DEPARTMENT OF PUBLIC WORKS

STATE OF CALIFORNIA

REPORTS OF THE

DIVISION OF WATER RESOURCES

Edward Hyatt, State Engineer

REPORT ON WATER MASTER SERVICE ON SOLDIER CREEK AND TRIBUTARIES MODOC COUNTY, CALIFORNIA DURING SEASON OF 1929

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By Leslie C. Jopson, Water Master

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Sacramento, California
March 1930

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STATE OF CALIFORNIA

Department of Public Works

SACRAMENTO

DIVISION OF WATER RESOURCES
401 PUBLIC WORKS BUILDING

March 1, 1930

EDWARD HYATT, STATE ENGINEER
CHIEF OF DIVISION

Mr. Edward Hyatt
State Engineer
Sacramento, California

Dear Sir: Attention: Mr. Gordon Zander, Hydraulic Engineer

A report covering the water master service on Soldier Creek and its tributaries, in Modoc County, California, during the season of 1929, is submitted herewith.

This report includes a description of the regulation and distribution of the waters of Soldier Creek and its tributaries in accordance with the provisions of the decree entered on November 28, 1928, by the Superior Court of the State of California, in and for the County of Modoc, in the case of San Francisco Cattle Loan Company, et al., vs. C. M. Crampton, et al., and a discussion of the results that were accomplished thereby.

Run-off records and other pertinent hydraulic data are included, together with a financial statement, showing the cost of water master service, and the sources from which such cost was met.

Respectfully submitted,

Leslie C. Jopson
Water Master

REPORT ON WATER MASTER SERVICE

ON SOLDIER CREEK AND TRIBUTARIES

MODOC COUNTY, CALIFORNIA

DURING SEASON OF 1929.

INTRODUCTION

A history of the case of San Francisco Cattle Loan Company, et al., vs. C. M. Crampton, et al., may be found in the "Report on Water Supply and Use of Water from Soldier Creek and Tributaries, Modoc County, California", by T. Russel Simpson, Assistant Hydraulic Engineer, dated December 21, 1925, and in the "Reports on Water Master Service on Soldier Creek and Tributaries" of 1926, 1927 and 1928.

As is stated in the "Report on Water Master Service on Soldier Creek and Tributaries" of 1928 a decree was entered in the above mentioned case on November 28, 1928, by the Superior Court of Modoc County. In this decree the Division of Water Rights, or its successor, was appointed permanent water master to act at such times as it was deemed necessary by the said Division. Accordingly, the writer, Mr. Leslie C. Jopson, was appointed Modoc County Water Master for the 1929 irrigation season and subsequently took up his duties in the field on April 1st. Mr. T. Russel Simpson acted temporarily as water master from March 19th to April 1st.

Distribution of the waters of Soldier Creek and tributaries was made by the water master in 1929 in accordance with the above mentioned court decree which sets forth the respective rights and priorities of all the water users on Soldier Creek. A schedule of allotments to water as was later provided for in the decree was embodied in the water

master report for the 1927 season as Tables XI to XV.

To insure a better understanding of the provisions of the above decree a meeting of the Soldier Creek water users was called on March 26, 1929, by Mr. T. Russel Simpson, who explained the details of the decree in regard to structures to be installed and made arrangements for their installation.

DISTRIBUTION OF WATER

1. Functions of Water Master

The primary function of the water master on Soldier Creek was the supervision of the distribution of the water of the stream in accordance with the decree entered by the Superior Court of Modoc County in the case of San Francisco Cattle Loan Company, et al., vs. C. M. Crampton, et al., dated November 28, 1928. The allotments of water under this decree were the same as the allotments under the agreements used in 1927 and 1928, a copy of which is included in the 1927 report. The water master also collected hydrographic and other data pertinent to the water master service.

The duties of water master were assumed in the field on March 19, 1929. Measuring devices were installed on all of the diversion ditches immediately thereafter, for the purpose of assisting in the regulation of the distribution of water. These devices consisted of staff gages rated with an accoustic current meter, but were later replaced by Parshall Measuring Flumes as time was available.

In order to obtain information as to the net water supply available for delivery, an automatic water stage recorder was installed on Soldier Creek immediately above the uppermost diversion. The flow of Soldier Creek often varies more than 50 per cent during a 24 hour period. The mean daily discharge for any current day could be computed from the recorded fluctuation in flow during the preceding 24 hour period.

The computed mean daily discharge for the current day was the criterion for apportioning the flow, rather than the flow at any particular moment of observation. The automatic recorder station was equipped with a staff gage rated with an electric current meter. The measured channel loss was subtracted from the mean daily discharge at the recorder station leaving the net water supply available for diversion under the schedules of allotments. The various diversions were regulated at the commencement of each rotation period and were re-regulated whenever the weather changed during the period.

Records were kept of the water supply and of the distribution of the same among the various diversions between March 19th and July 31st, 1929. Observations of crop conditions were made at frequent intervals and of the acreage irrigated from Soldier Creek in 1929.

2. Allotments Compared with Water Supply.

The water supply of Soldier Creek and the springs in the West Fork of Soldier Creek, during the 1929 season as compared with the total allotments under the decree is shown in Table 12 at the end of this report.

It will be noted that there was an average water supply in excess of the allotments during only two rotation periods, one to the upper users and one to the lower users. However, the upper users received a second rotation period with an average water supply of 81 per cent of the allotments while the lower users received but 50 per cent in their next best period except for the period from March 19th to April 1st which was too early, during the 1929 season, to irrigate many of the crops grown by the lower users.

The average water supply for the 1929 season from April 1st to June 30th was 71 per cent of the schedule allotments for that period,

whereas, in 1927, which has been considered a very nearly normal year as to precipitation and run-off, the average water supply for the period from April 1st to June 30th was 98 per cent of the allotments.

The deficiency as described above was felt most keenly by the lower users, the upper users receiving in most cases an adequate irrigation in 1929.

The late season water supply, that is, during August and September, when occasional regulations were made, by the water master dropped below one cubic foot per second and considerable difficulty was experienced in delivering water to all of the domestic rights.

3. Efficiency of Distribution.

A fair degree of efficiency of distribution, in accordance with the provisions of the court decree setting forth the respective rights on Soldier Creek, was obtained during the 1929 season. The factor of inadequate headgates and measuring devices was largely overcome during the season by the installation of a headgate on the Warrens Flood Ditch and by the installation in the various ditches of Parshall Measuring Flumes for measuring the amounts of water diverted. These installations will be discussed in more detail in a later chapter. The flashy character of the run-off of Soldier Creek during the general irrigation season was a factor effecting the efficiency of distribution for which there appears to be no remedy.

A channel division structure was also installed just below the county road to facilitate the division of water between the East and West Forks.

RUN-OFF RECORDS

The standard method of collecting run-off records, as is briefly described on page 14 of the "Report on Water Supply and Use of Water from Soldier Creek and Tributaries", dated December 21, 1925, prepared by T. Russel Simpson, was used in the water master service during the 1929 season.

An automatic water stage recorder was installed on Soldier Creek at the mouth of the canyon, above all diversions, on March 24, 1929. Continuous records were kept of the water supply at this point from that date until July 3rd. The water supply from March 19th to March 24th and from July 3rd to July 31st was estimated by the water master from frequent observations at the register station. The daily discharges from March 19th to July 31st, 1929 has been tabulated in Table 3 of this report.

The hydrographs on Plate 1 of this report graphically shows the relation between the water supply of Soldier Creek in 1929 and in 1927.

The totals of the allotments from Soldier Creek under the decree are also shown on Plate 1.

PRECIPITATION

The precipitation at Cedarville and Fort Bidwell, records of of which are kept by the United States Weather Bureau, for the seasonal year commencing September 1, 1928, and terminating on August 31, 1929, have been compared with the mean precipitation in Table 1 of this report.

It will be noted from Table 1 that the total precipitation for the seasonal year 1928-29 was but 71.5 per cent of the mean annual precipitation. It will be further noted that the precipitation did not occur uniformly through the year but was characterized by excessive fluctuation from month to month, whereas, it is the more regular occurrence of storms which causes the best run-off conditions.

Most of the season of snowfall on the Warner Range of mountains is normally included in the period from December 1st to April 1st. The most desirable snow pack, that is, snow which will usually pack hard and melt late in the spring, occurs during this period. In average years approximately 50 per cent of the total annual precipitation at Cedarville occurs during this four month period and 70 per cent of this is in the form of snow. During this four month period in 1928-29, the precipitation was about 65 per cent of the normal for the period, and but 54 per cent of this amount occurred in the form of snow. The deficiency in precipitation during these four months and especially the deficiency in snowfall largely accounts for the low run-off from Soldier Creek during the general irrigation season in 1929.

USE OF WATER

Continuous records were kept of the disposition made of the flow of Soldier Creek and its tributaries during the period from March 19 to July 30, 1929. A brief description of the manner of collecting the records of use of water is given on page 19 of the "Report on Water Supply and Use of Water from Soldier Creek", to which previous reference has been made.

The primary point of diversion of all of the users of water from both the West and the East Forks of Soldier Creek is at the point where the channel divides into the two forks. All of the land served with water from the West Fork is irrigated by flooding across the upper ranch and on across each succeeding ranch down to the lowest user. Likewise, most of the area irrigated from the East Fork is underlaid with an impervious stratum and irrigation of any of these tracts results in mutual benefits by means of sub-irrigation. Consequently all of the area irrigated from the West Fork has been treated as a unit, and all of the area under the East Fork as a unit, in records of the disposition made of the water.

The estimated mean daily diversions of the various diversion systems in 1929, are tabulated in Tables 4 to 11, inclusive, submitted at the end of this report.

The areas irrigated and sub-irrigated under the various diversion systems, during the period from March 19th to July 31st, 1929, were estimated by the water master and have been used in Table 13 of this report. The gross use of water under each diversion system, during the

general irrigation season in 1929, has been calculated in acre feet per acre and in acres irrigated per cubic foot per second and has been tabulated as part of Table 13 with the dates of commencement and termination of general irrigation in 1929.

It will be noted from Table 13 that the combined average rate of gross use during the 1929 season, for the acreage irrigated in 1929, was approximately one cubic foot per second to 104 acres.

A comparison of the use of water in 1929 with the use in 1927 follows:

Description	1929	1927	Use in 1929 Expressed in per cent of 1927
Days in irrigation season	100.	80.	125
Total acre feet diverted	2980.	3406.	87
Acreage irrigated	1561.2	1842.4	85
Use in acre feet per acre	1.91	1.85	103
Use in acres irrigated per cubic foot per second	104.	86.	121

As may be seen the irrigation season in 1929 was 25 per cent longer than in 1927 but the water supply is 13 per cent less and the acreage irrigated is 15 per cent less than in 1927. The use of water in acre feet per acre is greater in 1929 due to the longer irrigating season. The use of water in acres irrigated per cubic foot per second was 21 per cent greater than that in 1927 due to the shortage of water necessitating a greater efficiency in applying the water to use.

CROPS

The crop yields on lands irrigated from Soldier Creek were observed by the water master during the season and in most cases were fair. The alfalfa seed land yielded a good crop which was perhaps slightly below that of 1926. The meadow hay land on the West Fork yielded very satisfactorily while that on the East Fork was somewhat short. The grain and alfalfa hay land on the East Fork was the worst sufferer from the shortage of water but in most cases produced a fairly satisfactory crop.

DISCUSSION OF RESULTS IN 1929

The total water supply during the period from April 1st to June 30th on Soldier Creek in 1929 was about 72 per cent of that in 1927, when conditions more nearly approached normal than in any other year since 1925.

Assuming that 1927 was practically normal and that the water supply in that year was adequate to irrigate all lands irrigated from Soldier Creek the following table has been prepared.

Period	Average Water Supply in Cubic Feet Per Second		Flow in 1929 Expressed in per cent of flow in 1927
	1929	1927	
April 1 to April 11	10.5	7.8	135
April 11 to April 24	11.2	10.0	112
April 24 to May 4	23.1	42.9	54
May 4 to May 17	25.2	32.2	78
May 17 to May 27	17.8	28.3	63
May 27 to June 9	9.8	20.9	47
June 9 to June 19	14.7	14.1	105
June 19 to June 30	4.2	7.3	57
April 1 to June 30	14.4	20.2	71

The above table indicates that the average flow of Soldier Creek in 1929 was about 71 per cent of that in 1927 for the period shown. It will be seen also that the run-off commenced somewhat earlier in 1929 than in 1927 resulting in the greatest deficiency occurring during the middle of the general irrigation season instead of at the end as normally would be expected. The same condition was found to exist on Owl and Emerson Creek, in Surprise Valley, where watershed conditions are similar.

No difficulties were encountered in distributing the waters of Soldier Creek in 1929 even though the water supply was considerably below normal.

The installation of the division structure at the split in the channel into the East and West Forks was a great convenience, as with it, the water could be entirely shut off in one branch if it was desirable to have the entire flow go in one direction. The division box was built with openings the proper size to divide the water reaching it in proportion to the allotments on the two branches of the creek. Provision was also made for the insertion of flashboards to change the proportion between the channels when necessary.

The installation of Parshall Measuring Flumes on the various ditches, as time was available through the season, greatly facilitated the distribution during the latter part of the season.

MEASURING DEVICES

The decree in the case of San Francisco Cattle Loan Company, et al., vs. C. M. Crampton, et al., not only set forth the respective rights of the various parties concerned but included a provision requiring the installation of adequate headgates and measuring devices in all of the diversion conduits. Accordingly, the water master, in 1929, made the overseeing of these installations an important part of his duties. The following devices were installed:

Ditch	Owner	Device
Company	(J. C. Sharp) (John Street) (G. R. McMullen) (C. M. Warrens)	3 Foot Parshall Measuring Flume
Warrens Flood	G. M. Warrens	(2 Foot Headgate (2 Foot Parshall Measuring Flume
Daniels	(Celia Daniels) (F. E. Daniels)	1 Foot Parshall Measuring Flume
Crampton (Upper)	Oliver Crampton	1 Foot Parshall Measuring Flume
Atkinson	C. E. Atkinson	1 Foot Parshall Measuring Flume
Toney-Strief	(C. W. Toney) (M. R. Toney)	2 Foot Parshall Measuring Flume
Stiner-Heard East	(C. S. Stiner) (C. K. Heard)	2 Foot Parshall Measuring Flume
Stiner-Heard West	(C. S. Stiner) (F. S. Heard) (C. K. Heard)	2 Foot Parshall Measuring Flume
East Fork) West Fork)	All users diverting water below the forks in 1929	Division Box between the East and West Forks of Soldier Creek

The Parshall Measuring Flumes were constructed according to the plans and specifications prepared by the Division of Water Rights.

The Division Box was constructed according to plans prepared in the field to fit the unstable condition of the stream channel. Its foundation consists of two logs sunk into the creek bottom and concreted into place. The upper log is surmounted by a steel rail spiked in place while the lower log supports a floor to break the force of the water as it spills over the crest formed by the rail on the upper log. A total crest length of 18.05 feet is divided into two sections according to the allotments on the East and West channel of 11.00 and 7.05 cubic feet per second respectively. Four foot timber walls were built extending up and down stream at the two ends of the division log and a V-shaped dividing structure of the same height was built and filled with rocks at the position stated above to divide the water properly.

The cost of materials and labor outside of the water master's time was kept by the water master and was assessed against the water users benefited by the installation. An itemized statement of cost follows:

Hardware (Steel for crest, nails & bolts)	$ 5.48
Lumber	17.20
Cement	8.00
Labor	32.00
Total	$ 65.68

The cost of the various sizes of Parshall Measuring installed in Surprise Valley was kept by the water master and has been tabulated below for flumes having 2" x 6" mudsills, 2" x 4" sillcaps, 2" x 4" posts and, in all cases but one, 1 inch floor and sidewalls. The

heights of sidewalls were as shown in the table:

Throat Width in Inches	Height of Side Walls in Inches	Cost of Materials: Lumber @ $35.00 per M	Cost of Materials: Nails, etc.	Cost of Labor: Cutting	Cost of Labor: Installing	Total Cost
6	15	$2.10	$ 0.30	$ 2.50	$ 2.55	$ 7.45
9	15	2.75	0.35	2.50	2.65	8.25
12	18	3.75	0.40	2.65	4.15	10.95
24	18	4.50	0.45	2.80	4.75	12.50
36	18	5.00	0.50	3.00	5.50	14.00
*24	18	7.75	0.55	3.50	5.50	17.30

* 2 inch material used for floor and walls

STATUS OF APPLICATIONS

Six applications to appropriate water from Soldier Creek and its tributaries were withheld from action by the Division of Water Rights pending the outcome of the litigation on Soldier Creek. These applications are listed and described in the "Report on Water Supply and Use of Water from Soldier Creek and Tributaries, Modoc County, California", dated December 21, 1925.

Subsequent to the entering of a decree on November 28, 1928 in the case of San Francisco Cattle Loan Company, a corporation, et al., vs. C. M. Crampton, et. al., a hearing on the above mentioned applications and the protests thereto, was held, on March 20, 1929, at Cedarville, presided over by Mr. Gordon Zander, Hydraulic Engineer of the Division of Water Rights. An agreement was reached at this hearing whereby all the protests were withdrawn provided that all permits issued would be subject to the vested rights as decreed in the suit of San Francisco Cattle Loan Company, a corporation, et. al., vs. C. M. Crampton, et. al., and that the use under the permits would be regulated by the Division of Water Rights during periods of water scarcity to the end that such use would not interfere with prior vested rights. Accordingly the permits were issued as tabulated below:

Application No.	Permit No.	Name of Owner	Amount	Acres	Ditch
2908	3255	O. E.Atkinson	1.25	100	Atkinson Ditch
2935	3256	G.M.Warrens W.P.&	1.75	140	Warrens Flood Ditch
3033	3257	Hattie M.Hatfield	0.87	70	Company Ditch
3097	3258	Enoch Reynolds	1.00	90	Reynolds Ditch
3185	3259	Norman W. Jones	0.50	40	Jones Ditch
3214	3260	E. E. Cole	1.00	80	Cole Ditch

The application of G. R. McMullen to appropriate water from Snow Creek in the Soldier Creek area, for which a permit was issued in 1924 was licensed in 1927 for 0.50 cubic foot per second. This is application No. 3034, Permit No. 1637, License No. 638.

FINANCIAL STATEMENT

The investigation and water master service during the 1929 season in Modoc County on Davis, Soldier, Cedar, Owl and Emerson Creeks were financed partly by subscription from the water users and partly by contribution by the Division of Water Resources.

No segregation was made in the expense of conducting the work on these five stream systems in 1929. The total unit cost of the work on these five stream systems was twenty-five cents per acre of irrigated land, of which one-half was borne by the State. The unit cost to the water users was thus about twelve and one-half cents per acre of irrigated land.

A financial statement in which receipts and disbursements are itemized follows:

FINANCIAL STATEMENT

MODOC COUNTY WATER DISTRIBUTION

1929 SEASON

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RECEIPTS

Contributed by Owl Creek Water Users	$300.00	
Contributed by Soldier Creek Water Users	300.00	
Contributed by Cedar Creek Water Users	199.95	
Contributed by Davis Creek Water Users	500.05	
Contributed by Emerson Creek Water Users	299.95	
Contributed by Division of Water Resources	1,600.00	
		$ 3,199.95

DISBURSEMENTS

Salaries and Wages	$2,135.99	
Field Expenses	1,020.06	
Printing and Blueprinting	39.20	
Miscellaneous	4.70	
		$ 3,199.95

TABLES

TABLE 1

Precipitation for Seasonal Year 1928-1929 Compared with Mean Precipitation at Cedarville - 1894 to 1929 and at Fort Bidwell - 1866 to 1890 and 1911 to 1929

Month	Mean Precipitation			Precipitation-Seasonal Year 1928-1929			
	Cedarville Elevation 4675	Ft. Bidwell Elevation 4640	Average Ft.Bidwell Cedarville	Cedarville Elevation 4675	Ft.Bidwell Elevation 4640	Average Ft.Bidwell Cedarville	Per Cent of Total Mean
September	0.26	0.44	0.35	0.40	0.71	0.56	3.6
October	1.03	0.97	1.00	0.15	0.37	0.26	1.7
November	1.59	1.96	1.78	1.43	1.76	1.59	10.2
December	1.53	2.85	2.19	0.42	0.61	0.52	3.4
January	1.81	3.60	2.70	2.08	2.34	2.21	14.2
February	1.64	2.37	2.00	0.59	0.98	0.78	5.0
March	1.49	2.21	1.85	1.20	0.88	1.04	6.7
April	0.89	1.48	1.18	1.85	2.34	2.10	13.5
May	1.12	1.27	1.20	0.29	0.00	0.14	0.9
June	0.68	0.93	0.80	1.98	1.88	1.93	12.4
July	0.28	0.30	0.29	0.00	0.00	0.00	0.0
August	0.21	0.22	0.22	0.00	0.00	0.00	0.0
TOTAL	12.99	18.60	15.56	10.39	11.87	11.13	71.5

Note: Per cent of Total Mean from May 1st to August 31st of average year is 16.1%, whereas in 1929 it was 13.3%.

TABLE 2

Character of Precipitation at Cedarville for Seasonal Year 1928-29 compared with Mean

Month	Mean Precipitation				Precipitation 1928-29			
	Total Inches	Snow Inches	Rain Inches	Snow Expressed in per cent of total	Total Inches	Snow Inches	Rain Inches	Snow Expressed in per cent of total
December	1.53	1.10	0.43	72	0.42	0.20	0.22	48
January	1.81	1.40	0.41	77	2.08	1.50	0.58	72
February	1.64	1.00	0.64	61	0.59	0.40	0.19	68
March	1.49	1.10	0.39	74	1.20	0.20	1.00	17
TOTAL	6.53	4.60	1.93	70	4.29	2.30	1.99	54

Note: 10 inches of snow assumed equal to 1 inch of rain.

TABLE 3

CONTINUOUS RECORDS OF DAILY DISCHARGE IN CUBIC FEET PER SECOND OF SOLDIER CREEK ABOVE ALL DIVERSIONS FOR THE PERIOD FROM MARCH 19th to July 31st, 1929.

Day	March	April	May	June	July	
1		12.9	31.	10.1	4.3	
2		13.8	34.	10.1	4.2	
3		14.3	34.	10.1	4.0	
4		12.4	34.	9.4	3.8	
5		10.6	21.	9.3	3.6	
6		9.4	20.	9.0	3.4	
7		8.1	21.	9.0	3.4	
8		7.2	21.	7.8	3.3	
9		6.9	34.	9.0	3.3	
10		8.1	31.	11.2	3.2	
11		6.9	20.	9.3	3.2	
12	NO	6.6	25.	8.4	3.1	
13		6.6	26.	8.1	3.0	
14	RECORD	8.4	21.	7.8	2.9	
15		18.8	26.	31.	2.9	
16		20.	26.	31.	2.8	
17		16.4	24	18.8	2.8	
18		18.3	20.	12.9	2.7	
19	24.	10.4	24.	11.2	2.6	
20	18.7	7.8	18.2	10.1	2.6	
21	13.6	7.3	17.5	9.0	2.5	
22	10.5	6.9	20.	8.1	2.4	
23	8.8	7.5	17.0	7.5	2.4	
24	9.8	9.4	14.3	6.9	2.3	
25	9.6	10.8	12.1	6.4	2.2	
26	9.5	14.7	10.4	5.9	2.1	
27	9.7	23.	9.1	5.4	2.0	
28	11.0	26.	10.1	5.0	1.9	
29	10.4	22.	10.4	4.8	1.8	
30	8.7	25.	10.4	4.6	1.7	
31	10.4		10.1		1.6	
Total Sec. Ft. Days	*154.7	376.5	652.6	307.2	88.0	135 day Period
Mean Sec. Feet	* 11.9	12.55	21.05	10.24	2.84	11.70
Maximum Sec. Feet	* 24.	25.	34.	31.	4.3	34.
Minimum Sec. Feet	* 8.7	6.6	9.1	4.6	1.6	1.6
Total Ac. Feet	*306.8	746.6	1294.1	609.2	174.5	3131.2

* 13 day period.

TABLE 4

ESTIMATED DAILY DISCHARGE IN CUBIC FEET PER SECOND
OF COMPANY DITCH ON SOLDIER CREEK AT HEAD - 1929

Day	March	April	May	June	July	
1		8.0	11.0	1.0	2.4	
2		8.1	12.0	1.0	2.4	
3		8.4	12.0	1.0	2.3	
4		8.0	1.0	1.0	2.3	
5		7.0	1.0	1.0	2.2	
6		6.2	1.0	1.0	1.8	
7		5.4	1.0	1.0	1.8	
8		5.0	1.0	1.0	1.8	
9	NO	4.4	1.4	5.5	1.8	
10		5.4	1.4	6.7	1.7	
11		1.0	1.0	5.6	1.7	
12		1.0	1.0	5.3	1.7	
13	RECORD	1.0	1.0	5.0	1.6	
14		1.0	1.0	5.0	1.6	
15		1.1	1.0	10.0	1.6	
16		1.5	1.0	8.0	1.6	
17		1.5	9.1	5.0	1.6	
18		1.0	8.8	4.0	1.5	
19	1.0	2.0	9.1	4.0	1.5	
20	1.0	2.0	9.7	3.0	1.5	
21	1.0	1.1	9.6	3.0	1.4	
22	1.0	1.1	9.0	2.5	1.4	
23	1.0	1.1	9.0	2.4	1.3	
24	1.0	6.4	8.0	2.3	1.2	
25	1.0	7.6	6.3	3.7	1.15	
26	1.0	8.3	5.5	3.4	1.1	
27	1.0	10.0	1.0	3.4	1.0	
28	1.0	10.0	1.0	2.8	.95	
29	1.0	10.0	1.0	2.6	.9	
30	1.0	10.0	1.0	2.5	.8	
31	1.0		1.0		.75	
Total Sec. Ft. Days	* 13.0	144.6	137.9	103.7	49.95	135 day Period
Mean Sec. Ft.	* 1.0	4.82	4.45	3.46	1.61	3.33
Maximum Sec. Feet	* 1.0	10.0	12.0	10.0	2.4	12.0
Minimum Sec. Feet	* 1.0	1.0	1.0	1.0	0.75	0.75
Total Ac. Ft.	* 25.8	286.7	273.5	205.6	99.1	890.7

* day period.

TABLE 5

ESTIMATED DAILY DISCHARGE IN CUBIC FEET PER SECOND
OF WARRENS FLOOD DITCH ON SOLDIER CREEK AT HEAD - 1929

Day	March	April	May	June	July	
1		0.7	5.0	0.0		
2		1.0	5.8	0.0		
3		1.1	5.6	0.0		
4		1.0	0.0	0.0		
5		0.9	0.0	0.0		
6		0.8	0.0	0.0		
7		0.6	0.0	0.0		
8		0.5	0.0			
9		0.3	0.0			
10		0.4	0.0			
11		0.0	0.0			
12		0.0	0.0			
13		0.0	0.0			
14		0.0	0.0			
15		0.0	0.0			
16	DIVERSION	0.0	0.0	DIVERSION		
17		0.0	3.0			
18		0.0	2.0			
19		0.0	3.0			
20		0.0	2.0			
21		0.0	1.9			
22		0.0	2.5			
23	NO	0.0	1.9	NO		
24		0.3	1.2			
25		0.3	1.0			
26		1.6	0.4			
27		2.3	0.0			
28		2.0	0.0			
29		2.0	0.0			
30		4.0	0.0			
31			0.0			
Total Sec. Ft. Days		19.8	35.3	* 0.0		69 day Period
Mean Sec. Ft.		0.66	1.14	* 0.0		
Maximum Sec. Ft.		4.0	5.8	* 0.0		5.8
Minimum Sec. Ft.		0.0	0.0	* 0.0		0.0
Total Ac. Ft.		39.3	70.0	* 0.0		109.3

* 8 day period.

TABLE 6

ESTIMATED DAILY DISCHARGE IN CUBIC FEET PER SECOND OF DANIELS DITCH ON SOLDIER CREEK AT HEAD - 1929

Day	March	April	May	June	July	
1		1.7	2.0	2.0	1.2	
2		1.8	2.0	2.0	1.1	
3		1.8	2.0	2.0	1.0	
4		1.5	2.0	2.0	0.8	
5		1.3	2.0	2.0	0.7	
6		1.1	2.0	1.6	0.9	
7		1.4	2.0	1.6	0.9	
8		1.0	2.0	1.5	0.8	
9		1.3	2.0	1.6	0.8	
10		1.5	2.0	1.8	0.8	
11		0.5	2.0	1.8	0.8	
12		0.5	2.0	1.5	0.7	
13		0.5	2.0	1.5	0.7	
14		0.6	2.0	1.5	0.6	
15		0.5	2.0	2.0	0.6	
16		0.3	2.0	0.5	0.5	
17		0.0	2.0	1.0	0.5	
18		0.6	1.9	1.5	0.5	
19	2.0	0.6	2.0	1.8	0.4	
20	2.0	1.0	1.8	1.8	0.4	
21	2.0	1.0	1.8	1.7	0.4	
22	2.0	1.0	1.8	1.7	0.3	
23	0.3	1.0	1.8	1.6	0.4	
24	0.3	1.0	1.7	1.6	0.4	
25	0.2	1.0	1.7	1.5	0.35	
26	0.2	1.5	2.0	1.5	0.3	
27	0.2	2.0	2.0	1.5	0.3	
28	0.2	2.0	2.0	1.5	0.3	
29	0.4	2.0	2.0	1.5	0.3	
30	0.2	2.0	2.0	1.4	0.3	
31	0.2		2.0		0.25	
Total Sec. Ft. Days	*10.2	34.0	60.5	48.5	18.3	135 day Period
Mean Sec. Feet	* 0.78	1.13	1.95	1.62	0.59	1.27
Maximum Sec. Feet	* 2.0	2.0	2.0	2.0	1.2	2.0
Minimum Sec. Feet	* 0.2	0.0	1.7	0.5	0.25	0.0
Total Ac. Ft.	*20.2	67.4	120.0	96.2	36.3	340.1

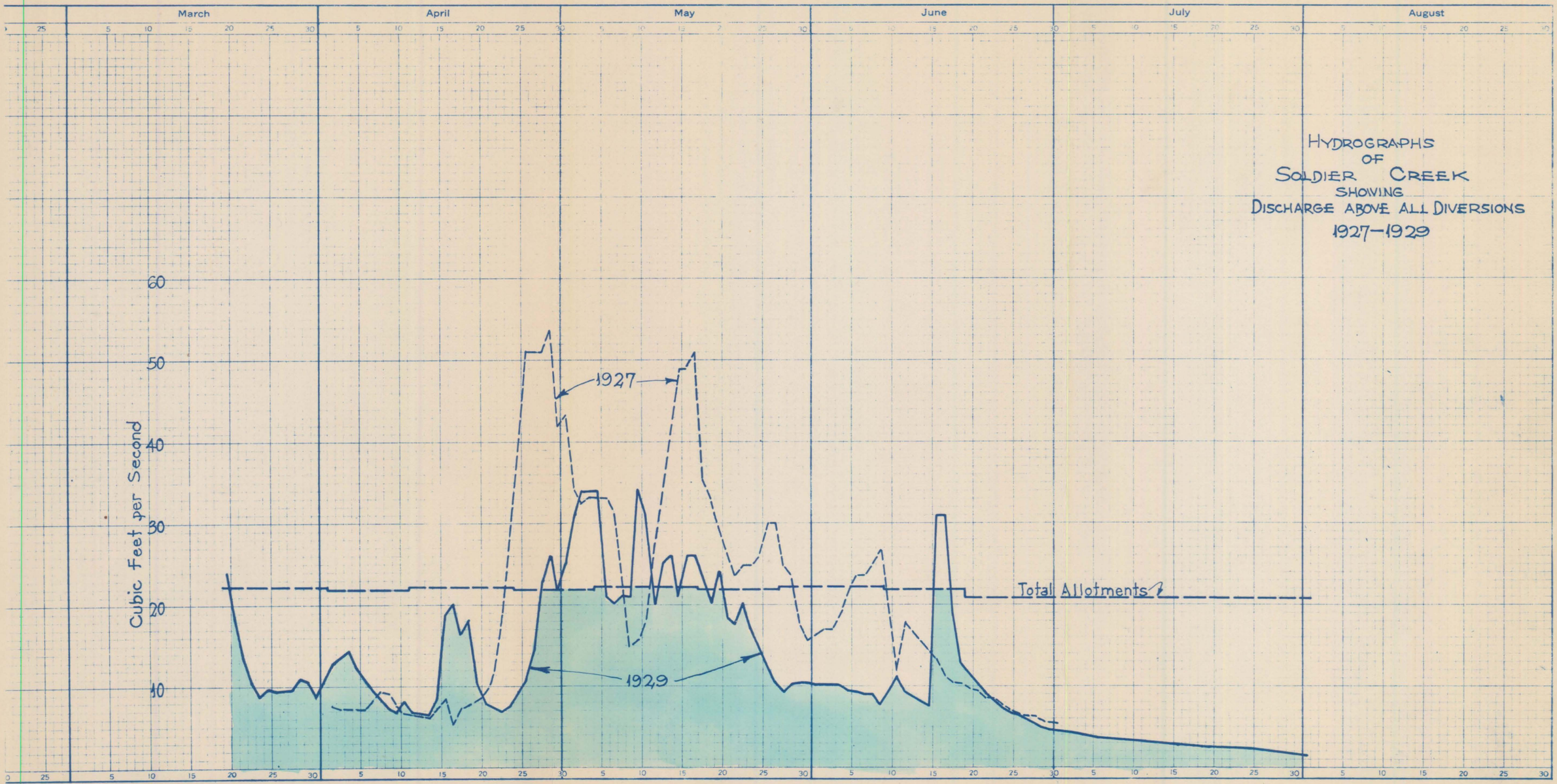
* 13 day period.

TABLE 7

ESTIMATED DAILY DISCHARGE IN CUBIC FEET PER SECOND OF ATKINSON DITCH ON SOLDIER CREEK AT HEAD - 1929

Day	March	April	May	June	July	
1		0.8	3.0	0.3	0.3	
2		0.9	3.0	0.3	0.3	
3		0.7	3.0	0.3	0.3	
4		0.4	0.3	0.3	0.3	
5		0.3	0.3	0.3	0.3	
6		0.3	0.3	0.3	0.3	
7		0.3	0.3	0.3	0.3	
8		0.3	0.3	0.3	0.3	
9		0.3	0.3	0.8	0.3	
10		0.3	0.3	1.2	0.3	
11		0.3	0.3	0.8	0.3	
12	NO	0.3	0.3	0.4	0.3	
13		0.3	0.3	0.4	0.3	
14	RECORD	0.3	0.3	0.5	0.3	
15		0.3	0.3	2.5	0.3	
16		0.3	0.3	0.8	0.3	
17		0.3	2.5	0.6	0.3	
18		0.3	2.4	0.5	0.3	
19	0.3	0.3	2.5	0.4	0.3	
20	0.3	0.3	1.5	0.0	0.3	
21	0.3	0.3	1.4	0.0	0.3	
22	0.3	0.3	1.5	0.0	0.3	
23	0.3	0.3	1.4	0.6	0.3	
24	0.3	0.6	1.0	0.5	0.3	
25	0.3	0.8	0.9	0.4	0.3	
26	0.3	1.2	0.7	0.3	0.3	
27	0.3	2.5	0.3	0.2	0.3	
28	0.3	2.5	0.3	0.3	0.25	
29	0.3	2.5	0.3	0.3	0.25	
30	0.3	2.5	0.3	0.3	0.25	
31	0.3		0.3		0.25	
Total Sec. Ft. Days	* 3.9	21.1	30.2	14.2	9.1	135 day Period
Mean Sec. Ft.	* 0.3	0.70	0.97	0.47	0.29	0.58
Maximum Sec. Ft.	* 0.3	2.5	3.0	2.5	0.3	3.0
Minimum Sec. Ft.	* 0.3	0.3	0.3	0.0	0.25	0.0
Total Ac. Ft.	* 7.7	41.8	59.9	28.2	18.0	155.6

* 13 day period.



HYDROGRAPHS OF SOLDIER CREEK SHOWING DISCHARGE ABOVE ALL DIVERSIONS 1927–1929