs along Snake River from three miles above Twin Falls to below the Malad River, April 15–28, 1902*

Station No.	Location	Discharge (cfs)	
		Estimated	Measured
1	South side of Snake, 3½ miles above Twin Falls	6.00	
2	3 miles above Twin Falls	10.00	
3	do	.75	
4	do	.75	
5	do	2.25	
6	2¾ miles above Twin Falls	3.00	
7	do	1.50	
8	do	7.50	
9	2½ miles above Twin Falls	.20	
10	do	.38	
11	do	4.50	
12	do	.38	
13	do	3.75	
14	do		0.76
15	do	.50	
16	1½ miles above Twin Falls		.29
17	¾ mile above Twin Falls		.86
18	¼ mile below Twin Falls, Devils Corral [upper outlet]		14.49
19	¼ mile below Twin Falls		.55
20	1½ miles above Shoshone Falls [Devils Corral, lower outlet]		3.36
21	1 mile above Shoshone Falls		1.95
22	do		1.39
23	do		1.75
24	¾ mile above Shoshone Falls		.75
25	do		2.26
26	½ mile above Shoshone Falls	.73	
27	¼ mile above Shoshone Falls		1.29
28	Below Ferry, Shoshone Falls		1.14
29	Blue Lakes		86.37
30	2 miles below Blue Lakes		24.96
31	South Side of Rock Creek (E. P. Weaver) [1]	1.00	
32	Trail Springs, 3 miles below Blue Lakes to 4½ miles below Blue Lakes	.10	
33	do	1.50	
34	do	.50	
35	do	.50	
36	do	1.00	
37	do	.50	
38	do	.25	
39	do	.75	
40	do	.25	
41	do	1.00	
42	do	.25	
43	do		.73
44	do	.05	
45	do	.50	
46	do	.50	

See footnotes at end of table.

TABLE 4.—*Discharge from springs along Snake River from three miles above Twin Falls to below the Malad River, April 15–28, 1902*—Continued

Station No.	Location	Discharge (cfs)	
		Estimated	Measured
47	Trail Springs, 3 miles below Blue Lakes to 4½ miles below Blue Lakes	.25	
48	do	.25	
49	do	.10	
50	do	1.00	
51	do	.25	
52	do	1.00	
53	do	.50	
54	do	.25	
55	do	.25	
56	do	.10	
57	do	.10	
58	do	.50	
59	do	1.00	
60	4 miles below Rock Creek [Groups of springs on south side of river in sec. 17, T. 9 S., R. 16 E.]		9.08
61	4 miles below Rock Creek		1.75
62	4 miles below Rock Creek		18.09
63	4½ miles below Rock Creek, Blue Spring [Station not identified; not the Blue Springs of this report] [Measurement in three outlets from Crystal Springs in sec. 12, T. 9 S., R. 15 E.]		272.79
64	4½ miles below Rock Creek		31.41
65	4½ miles below Rock Creek	2.50	
66	7 miles below Rock Creek, Smalley's Spring [Niagara Springs]		106.75
67	4 miles below Smalley's Spring	.25	
68	4½ miles below Smalley's Spring	.50	
69	5 miles below Smalley's Spring	.10	
70	5½ miles below Smalley's Spring, Devils Washboard [Clear Lakes outlet]	150.00	
71	2 miles below Devils Washboard, Briggs Spring[s]		77.15
72	Randalls Lake [Banbury cold Springs], 2 miles below Briggs		65.91
73	¾ mile below Randalls Lake, Blind Canyon	1.50	
74	1 mile below Randalls Lake, Box Canyon	450.00	
75	[Springs 75 to 84 occur in a half-mile reach below Box Canyon Springs and issue at or below the surface of the river.]	5.00	
76		1.50	
77		.10	
78		75.00	
79		1.00	
80		.50	
81		.25	
82		.25	
83		10.00	
84		.50	
85	Lake half a mile below Box Canyon [probably at Blue Springs]		48.47
86	2 miles below Box Canyon [possibly on Salmon Falls Creek, south side]		14.54
87	½ mile below Lewis' Ferry, Sand Springs		28.51
88	¾ mile below Lewis' Ferry		17.47
89	1 mile below Lewis' Ferry, Thousand Springs		492.85
90	2½ miles below Lewis' Ferry, Thousand Springs		138.80
91	do		14.70
92	do		46.03
93	do		8.62
94	do	17.28	
95	do		20.50
96	do		10.96

See footnotes at end of table.

TABLE 4.—*Discharge from springs along Snake River from three miles above Twin Falls to below the Malad River, April 15–28, 1902*—Continued

Station No.	Location	Discharge (cfs)	
		Estimated	Measured
97	2¾ miles below Lewis' Ferry, Thousand Springs	17.28	
98	----do	4.00	
99	----do		25.92
100	----do	.50	
101	3 miles below Lewis' Ferry, Vader's Creek [Bickel Springs]		10.29
102	3 miles below Vader's Creek, Riley Creek		137.13
103	¼ mile below Riley Creek		31.88
104	3 miles below Upper Salmon Falls	.50	
105	----do	5.00	
106	3¼ miles below Upper Salmon Falls	25.00	
107	3½ miles below Upper Salmon Falls	6.00	
108	3¾ miles below Upper Salmon Falls	50.00	
109	----do	1.00	
110	4 miles below Salmon Falls, Billingsley Creek		54.35
111	At mouth of Billingsley Creek Spring (John Frazier [1])	.70	
112	Below lower Salmon Falls (John Frazier [1])	.16	
113	¼ mile below Lower Salmon Falls	4.00	
114	----do	1.00	
15	----do	2.00	
116	----do		11.80
117	----do		4.02
118	1 mile above mouth of Malad (Frasier)[1]	.16	
	10 springs below Malad for a distance of 3 miles. Total estimated by Mr. Gardner not to exceed—	10.00	
	Discharge of Malad River (from springs near its mouth) 1,090 second-feet (U. S. Geological Survey). [Not measured by Stannard; record probably obtained from Dils, of the Geological Survey]		1,090.00
	Totals	899.92	2,932.67
	Grand total		[2] 3,832.59

[1] Name inserted in published record without explanation; probably refers to source of information.

[2] Ross (1903, p. 162) reported an aggregate total increment below Milner and above Bliss of 4,833.09 cfs, which was an error in addition. The actual total was 3,832.59 cfs, which included the discharge from some springs and creeks on the south side of the river.

MEASUREMENTS BY N. S. DILS, 1902

Springs above Shoshone Falls.—Measurements of springs "above Shoshone Falls" were recorded by N. S. Dils in U. S. Geological Survey field notebook No. 3730. Very few of the springs were named in the notes and most of the discharge rates were estimated. Table 5 is a digest of Dils' records, which he prefaced with the following title and explanation:

Springs between Shoshone Falls and Cedars (Cedars is name of a locality above Shoshone Falls near the head of the proposed Twin Falls diversion canal).

The sum of the measurements in table 5 was published in Water-Supply Paper 774 (p. 155) as follows: "June 10, 1902, 10 springs, between Devils Corral and Shoshone Falls, 17.0 cfs." The text of

TABLE 5.—*Discharge from springs between Shoshone Falls and "Cedars," 1902*

[The 16 springs were described as being south of the river, heading in or near the rock wall of the canyon, and flowing almost directly into the Snake River]

Spring No.	Discharge (cfs)	Remarks
1	1.5	Average of two measurements, at different points, of 1.6 and 1.4 cfs.
2	.04	Recorded as 2 miner's inches.
3	1.3	
4	1.4	
5	1.2	Partly estimated.
6	2.3	2.1 plus estimated 0.2.
7	.5	Estimated.
8	.5	Do.
9	1.0	Do.
10	2.0	Partly estimated.
11	2.5	Do.
12	2.0	Estimated.
13 plus 14	.4	Do.
15	.2	Do.
16	.2	Do.
Total	17.0	Total was published in Water-Supply Paper 774, 1938, p. 155, but listed as "10 springs."

Water-Supply Paper 774 incorrectly referred these springs to the north side of the river.

Dils' notes referred to the Devils Corral as follows:

Devils Corral is a side canyon in the Snake River Canyon, having two outlets to the Snake River. From these outlets short spring creeks discharge into Snake River. The lower outlet is located about one mile above the Shoshone Falls; the upper outlet is about a mile above the lower outlet and about one-half mile below the Twin Falls.

The recorded discharge of the lower outlet was 3.9 cfs and that of the upper outlet was 20.7 cfs. The notes indicate that Dils applied "Devils Corral" to the springs to which the name is still applied. The two measurements in the outlets of the Devils Corral Spring were published in Water-Supply Paper 774 (p. 155).

On June 11 the flows of many springs in the Snake River valley above Twin Falls were estimated (table 6), being "impossible to measure."

Dils summarized the measured or estimated discharge of the springs on June 10–11, 1902, as follows:

	Cfs
16 springs, Shoshone Falls to Devils Corral [on south side]	17.0
2 springs, Devils Corral	24.6
17 springs above Twin Falls and below Cedars	70.5
Total	112.1

TABLE 6.—*Estimated discharge from springs in Snake River valley above Twin Falls, June 11, 1902*

Spring No.	Description	Discharge (cfs)
1	Above Twin Falls	0.5
2	do	1.0
3	Above Twin Falls (plus seeps) from information [1]	2.0
4	Above Twin Falls	1.5
5	Banker [?] [2]	1.0
6	do [2]	.6
7	do	.2
8	do	5
9	do	1
10	Above Bkr	.4
11	Above Bnke [?] [2]	2
12	Series of large springs; hard to get at: about	40
13	South side	1.5
13 [3]	North side	.5
14	North side; several small springs [locality known to Snake River Canyon miners as Spring town].	.8
15	do	1.5
16	South side; hot water	6
17	North side	5
Total		[4] 70.5

[1] Probably Dils meant that he accepted a report, without having seen the spring.

[2] Dils' written descriptions of springs 5, 10, and 11 were not completely legible; ditto marks were used for the descriptions of nos. 6, 7, 8, and 9.

[3] Number repeated by Dils for no apparent reason.

[4] Total was published in Water-Supply Paper 774 (p. 155) with the notation "18 springs on both sides of Snake River between Milner and Devils Corral."

The group of 16 springs in table 5 and 2 of the 17 springs in table 6 were on the south side of the river. The total discharge from the north side was 112 minus 17, minus 7.5 cfs, or 87.5 cfs. The total of 112 cfs was published in Water-Supply Paper 85, p. 216, with the designation, "All of the springs flowing into Snake River" in the reach "Between Shoshone Falls and the Cedars."

Blue Lakes Springs.—The following excerpt from U. S. Geological Survey field notebook 3737 is the record of measurements on August 27, 1902, at Blue Lakes Creek.

Near mouth on creek at Blue Lakes, Idaho

[Section quite good; measurement made by wading]	*Cfs*
Main channel, measured	50
Other channel, estimated	20
Flume near head; ditch takes out of Blue Lakes Creek a short distance above measuring point. Measured	10
Total	80

The total of 80 cfs was published in Water-Supply Papers 85 (p. 216) and 774 (p. 143, 156).

MEASUREMENTS BY E. C. LA RUE, 1906

Snake River between Milner Dam and Shoshone Falls.—In November 1906 a special study was made by E. C. La Rue of increments to the Snake River between Milner Dam [1] and Shoshone Falls. Flow past Minidoka Dam (upstream from Milner Dam) was cut off entirely. The gates at Milner also were closed and flow in the river downstream from there consisted only of leakage through the gates, waste water from irrigated tracts, and the discharge from springs along the river. The purpose of the measurements was to determine what would be the permanent flow of the river below Milner if all Snake River water were diverted for irrigation, with no waste. The results of measurements are summarized in table 7.

TABLE 7.—*Flow of Snake River between Milner Dam and Shoshone Falls, November 14–22, 1906*

[From U. S. Geol. Survey Water-Supply Paper 214, p. 75, 1907]

Discharge below Milner Dam

	Nov. 17	Nov. 18			Nov. 20
Miles below Milner Dam	2	4	6	7	16
Discharge (cfs)	22	17	20	27	60

Discharge 1,500 ft above Shoshone Falls

	Nov. 14	Nov. 15	Nov. 16	Nov. 21	Nov. 22
Discharge (cfs)	195	165	158	169	200

La Rue summarized his results with the statement that about 30 cfs of water was contributed by leakage through Milner Dam and waste from the Twin Falls tract, and 128 cfs was derived from springs and drainage from pools in the river channel. He decided that the sustained flow over Shoshone Falls during the irrigation seasons, with all the flow of the Snake River diverted at Milner Dam, would be about 130 cfs. The river distance, Milner Dam to Shoshone Falls, is about 24 miles. Seemingly, the discharge from springs above the falls was quite small in 1906.

[1] Milner Dam was built in 1905 to divert water from the Snake River to irrigation projects on the north and south sides of the river.

MEASUREMENTS OF INDIVIDUAL SPRINGS

The following records of measurements summarize data from many sources. Abbreviations identifying those sources are as follows:

IPC	Idaho Power Co.
ISDR	Idaho State Department of Reclamation.
TFNSC	Twin Falls North Side Land & Water Co.
USBR	U. S. Bureau of Reclamation.
USDA	U. S. Department of Agriculture.
USGS	U. S. Geological Survey.
SEBR	Biennial Report of the State Engineer to the Governor of Idaho, 1901–02.
WSP	Water-Supply Paper of the U. S. Geological Survey.
T	Unpublished records by C. E. Tappan for Idaho Power Co.
PJIC	Proceedings of the Joint Conference of the Irrigation, Engineering, and Agricultural Societies of Idaho, 1918–19.

On following pages the springs records are introduced in the general downstream order in which the springs occur. The locations of many of the older measuring sections could not be determined accurately from the field notes or published records. Also some spring names were loosely used and others have changed. Some discrepancies between names and locations have been resolved by study of maps and records, but not all the discrepancies could be removed.

Throughout this report, altitudes are given in feet above mean sea level, obtained by interpolation between contours on topographic maps of the Geological Survey.

DEVILS WASHBOWL SPRING

Location.—About one-half mile east of the Twin Falls of the Snake River, at the head of a deep alcove canyon. Most of the openings seem to be in the SW¼ sec. 34, T. 9 S., R. 18 E.

Physical situation.—Water issues from basalt in sheer wall in lateral branch of large alcove. Water feeds small lake, which is tributary to Snake River through a channel one-half mile long.

Measuring sections.—Locations of sections not accurately determinable, but are in the NE¼ sec. 4, T. 10 S., R. 18 E.

Remarks.—Waste irrigation water discharges into spring alcove. Also called Rogerson Spring. No use is made of the water.

TABLE 8.—*Miscellaneous discharge records, Devils Washbowl Spring, 1902–24*

Date	Discharge (cfs)	Made by—	Publication record and remarks
4-?-02	1.15	Stannard	Published in SEBR. Sum of two measurements.
9-17-17	12.7	TFNSC	WSP 533, p. 283; 774, p. 155. Called Rogerson Springs in WSP 533.
8-20-23	19.7	Paulsen and Tappan	WSP 557, p. 45; 573, p. 252; 774, p. 155.
7-22-24	16.7	Tappan	WSP 593, p. 255; 774, p. 155.
8-19-24	15.2	do	WSP 593, p. 255; 774, p. 155.

DEVILS CORRAL SPRINGS

Location.—About 2 mi east of Shoshone Falls in the SE¼NE¼ sec. 32, T. 9 S., R. 18 E.

Physical situation.—Water issues from basalt beneath talus in long, deep springs alcove. Two adjacent groups of openings discharge by separate channels which reach the Snake River at points about three-fourths of a mile apart In the records these are called the upper (upstream) and lower outlets.

Use of water.—None; abandoned dam and wooden flume formerly diverted water for placer-mining.

Measuring sections.—Near mouths of outlet channels.

Remarks.—There is a considerable amount of unmeasurable underflow through talus beneath the outlet creeks.

TABLE 9.—*Miscellaneous discharge records, Devils Corral Springs, 1902–39*

Date	Discharge (cfs)	Made by—	Publication record and remarks
		Upper outlet	
4-?-02	14.49	Stannard	Published in SEBR.
6-10-02	20.7	Dils	WSP 774, p. 155. Measured near mouth.
7-30-23	37.3	Tappan	WSP 573, p. 252; 774, p. 155.
8-30-23	41.9	Paulsen and Tappan	Do.
7-21-24	41.5	Tappan	WSP 593, p. 255; 774, p. 155.
9-12-24	43.6	Vaksvik and Tappan	WSP 593, p. 255; 774, p. 155. Measured 500 ft above mouth.
7-14-39	31.6		WSP 883, p. 264. Measured about three-eights of a mile above mouth.
		Lower outlet	
4-?-02	3.36	Stannard	Published in SEBR.
6-10-02	3.8	Dils	WSP 774, p. 155.
8-6-23	8.4	Tappan	WSP 557, p. 45; 573, p. 252; 774, p. 155.

SPRINGS NEAR SHOSHONE FALLS

Location.—Above Shoshone Falls in SE¼NW¼ sec. 31, T. 9 S., R. 18 E.

Physical situation.—Water emerges from foot of basalt-talus slope at foot of canyon wall and enters Snake River from north side.

Use of water.—Part is used for irrigation.

Measuring section.—In outlet channel east of spring openings; location not accurately determinable. Published record says in SW¼ of sec. 31.

Remarks.—Considerable unmeasurable underflow to Snake River through talus slope upstream from spring.

Record of measurements.—Discharge Sept. 29, 1923, 6.3 cfs; measured by Paulsen and Tappan; published in WSP 573, p. 252; 774, p. 155.

See also the records of measurements in 1902 on pp. 33, 42, tables 4, 5, and 6.

Note: Paulsen and Tappan measured several springs on the south side of the river at about the same time. Dates, descriptions, and discharges are as follows (from WSP 573, p. 252):

Aug. 6, 1923: Unnamed springs on south side of Snake River, 4 mi north of Kimberly, in SE ¼ sec. 32, T. 9 S., R. 18 E.: 3.9 cfs. Unnamed springs on south side of Snake River, 4 mi north of Kimberly, in NW¼ sec. 4, T. 10 S., R. 18 E.: 7.4 cfs.

Sept. 22, 1923: Unnamed springs on south side of Snake River, 4 mi north of Kimberly in NE¼ sec. 4, T. 10 S., R. 18 E.; feed the south side of the falls; three springs: 6.28 cfs, 7.36 cfs, and 7.67 cfs; total, 21.3 cfs.

BLUE LAKES SPRINGS

Location.—Principal openings are in the NE¼SE¼ sec. 28, T. 9 S., R. 17 E.

Physical situation.—Water issues from basalt and talus in bottom of alcove canyon and feeds a twin lake which discharges to the Snake River. Springs are about 160 ft above river level.

Altitude.—About 3,275 feet.

Use of water.—Perrine ditch and several small diversions; about 2 cfs diverted above gage, and one diversion 150 ft below gage.

Measuring sections.—Two channels at mouth of outlet to Snake River in SW¼SW¼ sec. 28, T. 9 S., R. 17 E., Jerome County; measured by wading or from bridge; gage was on right bank 200 ft below old highway bridge at Blue Lakes Ranch, 4 mi north of Twin Falls, Twin Falls County.

Mean and extremes of discharge. Mean discharge May 20–Dec. 31, 1917, 202 cfs; 1918 calendar year, 210 cfs; 1919, 200 cfs; 1920, 204 cfs; May 20, 1917–Dec. 25, 1920, 204 cfs. Maximum discharge recorded, Sept. 21, 1944, 238 cfs. Minimum discharge recorded, June 8, 1939, 183 cfs (smaller discharges recorded on other dates did not include total flow).

Remarks.—Unless otherwise noted, discharges in following table are sums of measurements in rocky beds of two channels at mouth. A staff gage was installed on the right bank of the spring-lake outlet, and daily records were obtained from May 20, 1916 to Dec. 25, 1920. Station information and discharge records were published in Water-Supply Paper 533, p. 156–161.

TABLE 10.—*Miscellaneous discharge records, Blue Lakes Springs, 1902–47*

Date	Discharge (cfs)	Made by—	Publication record and remarks
4- ?-02	86.37	Stannard	Published in SEBR. Location of measured section not accurately determinable.
8-27-02	80	Dils	PJIC and WSP 85, p. 216, 774, p. 156. Main creek channel measured: 50.0 cfs. Small channel estimated: 20.0 cfs. "Flume (Perrine ditch) near head: 10 cfs. Ditch leaves Blue Lakes Creek a short distance above measuring point."
8-27-10	110	----------	WSP 774, p. 156.
9- 7-13	191	Jordan	WSP 362-B, p. 285; 533, p. 158; 557, p. 45; 774, p. 156. Main channel, 118.6 cfs; small channel, 63.9 cfs; Perrine ditch, 8.2 cfs.
8- 6-14	199	Roush	WSP 393, p. 241; 533, p. 158; 557, p. 45; 774, p. 156. "Measured at bridge above gage. The amount diverted below is not known."
1917-20	185-230	TFNSC	WSP 533, p. 158-161. See table 12 for complete record.
9- 7-17	205	Burdick and Crandall	WSP 533, p. 158; 557, p. 45; 774, p. 156. Includes 75 cfs estimated flow in diversion (Perrine ditch) and west channel.

TABLE 10.—*Miscellaneous discharge records, Blue Lakes Springs, 1902–47*—Con.

Date	Discharge (cfs)	Made by—	Publication record and remarks
10-26-17	220	Burdick	WSP 533, p. 158; 557, p. 45. Includes 77 cfs, estimated flow in Perrine ditch and west channel.
4-26-18	200	Howard and Crandall	WSP 533, p. 158; 557, p. 45. Includes 64 cfs, estimated flow in Perrine ditch and west channel.
10- 7-18	218	Carter and Crandall	WSP 533, p. 158; 557, p. 45. Includes 78 cfs, estimated as above.
4-19-19	196	Jensen and Crandall	WSP 533, p. 158; 557, p. 45. Includes 72 cfs, estimated as above.
7- 2-19	209	Burdick	WSP 533, p. 158; 557, p. 45. Includes 69 cfs, estimated as above.
7-12-19	210	McCombs	WSP 533, p. 158; 557, p. 45. East channel, 131.4 cfs; west channel, 60.2 cfs; includes 18 cfs estimated diversion.
7-27-19	211	McCombs and Fiedler	WSP 533, p. 158; 557, p. 45. East channel, 150.9 cfs; west channel, 50.7 cfs; includes 9 cfs estimated diversion.
9-18-19	204	Burdick and Jensen	WSP 533, p. 158; 557, p. 45. Includes 72 cfs estimated flow in diversion and in west channel.
11- 5-19	185	Burdick	WSP 533, p. 158; 557, p. 45. Includes 64 cfs, estimated flow in diversion channel and in west channel.
2- 4-20	196	Burdick and Jensen	WSP 533, p. 158; 557, p. 45. "Includes diversion. Amount diverted not known."
4-26-20	192	Bryan	WSP 533, p. 158; 557, p. 45. East channel 126.4 cfs; west channel 65.5 cfs. Note in WSP 533; "Estimated 2 cfs additional in diversion." Note in original record: "10 to 15 cfs in diversion."
6-10-20	198	do	WSP 533, p. 158; 557, p. 45. East channel 124 cfs, west channel 62.8 cfs; includes estimated 11 cfs in diversion.
7-20-20	206	Burdick and Maxwell	WSP 533, p. 158; 557, p. 45. Includes estimated 19 cfs in diversion. Reported as 187 cfs in WSP 557.
8- 8-20	206	Bryan	WSP 533, p. 158; 557, p. 45. East channel 132 cfs; estimated 12 cfs in diversion. Reported as 194 cfs in WSP 557.
9- 8-20	218	Conover and Burdick	WSP 533, p. 158; 557, p. 45. Estimated 5 cfs in diversion. Reported as 213 cfs in WSP 557.
3-30-21	192	Fiedler and Paulsen	WSP 533, p. 158; 557, p. 45; 774, p. 156. East channel 121 cfs; west channel 70.9 cfs. "No diversion at this season."
7-25-21	193	B. Johnson	WSP 533, p. 158; 557, p. 45; 774, p. 156. East channel 136.3 cfs; west channel 57.2 cfs. Diversions not known.
8-12-21	190	do	WSP 533, p. 158; 557, p. 45; 774, p. 156. East channel 134.9 cfs; west channel 55.03 cfs; does not include amount diverted.
9-19-21	200	do	WSP 533, p. 158; 557, p. 45; 774, p. 156. East channel 135.3 cfs; west channel 64.71 cfs; does not include amount diverted.
4-30-22	198	do	WSP 553, p. 288, 557, p. 45; 774, p. 156. East channel 132.17 cfs; west channel 66.83 cfs.
8-12-22	185	do	WSP 553, p. 288; 557, p. 45; 774, p. 156. East channel 132.43 cfs; west channel 52.48 cfs.
4-14-23	209	Fiedler	WSP 557, p. 45; 573, p. 253; 774, p. 156. East channel 141.19 cfs; west channel 67.41 cfs.
5- 5-23	192	do	WSP 557, p. 45; 573, p. 253; 774, p. 156. East channel 126.05 cfs; west channel 65.58 cfs.
7-23-23	210	do	WSP 557, p. 45; 573, p. 253; 774, p. 156. East channel 137.60 cfs; west channel 72.40 cfs.
11- 1-23	220	B. Johnson	WSP 593, p. 255; 774, p. 156. East channel 149.27 cfs; west channel 70.33 cfs.

TABLE 10.—*Miscellaneous discharge records, Blue Lakes Springs, 1902–47*—Con.

Date	Discharge (cfs)	Made by—	Publication record and remarks
4-16-24	186	Veatch	WSP 593, p. 255; 774, p. 156.
5-18-24	187	do	Do.
6- 6-24	193	B. Johnson	Do.
7-21-24	208	Tappan and Golden	WSP 593, p. 255; 774, p. 156. Includes 11.3 cfs diverted; total shown as 196 cfs in WSP 774.
7-24-24	192	Veatch	WSP 593, p. 255; 774, p. 156.
8-19-24	198	Tappan and Golden	Do.
9-11-24	194	Vaksvik and Tappan	Do.
11- 2-24	211	Tappan	WSP 613, p. 263; 774, p. 156.
3- 6-25	184	Veatch	WSP 613, p. 263. Note in original record: "No water in diversion."
7-16-25	201	B. Johnson	WSP 613, p. 263.
8-20-25	196	do	Do.
8-30-25	225	Tappan and Fite	Do.
10-24-25	202	Veatch	WSP 633, p. 257.
3-25-26	198	do	Do.
5- 3-26	195	do	Do.
3-10-27	212	do	WSP 643, p. 225. Includes 2 cfs in diversion.
8- 6-28	153	Parsons	WSP 673, p. 167. East channel only.
9-10-28	221	do	WSP 673, p. 168.
3-16-29	201	Boyer	WSP 693, p. 176.
8- 7-29	199	do	WPS 693, p. 176. 197.79 on original record.
3-13-30	207	Iorns	WPS 708, p. 183. Published record incorrectly gives year as 1929.
4-10-30	202	do	Do.
7-12-30	198	Bailey	Do.
8- 4-30	197	do	WSP 708, p. 183. Published record gives date as 8-14-29. Date on original record is 8-4-30.
11-18-30	193	do	WSP 723, p. 199.
3-16-31	205	do	Do.
4- 9-31	197	Iorns	Do.
5-14-31	189	Bailey	Do.
6-13-31	194	do	Do.
7-21-31	197	do	Do.
9-16-31	199	do	Do.
6-27-32	198	do	WSP 738, p. 192.
4-13-33	213	Allis	WSP 753, p. 192.
7-14-33	209	do	WSP 753, p. 192. East channel 160.60 cfs; west channel 48.85 cfs.
8-24-33	207	Bailey	WSP 753, p. 192.
11-13-33	234	Sawyer	WSP 768, p. 196.
12-20-33	211	Travis	Do.
3-23-34	219	Craig	Do.
4-15-34	201	do	Do.
6- 5-34	199	Bailey	Do.
7-11-34	202	do	Do.
8-31-34	214	Sawyer	Do.
10-26-34	202	do	WSP 813, p. 233.
1-26-35	203	Throckmorton	Do.
3-26-35	193	do	Do.
4-20-35	183	do	Do.
6- 3-35	227	Miller	WSP 813, p. 233. Measured 215 cfs in single channel 800 ft above mouth; 12 cfs in Perrine ditch, diverted above measured section.
6-13-35	232	do	WSP 813, p. 233. Measured 215 cfs in single channel 800 ft above mouth; 16.8 cfs in Perrine ditch.

TABLE 10.—*Miscellaneous discharge records, Blue Lakes Springs, 1902–47*—Con.

Date	Discharge (cfs)	Made by—	Publication record and remarks
7-12-35	231	Miller	WSP 813, p. 233. Measured 215 cfs in single channel 800 ft above mouth; 15.7 cfs in Perrine ditch.
7-21-35	210	do	WSP 813, p. 233. Measured 196 cfs in single channel 800 ft above mouth; 14.2 cfs in Perrine ditch.
8- 7-35	231	do	WSP 813, p. 233. Measured 216 cfs in single channel 800 ft above mouth; 15.0 cfs in Perrine ditch.
8-15-35	222	do	WSP 813, p. 233. Measured in single channel 800 ft above mouth; no record for Perrine ditch.
9- 7-35	204	Bailey and Wark	WSP 813, p. 233.
10-25-35	204	Throckmorton	Do.
2- 2-36	204	Benedict	Do.
4- 8-36	192	Throckmorton	Do.
5- 9-36	188	do	Do.
6-15-36	194	Bailey	Do.
6-27-36	189	do	WSP 813, p. 233.
8- 3-36	187	Craig and Miller	Do.
9-23-36	196	Craig	Do.
10-15-36	210	Throckmorton	WSP 833, p. 212.
1-30-37	212	Newell	WSP 833, p. 212. Estimated diversion of 5 to 7.5 cfs not included.
5- 8-37	200	Miller	WSP 833, p. 212.
6- 8-37	190	Bailey	Do.
7-14-37	188	do	Do.
8-12-37	205	do	Do.
10-26-37	206	Benedict	WSP 863, p. 231.
12-19-37	211	Espy	Do.
2-26-38	215	Miller	Do.
3-31-38	201	Espy	Do.
7-20-38	187	Bailey	Do.
7-23-38	197	Espy	Do.
9- 5-38	199	Bailey	Do.
12-12-38	212	Snell	WSP 883, p. 264. Includes estimated diversion of 8 cfs.
3-29-39	192	Miller	WSP 883, p. 264.
5-10-39	201	Snell	WSP 883, p. 264. Includes estimated diversion of 8 cfs.
6- 8-39	183	do	WSP 883, p. 264. Includes estimated diversion of 8 cfs.
7-21-39	197	do	WSP 883, p. 264.
8-27-39	207	Andros	Do.
10- 4-39	213	Snell	WSP 903, p. 241. Measured at mouth.
12- 3-39	217	Andros	Do.
1-23-40	212	do	Do.
3- 1-40	204	Snell	Do.
3-29-40	193	do	WSP 903, p. 241. Includes estimated diversion of 6 cfs.
5- 2-40	196	do	WSP 903, p. 241. Includes estimated diversion of 8 cfs.
5-28-40	195	do	WSP 903, p. 241. Measured at mouth.
6-29-40	204	Andros	Do.
7-31-40	218	Newell	Do.
9- 3-40	212	Andros	Do.
10-21-40	231	Bailey	WSP 933, p. 240. Measured at mouth.
12-15-40	207	Benedict	Do.
3-26-41	198	Morken	Do.
5-15-41	201	Morken and Thomason	Do.
7- 2-41	189	Bailey	WSP 933, p. 240. Measured at mouth.
8- 2-41	195	Miller	Do.
9-17-41	220	Krabler and Bailey	Do.
10-11-41	218	Fiske	WSP 963, p. 225. Includes 9.71 cfs diverted in Perrine ditch. Measured at mouth of outlet.

TABLE 10.—*Miscellaneous discharge records, Blue Lakes Springs, 1902–47*—Con.

Date	Discharge (cfs)	Made by—	Publication record and remarks
12-16-41	217	Fiske	WSP 963, p. 225. Measured at mouth of outlet.
3- 7-42	212	do	Do.
6-14-42	210	do	Do.
7-21-42	210	Thomas and Koski	Do.
8-23-42	214	Miller	Do.
9-29-42	251	Thomas	Do.
7-29-43	224	Miller	WSP 983, p. 227. Measured at mouth of outlet.
9-13-43	226	do	Do.
5-19-44	210	Thomas	WSP 1013, p. 221. Measured both channels at mouth.
7-28-44	206	do	Do.
9-14-44	171	Comer	WSP 1013, p. 221. Measured east channel only.
9-21-44	238	do	WSP 1013, p. 221. Measured both channels at mouth.
10-14-44	257	Comer	WSP 1043, p. 242. Measured both channels at mouth.
5- 5-45	215	Travis	Do.
8- 9-45	236	Miller	Do.
9-20-45	221	Travis	Do.
5- 2-46	205	Travis and Spofford	WSP 1063, p. 256. Both channels at mouth.
6-20-46	205	Spofford	Do.
8- 6-46	225	Miller	Do.
9-19-46	231	Revell	Do.
3-12-47	221	Thomas	WSP 1093, p. 261. Both channels at mouth.
4-25-47	223	Miller	Do.
5-27-47	208	Fiske	Do.
7-22-47	214	Krabler	Do.
8-30-47	218	Koski	Do.

TABLE 11.—*Daily discharge in cfs of Blue Lakes Springs, 1917–20*

[From U. S. Geol. Survey Water-Supply Paper 533, p. 159–160]

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1917 data												
1						190	185	185	195	205	218	218
2						190	185	185	195	210	218	218
3						190	185	185	195	210	218	218
4						190	185	185	200	210	218	215
5						190	185	190	200	210	218	215
6						190	185	190	200	210	218	215
7						190	185	190	205	210	218	215
8						190	185	190	205	210	218	215
9						190	185	190	205	210	218	215
10						190	185	190	205	210	218	215
11						190	185	190	205	215	218	215
12						190	185	190	205	215	218	215
13						190	185	190	205	215	218	215
14						185	185	190	205	215	218	215
15						185	185	190	205	215	218	215
16						185	185	190	205	215	218	215
17						185	185	195	205	215	218	215
18						185	185	195	205	215	218	215
19						185	185	195	205	215	218	215
20					190	185	185	195	205	215	218	215
21					190	185	185	195	205	220	218	215

TABLE 11.—*Daily discharge in cfs of Blue Lakes Springs, 1917–20*—Continued

[From U. S. Geol. Survey Water-Supply Paper 533, p. 159–160]

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1917 data—Continued												
22					190	185	185	195	205	220	218	215
23					190	185	185	195	205	220	218	215
24					190	185	185	195	205	220	218	215
25					190	185	185	195	205	220	218	215
26					190	185	185	195	205	220	218	215
27					190	185	185	195	205	220	218	215
28					190	185	185	195	205	220	218	215
29					190	185	185	195	205	220	218	215
30					190	185	185	195	205	220	218	212
31					190		185	195		220		212
Max					190	190	185	195	205	220	218	218
Min					190	185	185	185	195	205	218	212
Mean					190	187	185	192	204	215	218	215
1918 data												
1	212	205	202	200	200	205	207	210	215	218	222	220
2	212	205	202	200	200	205	207	210	215	218	222	219
3	212	205	202	200	202	205	207	210	215	218	222	219
4	210	205	200	200	202	205	207	212	215	218	222	219
5	210	205	200	200	202	205	207	212	215	218	222	219
6	210	205	200	200	202	205	207	212	215	218	222	219
7	210	205	200	200	203	205	207	212	215	218	222	219
8	210	205	200	200	203	205	207	212	215	218	222	219
9	210	204	200	200	203	205	207	212	215	218	222	219
10	210	204	200	200	203	205	207	212	215	218	222	219
11	210	204	200	200	203	205	207	212	215	218	222	219
12	210	204	200	200	203	205	207	212	215	218	222	218
13	210	204	200	200	203	205	207	212	215	218	222	218
14	208	204	200	200	203	205	207	212	215	218	222	218
15	208	202	200	200	203	205	210	212	215	218	222	218
16	208	202	200	200	203	205	210	212	218	218	222	218
17	208	202	200	200	203	205	210	212	218	218	222	218
18	208	202	200	200	203	207	210	212	218	220	220	218
19	208	202	200	200	203	207	210	212	218	220	220	218
20	208	202	200	200	203	207	210	212	218	220	220	218
21	207	202	200	200	203	207	210	212	218	220	220	218
22	207	202	200	200	203	207	210	212	218	220	220	218
23	207	202	200	200	203	207	210	212	218	220	220	218
24	207	202	200	200	203	207	210	212	218	220	220	218
25	207	202	200	200	203	207	210	215	218	220	220	218
26	207	202	200	200	203	207	210	215	218	222	220	218
27	207	202	200	200	203	207	210	215	218	222	220	218
28	207	202	200	200	203	207	210	215	218	222	220	218
29	207		200	200	203	207	210	215	218	222	220	218
30	207		200	200	203	207	210	215	218	222	220	213
31	207		200		203		210	215		222		213
Max	212	205	202	200	203	207	210	215	218	222	222	220
Min	207	202	200	200	200	205	207	210	215	218	220	213
Mean	209	203	200	200	203	206	209	212	216	219	221	218

TABLE 11.—*Daily discharge in cfs of Blue Lakes Springs, 1917–20*—Continued

[From U. S. Geol. Survey Water-Supply Paper 533, p. 159–160]

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1919 data												
1	213	202	198	197	198	205	210	210	208	192	187	187
2	213	202	198	197	198	205	210	210	208	192	186	187
3	213	202	197	197	198	205	210	210	208	192	186	187
4	213	202	197	197	198	206	210	210	208	192	185	187
5	211	202	197	197	198	206	210	210	208	192	185	187
6	211	202	197	197	198	206	210	210	208	192	185	187
7	211	202	197	196	198	206	210	211	204	192	185	187
8	211	202	197	196	198	206	210	211	204	191	185	187
9	211	200	197	196	198	206	210	211	204	191	185	187
10	208	200	197	196	198	206	210	211	204	191	185	187
11	208	200	197	196	198	208	210	211	204	191	185	187
12	208	200	197	196	198	208	210	211	204	191	185	187
13	208	200	197	196	200	208	210	210	204	191	185	187
14	208	200	197	196	200	208	210	210	204	191	185	187
15	206	200	197	196	200	208	210	210	204	191	185	187
16	206	200	197	196	200	208	211	210	204	190	185	187
17	206	200	197	196	200	208	211	210	204	190	185	190
18	206	198	197	196	200	209	211	210	204	190	185	190
19	206	198	197	196	200	209	211	210	204	190	185	190
20	206	198	197	196	200	209	211	210	204	190	185	190
21	206	198	197	196	200	209	211	210	204	190	185	190
22	206	198	197	196	201	209	211	209	204	190	185	190
23	206	198	197	196	201	209	211	209	193	189	185	190
24	204	198	197	196	201	209	211	209	193	189	185	190
25	204	198	197	196	201	209	211	209	193	189	185	190
26	204	198	197	196	201	210	211	209	193	189	185	190
27	204	198	197	196	201	210	211	208	193	188	185	190
28	204	198	197	196	203	210	211	208	193	188	185	190
29	204	-------	197	196	203	210	211	208	193	188	185	190
30	204	-------	197	198	205	210	211	208	193	188	185	190
31	202	-------	197	-------	205	-------	211	208	-------	187	-------	190
Max	213	202	198	198	205	210	211	211	208	192	187	190
Min	202	198	197	196	198	205	210	208	193	187	185	187
Mean	207	200	197	196	200	208	211	210	202	190	185	188
1920 data												
1	190	196	191	194	194	196	202	206		228	230	206
2	190	196	191	194	194	196	202	206		228	224	206
3	190	196	191	194	194	196	204	206		228	224	206
4	190	196	191	194	194	196	204	206	[1] 216	228	224	200
5	190	196	191	194	194	196	204	206		228	224	200
6	190	196	191	194	194	196	204	206		228	224	200
7	190	196	191	194	194	196	204	206		228	224	200
8	190	196	191	194	194	198	204	206	218	228	224	200
9	190	196	191	194	194	198	206	206	218	228	224	200
10	190	196	194	194	194	198	206	206	218	228	224	200
11	190	196	194	194	194	198	206	206	218	228	224	200
12	190	191	194	194	194	198	206	206	218	228	224	195
13	190	191	194	194	194	198	206	206	218	228	224	195
14	190	191	194	194	194	200	206	206	218	228	218	195
15	190	191	194	194	194	200	206	206	218	228	218	195

[1] Estimated mean discharge for periods indicated.

TABLE 11.—*Daily discharge in cfs of Blue Lakes Springs, 1917–20*—Continued

[From U. S. Geol. Survey Water-Supply Paper 533, p. 159–160]

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1920 data—Continued												
16	196	191	194	194	194	200	206	206	218	228	218	190
17	196	191	194	194	194	200	206	206	218	228	218	190
18	196	191	194	194	194	200	206	212	218	228	218	190
19	196	191	194	194	194	200	206	212	218	228	218	190
20	196	191	194	194	196	200	206	212	218	228	218	190
21	196	191	194	194	196	200	206	212	224	228	212	190
22	196	191	194	194	196	200	206		224	230	212	190
23	196	191	194	194	196	200	206		224	230	212	190
24	196	191	194	194	196	200	206		224	230	212	190
25	196	191	194	194	196	200	206		224	230	212	190
26	196	191	194	194	196	202	206	[1] 214	224	230	212	-------
27	196	191	194	194	196	202	206		224	230	212	-------
28	196	191	194	194	196	202	206		224	230	212	-------
29	196	191	194	194	196	202	206		228	230	212	-------
30	196	-------	194	194	196	202	206		228	230	206	-------
31	196	-------	194	-------	196	-------	206		-------	230	-------	-------
Max	196	196	194	194	196	202	206	-------	228	230	230	206
Min	190	191	191	194	194	196	202	206	-------	228	206	190
Mean	193	193	193	194	195	199	205	209	220	229	219	196

[1] Estimated mean discharge for periods indicated.

WARM SPRINGS

Location.—About 1 mi northwest of mouth of Blue Lakes outlet, above Auger Falls, in the NE¼NW¼ sec. 29, T. 9 S., R. 17 E.

Physical situation.—Water emerges from basalt at foot of talus slope and flows about 1 mi northwestward to Snake River.

Altitude.—About 3,125 ft.

Use of water.—Irrigation; water discharges into Perrine ditch.

Measuring section.—On outlet creek and on ditch near Snake River.

Remarks.—Channel at times may receive excess flow from Perrine ditch, which diverts water from Blue Lakes.

Record of measurement.—Discharge Oct. 9, 1917, 16.5 cfs, reported by TFNSC; published in WSP 533, p. 283; 557, p. 45; 774, p. 157. In 1902 Stannard reported a measured discharge of 24.96 cfs in a measured section "2 miles below Blue Lakes" (see table 4).

TRAIL SPRINGS (ELLISONS SPRINGS)

Location.—About 4 mi downstream from Blue Lakes, in the SE¼SE¼ sec. 15, T. 9 S., R. 16 E.

Physical situation.—Water emerges from basalt near top of talus slope in small alcove in canyon wall and flows to Snake River.

Altitude.—About 3,100 ft.

Use of water.—Small amount used for irrigation and stock water.

Measuring sections.—On outlet channel; locations not accurately determinable.

Remarks.—Name shown on Geological Survey topographic map, Jerome quadrangle, 1950, is "Ellisons" Springs, but "Trail Spring" is the only name that appears in discharge records. The measurement locations given in various

published records do not agree. Listed as Trail Springs in WSP 557 and 774; no name applied in WSP 533; may be the same as "Auger Falls Spring," according to WSP 774, p. 157. Stannard (see table 4) listed estimated discharges at 28 places under the name "Trail Spring."

Record of measurement.—Discharge Oct. 9, 1917, 5.5 cfs, reported by TFNSC; published in WSP 533, p. 283; 557, p. 45; 774, p. 157.

SPRINGS BETWEEN ROCK CREEK AND CRYSTAL SPRINGS

Location.—Seemingly scattered in secs. 14–17 and 23, T. 9 S., R. 16 E.

Physical situation.—Not determinable from available records; discharge probably is from basalt and basalt talus.

Measuring sections.—Locations not determinable.

Remarks.—Records of springs in this part of the Snake River Valley are confused. Stannard listed 28 springs with the descriptive location "Trail Springs, 3 miles below Blue Lakes to 4½ miles below Blue Lakes." The Geological Survey topographic map, Jerome quadrangle, 1950, shows 19 springs on the north side of the river and 18 springs on the south, between the mouth of Rock Creek and Crystal Springs. WSP 533, 557, and 774 each lists the discharge, on Oct. 9, 1917, of a group of 8 springs, but different locations are given in each publication. The topographic quadrangle map shows no springs in any of the three locations. Stannard (see table 4) listed 3 springs "below Rock Creek" on the south side of the Snake River, having a combined measured discharge of 28.9 cfs. Original records are not available to the writer.

Record of measurements.—Discharge April 1902 (28 springs, called "Trail Springs"), 13.84 cfs, estimated by Stannard; published in SEBR. Discharge Oct. 9, 1917 (8 springs, not including Trail Spring), 10.9 cfs, reported by TFNSC; published in WSP 533, p. 283; 557, p. 45; 774, p. 157.

CRYSTAL SPRINGS

Location.—Scattered through central part of sec. 12, T. 9 S., R. 15 E.

Physical situation.—Water issues from basalt and talus at foot of canyon wall and enters Snake River. Seemingly, the aquifer is the Sand Springs basalt, near its contact with the Banbury volcanics.

Altitude.—About 3,040 to about 3,140 ft.

Use of water.—Ponded by dams and used by fish hatchery.

Measuring section.—On several outlet channels; successive measurements not consistent in location.

Remarks.—Published records are the sums of measurements and estimates in several channels.

TABLE 12.—*Miscellaneous discharge records, Crystal Springs, 1902–31*

Date	Discharge (cfs)	Made by—	Publication record and remarks
4- ?-02	272.8	Stannard	SEBR. Listed as Blue Spring, 4.5 mi below Rock Creek.
Do	31.4	do	SEBR. 4.5 mi below Rock Creek.
Do	2.5	do	Do.
Do	307	do	Sum of preceding 3 measurements.
Do	304	do	WSP 774, p. 158. Sum of two measurements.
Do	2.5	do	SEBR.
Do	336	do	PJIC. Sum; includes measurements of 3 springs half a mile upstream, as listed in SEBR.

TABLE 12.—*Miscellaneous discharge records, Crystal Springs, 1902–31*—Continued

Date	Discharge (cfs)	Made by—	Publication record and remarks
10–11 and 10–12–17	536	TFNSC	WSP 533, p. 283; 577, p. 45; 774, p. 158. Meinzer, in WSP 557, says "Crystal Springs (6 springs at Fish Hatchery)."
9–22–19	475	do	Do.
7–20–24	407	IPC	WSP 593, p. 255; 774, p. 158. Reported as 433 cfs on July 22, 1924 in WSP 774. Recomputed from 433 cfs to 407 cfs in original record.
8–18–24	478	IPC	WSP 593, p. 255; 774, p. 158. WSP 774 and Tappan's private report say "477 cfs."
9– 9–24	486	Vaksvik and Tappan	WSP 593, p. 255; 774, p. 158.
11– 1–24	479	IPC	WSP 613, p. 263; 774, p. 158. Total in 7 channels as follows: 13.97, 7.74, 37.84, 358.0, 24.98, 25.06, and 11.01 cfs.
8–29–25	603	Tappan and Fite	WSP 613, p. 263. Total in 7 channels as follows: 16.08, 9.16, 50.42, 449.8, 32.41, 28.10, and 16.57 cfs.
10– 5–31	374	Allis and Burdick	WSP 738, p. 192. Includes 50 cfs estimated flow in 3 channels; in two measured channels: upper channel, 47.91 cfs; lower channel, 276.1 cfs.

NIAGARA SPRINGS

Location.—Six mi northeast of Buhl in the NE¼NE¼ sec. 10 and the NW¼NW¼ sec. 11, T. 9 S., R. 15 E.

Physical situation.—Water emerges from talus slope of Sand Springs basalt, in canyon wall at contact with Banbury volcanics, and flows into Snake River. The springs issue about 125 ft above river level.

Altitude.—About 3,140 to about 3,210 ft.

Use of Water.—Several diversions for irrigation and fish hatchery.

Measuring sections.—At mouth of several channels, and in diversion channels, about 200 ft below bridge on dirt road crossing channel, ¼ mile above mouth.

TABLE 13.—*Miscellaneous discharge records, Niagara Springs, 1902–31*

Date	Discharge (cfs)	Made by—	Publication record and remarks
4– ?–02	107	Stannard	SEBR; PJIC, WSP 774, p. 159. Also reported by Tappan (1925). Listed as "Smalley's Spring" in SEBR.
9– 8–17	242	TFNSC	WSP 533, p. 283; 557, p. 45; 774, p. 159. At mouth. Includes 14 cfs diverted.
9– 1–18	322(?)	do	WSP 533, p. 283; 557, p. 45; 774, p. 159. WSP 533 says "Above diversions. Includes 125 cfs diverted." (This probably should be 12.5 cfs diverted and 209.5 cfs discharge).
9–23–19	250	do	WSP 533, p. 283; 557, p. 45; 774, p. 159. At mouth. Includes 10 cfs diverted.
9–16–20	252		WSP 533, p. 284; 557, p. 45; 774, p. 159. At mouth.
7–19–24	218	Vaksvik and Tappan	WSP 593, p. 255; 774, 159. Five outlet channels measured separately. Does not include diversions.
8–17–24	226	Tappan	WSP 593, p. 255; 774, p. 159. Also reported by Tappan (1925). At mouth in 5 channels.
Do.	33.2	do	WSP 593, p. 255; 774, p. 159. Also reported by Tappan (1925). Diversions.
Do.	262	do	Total flow, reported by Tappan (1925).

TABLE 13.—*Miscellaneous discharge records, Niagara Springs, 1902–31*—Continued

Date	Discharge (cfs)	Made by—	Publication record and remarks
9- 9-24	215	Vaksvik and Tappan	WSP 593, p. 255; 774, p. 159. Also reported by Tappan (1925). At mouth in 5 channels.
Do	27.2	do	WSP 593, p. 255; 774, p. 159. Also reported by Tappan (1925). Diversions.
Do	242	do	Total flow, reported by Tappan (1925).
11- 1-24	230	Tappan	WSP 613, p. 263; 774, p. 159. Also reported by Tappan (1925). Incorrectly recorded as 239 cfs in Tappan's report.
Do	18.7	do	WSP 613, p. 263; 774, p. 159. Also reported by Tappan (1925). Diversions; recorded as 19.0 cfs by Tappan (1925).
11- 1-24	250	do	WSP 774, p. 159. Total flow, reported by Tappan (1925).
10- 6-31	269	Allis	WSP 738, p. 192. At mouth in 5 channels.

CLEAR LAKES SPRINGS

Location.—Chiefly along the north part of the SE¼ sec. 1, T. 9 S., R. 14 E.

Physical situation.—Water emerges from numerous places in Thousand Springs basalt at bottom of talus slope at foot of canyon wall and feeds Clear Lakes, which have outlets to the Snake River. The springs issue about 125 ft above river level.

Altitude.—About 3,020 to 3,050 ft.

Use of water.—Snake River Fish Hatchery and Idaho Power Co. hydroelectric plant; several small diversions for irrigation above gage.

Measuring sections.—Gaging station was on outlet in rocky channel below lakes, in sec. 2, T. 9 S., R. 14 E., at Clear Lakes Ranch in Gooding County, 50 ft below Clear Lakes, one-fourth of a mile above junction with Snake River; three-fourths of a mile west of the Buhl-Wendell highway bridge across Snake River, and 5 mi north of Buhl; several sections near mouth measured by boat, others as noted in table 14. Daily discharge record, obtained from June 6, 1917 to Nov. 27, 1920, was published with station description in WSP 553, p. 162–165.

Mean and extremes of discharge.—Mean discharge June 6 to Dec. 31, 1917, 517 cfs; 1918 calendar year, 490 cfs; 1919, 482 cfs; Jan. 1 to Nov. 26, 1920, 477 cfs; June 6, 1917 to Nov. 26, 1920, 488 cfs. Minimum discharge, May 2, 1918, 454 cfs; maximum, Nov. 14, 15, 1917, 544 cfs (other extremes shown by miscellaneous measurements probably caused by uncompensated disturbing factors).

TABLE 14.—*Miscellaneous discharge records, Clear Lakes Springs, 1902–37*

Date	Discharge (cfs)	Measurer	Publication record and remarks
4- ?-02	150	Stannard	SEBR, PJIC; WSP 774, p. 158–159. Estimated, "five and a half miles below Smalley's (Niagara) Spring, Devils Washboard."
4- ?-13	410		WSP 774, p. 159.
7- 1-14	510		WSP 774, p. 159. Measured at mouth of outlet.
7- 1-14	437		WSP 774, p. 159. Measured at lake outlet.

TABLE 14.—*Miscellaneous discharge records, Clear Lakes Springs, 1902–37*—Con.

Date	Discharge (cfs)	Measurer	Publication record and remarks
9–13–17	523	Burdick and Crandall	WSP 533, p. 162; 557, p. 45. Includes 4 cfs diverted above measured section.
4–28–18	457	Howard and Crandall	WSP 533, p. 162; 557, p. 45.
10– 8–18	510	Crandall and Carter	WSP 533, p. 162; 557, p. 45.
9–12–19	542(?) or 477(?)	Burdick and Jensen	WSP 533, p. 162; 557, p. 45. Note in WSP 533: "Measurement evidently not accurately made." Gage record for this date indicates 477 cfs.
9–19–19	480	do	WSP 533, p. 162; 557, p. 45. Includes 4 cfs diverted above measured section.
8– 5–20	479	Johnson and Brewer	WSP 533, p. 163; 557, p. 45. Diversions not included.
1917–20	454–544		WSP 533, pp. 163–165. See table 15 for daily discharge.
7–19–24	501	IPC	WSP 593, p. 255.
8–17–24	495	Tappan and Golden	WSP 593, p. 255. At lake outlet.
6–13–26	504	Paulsen and Dibble	WSP 633, p. 257. Measured 50 ft above outlet to Snake River.
5–20–27	314	Paulsen and Tolman	Not published. At headrace of power plant with needle valve 40 percent open. Lake stage lowered 0.09 ft during measurement; hence, measurement probably is not valid.
5–20–27	526	Paulsen	Not published. At headrace of power plant with needle valve 65 percent open. Lake stage lowered 0.55 ft during measurement; hence, measurement probably is not valid.
8–22–37	510	Benedict and Newell	WSP 833, p. 212. At lake outlet above intake to power plant.
11– 9–37	518	do	WSP 863, p. 231. About 100 ft below lake outlet.

TABLE 15.—*Daily discharge, in cubic feet per second, of Clear Lakes Springs, 1917–20*

[From U. S. Geol. Survey Water-Supply Paper 533, p. 163–165]

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1917 data												
1							483	492	532	532	535	524
2							483	498	518	523	535	524
3							485	503	505	532	535	524
4							483	503	523	539	540	527
5							483	500	530	539	540	527
6						483	487	496	523	539	535	527
7						485	490	513	521	539	535	520
8						486	488	498	519	539	540	520
9						487	487	513	527	539	540	524
10						485	487	523	523	539	540	527
11						482	483	515	527	539	540	520
12						480	487	507	527	539	540	520
13						482	487	515	523	539	540	524
14						483	496	519	523	535	544	532
15						492	494	515	527	532	544	532
16						490	492	507	527	527	540	528
17						488	492	531	519	539	535	524
18						487	492	507	525	539	540	532
19						485	490	519	523	535	540	532
20						492	487	519	523	535	540	524

TABLE 15.—*Daily discharge, in cubic feet per second, of Clear Lakes Springs, 1917–20*—Continued

[From U. S. Geol. Survey Water-Supply Paper 533, p. 159–160]

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1917 data—Continued												
21						487	487	515	535	535	535	524
22						483	492	524	539	535	540	520
23						493	492	507	535	539	540	520
24						492	496	523	532	539	540	524
25						490	483	524	527	539	540	527
26						492	490	525	519	539	535	527
27						492	492	517	539	539	535	527
28						493	496	523	539	539	540	520
29						492	494	528	537	535	535	520
30						483	492	530	535	539	524	515
31							498	532		539		515
Max						493	498	532	539	539	544	532
Min						480	483	492	505	523	524	515
Mean						487	489	514	527	537	538	524
1918 data												
1	515	488	458	476	459	476	476	494	510	522	510	494
2	500	488	464	476	454	466	483	494	514	522	514	494
3	503	494	482	473	459	476	483	494	514	518	510	494
4	503	494	482	476	458	476	487	494	517	518	510	494
5	507	488	464	476	462	473	483	494	514	515	510	490
6	512	494	464	476	462	476	483	494	520	515	510	490
7	512	494	468	473	462	476	483	494	517	515	507	490
8	520	494	470	476	462	476	487	494	517	514	507	490
9	500	488	470	475	459	474	487	497	517	518	507	490
10	500	488	470	476	459	469	487	497	517	518	504	494
11	500	488	476	476	462	469	483	497	517	514	504	494
12	500	488	470	476	462	473	483	497	517	514	504	490
13	501	488	478	476	462	474	487	497	517	514	504	490
14	503	488	479	476	462	476	487	497	517	514	504	487
15	503	488	473	476	462	480	487	497	522	518	500	487
16	507	488	476	476	462	476	483	497	515	514	500	487
17	507	480	476	476	466	476	483	500	522	510	498	484
18	503	458	476	476	466	483	483	500	522	518	497	487
19	512	470	463	476	476	483	487	500	522	518	498	487
20	504	458	473	473	474	483	481	500	522	514	500	487
21	504	482	468	476	470	483	481	500	522	514	500	487
22	487	470	464	476	469	483	487	500	518	518	500	490
23	494	458	459	473	469	476	490	500	518	522	500	490
24	494	464	459	473	469	476	490	497	515	522	497	487
25	487	470	464	476	469	476	490	505	522	525	494	487
26	487	482	464	476	473	476	490	507	522	522	494	487
27	487	488	464	476	473	483	490	507	522	518	494	487

TABLE 15.—*Daily discharge, in cubic feet per second, of Clear Lakes Springs, 1917–20*—Continued

[From U. S. Geol. Survey Water-Supply Paper 533, p. 159-160]

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1918 data—Continued												
28	487	464	466	458	473	483	490	507	525	518	497	480
29	487	-------	466	459	473	483	494	509	522	514	497	483
30	487	-------	469	459	476	483	494	515	522	504	497	483
31	487	-------	476	-------	476	-------	494	507	-------	515	-------	483
Max	520	494	482	476	476	483	494	515	525	525	514	494
Min	487	458	458	458	454	466	476	494	510	510	494	483
Mean	500	482	469	474	466	477	486	499	519	517	502	489
1919 data												
1	483	487	487	467	472	470	480	487	498	492	492	477
2	483	487	485	467	472	475	480	487	492	492	492	477
3	483	487	483	470	472	478	480	489	487	492	492	477
4	483	487	480	470	476	474	480	491	484	487	494	477
5	480	487	480	467	476	478	482	491	484	492	492	477
6	480	487	480	470	475	480	485	491	480	487	490	477
7	483	483	473	466	476	480	485	491	477	492	489	473
8	480	487	473	466	476	478	485	495	477	492	488	473
9	480	487	473	466	475	478	485	495	477	487	487	473
10	480	487	473	466	476	478	485	498	477	487	487	472
11	480	487	473	476	483	476	481	498	477	492	487	472
12	480	487	477	476	476	474	477	498	477	500	484	472
13	476	487	477	476	475	475	477	498	480	500	484	472
14	480	485	477	473	470	480	477	498	480	500	484	472
15	476	483	477	476	473	480	477	498	484	500	484	472
16	476	483	475	473	470	480	474	498	484	492	484	472
17	480	487	472	476	470	480	474	498	486	492	484	476
18	480	487	472	476	465	478	474	498	487	492	484	476
19	480	487	470	476	465	477	474	498	482	492	484	427
20	483	490	472	476	465	477	477	498	487	492	484	476
21	483	490	477	476	465	476	477	498	487	495	484	478
22	480	490	477	476	470	476	477	498	487	492	484	480
23	480	490	477	473	465	476	480	498	487	492	480	476
24	483	483	473	474	465	476	480	498	487	492	480	480
25	483	483	473	476	465	476	480	498	487	487	480	480
26	483	487	475	476	465	476	480	498	492	487	480	480
27	483	487	477	476	465	476	480	498	492	492	480	484
28	483	487	477	476	465	476	480	498	492	487	480	480
29	483	-------	477	476	468	476	480	498	492	487	492	484
30	483	-------	467	476	468	480	485	498	492	492	477	484
31	483	-------	470	-------	468	-------	487	491	-------	492	-------	484
Max	483	490	487	476	483	480	487	498	498	500	494	484
Min	476	483	467	466	465	470	474	487	477	487	477	472
Mean	481	487	476	473	471	477	480	496	485	492	485	477

TABLE 15.—*Daily discharge, in cubic feet per second, of Clear Lakes Springs, 1917–20*—Continued

[From U. S. Geol. Survey Water-Supply Paper 533, p. 159–160]

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1920 data												
1	484	490	486	468	473	464	466	473	484	476	490	-------
2	484	490	484	468	473	468	466	473	476	476	490	-------
3	484	490	484	470	473	470	466	474	473	476	490	-------
4	484	490	482	470	476	466	466	476	470	473	486	-------
5	484	490	482	468	476	468	468	476	470	476	486	-------
6	484	488	482	470	476	473	470	476	466	473	486	-------
7	484	486	473	466	476	470	470	476	463	476	486	-------
8	484	490	473	466	476	470	470	482	463	476	486	-------
9	484	490	473	466	476	470	470	482	463	473	490	-------
10	484	494	473	466	476	470	470	484	463	473	490	-------
11	484	494	473	476	484	468	466	484	463	476	486	-------
12	484	490	476	476	476	466	463	484	463	484	486	-------
13	484	490	476	476	474	466	463	484	463	484	484	-------
14	486	488	476	473	473	470	463	484	466	484	484	-------
15	487	486	476	476	473	470	463	484	466	484	484	-------
16	487	486	474	473	470	470	460	484	468	476	484	-------
17	487	486	473	474	470	470	460	484	468	476	484	-------
18	494	486	473	476	466	468	460	484	468	476	484	-------
19	494	486	473	476	466	466	460	484	473	476	484	-------
20	496	494	473	476	466	466	463	484	473	476	484	-------
21	496	494	476	476	466	463	463	484	473	482	484	-------
22	494	494	476	476	470	463	463	484	473	476	485	-------
23	494	488	476	473	466	463	466	484	473	476	486	-------
24	496	482	473	474	463	463	466	484	473	476	486	-------
25	496	482	473	476	463	463	466	476	473	473	486	-------
26	496	486	474	476	463	463	466	476	476	473	486	-------
27	496	486	476	476	463	463	466	476	476	476	490	-------
28	496	486	476	476	464	463	466	484	476	473	-------	-------
29	496	486	476	476	466	463	466	484	476	473	-------	-------
30	496	-------	466	476	466	464	470	484	476	476	-------	-------
31	496	-------	470	-------	466	-------	473	476	-------	490	-------	-------
Max	496	494	486	476	484	473	473	484	484	490	490	-------
Min	484	482	466	466	463	463	460	473	463	473	484	-------
Mean	490	489	476	473	470	467	466	481	470	477	486	-------

BRIGGS SPRINGS

Location.—About 1.5 mi west of Clear Lakes, in the central part of the N½SW¼ sec. 3, T. 9 S., R. 14 E.

Physical situation.—Water emerges from Sand Springs basalt, at contact with Banbury volcanics, near foot of talus slope, and flows through Briggs Creek to the Snake River.

Altitude.—About 3,025 ft.

Use of water.—Small irrigation diversion at head of creek.

Measuring sections.—At ford above ranch house, and elsewhere.

Remarks.—Locations of measured sections not accurately determinable.

TABLE 16.—*Miscellaneous discharge records, Briggs Springs, 1902–31*

Date	Discharge (cfs)	Made by—	Publication record and remarks
4– ?–02	77.2	Stannard	SEBR; PJIC; WSP 774, p. 160.
4– ?–13	181		From notes furnished by Lynn Crandall, 11–29–48.
9–13–17	128	TFNSC	WSP 533, p. 284; 557, p. 45; 774, p. 160. Measured at ford above ranch house.
9–30–18	130	do	Do.
9–12–19	128	do	Do.
9–17–20	122	do	Do.
7–16–24	110	IPC	WSP 593, p. 255; 774, p. 160. Measured at ford above ranch house.
8–17–24	111	do	Do.
9–10–24	113	Vaksvik and Tappan	Do.
10–31–24	125	IPC	WSP 613, p. 263; 774, p. 160. Measured at ford above ranch house.
6– 6–25	117	do	WSP 613, p. 263. Measured at ford above ranch house.
8–29–25	119	Tappan and Fite	Do.
10– 6–31	149	Allis	WSP 738, p. 192. Note on original record: "From bridge, probably near old fording place."

BANBURY SPRINGS

Location.—Numerous openings in the central part of sec. 33, T. 8 S., R. 14 E.

Physical situation.—Water emerges from Sand Springs basalt at contact with Banbury volcanics, in talus slope at foot of canyon wall, and flows through short channel to Snake River.

Altitude.—About 3,050 ft.

Use of water.—Pipeline carries part of water across river for irrigation.

Measuring section.—At mouth.

Remarks.—Waste irrigation water drains into spring from top of bluff.

TABLE 17.—*Miscellaneous discharge records, Banbury Springs, 1902–25*

Date	Discharge (cfs)	Made by—	Publication record and remarks
4- ?-02	65.9	Stannard	SEBR; PJIC; WSP 774, p. 160. Listed as "Randall's Lake" in SEBR.
4- ?-13	128		WSP 774, p. 160.
9-14-17	124	TFNSC	WSP 533, p. 284; 557, p. 46; 774, p. 160. Measured at mouth; includes 4 cfs diverted.
9-13-19	108	do	WSP 533, p. 284, 557, p. 46; 774, p. 160. Includes 3 cfs diverted.
9-17-20	117	do	WSP 533, p. 284, 557, p. 46; 774, p. 160.
7-15-24	95.4	IPC	WSP 593, p. 255; 774, p. 160.
8-16-24	93.8	do	Do.
9- 8-24	101	Vaksvik and Tappan	WSP 593, p. 255; 774, p. 160. Measured about 150 ft above mouth.
10-31-24	101	IPC	WSP 613, p. 263; 108 cfs according to WSP 774, p. 160, and to report by Tappan (1925).
8-28-25	114	Tappan and Fite	WSP 613, p. 263. Note in original record says "Banbury estimates about 4 cfs diverted for irrigation."

BLIND CANYON SPRING

Location.—Six mi west and 5.5 mi south of Wendell, in the SE¼SE¼ sec. 28, T. 8 S., R. 14 E.

Physical situation.—Springs discharge from Sand Springs basalt through talus at head and along walls of alcove canyon; feed creek which discharges to Snake River about one-half mi to northwest.

Altitude.—About 3,040 to about 3,080 ft.

Use of water.—None.

Measuring sections.—At mouth, and elsewhere.

Remarks.—Locations of measuring sections not accurately determinable.

TABLE 18.—*Miscellaneous discharge records, Blind Canyon Spring, 1902, 1917, 1919*

Date	Discharge (cfs)	Made by—	Publication record and remarks
4- ?-02	1.5	Stannard	SEBR; WSP, 774, p. 160. Estimated; published as 2.0 cfs in WSP 774.
10-13-17	11.8	TFNSC	WSP 533, p. 284; 557, p. 46; 774, p. 160. At mouth; WSP 557 says "at mouth of spring branch."
9-19-19	8.5	do	Do.

BOX CANYON SPRING

Location.—Six mi west and 5 mi. south of Wendell, in the NW¼ sec. 27 and the NE¼ sec. 28, T. 8 S., R. 14 E.

Physical situation.—Main spring at foot of cliff at head of deep, narrow alcove canyon; others along spring-fed creek. Water issues from Sand Springs basalt and flows about a mile in creek to Snake River. Most of the water issues about 200 ft above river level.

Altitude.—About 3,065 ft.

Use of water.—None. There is an abandoned diversion structure near the head of the canyon.

Measuring sections.—On Box Canyon Creek, about 100 ft below unnamed falls, 0.75 of a mile from Snake River; (2) at mouth; (3) 0.3 mile above mouth and 0.5 mile below unnamed falls; (4) others as noted in table 19.

Remarks.—There is considerable inflow along entire length of channel and there is evidence of underflow in talus at all measured sections above mouth.

TABLE 19.—*Miscellaneous discharge records, Box Canyon Spring, 1902–41*

Date	Discharge (cfs)	Made by—	Publication record and remarks
?- ?-02	1,000	Russell	USGS Bull. 199. Estimated flow at mouth of outlet creek.
4- ?-02	450	Stannard	SEBR; PJIC; WSP 774, p. 161. Estimated flow at mouth of outlet creek.
?- ?-11	465		WSP 774, p. 161. At mouth.
9-14-17	341	TFNSC	WSP 533, p. 284; 557, p. 46; 774, p. 161. At section (1); inflow below section estimated as 120 cfs.
9-30-18	338	do	WSP 533, p. 284; 557, p. 46; 774, p. 161. At section (1).
9-13-19	302	do	Do.
9-15-20	308	TFNSC	Do.
7-13-21	356	Paulsen and Hoyt	WSP 533, p. 284; 557, p. 46; 774, p. 161. At section (1); computed from measurement of surface velocities.
8-16-24	303	IPC	WSP 593, p. 255; 774, p. 161. WSP 774 shows 309 cfs. "Below falls, ⅞ mile above mouth," section (1).
9- 8-24	264	Vaksvik and Tappan	Do.
10-31-24	277	IPC	WSP 613, p. 263; 774, p. 161. WSP 774 gives date as Nov. 2, 1924.
5-31-25	282	Tappan and Vance	WSP 613, p. 263. At section (1).
10- 6-31	354	Allis	WSP 738, p. 354. Location recorded in WSP 738: "sec. 28, T. 8 S., R. 14 E.; at mouth." Note in original record: "Measurement made from footbridge where Mr. Burdick says other measurements have been made.". There is no present evidence of a footbridge at the mouth of this canyon, but there are two footbridges upstream, above the falls. The discharge corresponds more closely to others recorded upstream than it does to those at the mouth. The measurement probably was made near the falls.
4- 9-41	300	Benedict and Newell	WSP 933, p. 240. Below falls, about 600 ft below Idaho Power Co. flume (abandoned diversion structure). At section (1).
4-10-41	496	do	WSP 933, p. 240. ⅜ mile above mouth.

BLUE SPRINGS

Location.—One-half mi. below mouth of Box Canyon in SW¼SW¼ sec. 21 and adjacent part of sec. 28, T. 8 S., R. 14 E.

Physical situation.—Pool at edge of Snake River. I. C. Russell described this spring under the name Sand Spring (U. S. Geol. Survey Bull. 199, p. 163): "Half a mile below the mouth of Little Canyon near the level of the river at its lowest stage, an immense spring of wonderfully clear water of a delicate bluish color rises through a bed of clear white sand and for this reason is named Sand Spring. This great spring is situated in a slight reentrant of the canyon wall, which indicates the nature of the beginning of a spring-formed alcove."

Altitude.—About 2,875 ft.

Use of water.—None.

Measuring section.—At mouth.

Remarks.—Some of the published records use the name "Blue Spring," but the Geological Survey topographic map, Thousand Springs quadrangle, 1951, shows name as "Big Springs." See also the record for "Springs near Blue Springs," which follows.

TABLE 20.—*Miscellaneous discharge records, Blue Springs, 1902–31*

Date	Discharge (cfs)	Made by—	Publication record and remarks
4- ?-02	48.5	Stannard	SEBR, WSP 774, p. 161.
10-13-17	61.5	TFNSC	WSP 533, p. 284; 557, p. 46; 774, p. 161. Locality reported in WSP 533 as sec. 20, but springs are in secs. 21 and 28.
9-19-19	61.0	TFNSC	Do.
10- 6-31	65.6	Allis	WSP 738, p. 192. Measured at mouth from boat.

SPRINGS NEAR BLUE SPRINGS

Location.—One-half mi downstream from mouth of Box Canyon, at river level, in or near the NW¼NW¼ sec. 28, T. 8 S., R. 14 E.

Altitude.—About 2,875 ft.

Measuring section.—Location not listed in record.

Remarks.—Series of springs discharging at or below the surface of the Snake River. The location and identity of this group of springs are not accurately determinable. The location given above is that of Blue Springs. The measure ment noted below probably includes 61.5 cfs from Blue Springs and an estimate of unmeasurable flow in the vicinity of Blue Springs (see record for Blue Springs).

Record of measurements.—Discharge Oct. 13, 1917, 90 cfs estimated by Burdick and McConnel; published in WSP 533, p. 284; 557, p. 46.

SAND SPRINGS

Location.—Six mi west and 4 mi south of Wendell, in the NW¼NE¼ sec. 21 and the SE¼SW¼ sec. 16, T. 8 S., R. 14 E.

Physical situation.—Water emerges from Sand Springs basalt below Thousand Springs basalt at foot of low bluff near top of canyon rim; forms Sand Springs, which flow about a mile and a half to the Snake River. The water emerges nearly 200 ft above river level.

Altitude.—About 3,150 ft.

Use of water.—Several diversions for irrigation and one through feeder canal and flume for the Thousand Springs power plant of Idaho Power Co.

Measuring sections.—Several. Diversions and main channel are measured separately. Locations of measuring sections are not accurately determinable and they have been changed several times.

Remarks.—A flume and pipeline to Thousand Springs power plant was built in 1921. Measurements prior to 1921, except in 1902, probably were made at point where a county road crosses Sand Springs Creek in sec. 17, T. 8 S., R. 14 E.

TABLE 21.—*Miscellaneous discharge records, Sand Springs, 1902–31*

Date	Discharge (cfs)	Made by—	Publication record and remarks
4- ?-02	46.0	Stannard	WSP 774, p. 162. Sum of measurements in two channels at mouth, below diversions. Reported as 51 cfs in PJIC. Includes discharge from unnamed springs near the river (see records for "Springs near mouth of Sand Springs Creek"). Sand Springs, "three-fourths of a mile below Lewis Ferry."
5- 7-12	52	TFNSC	WSP 774, p. 162. Includes 5.1 cfs diverted above section.
4- ?-13	67.6	do	WSP 774, p. 162. Includes diversions.
9-15-17	80.4	do	WSP 533, p. 284; 557, p. 46; 774, p. 162. Includes 14.2 cfs diverted.
4- 8-18	81.9	do	WSP 533, p. 284; 557, p. 46; 774, p. 162. Includes 3 cfs diverted.
9-30-18	94.5	TFNSC	WSP 533, p. 284; 557, p. 46; 774, p. 162. Includes 11.2 cfs diverted.
9- 6-19	75.9	do	WSP 533, p. 284; 557, p. 46; 774, p. 162. Includes 12.2 cfs diverted.
10-19-19	66.6	do	WSP 533, p. 284; 557, p. 46; 774, p. 162. Locality given in WSP 533: "At head ir sec. 17, T. 8 S., R. 14 E., Idaho." Head actually is in secs. 16 and 21.
10-21-19	71.9	do	WSP 533, p. 284; 557, p. 46; 774, p. 162. Does not include diversions.
9-21-20	80.7	do	WSP 533, p. 284; 557, p. 46; 774, p. 162. Includes 8.0 cfs diverted.
7-13-21	66.5	Paulsen and Hoyt	WSP 533, p. 284; 557, p. 46; 774, p. 162. Does not include about 14 cfs diverted; measured about one-fourth mile above headworks of flume and represents flow to Thousand Springs power plant.
7-15-24	82.6	Tappan	WSP 593, p. 255; 774, p. 162. Includes 17.6 cfs diverted above measuring section. Measured about 200 ft below flume headworks.
8-15-24	73.7	IPC	WSP 593, p. 255; 774, p. 162. Includes 20.0 cfs diverted Measured about 200 ft below flume headworks. "Total flow of Sand Springs Creek." Published as 72.4 cfs in WSP 774.
9- 7-24	79.6	Vaksvik and Tappan	WSP 593, p. 255; 774, p. 162. Includes 18.5 cfs diverted. Measured about 300 ft below flume headworks. Includes 1.2 cfs diverted.
10-30-24	98.9	IPC	WSP 613, p. 263. 200 ft below head. Includes 6.97 cfs diverted above and 6.74 cfs inflow below measuring section.
11- 3-24	85.9		WSP 774, p. 162. Includes 1.2 cfs diverted.
6- 4-25	91.3	Tappan	WSP 613, p. 263. Measured near diversion flume. Includes 15.5 cfs diverted; inflow of 4.37 cfs not included.
8-27-25	100	Tappan and Fite	WSP 613, p. 263. Measured near diversion flume. Includes 19.6 cfs diverted.
10- 7-31	77.6	Allis	WSP 738, p. 192. From bridge on county road (probably the same section as that used in 1917–20).

SPRINGS ONE-HALF MILE BELOW OLD RIVERSIDE FERRY

Location.—One-half mi below Riverside Ferry, probably in or near the SW¼ sec. 20, T. 8 S., R. 14 E.

Altitude.—Probably about 2,875 ft.

Use of water.—None.

Measuring section.—Location not determinable.

Remarks.—The location and identity of this spring or group of springs are not determinable. The location given with the published record is near the

mouth of Salmon Falls Creek, and the 1902 measurement may have been on Salmon Falls Creek. The locality for a measurement on Oct. 13, 1917, as given with the published record, was one-half mi. below old Riverside Ferry in sec. 20, T. 8 S., R. 14 E., Idaho. The Geological Survey topographic map of Thousand Springs quadrangle, 1951, does not show any springs in that section.

Record of measurements.—Discharge April, 1902, 15 cfs; measured by Stannard; published in SEBR and WSP 774, p. 161. Discharge Oct. 13, 1917, 13.2 cfs, measured by Burdick and McConnel; published in WSP 533, p. 284; 557, p. 46; 774, p. 161. The original records are not available to the writers.

SPRINGS NEAR MOUTH OF SAND SPRINGS CREEK

Location.—Near where Sand Springs Creek discharges into the Snake River, in the SE¼SW¼ sec. 17, T. 8 S., R. 14 E.

Physical situation.—At foot of canyon wall; water discharges through short channel to Snake River.

Altitude.—About 2,900 ft.

Use of water.—None.

Measuring sections.—In two channels, 100 ft and 700 ft from mouths.

Remarks.—Before 1921 the spring openings for one or both of these groups of springs were hidden by the discharge of Sand Springs Creek, which fell over the rim of the canyon directly above. The diversion of Sand Springs Creek into the Thousand Springs power plant made it possible to segregate the flow of these springs during periods when there was little or no water being wasted from Sand Springs Creek. The first recorded true measurement of these springs was by Allis in 1931, when the estimated rate of waste from Sand Springs Creek was 3 cfs.

TABLE 22.—*Miscellaneous discharge record, springs near mouth of Sand Springs Creek, 1902, 1931*

Date	Discharge (cfs)	Made by—	Publication record and remarks
4- ?-02	28.5	Stannard	SEBR. "Half a mile below Lewis' Ferry, Sand Springs." Measurement probably included discharge of Sand Springs Creek.
4- ?-02	17.5	do	SEBR. "Three-fourths of a mile below Lewis' Ferry."
4- ?-02	45.98	do	PJIC. Sum of measurements in two channels at mouth. Reported in PJIC as 51 cfs from Sand Springs.
10- 7-31	41.6	Allis	Not published separately. Channel receiving flow from Sand Springs, 100 ft from mouth. Probably the same section as that referred to by Stannard as "half mile below Lewis' Ferry."
10- 7-31	36.4	do	Not published separately. Probably same section referred to by Stannard as "Three-fourths of a mile below Lewis' Ferry;" 700 ft above mouth.
10- 7-31	77.9	do	WSP 738, p. 192. Sum in above two channels. "About 3 cfs subtracted from measurement to allow for Sand Springs Creek water spilling over canyon rim."

SPRING BETWEEN SAND SPRINGS AND THOUSAND SPRINGS

Location.—Between Sand Springs and Thousand Springs; believed to be about in the NW¼NE¼ sec. 17, T. 8 S., R. 14 E.

Physical situation.—Water emerges from basalt at foot of talus slope below canyon wall, and flows to Snake River.

Altitude.—About 3,060 ft.

Use of water.—Small diversions for irrigation and domestic supply.

Measuring section.—None. Flow estimated at unspecified location.

Record of measurements.—Discharge Oct. 13, 1917, 4.2 cfs, estimated by Burdick and McConnel; published in WSP 533, p. 285; 557, p. 46; 774, p. 162.

SNOWBANK SPRINGS

Location.—Cliff southeast of Thousand Springs power plant (pl. 2), at east end of collecting canal, in SE¼SE¼ sec. 8, T. 8 S., R. 14 E.

Physical situation.—Same as Thousand Springs, with which these springs usually are grouped.

Altitude.—About 3,100 ft.

Use of water.—Practically all the water is used for power generation.

Measuring section.—Not described.

Discharge.—About 150 to 180 cfs (see table 23, under "inflow at Snowbank Fall").

Remarks.—Not usually distinguished from Thousand Springs, with which the water mingles in the power plant collecting canal.

THOUSAND SPRINGS

Location.—Cliff above Thousand Springs power plant of Idaho Power Co., in central part of sec. 8, T. 8 S., R. 14 E.

Physical situation.—Water emerges from Thousand Springs basalt, at and above contact with Banbury volcanics; many openings in face of sheer canyon wall, without appreciably developed alcoves. Most of water issues about 195 ft above river. Most of water passes through power plant to Snake River.

Altitude.—From about 2,900 to about 3,100 ft.

Use of water.—Power plant collecting canal intercepts most of water.

Measuring sections.—Several, on outflow channels from power plant (see pl. 2).

Remarks.—The designation of these springs varies among investigators. From the vicinity of a water-collecting flume of the Idaho Power Co. in sec. 8, northwestward into the southeast part of sec. 6, there is a nearly continuous line of springs issuing along the canyon wall of basalt. Loosely, all these are called Thousand Springs. The discharge has been measured in many outlet channel sections, lettered *A* through *L* from southeast to northwest, and one unlettered channel section at the extreme southeast (see pl. 2), here called section *X*. In some reports, sections *X* and *A* are presumed to represent the discharge from Thousand Springs, thus restricting the name chiefly to those springs that feed the Idaho Power Co. generator plant, and including Snowbank Springs. In other reports, including the present one, the name is applied to springs discharging through channel sections *X* and *A* to *D*. Channel sections *E* to *L* are considered to be the outlets for Bickel Springs.

At Thousand Springs, water from the southeast group of openings is collected in a canal and sent through penstocks to a hydropower plant. The tailrace from

the power plant is drained by two channels, one (channel *X*) flowing southward ("east channel" of authors) and the other (channel *A*) flowing northwestward ("west channel" of authors). In some reports (see Water-Supply Paper 738, and others), section *D* also is called the west channel. Major modifications of the water-collecting system were made in 1920–21 and a flume was constructed to divert a considerable part of the water from Sand Springs to the collecting canal. The discharge records after 1920 therefore include some water from Sand Springs.

TABLE 23.—*Miscellaneous discharge records, Thousand Springs, 1917–31*

Date	Discharge (cfs)	Made by—	Publication record and remarks
		Channel flowing northwestward	
		[Measuring section *A* in WSP 774, p. 163, fig. 13 and shown on pl. 1 of this report]	
9-15-17	42.0	TFNSC	WSP 533, p. 285
7-11-21	90.3	Paulsen and Hoyt	WSP 774, p. 163
7-11-21	81.1(?)	do	Not published. From original record, which says "Change in discharge, caused by change in power plant setting during measurement, makes measurement invalid."
		Channel flowing southward	
		[Measuring section *X* of this report]	
9-15-17	587	TFNSC	WSP 533, p. 285
7-13-21	478	Paulsen and Hoyt	Not published; from original record.
7-14-24	634	IPC	WSP 593, p. 256
8-16-24	526	Tappan and Golden	Do.
9- 8-24	544	Vaksvik and Tappan	Do.
10-30-24	550	IPC	WSP 613, p. 263. Below bridge at power plant.
8-27-25	579	Tappan and Fite	Do.
10- 7-31	730	Allis	WSP 738, p. 192. "East channel" at bridge about 400 ft above mouth.
		Combined flow available for power plant	
		["East" and "west" channels]	
9-15-17	629	TFNSC	WSP 533, p. 285, 557, p. 46.
9-19-18	656	do	Do.
9- 6-19	515	do	Do.
7-13-21	560	Paulsen and Hoyt	Not published; from original record.
		Inflow at Snowbank Falls (Snowbank Springs)	
5-19-17	153	TFNSC	WSP 533, p. 285.
9-15-17	160	do	Do.
9-19-18	186	do	Do.

TABLE 23.—*Miscellaneous discharge records, Thousand Springs, 1917–31*—Con.

Date	Discharge (cfs)	Made by—	Publication record and remarks
Other measurements in vicinity of power plant			
8- 9-20	864	TFNSC	WSP 533, p. 285; 557, p. 46. Combined flow, east and west channels, plus discharge from several springs that enter below power plant.
7-11-21	72.7	IPC	WSP 533, p. 285. Inflow to "west" channel (equals sections *B* plus *C*).
7-14-24	48.9	do	WSP 593, p. 256. Inflow to "west" channel (equals sections *B* plus *C*).
8-15-24	50.2	do	Do.
9- 7-24	48.3	do	WSP 593, p. 256. "Inflow to west channel"; includes some unmeasured water from wasteways.
8-16-24	423	Tappan and Golden	Not published separately. Tailrace of Thousand Springs power plant unit No. 3.
8-16-24	86.1	do	Not published separately. Tailrace of Thousand Springs power plant unit No. 1.
8-16-24	509	do	WSP 593, p. 256. Total flow from tailrace of power plant.
9- 8-24	424	Vaksvik and Tappan	Not published separately. Tailrace of Thousand Springs power plant unit No. 3.
9- 8-24	84.8	do	Not published separately. Tailrace of Thousand Springs power plant unit No. 2.
9- 8-24	509	do	WSP 593, p. 256. Total flow from tailrace of power plant.
8-27-25	542	Tappan and Fite	WSP 613, p. 263. Tailrace of unit No. 3. Measurement made to compute efficiency of unit, which was 76 percent.
Measuring section *B*			
[Sums of measurements in sections *B* and *C* listed in WSP 593 and 613 as inflow to Thousand Springs "west" channel]			
4- ?-02	46.0	Stannard	SEBR. Location of measuring section not determinable; may not correspond to measured section *B* as shown on plate 2.
7-11-21	39.7	Paulsen and Hoyt	WSP 774, p. 163.
7-14-24	38.2	Tappan	Do.
8-15-24	39.0	Tappan and Golden	WSP 774, p. 163.
9- ?-24	40.2	Vaksvik and Tappan	WSP 774, p. 163.
10-29-24	46.8	IPC	WSP 613, p. 264; 774, p. 163. Shown as 36.8 in WSP 774.
8-28-25	48.2	Tappan and Fite	WSP 613, p. 264.
Measuring section *C*			
[See remarks, measuring section *B*]			
4- ?-02	8.62	Stannard	SEBR. Location of measuring section not accurately determinable; may not correspond to measured section *C* as shown on plate 2.
7-11-21	10.9	Paulsen and Hoyt	WSP 774, p. 163.
7-14-24	10.7	Tappan	WSP 774, p. 163. Recorded as 9.2 cfs in original field notes.
8-15-24	11.2	Tappan and Golden	WSP 774, p. 163.
9- 7-24	8.1	Vaksvik and Tappan	Do.
10-29-24	10.0	IPC	Do.

TABLE 23.—*Miscellaneous discharge records, Thousand Springs, 1917–31*—Con.

Date	Discharge (cfs)	Made by—	Publication record and remarks
		Measuring section *D*	
[Difference between simultaneous measurements on measuring sections *D* and *A* gives total inflow to channel leading northwestward from power-plant tailrace. That difference was published in WSP 533 as 72.7 cfs on July 11, 1921. Measurements at section *D* are listed under the name "Thousand Springs west channel" in WSP 593 and 613]			
4– ?–02	138.8	Stannard	SEBR. Location not accurately determinable. May not correspond to measuring section *D* as shown on plate 2.
9–17–17	157	TFNSC	WSP 533, p. 285. "West channel."
7–11–21	163	Paulsen and Hoyt	WSP 774, p. 163.
7–14–24	252	Tappan	WSP 593, p. 256; 774, p. 163.
8–16–24	243	Tappan and Golden	WSP 593, p. 256; 774, p. 163. Published as 244 cfs in WSP 774.
9– 8–24	238	Vaksvik and Tappan	WSP 593, p. 256; 774, p. 163.
10–30–24	254	IPC	WSP 613, p. 264; 774, p. 163.
8–27–25	268	Tappan and Fite	Do.
10– 7–31	268	Allis	WSP 738, p. 192. Measured in "west" channel, 200 ft above mouth.

BICKEL SPRINGS

Location.—About 5 mi southeast of Hagerman in adjacent quarters of secs. 6, 7 and 8, T. 8 S., R. 14 E.

Physical situation.—Large springs, some of which issue from basalt through talus, and some directly from openings in basalt in sheer canyon wall. Most of the water issues about 140 to 150 ft above river level. The aquifer seems to be the Thousand Springs basalt at and above its contact with the Banbury volcanics. Some of the water spills down the canyon wall into the Snake River and some passes through short channels to the river.

Altitudes.—Altitudes of springs openings range from about 3,020 to about 3,170 ft. The altitudes of measuring sections are about 2,880 to 3,000 ft.

Use of water.—Several diversions for fish hatcheries and irrigation.

Measuring sections.—Several (pl. 2). Locations are not well defined and measurements have not always been made at the same locations.

Remarks.—Also called Hagerman Springs. Records in table 25 are for measuring sections designated *E* to *L* on plate 2 of this report. See also the remarks on Thousand Springs.

TABLE 24.—*Miscellaneous discharge records, Bickel Springs, 1917–31*

Date	Discharge (cfs)	Made by—	Publication record and remarks
Measuring section *E*, one-half mile above Bickel Ranch house			
9–17–17	112	TFNSC	WSP 533, p. 285, 577, p. 46. Measured in "main channel."
7–13–21	114	Fiedler	WSP 533, p. 285; 557, p. 46; 774, p. 163.
7–12–24	107	Tappan	WSP 593, p. 256; 774, 163.
8–14–24	104	Tappan and Golden	Do.
9– 6–24	120	Vaksvik and Tappan	Do.
8–28–25	120	Tappan and Fite	WSP 613, p. 264. Measured "1,300 ft northwest of Thousand Springs (west channel)".
Measuring sections F and G			
7–13–21	9.2	Fiedler	WSP 774, p. 163. Section *F* only.
7–13–21	16.2	do	WSP 774, p. 163. Sum of estimated discharges through several sections.
Measuring sections *H* (diversion from small lake on Bickel Ranch, into siphon which crosses Snake River) and *I* (where trail crosses outlet from lake on Bickel Ranch).			
7–13–21	43.9	Fiedler	WSP 774, p. 163. Partly estimated; sum of two measurements, 20 cfs plus 23.9 cfs.
7–14–24	48.2	Tappan	WSP 593, p 256; 774, p. 163; (Sum of measurements in *H* and *I* in WSP 774).
8–14–24	45.0	Tappan and Golden	Do.
9– 7–24	42.4	Vaksvik and Tappan	Do.
6– 1–25	41.9	Tappan	WSP 613, p. 264. Sum of two channels.
8–28–25	45.3	Tappan and Fite	Do.
Measuring section *J*, in "Vader's Creek," which is a drainageway for a small spring and for waste irrigation water			
4– ?–02	10.3	Stannard	SERB. Probably chiefly waste irrigation water.
7–13–21	0.78	Fiedler	WSP 774, p. 163.
7–14–24	0.77	Tappan	WSP 593, p. 256; 774, p. 163.
8–14–24	0.74	Tappan and Golden	Do.
9– 7–24	2.0	Vaksvik and Tappan	WSP 593, p. 256; 774, p. 163. Estimated; includes waste irrigation water.

See footnote at end of table.

TABLE 24.—*Miscellaneous discharge records, Bickel Springs, 1917–31*—Continued

Date	Discharge (cfs)	Made by—	Publication record and remarks
Measuring section *K*, in one of two outlets from a small lake on Bickel Ranch, about 500 ft north of Bickel Ranch house. [Sum of discharge through sections *K* and *L* is total from lake]			
7–13–21	11.8	Fiedler	WSP 774, p. 163.
7–14–24	15.4	Tappan	WSP 593, p. 256; 774, p. 163. Published in WSP 593 as sum (23.3) in sections *K* and *L*.
8–14–24	15.5	Tappan and Golden	WSP 593, p. 256; 774, p. 163. Includes 0.7 cfs of diverted water. Published in WSP 593 as sum (17.0 cfs) in sections *K* and *L*.
9– 7–24	11.3	Vaksvik and Tappan	WSP 593, p. 256; 774, p. 163. Published in WSP 593 as sum (16.5 cfs) in sections *K* and *L*.
6– 1–25	18.2	Tappan	WSP 613, p. 264. Includes estimated flow of 0.1 cfs at measured section *L*; measured "500 ft north of Bickel's house."
8–27, 28–25	18.8	IPC	WSP 613, p. 264. Measured 500 ft north of Bickel's house.
8–28–25	16.7	Tappan and Fite	WSP 613, p. 264. Listed as section *L* in original records. Published as 18.8, which is sum of 16.7 in section *K* and 2.1 in section *L*.
10– 7–31	12.4	Allis	WSP 738, p. 192. Sum of measurements at sections *K* and *L* published in WSP 738 as 21.1 cfs.
Measuring section *L*, in diversion canal from a small lake on Bickel Ranch, about 500 ft north of Bickel Ranch house. [Sum of measurements in sections *K* and *L* constitutes total flow from lake[1]]			
7–13–21	5.7	Fiedler	WSP 774, p. 163.
7–14–24	7.9	Tappan	WSP 593, p. 256; 774, p. 163. Published in WSP 593 as sum (23.3) in sections *K* and *L*.
8–15–24	2.4	Tappan and Golden	WSP 593, p. 256; 774, p. 163. Published in WSP 593 as sum (17.9 cfs) in sections *K* and *L*.
9– 7–24	5.2	Vaksvik and Tappan	WSP 593, p. 256; 774, p. 163. Published in WSP 593 as sum (16.5 cfs) in sections *K* and *L*.
8–28–25	2.1	Tappan and Fite	WSP 613, p. 264. Weir measurement. Listed as "section *K*" in original record.
10– 7–31	6.73	Allis	WSP 738, p. 192. Sum of measurements at sections *K* and *L* published as 21.1 cfs.
"Springs on Bickel Ranch"			
9–17–17	84.5		WSP 533, p. 285; 557, p. 46. Includes estimated 15.5 cfs not measured.
7–13–21	87.6		WSP 533, p. 285; 557, p. 46. Includes estimated 16.2 cfs not measured.

[1] Measurements in sections *K* and *L* were published separately in Water-Supply Paper 774, but as sums in Water-Supply Papers 593, 613, and 738.

RILEY SPRINGS

Location.—About 4.5 mi southeast of Hagerman, north and east of the center of sec. 6, T. 8 S., R. 14 E.

Physical situation.—Springs issue from basalt at head of talus and debris cone along base of basalt cliff. Springs consist of half a dozen or more openings scattered along the canyon wall. Some discharge through Riley Creek and some discharge directly to Brailsford ditch.

Altitude.—About 3,050 ft.

Use of water.—Two fish hatcheries and several irrigation ditches divert water at several places above and below measured sections.

Measuring sections.—(1) "At bridge on road into Bickel Ranch and springs." This is measuring section *M* of plate 2, in the SE¼ NW¼ sec. 6, T. 8 S., R. 14 E. (2) Several other measuring sections are in Riley Creek and in diversion ditches, but the names for the diversions were not consistently applied and they cannot be assuredly identified (see "remarks" in table 25). The principal locations were in sec. 36, T 7. S., R. 13 E. and sec. 1, T. 8 S., R. 13 E.

Remarks.—At section *M* the discharge from only a small group of openings is measured. Several return-flow channels enter Riley Creek above and below the several measuring sections. The lower reach of Riley Creek receives discharge from Tucker Spring and from part of the Bickel Springs group. The numerous diversion and return-flow ditches make measurement a complex and unreliable process. Results of several measurements were published in Water-Supply Paper 774, p. 163 (repeated on p. 165). Many published records are the sums of several measurements. Table 25 includes a few previously unpublished records, obtained from field notes. A few total-flow summations were obtained from an unpublished report by C. E. Tappan, of the Idaho Power Co.

TABLE 25.—*Miscellaneous discharge records, Riley Springs, 1902–31*

Date	Discharge (cfs)	Made by—	Publication record and remarks
Measuring section *M*, at bridge on road into Bickel Ranch			
9–17–17	62.4	TFNSC	WSP 533, p. 285; 557, p. 46; 774, p. 165. Excludes 3.0 cfs, estimated diversion above measured section.
7–13–21	45.9	Fiedler	WSP 533, p. 285; 557, p. 46; 744, p. 163, 165. Diversions not included.
7–14–24	28.2	Tappan	Not published. May not be at same section as above. Information obtained from original records.
8–15–24	57.0	do	WSP 593, p. 256; 774, p. 163, 165. Diversions not included.
9– 6–24	67.7	Vaksvik and Tappan	Do.
5–29–25	53.9	Tappan	WSP 613, p. 264. Diversions not included.
8–27–25	57.0	Tappan and Fite	Do.
10– 7–31	42.2	Allis	WSP 738, p. 192. Diversions not included.

TABLE 25.—*Miscellaneous discharge records, Riley Springs, 1902–31*—Continued

Date	Discharge (cfs)	Made by—	Publication record and remarks
Measuring section in Riley Creek at bridge, 300 yds above unnamed falls at mouth; below diversions			
7-12-24	117	Tappan	WSP 593, p. 256.
8-14-24	113	do	WSP 593, p. 256. Published as 200 ft above mouth and below diversions.
9- 6-24	128	Vaksvik and Tappan	WSP 593, p. 256.
10-23-24	128	Tappan	WSP 613, p. 264.
5-29-25	105	do	Do.
8-26-25	125	Tappan and Fite	WSP 613, p. 264. Published as 130 cfs; recomputed on original record as 124.54 cfs.
Measuring section in Brailsford ditch			
8-14-24	8.56	Tappan.	
Other measuring sections			
4- ?-02	137	Stannard	SEBR. Probably at mouth of creek at eastern tip of Gridley Island.
4- ?-02	31.9	do	SEBR. Probably at western tip of Gridley Island.
8-14-24	164	Tappan	"Total flow of Riley Creek," reported by Tappan (1925).
9- 6-24	.25	Vaksvik and Tappan	"Ditch no. 1 on hillside above ditch no. 2" (Brailsford ditch).
9- 6-24	160	do	"Total flow of Riley Creek," reported by Tappan (1925).
10-23-24	153	do	Do.
5-29-25	153	do	Do.
8-26-25	166	Tappan and Fite	Do.

TUCKER SPRINGS

Location.—About 3.5 mi southeast of Hagerman in the SE¼ sec. 36, T. 7 S., R. 13 E. Described as sec. 6, T. 8 S., R. 14 E. in Water-Supply Paper 593, p. 256, and elsewhere.

Physical situation.—At foot of basalt bluff.

Altitude.—Altitudes of openings range between 2,950 and 2,960 ft.

Use of water.—Largely diverted for irrigation and for fish hatchery.

Measuring sections.—Location poorly described. One is a few yards below the springs in a natural outlet ("south channel") which is tributary to Riley Creek. Another is a few yards from the springs in Big Bend ditch ("north channel"). A flume, or siphon, leads from the springs to Pipeline (Buckeye) ditch, in which some measurements have been made.

Remarks.—Probably the total discharge from the springs never has been measured, because many diversions have not been measured.

TABLE 26.—*Miscellaneous discharge records, Tucker Springs, 1924–25*

Date	Discharge (cfs)	Made by—	Publication record and remarks [1]
7-12-24	52.9	Tappan	Not published separately. Measured in south channel.
7-12-24	25.5	do	Not published separately. Measured in north channel (Big Bend ditch).
7-12-24	78.4	do	WSP 593, p. 256. Sum of above two measurements.
7-12-24	79.0	do	WSP 774, p. 165. Described as Tucker Springs "near head."
7-12-24	14.4	do	Not published separately. Measured in Buckeye ditch "at end, 100 yds above highway bridge."
7-12-24	21,2	do	Not published separately. Measured in "ditch from Riley Creek below bridge" (probably Hunt ditch).
7-12-24	35.6	do	WSP 593, p. 256. Sum of above two measurements. Includes some water from Riley Springs.
8-14-24	17.8	do	Not published separately. Measured in Buckeye ditch
8-14-24	24.9	do	Not published separately. Measured in Big Bend ditch at headgate.
8-14-24	8.6	do	Not published separately. Measured in "Riley Creek ditch near Tucker Springs" (possibly the "south channel").
8-14-24	51.2	do	WSP 593, p. 256. Sum of above three measurements. May include some water from Riley Creek.
9- 6-24	10.3	Vaksvik and Tappan	Not published separately. Measured in "Buckeye ditch at highway bridge."
9- 6-24	22.2	do	Not published separately. Measured in "ditch no. 2 (probably Big Bend ditch), north side Riley Creek at concrete headgate."
9- 6-24	32.5	do	WSP 593, p. 256. Sum of above two measurements.
10- 9-24	8.6	Tappan	Not published. Measured in "Buckeye ditch."
10- 9-24	16.6	do	Not published. Measured in "Tucker Springs ditch."
10- 9-24	25.4	do	WSP 613, p. 264. Sum of above two measurements.
5-29-25	9.5	do	Not published. "Upper Riley ditch at bridge" (possibly in "south channel").
5-29-25	23.1	do	Not published. "Tucker Springs [Big Bend] ditch at concrete headgate."
5-29-25	15.6	do	Not published. "Buckeye ditch 200 ft above highway."
5-29-25	48.2	do	WSP 613, p. 264. Sum of above three measurements.
8-26-25	13.9	Tappan and Fite	Not published. "Buckeye ditch 300 ft above highway bridge."
8-26-25	18.4	do	Not published. "Tucker Springs [Big Bend] ditch."
8-26-25	9.4	do	Not published. "Upper Riley Creek ditch at wooden bridge" (possibly "south channel").
8-26-25	41.7	do	WSP 613, p. 264. Sum of above three measurements.

[1] Unpublished records from Tappan, C. E., Water resources of the Snake River, surface and subsurface, between Shoshone Falls and Malad River: Idaho Power Co. unpublished report, 1925.

CURRAN SPRING ("KEARN SPRING")

Location.—Four mi southeast of Hagerman, in the SW¼NW¼ sec. 32, T. 7 S., R. 14 E.

Physical situation.—Water emerges from tunnel dug into brecciated, highly permeable basalt, and from talus slope below tunnel; outlet creek discharges westward through Billingsley Creek.

Altitude.—About 3,150 ft.

Use of water.—Curran ditch and other small unnamed ditches transmit water for irrigation.

Measuring section.—In sec. 36, T. 7 S., R. 13 E., near bridge on county road.

Remarks.—The name "Kearn" appeared in WSP 533, p. 285, and also in WSP 238 and 774. Plate 5 of WSP 774 shows a "Kearn" tunnel. Other records [2] do not mention "Kearn" Spring but describe Curran tunnel in detail. The name "Kearn" probably originated through misunderstanding of a vocal reference to Curran Spring. The spring formerly was part of the Martin Curran estate.

TABLE 27.—*Miscellaneous discharge records, Curran Spring, 1902–31*

Date	Discharge (cfs)	Made by—	Publication record and remarks
4- ?-02	54.3	Stannard	SEBR. See records of Billingsley Creek.
9-17-17	91.8	Kief and Crandall	WSP 533, p. 285; 557 of 46; 774, p. 165.
10- 8-31	50.7	Allis	WSP 738, p. 192. Includes 10 cfs diverted above measured section.

SPRINGS ALONG BILLINGSLEY CREEK

Location.—Generally east of Hagerman from sec. 12, T. 7 S., R. 13 E. to sec. 30, T. 7 S., R. 14 E.

Physical situation.—Numerous openings in basalt along foot of bluff; springs drain through short channels to Billingsley Creek, which flows generally northwestward and joins the Snake River in sec. 11, T. 7 S., R. 13 E. The drainage system is complex.

Altitude.—About 3,150 ft.

Use of water.—Buckeye, Sands, Bell, Curran and other ditches transmit water for irrigation.

Measuring sections.—Several, in main channel of Billingsley Creek and in diversion channels near where they cross U. S. Highway 30.

Remarks.—Descriptive information about this complex irrigation and drainage system is contained in the files of the Federal District Court for Southern Idaho, New International Mortgage Bank *vs.* the Idaho Power Co., Equity No. 1602. The village of Hagerman obtains its public water supply from Big Springs, one of the groups of springs that feed Billingsley Creek. No separate records for Big Springs have been found.

[2] Law case Equity No. 1602, U. S. Federal District Court for Southern Idaho. New International Mortgage bank *vs.* Idaho Power Co. 1932.

TABLE 28.—*Miscellaneous discharge records, Billingsley Creek north of Hagerman, 1902–31*

Date	Discharge (cfs)	Made by—	Publication record and remarks
4- ?-02	54.4	Stannard	SEBR. 4 mi below Salmon Falls. (Location of measured section not accurately determinable. May have been near head of creek, where it would include only the flow from Curran Spring.)
9-17-17	159	Kief and Crandall	WSP 533, p. 285; 557, p. 46; 774, p. 165. Does not include 75.2 cfs diverted. Measured at highway bridge.
9-24-19	128	Burdick and Kief	WSP 533, p. 285; 557, p. 46; 774, p. 165. Does not include diversions.
7-10-24	87.3	IPC	WSP 593, p. 256; 774, p. 165. Includes 42.2 cfs diverted in 7 ditches.
8-13-24	99.6	Tappan and Golden	WSP 593, p. 256; 774, p. 165. Includes 57.5 cfs diverted.
9- 5-24	105	Vaksvik and Tappan	WSP 593, p. 256; 774, p. 165. Includes 41.9 cfs diverted.
10-29-24	160	Tappan and Hapeny	WSP 613, p. 264, 774, p. 165. Major diversions dry. Discharge included waste irrigation water.
5-28-25	110	Tappan	WSP 613, p. 264. Includes 47.0 cfs diverted in 5 ditches.
8-26-25	149	Tappan and Fite	WSP 613, p. 264. Includes 42.8 cfs diverted in 5 ditches.
10- 7-25	125	USGS	Not published. Status of diversions not stated.
10- 7-31	125	Allis	WSP 738, p. 138. Diversions not stated.

MISCELLANEOUS SPRINGS NORTH OF HAGERMAN

Location.—Between Hagerman and the mouth of the Malad River, in Tps. 6 and 7 S., R. 13 E.

Physical situation.—The aquifer undoubtedly is basalt, but single openings represented by the records cannot be identified.

Use of water.—Several diversions for irrigation.

Measuring sections.—Several, but not identifiable.

Remarks.—Published records are sums of estimates and measurements at several locations and are not consistent in their locations or number of springs represented.

Record of measurements.—Discharge of springs "between Billingsley Creek and mouth of Big Wood [Malad] River," Sept. 17, 1917, 6.5 cfs; measured by Kief and Crandall for TFNSC; published in WSP 533, p. 285; 557, p. 46; 774, p. 165. Discharge of "miscellaneous . . . small springs between Hagerman and mouth of Big Wood River," Sept. 24, 1919, 20.5 cfs; estimated by Kief and Burdick for TFNSC; probably included more springs than in the measurement in 1917; published in WSP 533, p. 285; 557, p. 46; 774, p. 165. It is not known whether the discharge of Birch Creek (Cove Creek) is included in these records. The discharge of Cove Creek was 40.2 cfs, July 12, 1921, measured near mouth; published in Water-Supply Paper 533, p. 286.

MALAD SPRINGS

Location.—Along channel of Malad River from the SE¼ sec. 25 to the NE¼ sec. 34, T. 6 S., R. 13 E.

Physical situation.—Water issues directly from the Malad basalt in and near the floor of a deep canyon. Discharge from numerous openings above the river is visible, but much of the discharge occurs along the floor of the river channel and is apparent only as a gain in flow in the reach extending about 2.5 mi above the mouth.

Altitude.—About 2,725 to 2,800 ft.

Use of water.—Water is diverted to hydroelectric plants of the Idaho Power Co. and to the King Hill irrigation ditch.

Water rights to the Malad River were first owned by the Glenns Ferry Land and Irrigation Co. and work was started on irrigation diversions in 1902. In 1908 the rights were acquired by C. H. Hammett and an assignment was made giving 300 cfs to the King Hill Irrigation Co. and 700 cfs to the Malad Power Co. The King Hill canal was constructed in 1908. Attempts had been made to develop power as early as 1906. In 1910–11 the Beaver River Power Co. constructed diversion works for power development, consisting of a log-crib dam near the SW cor. of sec. 25, T. 6 S., R. 13 E., about two miles above the mouth of the river (now called the "upper" or "old diversion"). The water passed through a flume to a power-plant penstock near the mouth of the river. The structures were in use from about 1911 to 1917, inclusive. About 1917 the old diversion dam and flume were abandoned in favor of a timber crib and flashboard dam about a mile above the mouth of the river. The decrease in head was compensated by increased flow at the lower diversion. The new flume carried water for the power plant and the King Hill canal. In August 1913 the Beaver River Power Co. transferred its water-power rights to the newly formed Idaho Power and Light Co. In 1915 the latter company went into receivership and the Electric Investment Co. took over operation of the plant. The Idaho Power Co. was formed in 1916 and has maintained the power and water rights continuously since then. The existing "upper diversion dam" of the Idaho Power Co. is near the site of the old diversion dam of the Beaver River Power Co. (fig. 2).

Measuring sections.—Several; see figure 2 and "remarks" in table 29.

Remarks.—Measurements have been made at several locations to obtain records of the total discharge and of segmental increments. In general, the sum of

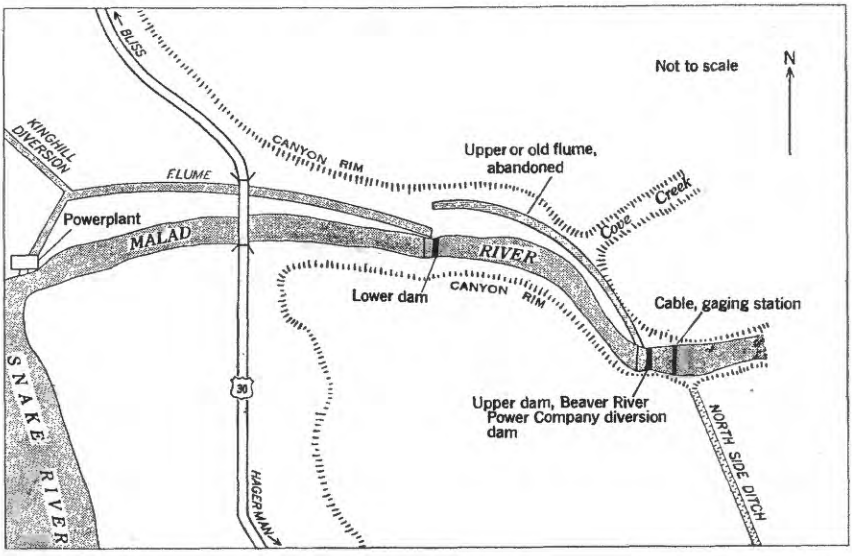

FIGURE 2.—Sketch map of Malad River, from original record of measurement, dated October 26, 1919

the discharges in the Malad flume and the Malad River above the tailrace of the old lower power plant, minus the discharge of the Big Wood River near Gooding corrected for diversions, is the total discharge of the springs. In 1899 the computed mean daily flow ranged from 1,060 cfs in September to 1,311 cfs in April (see table 3).

TABLE 29.—*Miscellaneous discharge records, Malad River, 1899–1946*

Date	Discharge (cfs)	Made by—	Publication record and remarks
3-27-99	1,345	Shirley and Dils	WSP 38, p. 355.[1] Near mouth; "at wagon bridge 8 mi southwest of . . . Bliss."
5-26-99	1,736	do	Do.
6-23-99	2,878	do	Do.
7-26-99	1,203	do	Do.
9-23-99	1,095	do	Do.
3-28-99	42	do	WSP 38, p. 354.[1] "Near Gooding; at wagon bridge half a mile north of Toponis."
5-25-99	523	do	Do.
6-24-99	1,356	do	Do.
7-27-99	125	do	Do.
3-28-99	164	do	WSP 38, p. 353. Little Wood River "at Toponis," at highway bridge half a mile sonth of railroad.
3-28-99	25	do	WSP 38, p. 353. Irrigation diversion from Little Wood River at Topinis.
5-25-99	.1	do	WSP 38, p. 353. Little Wood River at Topinis.
6-24-99	11	do	Do.
4- ?-02	1,090	Stannard(?)	SEBR; PJIC; WSP 774, p. 166. "Includes 150 cfs from Big Wood River." Location of measured section not stated. Measurement report by Stannard but probably made by Dils.
?- ?-10	997	TFNSC	WSP 774, p. 166. "At mouth, total flow."
?- ?-11	998	do	Do.
8-28-13	201	Jordan	WSP 362-B, 553, p. 286. King Hill ditch, 150 ft below heading.
8-28-13	1,060	do	WSP 362-B, p. 285; 533, p. 285; 557, p. 46. River, half a mile above power diversion, "400 ft above upper dam." Location not certainly determinable.
9-18-17	600	TFNSC	WSP 533, p. 285; 557, p. 46; 774, p. 166. River, 400 ft above upper Beaver River Power Co. diversion dam. 'Includes spring flow only." (Flow of Big Wood River near Gooding, this date, 14 cfs).
9-18-17	533	TFNSC	WSP 533, p. 286. At mouth; inflow increment between diversion and mouth.
9-18-17	1,133	do	WSP 557, p. 46; 774, p. 176. Total discharge of springs (computed), including inflow between upper dam and mouth.
9-26-19	496	do	WSP 533, p. 286; 774, p. 166. River above power-plant tailrace.
9-26-19	649	do	WSP 533, p. 286; 774, p. 166. Malad flume.
9-26-19	1,145	do	WSP 774, p. 166. Sum of above two measurements.
4-25-20	621	Bryan	WSP 533, p. 285; 774, p. 166. 400 ft above upper dam.
6- 4-20	608	Ryan	Do.
8- 9-20	642	Bryan	WSP 533, p. 285; 774, p. 166. River, 400 ft above upper dam. Note in original record: "Mr. Woodhead, Supt. of Malad power plant, estimated King Hill diversion to be 260 cfs, power use 610 cfs, dam leakage 160 cfs. Total flow 1,030 cfs."
7-12-21	621	Fiedler	WSP 533, p. 286; 774, p. 166. River, 400 ft above upper diversion dam.

See footnote at end of table.

TABLE 29.—*Miscellaneous discharge records, Malad River, 1899–1946*—Continued

Date	Discharge (cfs)	Made by—	Publication record and remarks
7-12-21	40.2	Fiedler and Hoyt	WSP 533, p. 286. Cove Creek, 20 ft above mouth. Note in original record: "Shows surface flow between upper and lower dam. Practically all other inflow is considered spring flow." (See also record of "miscellaneous springs north of Hagerman," p. 151.)
7- 8-24	196	Tappan and Golden	WSP 593, p. 257. River above power-plant tailrace.
7- 8-24	953	do	WSP 593, p. 257; 774, p. 166. Malad flume at station 35+25, above King Hill ditch.
7- 8-24	1,149	do	WSP 774, p. 166. Sum of above two measurements.
7- 9-24	601	do	WSP 593, p. 266; 774, p. 166. Above upper dam. Listed as 601 cfs in WSP 593 and 606 cfs in WSP 774. Changed from 606 cfs to 601 cfs in original record.
7- 9-24	293	do	WSP 593, p. 257. King Hill ditch.
7-17-24	178	Tappan	WSP 593, p. 257; 774, p. 166. River above power-plant tailrace.
7-17-24	1,020	do	WSP 593, p. 257; 774, p. 166. Malad flume, at station 35+25. Listed as 1,020 cfs in WSP 593 and 774. Changed from 1,062 to 1,020 cfs in original record.
7-17-24	1,198	do	WSP 774, p. 166. Sum of above two measurements.
8-12-24	620	Tappan and Golden	WSP 593, p. 256; 774, p. 166. Above upper dam.
8-12-24	995	do	WSP 593, p. 257; 774, p. 166. "Malad flume, above siphon."
8-12-24	196	do	WSP 593, p. 257; 774, p. 166. River above power-plant tailrace.
8-12-24	1,191	do	WSP 774, p. 176. Sum of above two measurements.
8-13-24	301	do	WSP 593, p. 257. King Hill ditch.
9- 5-24	623	Vaksvik and Tappan	WSP 593, p. 256; 774, p. 166. 200 ft above upper dam.
9- 5-24	975	do	WSP 593, p. 257; 774, p. 166. Malad flume, 200 ft above dividing structure for power plant.
9- 5-24	215	do	WSP 593, p. 257; 774, p. 256. River, about 200 ft above power-plant tailrace.
9- 5-24	1,190	do	WSP 774, p. 166. Sum of above two measurements.
9- 5-24	274	do	WSP 593, p. 257. King Hill ditch, about 2.5 mi below point of diversion from Malad flume.
10-28-24	638	IPC	WSP 613, p. 264; 774, p. 166. Above upper dam.
10-28-24	780	do	WSP 613, p. 264. Malad flume.
5-28-25	244	Tappan	WSP 613, p. 264. King Hill ditch.
8-25-25	293	Tappan and Fite	WSP 613, p. 264. River, above power-plant tailrace.
8-25-25	929	do	WSP 613, p. 264. Malad flume.
8-25-25	245	do	WSP 613, p. 264. King Hill ditch.
8-26-25	688	do	WSP 613, p. 264. Above upper dam.
7- 8-46	694	Newell	WSP 1063, p. 256. 5,600 ft above King Hill diversion dam in NW¼NW¼ sec. 36, T. 6 S., R. 13 E.; station 0+00, point of proposed diversion for Upper Malad Power Plant.
7- 8-46	934	do	WSP 1063, p. 256. SE¼SE¼ sec. 26, T. 6 S., R. 13 E.; 4,450 ft above King Hill diversion.
7- 8-46	940	do	WSP 1063, p. 256. NE¼NE¼ sec. 35, T. 6 S., R. 13 E.; 3,500 ft above King Hill diversion.
8- 5-46	766	do	WSP 1063, p. 256. Same location as on July 8. Note on original records: "Water not clear, indicating that some flow was coming through from Big Wood River."
8- 5-46	840	do	WSP 1063, p. 256. Malad flume, just above dividing structure. NW¼NE¼ sec. 34, T. 6 S., R. 13 E.
8- 5-46	204	do	WSP 1063, p. 256. Computed flow over diversion-dam weir. This is the "lower" or Idaho Power Co. diversion.

[1] Measurements "at Bliss" and "at Toponis" were intended to reflect the discharge of the Malad Springs as the net increment between the two locations.

WOODWORTH SPRING

Location.—About 4.5 mi below Hagerman. According to original record spring is about a half a mile above Bliss Spring, which fits approximately the location of Madson Springs (pl. 5, WSP 774). Published records list the location as 6 or 6.5 mi below Hagerman.

Physical situation.—Water issues near base of talus slope in canyon.

Diversions.—One or more irrigation laterals.

Measuring section.—"In irrigation lateral just below where it crosses the highway" (U. S. Highway 30 ?).

Remarks.—Identity and location of spring not certainly determinable. According to WSP 774, p. 164, "This may be Sullivan Springs," but the description seems to fit Madson Springs.

Record of measurement.—Discharge July 11, 1921, 7.7 cfs; measured by C. G. Paulsen and W. G. Hoyt; published in WSP 533, p. 286; 557, p. 46; 774, p. 165.

BLISS SPRING

Location.—In SE¼NW¼ sec. 17, T. 6 S., R. 13 E.

Physical situation.—At foot of basalt bluff in talus slope.

Use of water.—One diversion for irrigation.

Measuring section.—Probably near U. S. Highway 30 on irrigation-diversion channel.

Remarks.—Identity of spring not certainly determinable. WSP 774, pl. 5, shows the spring in sec. 17, T. 6 S., R. 13 E., but the latest (1950) Geological Survey topographic map does not show a spring in sec. 17. Published records give location as seven miles below Hagerman but it is listed as five miles in the original record. "Five miles below Hagerman" would place the location about at Sullivan Spring.

Record of measurements.—Discharge July 11, 1921, 2.0 cfs (partly estimated); measured by C. G. Paulsen and W. G. Hoyt; published in WSP 533, p. 286; 557, p. 46; 774, p. 165.

SPRINGS BETWEEN MOUTH OF MALAD RIVER AND BLISS

Location.—Indeterminate. The group probably includes some or all of Steele, Sullivan, Madson, and Bliss Springs.

Physical situation.—At foot of basalt bluff in talus slope.

Altitude.—About 2,850 to about 2,900 ft.

Use of water.—Several diversions for domestic supply and irrigation.

Measuring sections.—Several sections where spring-fed creeks and diversion canals cross U. S. Highway 30.

Remarks.—Published discharge records are the sum of measurements and estimates at several sections.

TABLE 30.—*Miscellaneous discharge records, springs between mouth of Malad River and Bliss*

Date	Discharge (cfs)	Made by—	Publication record and remarks
4– ?–02	10.0	Gardner	SEBR. Reported estimate.
9–18–17	33.0	Kief and Crandall	WSP 535, p. 286; 557, p. 46; 774, p. 166 Estimated
9–24–19	14.8	do	Do.

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