

BEAR RIVER COMMISSION

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REPORT NO. 28

WALLACE N. JIBSON

ALLOCATION OF DIRECT FLOW

BEAR RIVER COMPACT

Report to

BEAR RIVER COMPACT COMMISSION

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Prepared By

W. N. Jibson, Hydraulic Engineer
U. S. Geological Survey

Dec. 2, 1954

ALLOCATION OF DIRECT FLOW
BEAR RIVER COMPACT

This report consists essentially of an application of the natural or direct flow provisions of the present draft of the Bear River Compact to all land above Bear Lake. It comprises a hydrographic analysis and a summary of the effects of Compact regulation in each section of the Upper and Central Divisions for years in which diversion records were collected. These records were obtained in 1944-47, 1953 and 1954 in both Divisions and ^{a/s} in addition in 1948 in the Central Division.

A study of the pattern and magnitude of irrigation season flows passing the Evanston gaging station for the past 30 years indicates that no individual year in the above group would constitute a good index of average supplies and diversions. Actually, several extremes are represented. For instance, in 1945 and 1947 the month of June was among the coldest and wettest on record. Deficient supplies in 1954, especially in the Upper Division, define it with the lower three or four years of the past 30. Consequently, it would be of little value to analyze Compact regulation from a standpoint of an average effect during the years of record. A better picture of compact operation can be obtained from a study of the individual hydrographs comprising the bulk of this report.

Upper Division

A brief summary of regulation in the three major sections of this Division would include the following:

1. In most years initial regulation would be in effect for a few days early in May. Following high water the principal period of regulation would start between June 25 and July 10 and extend thru the balance of the season.

2. Initial regulation in May would have little, if any, significance. In general, only a portion of available water is being diverted at this time.
3. In average years, a relatively small reduction in Upper Wyoming diversions would be necessary from the beginning of the principal regulation period and extending past the middle of July. This reduction might be estimated near 10% of diversions for a period of two or three weeks in years of average supplies.
4. In 1954 regulation would have been in effect throughout the entire season except about 2 weeks in the middle of May. During June and July the reduction in Upper Wyoming would have averaged 29% of diversions.
5. In most years under present irrigation practices, diversions in Lower Wyoming would cease prior to the principal Compact regulation period.

In order to analyze Compact operation in the Upper Division it was necessary to compute the daily flow passing Pixley Dam for the 1944-47 irrigation seasons during which the discharge was not gaged. This computation was made by correlation with the water passing Bear River near Randolph gaging station minus the diversions at B.Q. and Pixley Dams. The curve of relationship was developed from 1953 and 1954 records of Bear River below Pixley Dam. This relationship is well defined and should result in a reliable computed record within the limits necessary for this study.

Plates 1 to 12 show hydrographs of actual diversions and corresponding Compact operation data in the four sections comprising the Upper Division, while Table I summarizes chronologically the seasonal quantities. It is to be noted that in several years there is either an increase or no effect

shown in each of the three principal sections by reason of Compact regulation. This is due to the provision whereby section allocations are a percentage of the total diversions plus the flow leaving the Division. The latter quantity is the flow passing Pixley Dam and as can be seen on plates 7 to 12 is rather sizeable in many years.

Total seasonal allowable diversions under Compact operation, as summarized in Table I, have little significance except in instances where reduction extends through most of the season (Upper Wyoming, 1954). In most other years increased allocations during August and September when the demand is of relatively minor importance, tends to offset reductions during the more critical portion of the regulation period. Likewise, increased allowable diversions in a section are made up in part by water leaving the Division. It is physically impossible to take all of this flow upstream because a part is developed in the lower end of the Division. In average and better years the physical distribution probably limits total utilization in the various sections. In low years such as 1954 the flow passing Pixley was negligible, indicating that total utilization was possible.

As stated earlier, none of the years of diversion records is a good index of average conditions. However, during the important part of the regulation period (prior to July 15), a combination of 1944 and 1946 flows at Evanston is near the 30-year average.

Magnitude of reductions is much greater than corresponding water increase in the section below

TABLE I
UPPER DIVISION

Section	Year	ACTUAL DIVERSIONS		COMPACT OPERATION		
		Total Diversions May 1-Sep. 30 Ac.-Ft.	Acre Feet Per Acre	Dates of Regulation	Allowable Diver- sions Ac.-Ft.	Acre Feet Per Acre
Upper Utah	1944	1,100	5.1	May 1-10; July 9 - Sept. 30	830	3.8 - 1
Upper Utah	1945	1,400	6.4	May 1-9; 22-28; July 14-Sept. 30	910	4.2 - 2
Upper Utah	1946	1,400	6.4	June 21 - Sept. 30	1,260	5.8 - 3
Upper Utah	1947	500	2.3	May 1-4; July 8 - Sept. 30	500	2.3 - 4
Upper Utah	1953	1,050	4.8	July 4 - Sept. 30 (<i>Most of May</i>)	690	3.2 - 5
Upper Utah	1954	* 800	3.7	May ? - Sept. 30	* 440	2.0 - 6
Upper Wyo.	1944	92,000	2.2	May 1-10; July 9 - Sept. 30	93,600	2.2 - 1
Upper Wyo.	1945	115,000	2.7	May 1-9; 22-28; July 14-Sept. 30	118,600	2.8 - 2
Upper Wyo.	1946	89,500	2.1	June 21 - Sept. 30	87,100	2.0 - 3
Upper Wyo.	1947	117,000	2.8	May 1-4; July 8 - Sept. 30	117,800	2.8 - 4
Upper Wyo.	1953	*76,000	1.8	July 4 - Sept. 30 (<i>Most of May</i>)	*71,700	1.7 - 5
Upper Wyo.	1954	*50,500	1.2	May ? - Sept. 30	*37,600	0.9 - 6
Lower Utah	1944	89,000	2.5	May 1-10; July 9 - Sept. 30	102,000	2.9 - 7
Lower Utah	1945	95,800	2.7	May 1-9; 22-28; July 14-Sept. 30	114,300	3.3 - 8
Lower Utah	1946	62,200	1.8	June 21 - Sept. 30	75,800	2.2 - 9
Lower Utah	1947	92,900	2.7	May 1-4; July 8 - Sept. 30	110,300	3.2 - 10
Lower Utah	1953	83,300	2.4	July 4 - Sept. 30 (<i>Most of May</i>)	98,700	2.8 - 11
Lower Utah	1954	*17,100	0.5	May ? - Sept. 30	*30,900	0.9 - 12
Lower Wyo.	1944	25,800	3.1	May 1-10; July 9 - Sept. 30	25,800	3.1 - 7
Lower Wyo.	1945	29,300	3.5	May 1-9; 22-28; July 14-Sept. 30	29,300	3.5 - 8
Lower Wyo.	1946	24,000	2.9	June 21 - Sept. 30	23,500	2.8 - 9
Lower Wyo.	1947	20,400	2.5	May 1-4; July 8 - Sept. 30	20,400	2.5 - 10
Lower Wyo.	1953	*17,800	2.2	July 4 - Sept. 30 (<i>Most of May</i>)	*18,500	2.2 - 11
Lower Wyo.	1954	* 5,550	0.7	May ? - Sept. 30	* 7,300	0.9 - 1

* In 1953 total diversions are from June 1st in Lower Wyoming and
and from June 12 in Upper Wyoming
In 1954 all diversions are from June 1.

Central Division

1. Regulation would have begun in most years early in July following the high water period.
2. In three years (1948, 1953, 1954) of the seven-year period of record, Wyoming diversions would have been reduced from the beginning of the regulation period throughout most of the irrigation season. The extent of these reductions is as follows:

<u>Year</u>	<u>Total Reduction</u>	<u>Acre-feet per Acre</u>
1948	6,000 acre-feet	0.35
1953	*4,600 acre-feet	0.26
1954	27,000 acre-feet	1.56

* Plus or minus an undetermined amount in May.

Regulation in Wyoming would have been relatively minor in the remaining four years of the period. *on a seasonal basis*

3. In each year of record both Sections in the Central Division would have been initially restricted at the beginning of regulation to a maximum diversion rate of one second-foot to 50 acres, which represents a reduction below percentage allocations. This initial allocation, usually in effect one or two weeks, is less than Wyoming diversions and greater than Idaho diversions in each year.
4. Following high water the flow at Border drops below 400 second-feet in all years at an earlier date than the total divertible flow drops to 810 second-feet. The average period between these dates is 15 days.

Table II summarizes diversion and Compact operation data for the Central Division. Hydrographs for this Division are shown on plates 13 to 26. As in

the Upper Division, large increases in allowable diversions have very little significance in most years because of relatively large flows leaving the Division. From this consideration, the magnitude of reduction in Wyoming is of greater importance than the much larger corresponding increase in Idaho. An exception is 1954 when the reduction and increase in the two sections are nearly equal due to decreased flow leaving the Division and a long period of regulation under the 1:50 limitation.

A study of supplies to the Central Division from June 15 to Aug. 1 for the past 13 years (1942-54) indicates that 1945 and 1947 are above average, 1946, 1948 and 1954 below average, and 1944 and 1953 fairly well define average supplies for the six-week period.

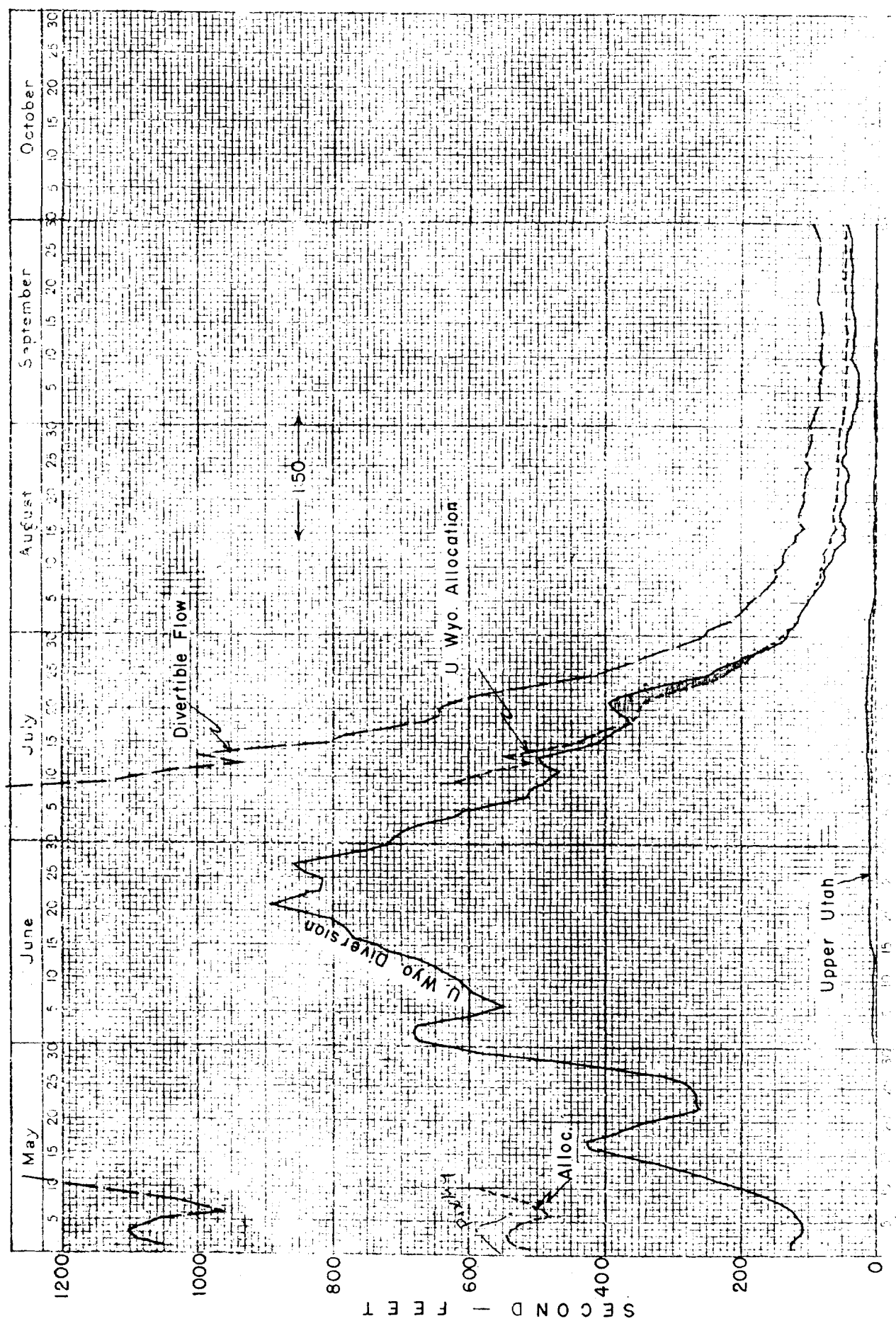
TABLE II
CENTRAL DIVISION

Section	Year	ACTUAL DIVERSIONS		COMPACT OPERATION		
		Total Diversions May 1-Sep.30 Ac.-Ft.	Acre Feet Per Acre	Dates of Regulation	Allowable Diver- sions Ac.-Ft.	Acre Feet Per Acre
Wyoming	1944	76,400	4.4	July 14 - Sept. 30	73,600	4.3
Wyoming	1945	80,600	4.7	May 1-7; July 18 - Sept. 30	86,100	5.0
Wyoming	1946	77,100	4.5	June 27 - Sept. 30	79,000	4.6
Wyoming	1947	88,500	5.1	July 21 - Sept. 30	94,700	5.5
Wyoming	1948	90,000	5.2	June 29 - Sept. 30	84,000	4.9
Wyoming	1953	*93,000	5.4	May 4-June 3; July 6-Sep.30	*88,400	5.1
Wyoming	1954	*84,000	4.9	May 25 - Sept. 30	*56,600	3.3
Idaho	1944	80,500	3.5	July 14 - Sept. 30	100,000	4.3
Idaho	1945	67,200	2.9	May 1-7; July 18 - Sept.30	97,800	4.2
Idaho	1946	78,700	3.4	June 27 - Sept. 30	104,000	4.5
Idaho	1947	77,300	3.3	July 21 - Sept. 30	109,500	4.7
Idaho	1948	70,400	3.0	June 29 - Sept. 30	95,200	4.1
Idaho	1953	90,000	3.9	May 4-June 3; July 6-Sep.30	117,600	5.1
Idaho	1954	71,500	3.1	May 25 - Sept. 30	100,000	4.3

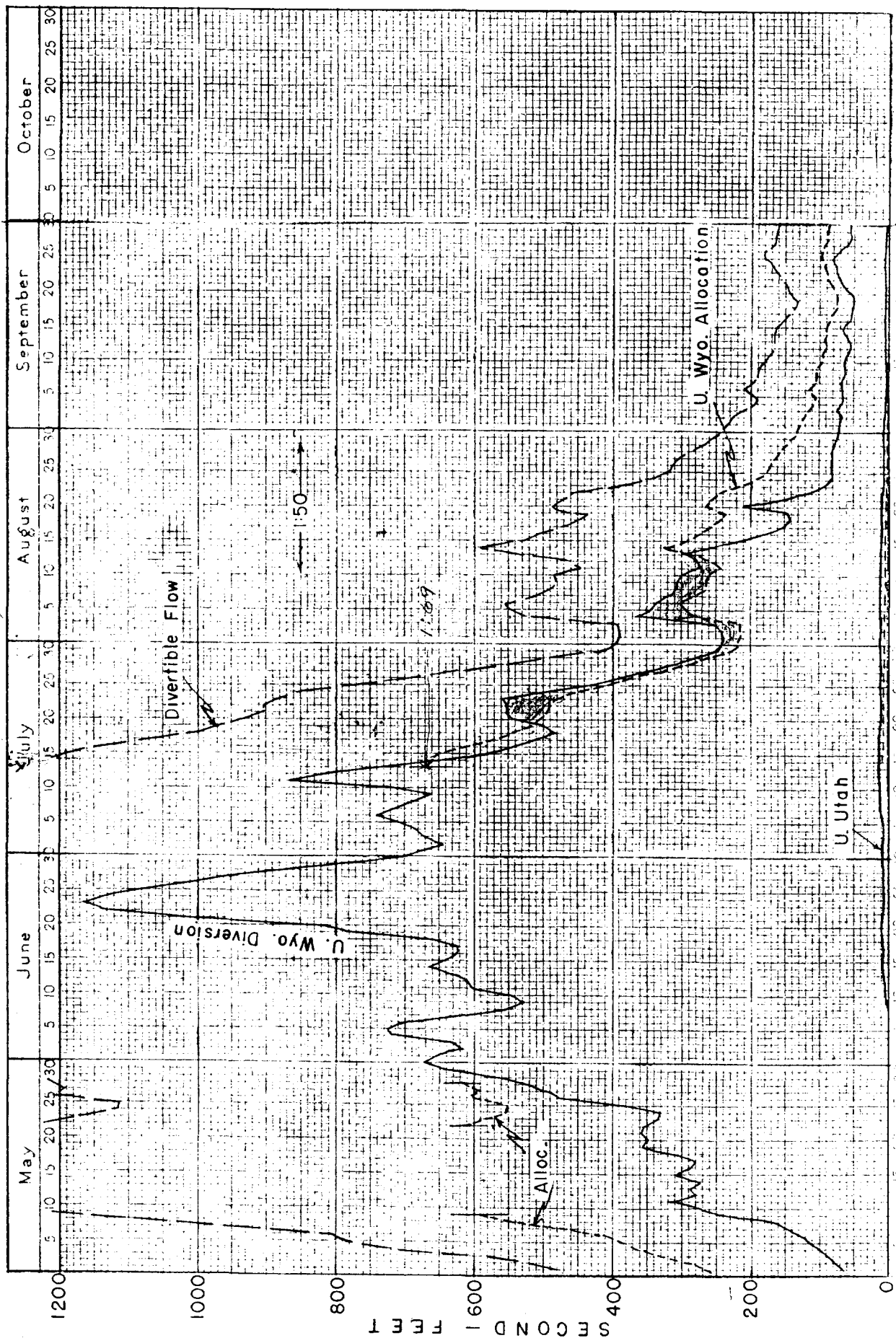
* Diversions from June 1 to Sept. 30

Note: In 1953 extent of regulation May 4 - June 3 not determined.

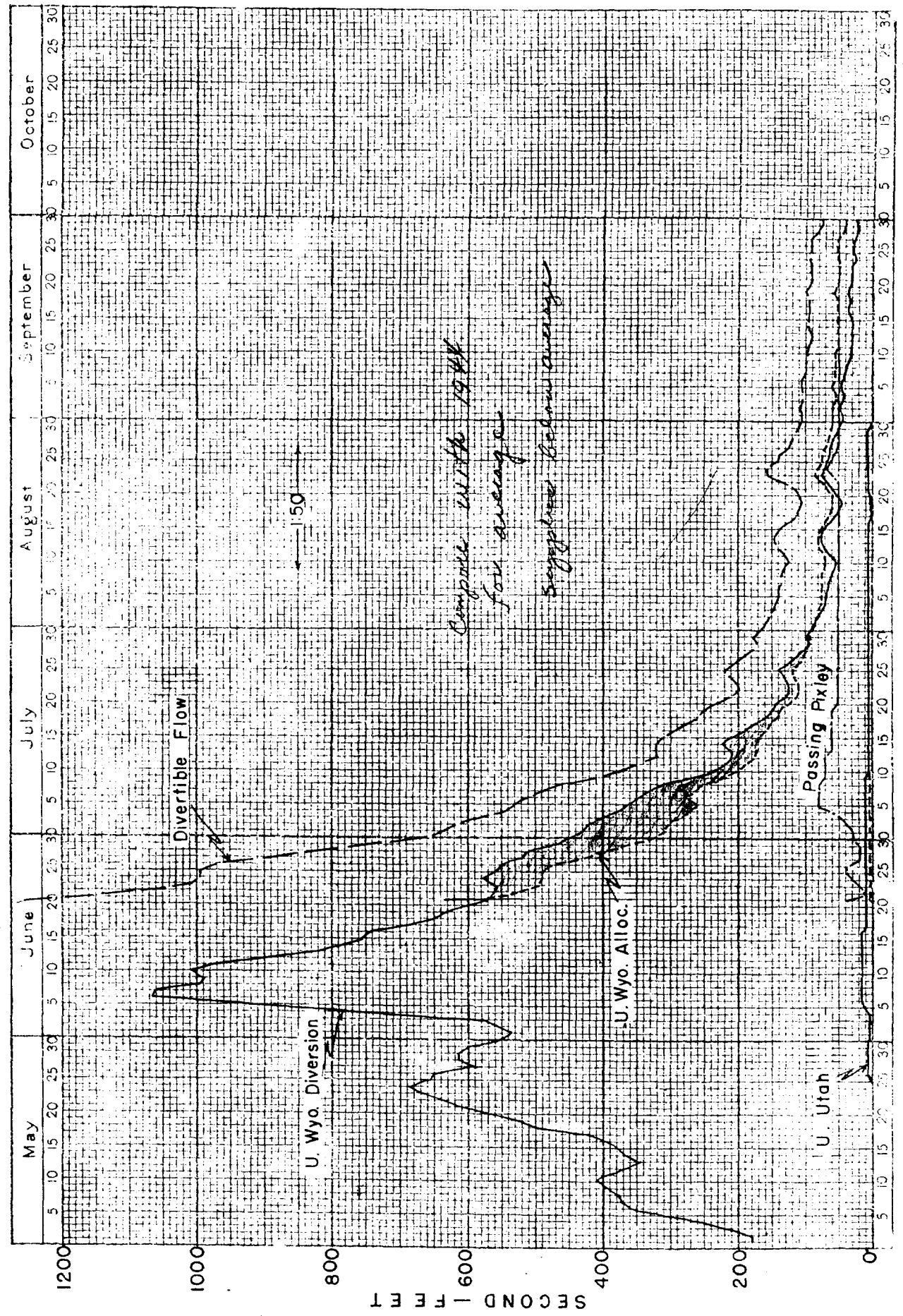
1944 — UPPER DIVISION — Upper Utah & Upper Wyoming



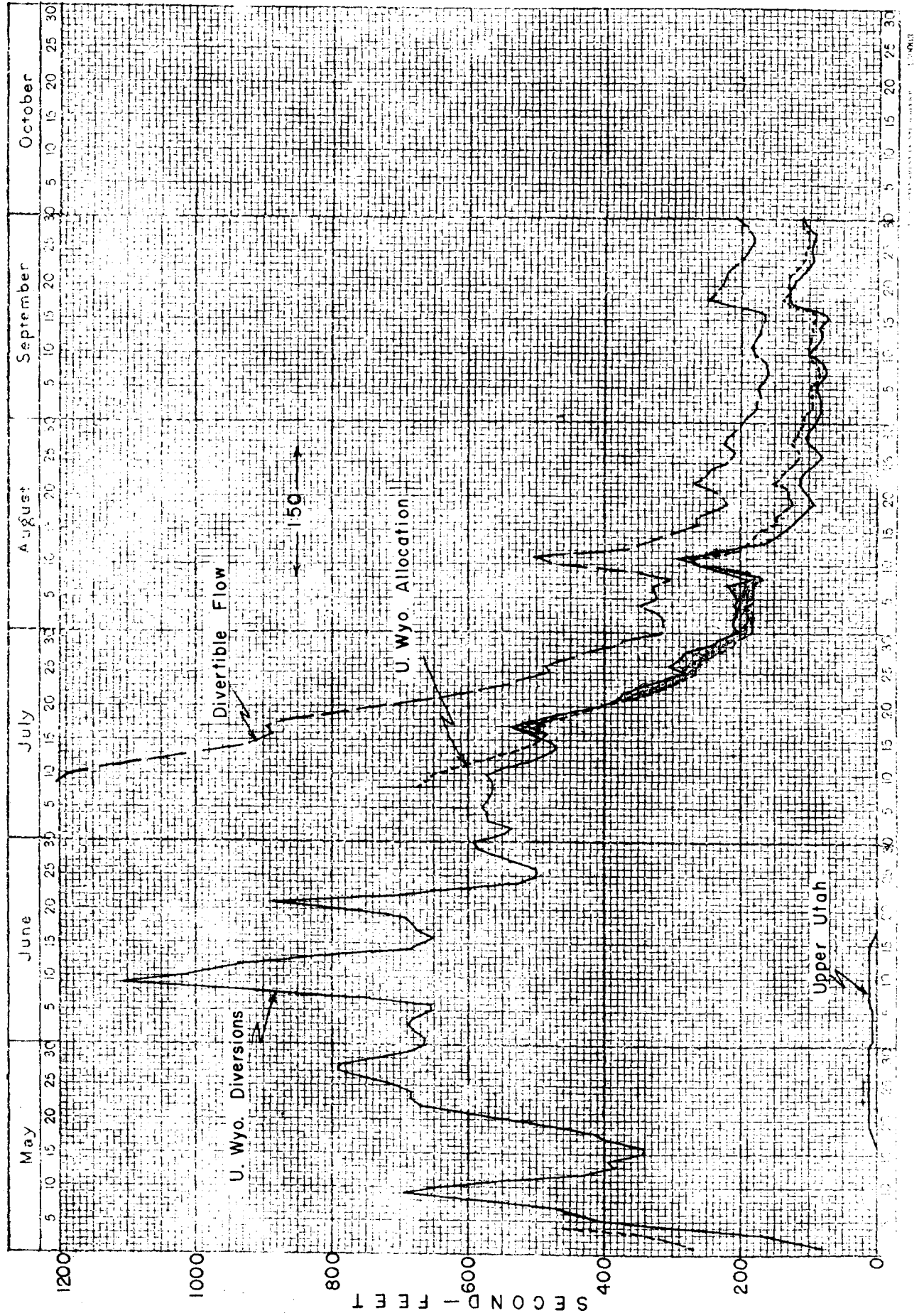
1945 — UPPER DIVISION — Upper Utah & Upper Wyoming



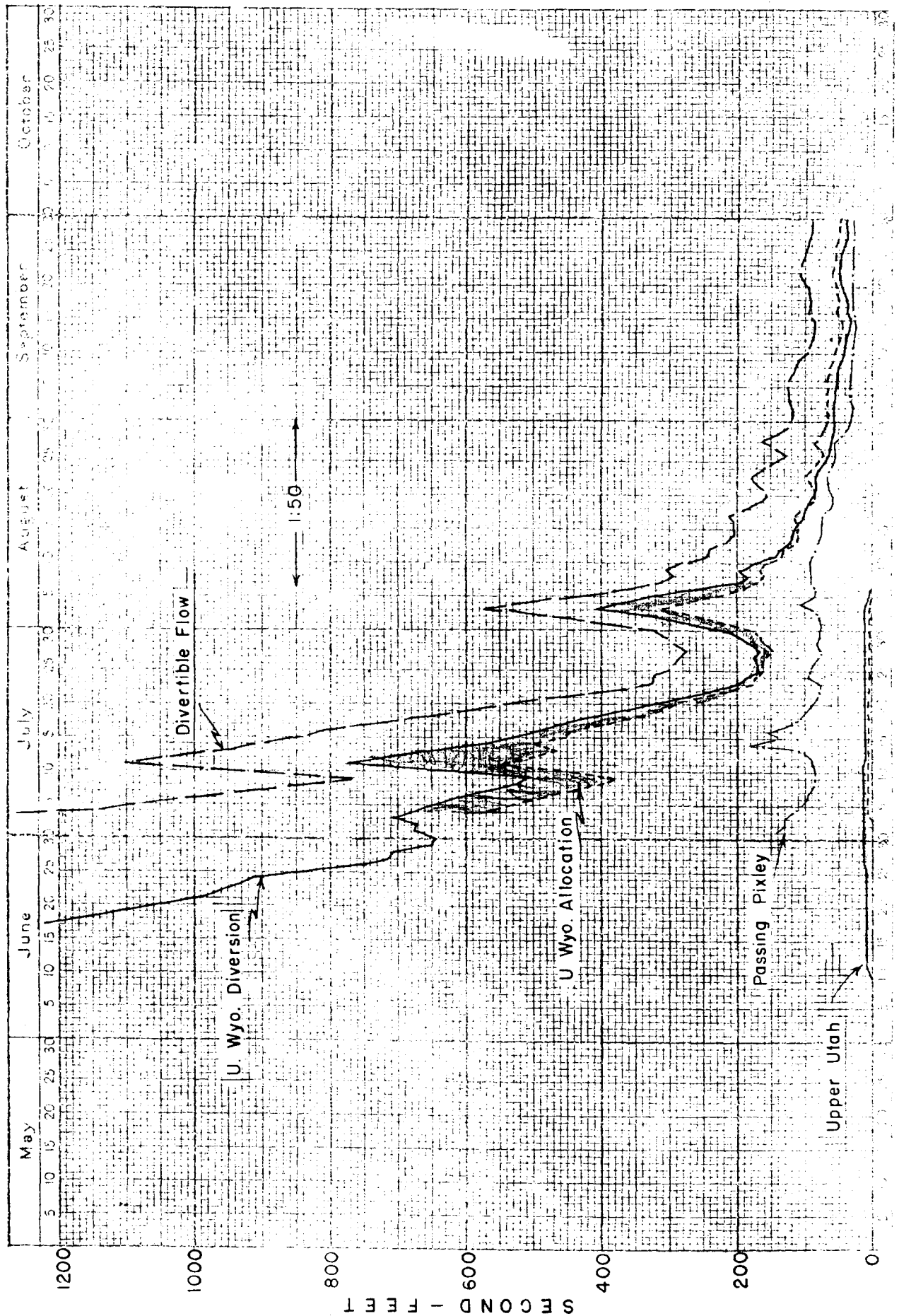
1946 — UPPER DIVISION — Upper Utah & Upper Wyoming



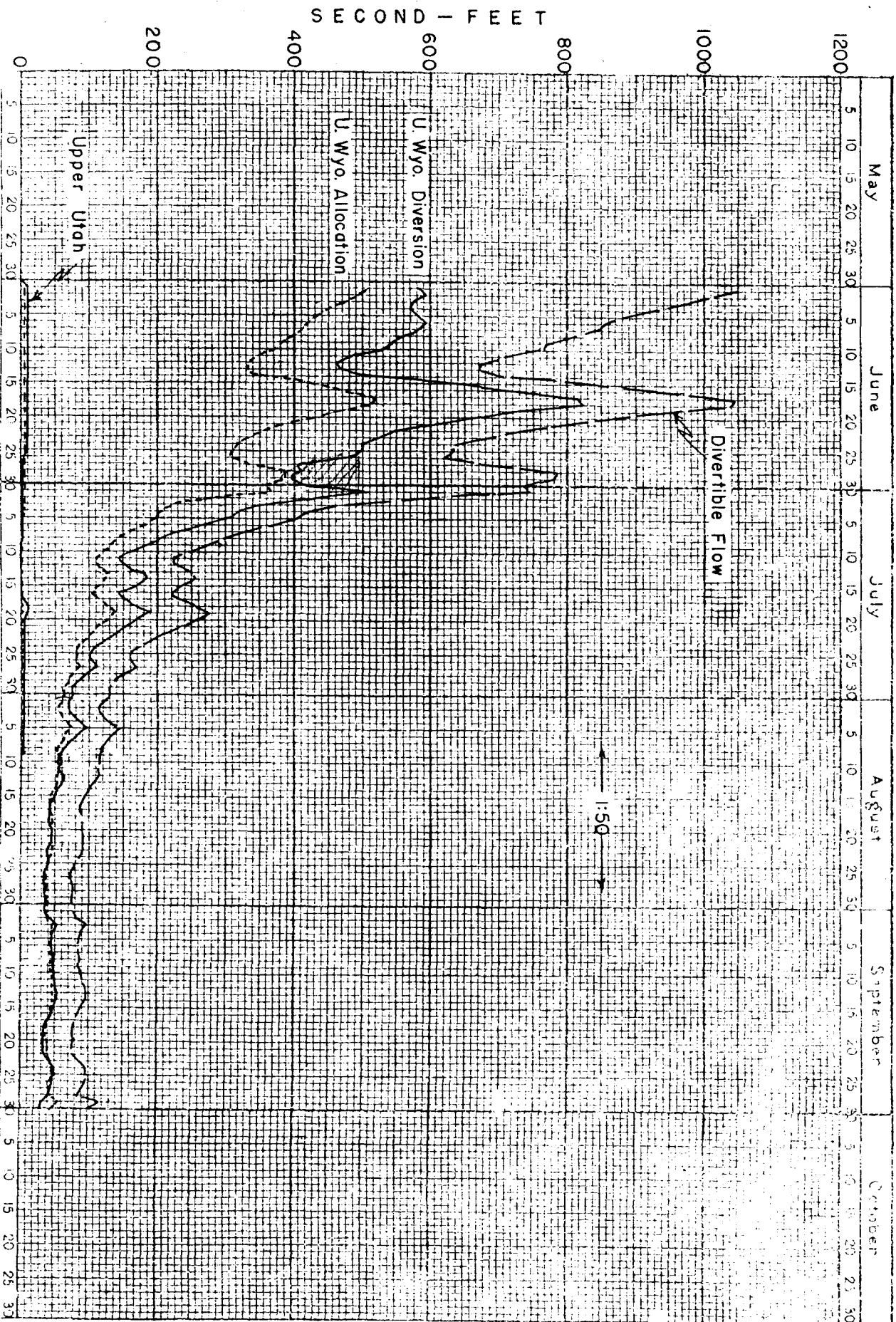
1947 — UPPER DIVISION — Upper Utah & Upper Wyoming



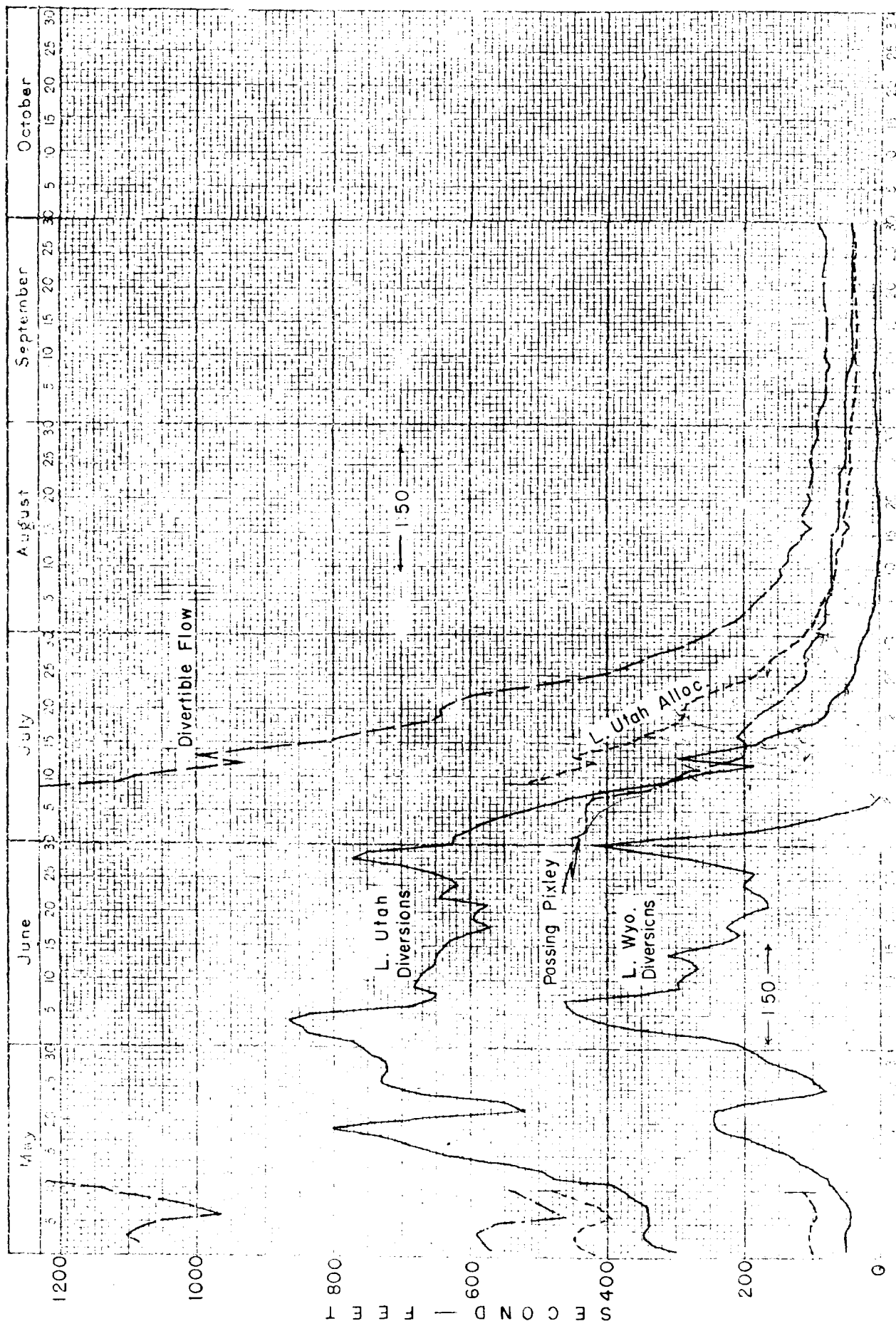
1953 — UPPER DIVISION — Upper Utah & Upper Wyoming



1954 - UPPER DIVISION - Upper Utah & Upper Wyoming



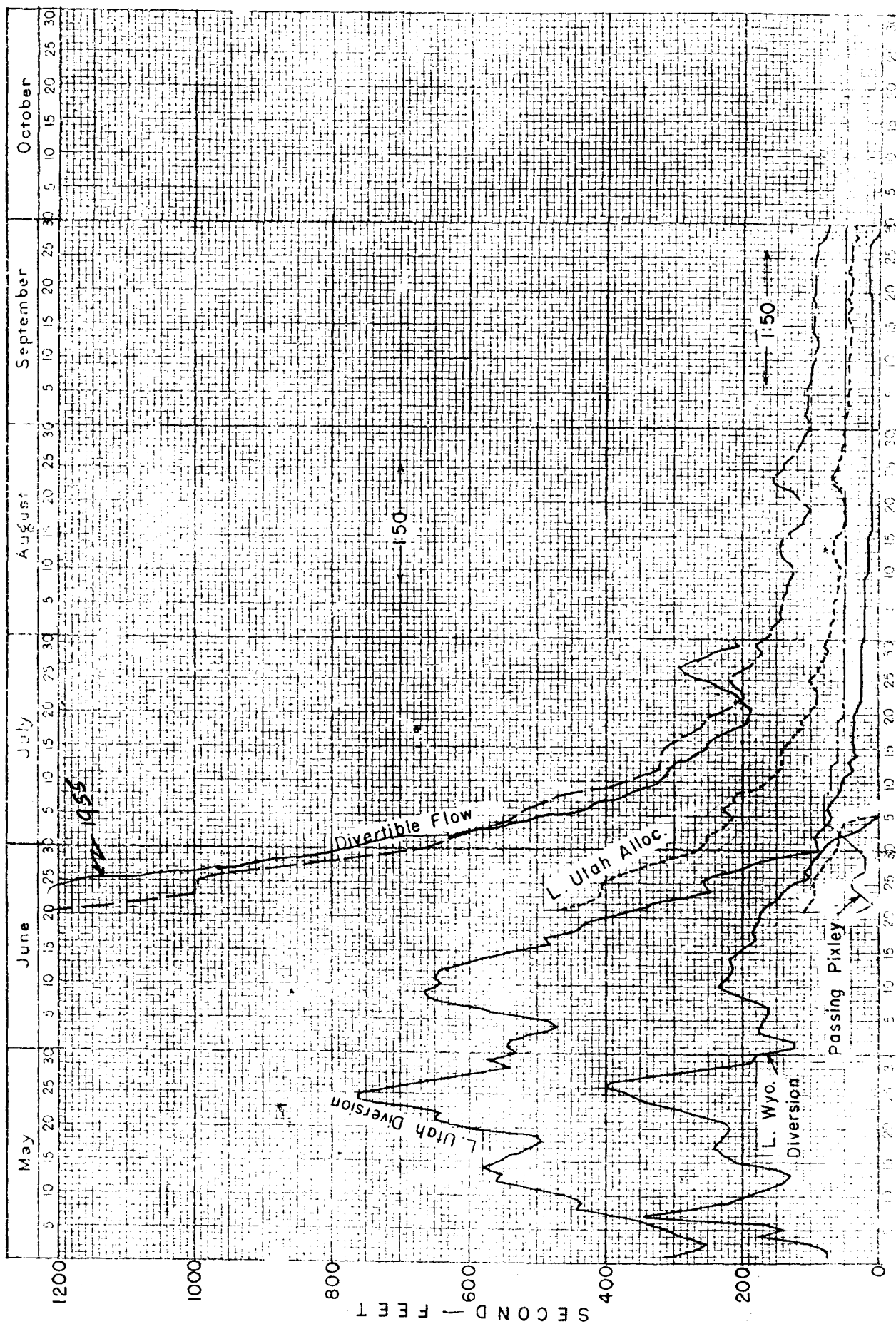
1944 — UPPER DIVISION — Lower Utah & Lower Wyoming



1945 — UPPER DIVISION — Lower Utah & Lower Wyoming



1946 — UPPER DIVISION — Lower Utah & Lower Wyoming



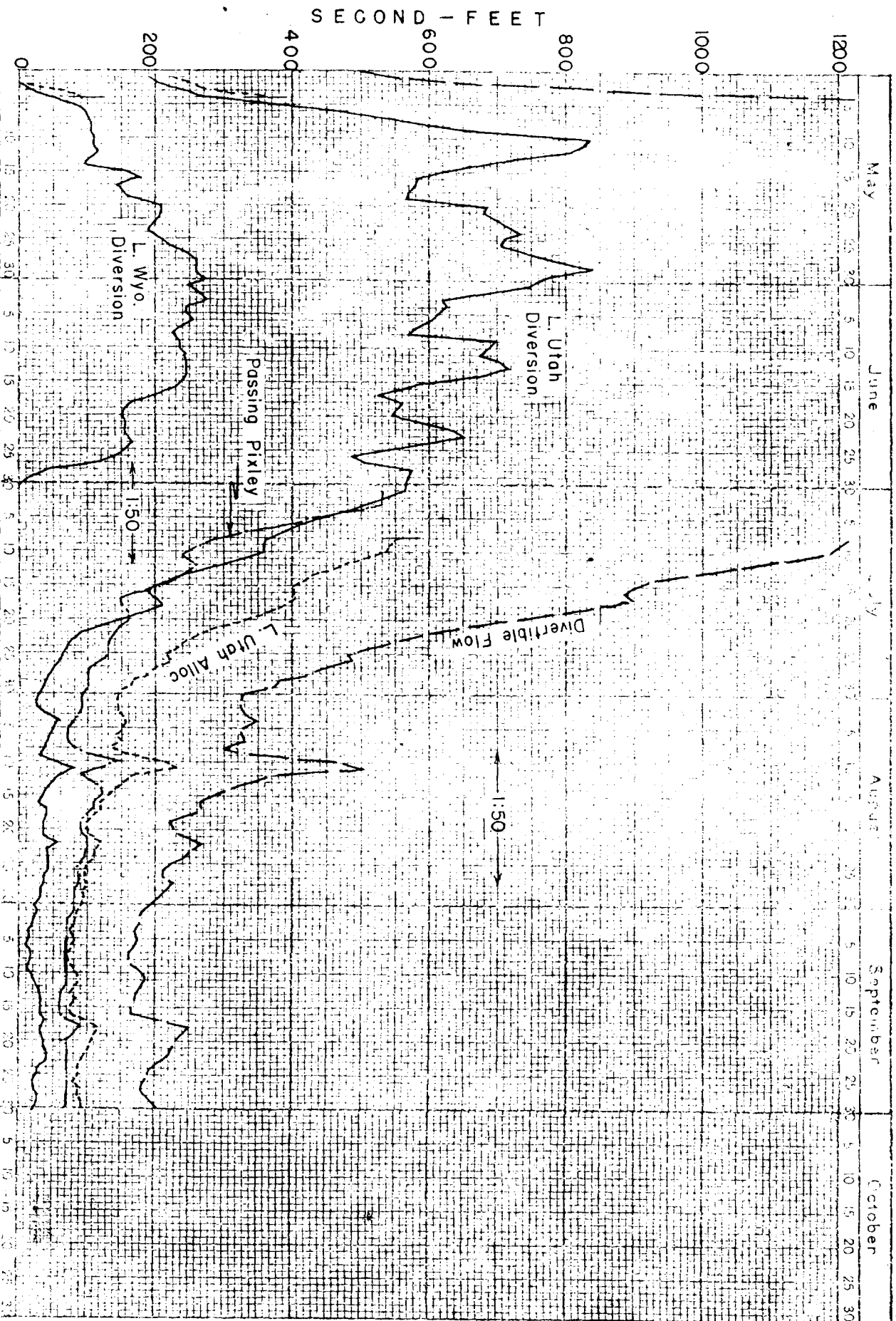
9-279-1
(Sept. 1947)

UNITED STATES DEPARTMENT OF THE INTERIOR

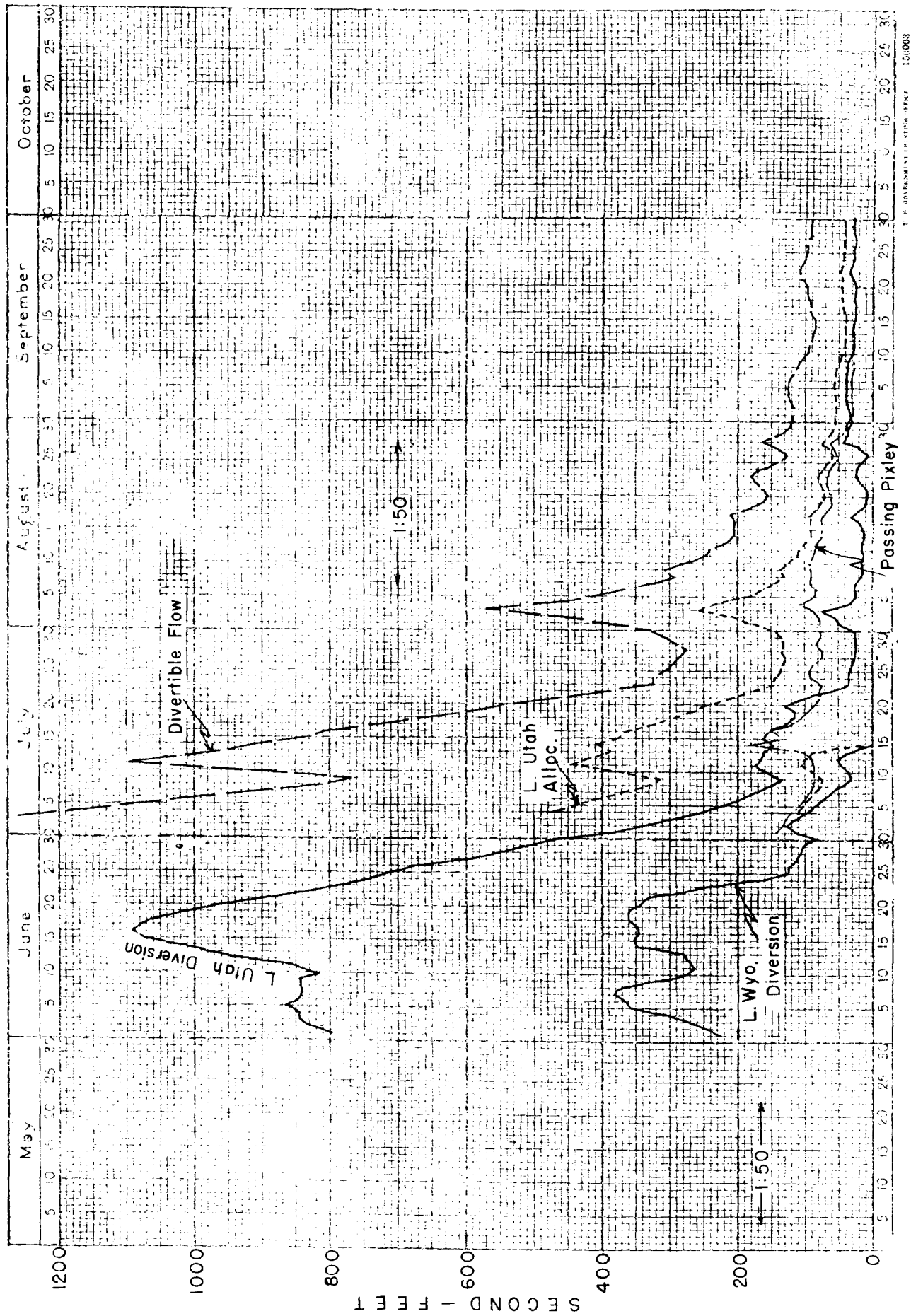
GEOLOGICAL SURVEY

(WATER RESOURCES BRANCH)

1947 - UPPER DIVISION - Lower Utah & Lower Wyoming



1953 — UPPER DIVISION — Lower Utah & Lower Wyoming



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April 1954

UNITED STATES DEPARTMENT OF THE INTERIOR

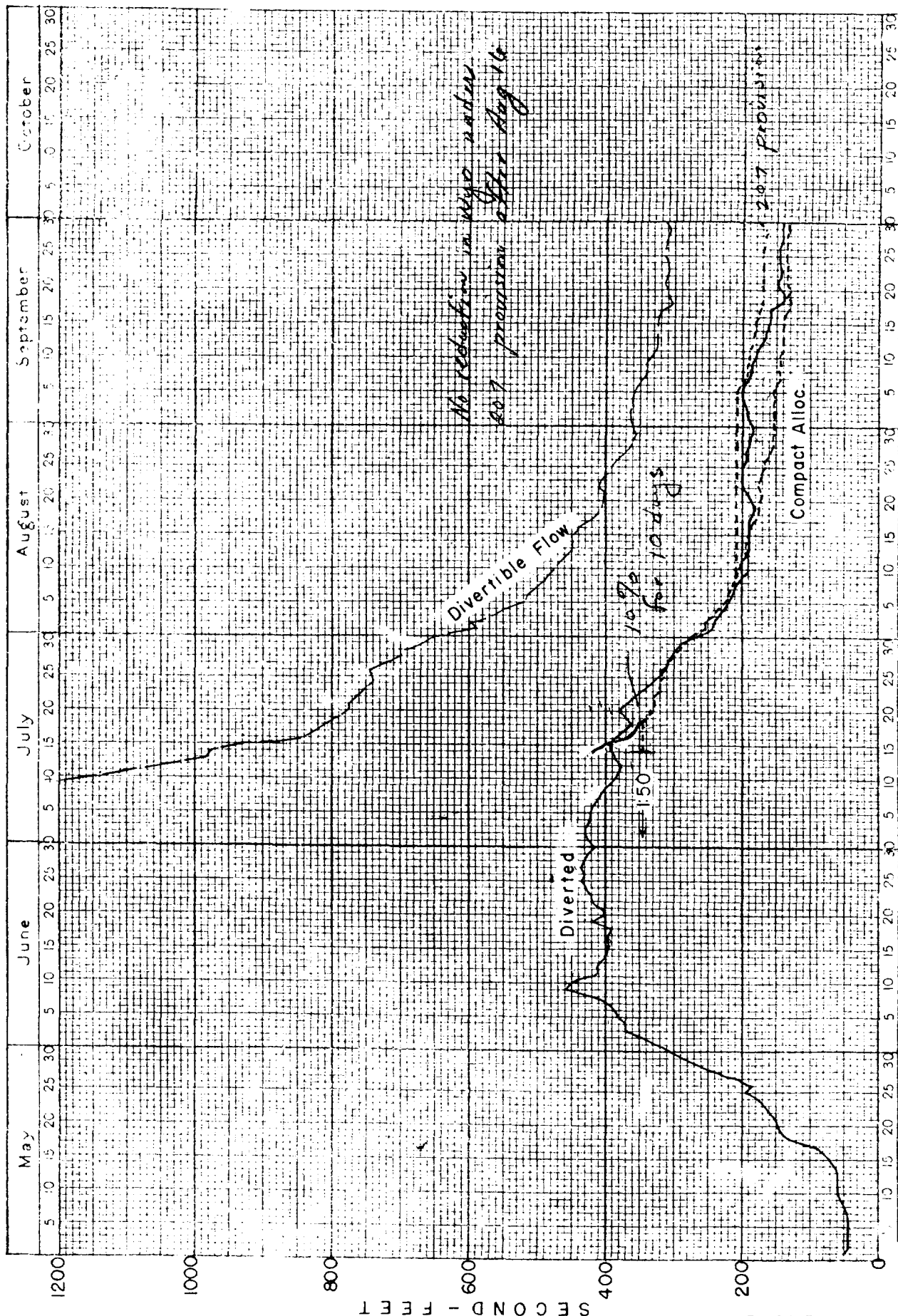
GEOLOGICAL SURVEY

(WATER RESOURCES BRANCH)

1954 - UPPER DIVISION - Lower Utah & Lower Wyoming

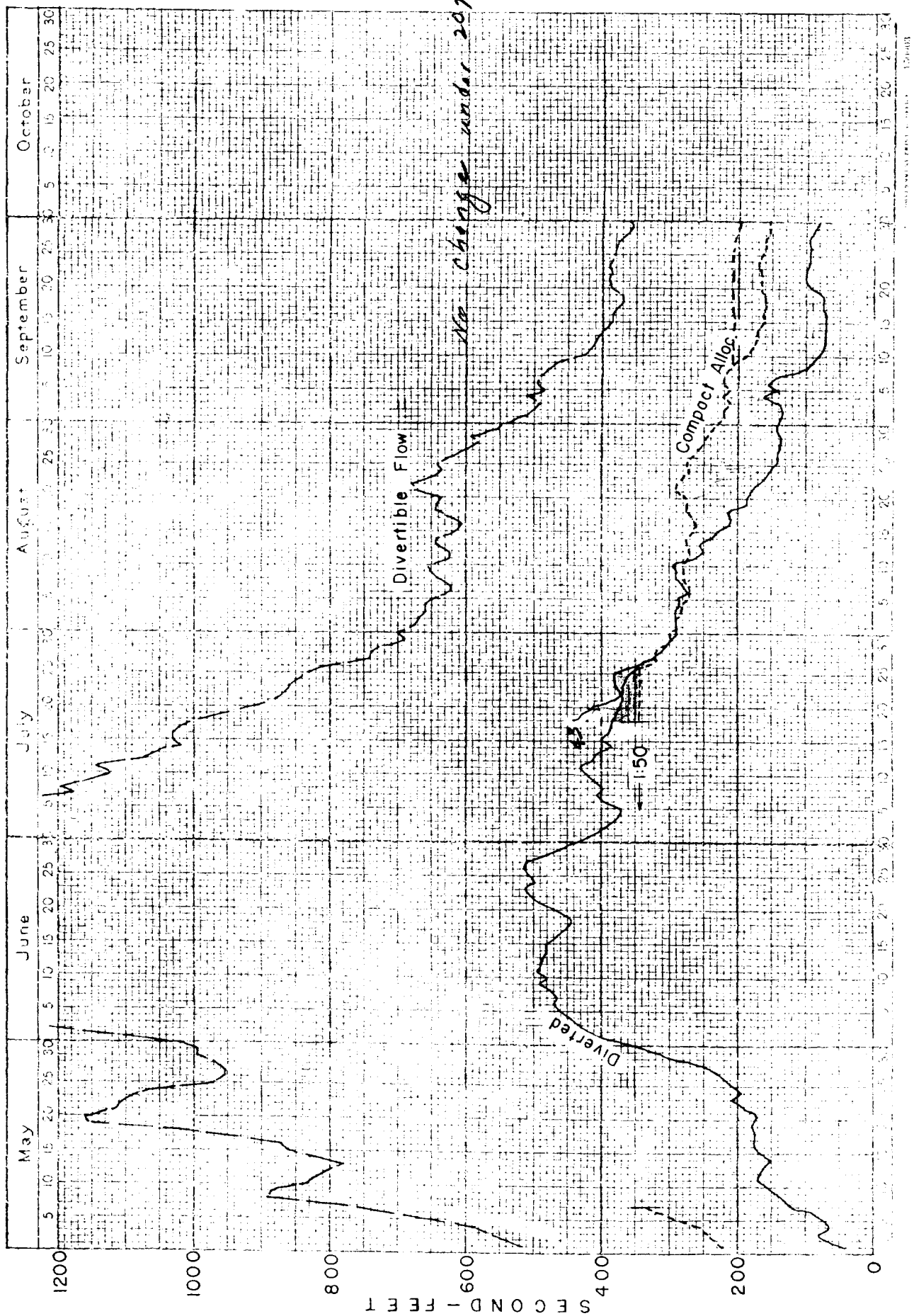


1944 - CENTRAL DIVISION - Wyoming

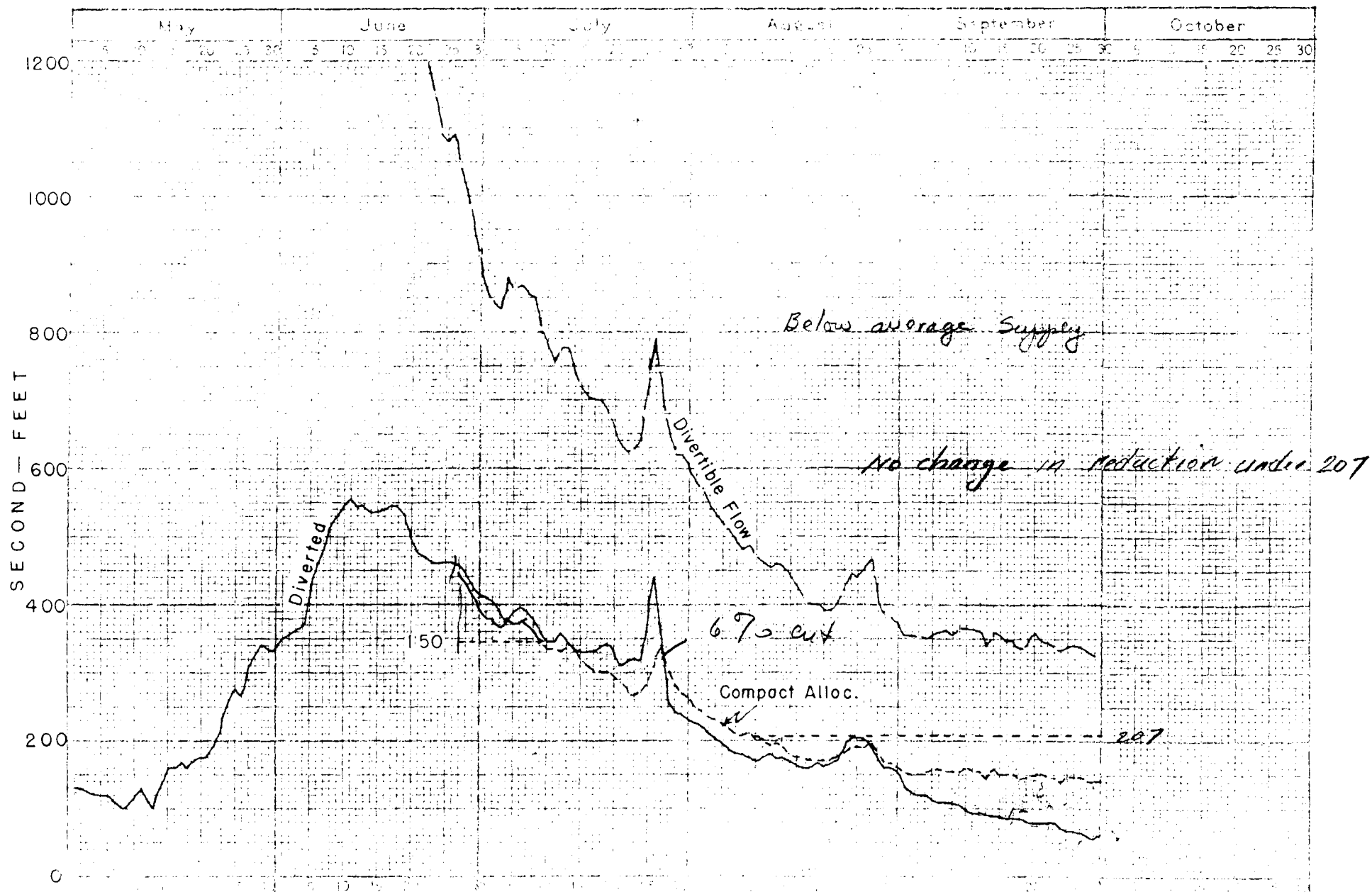


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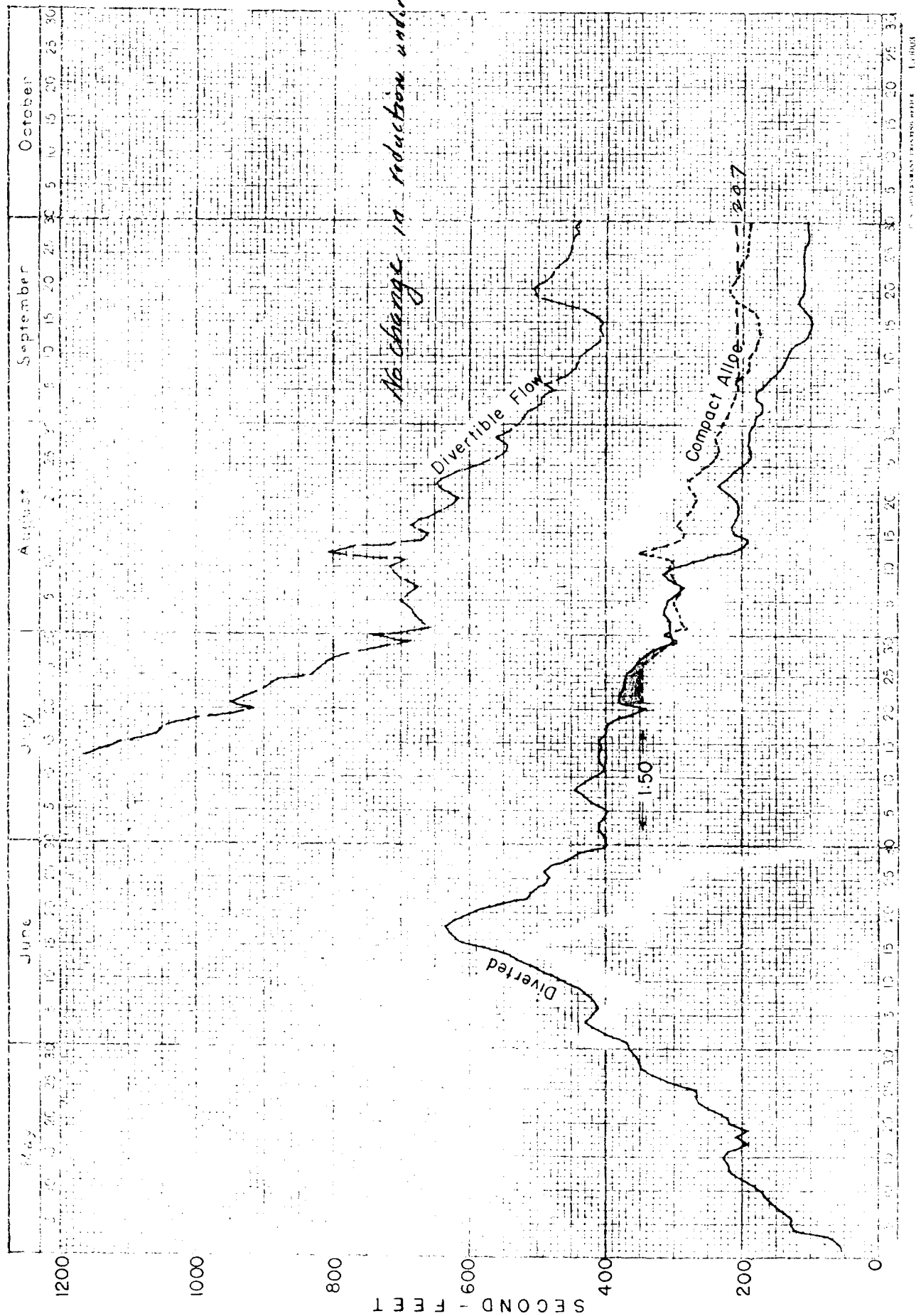
1945- CENTRAL DIVISION - Wyoming



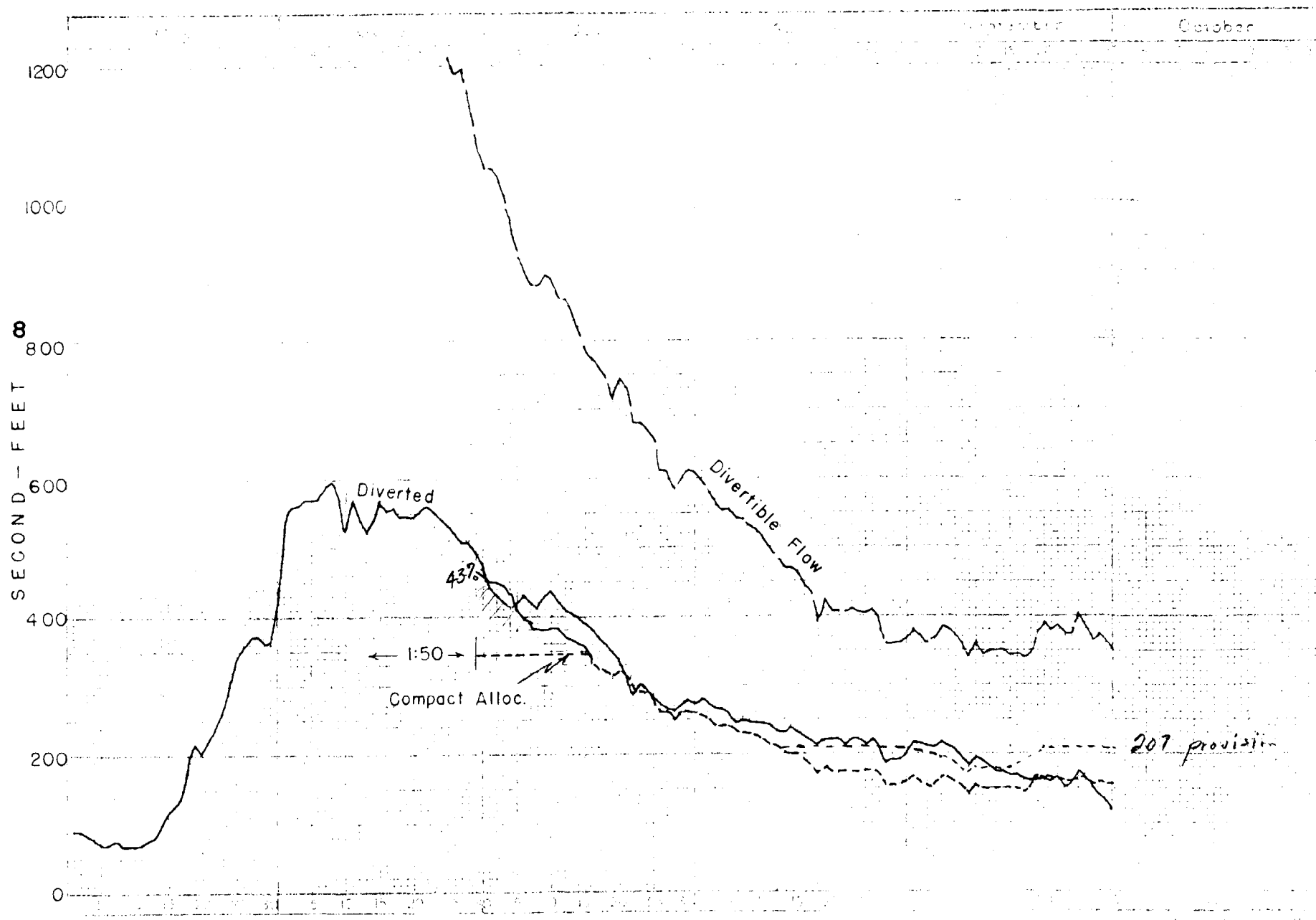
1946 - CENTRAL DIVISION - Wyoming



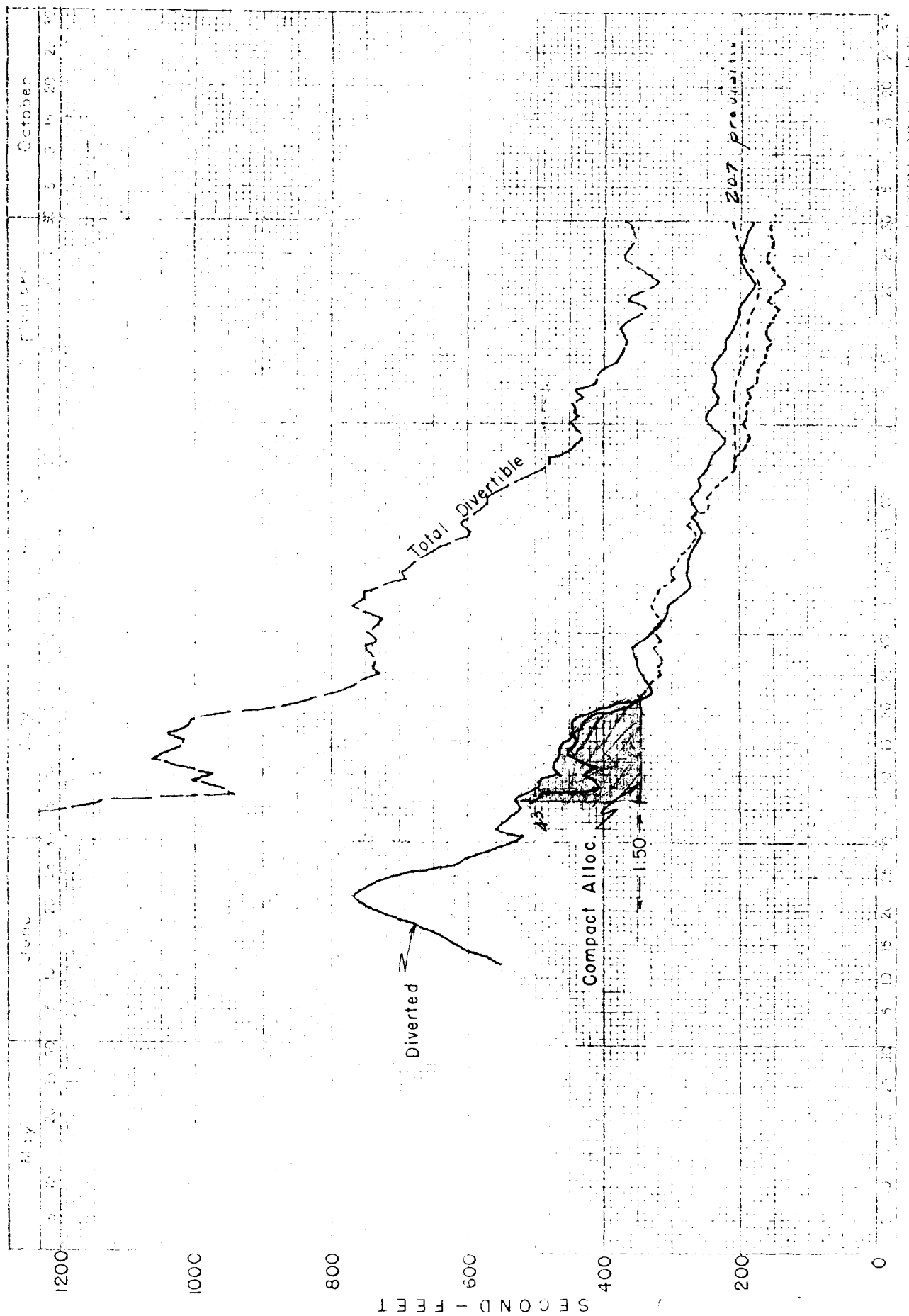
1947 - CENTRAL DIVISION - Wyoming



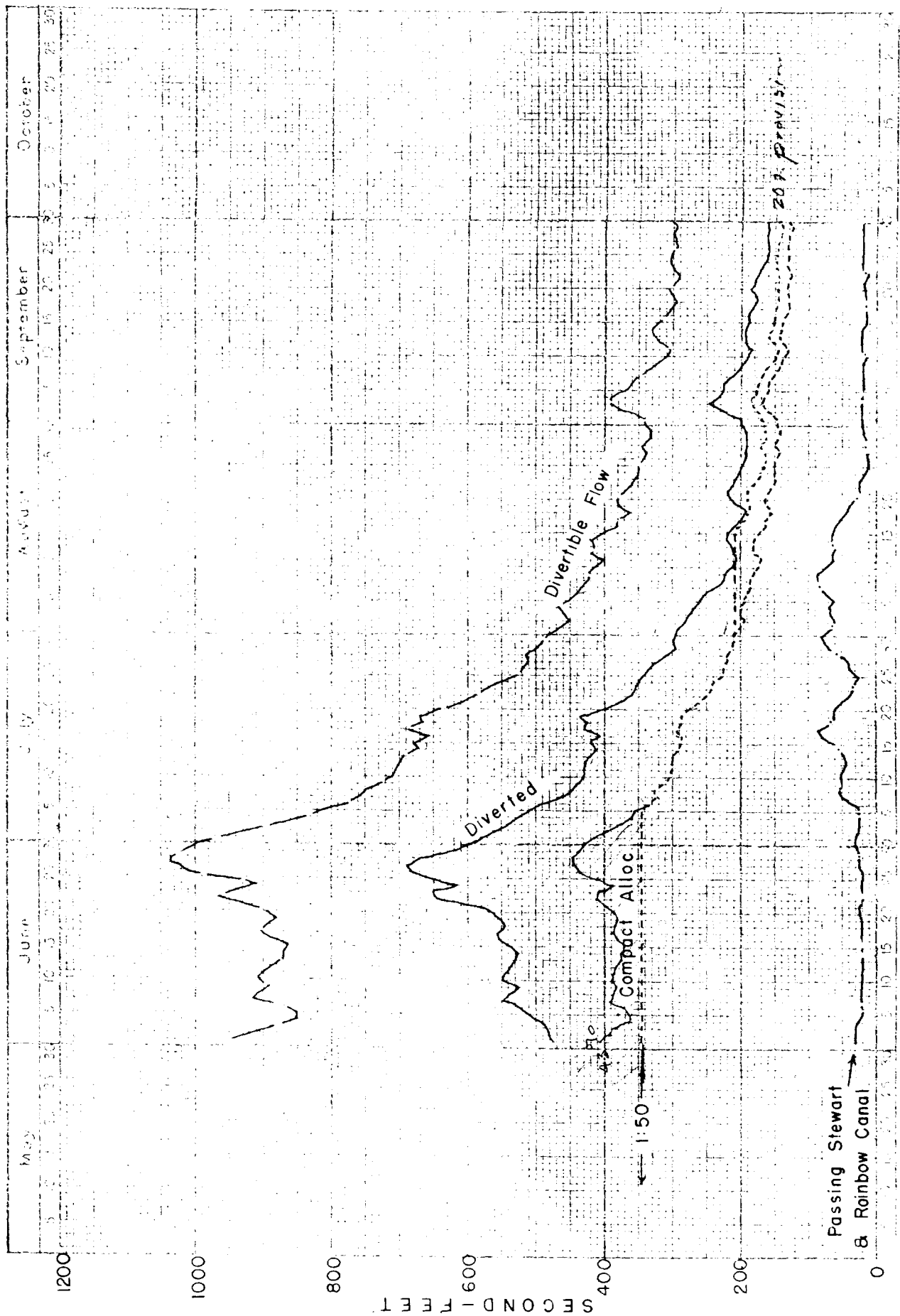
1948—CENTRAL DIVISION—Wyoming



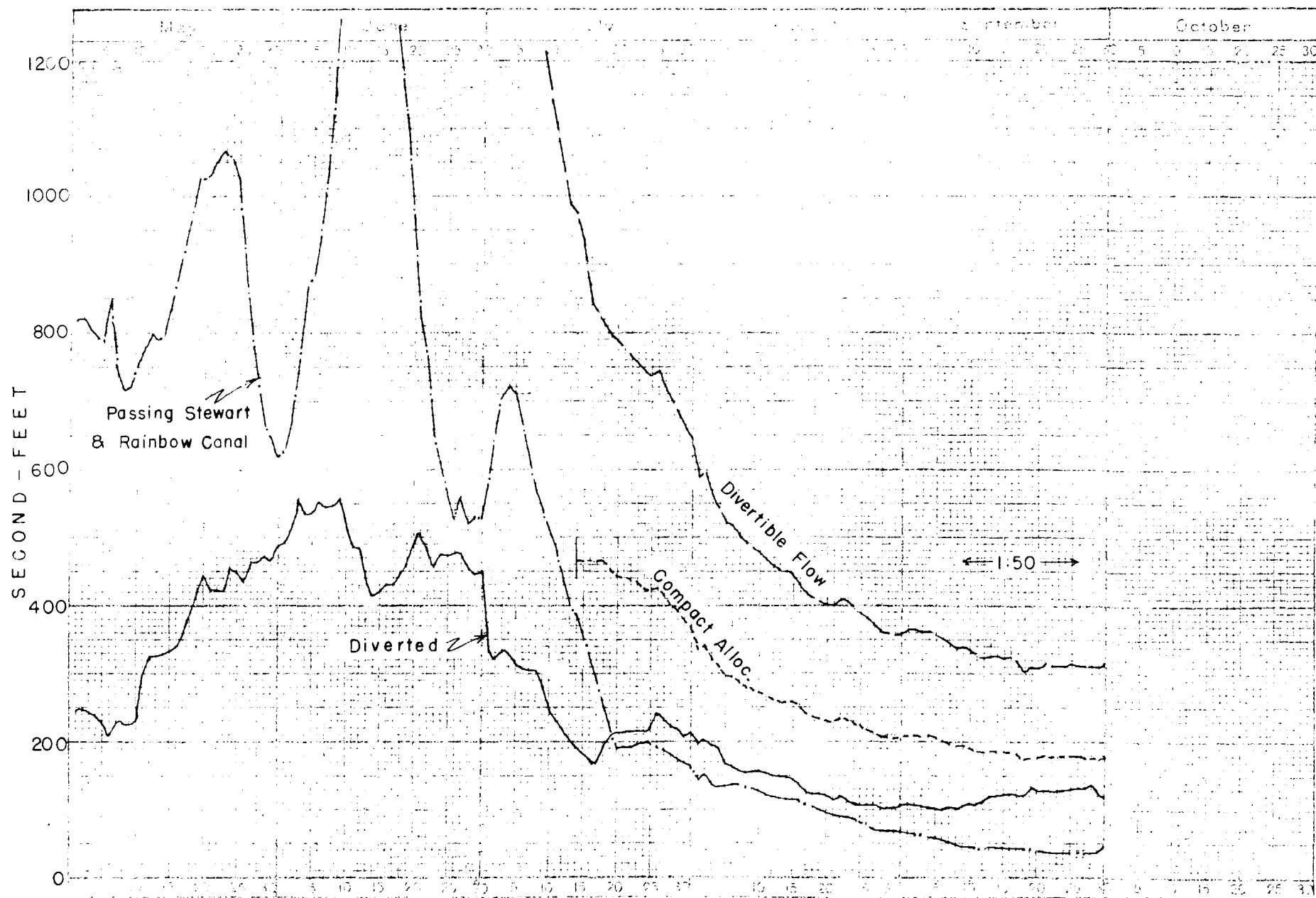
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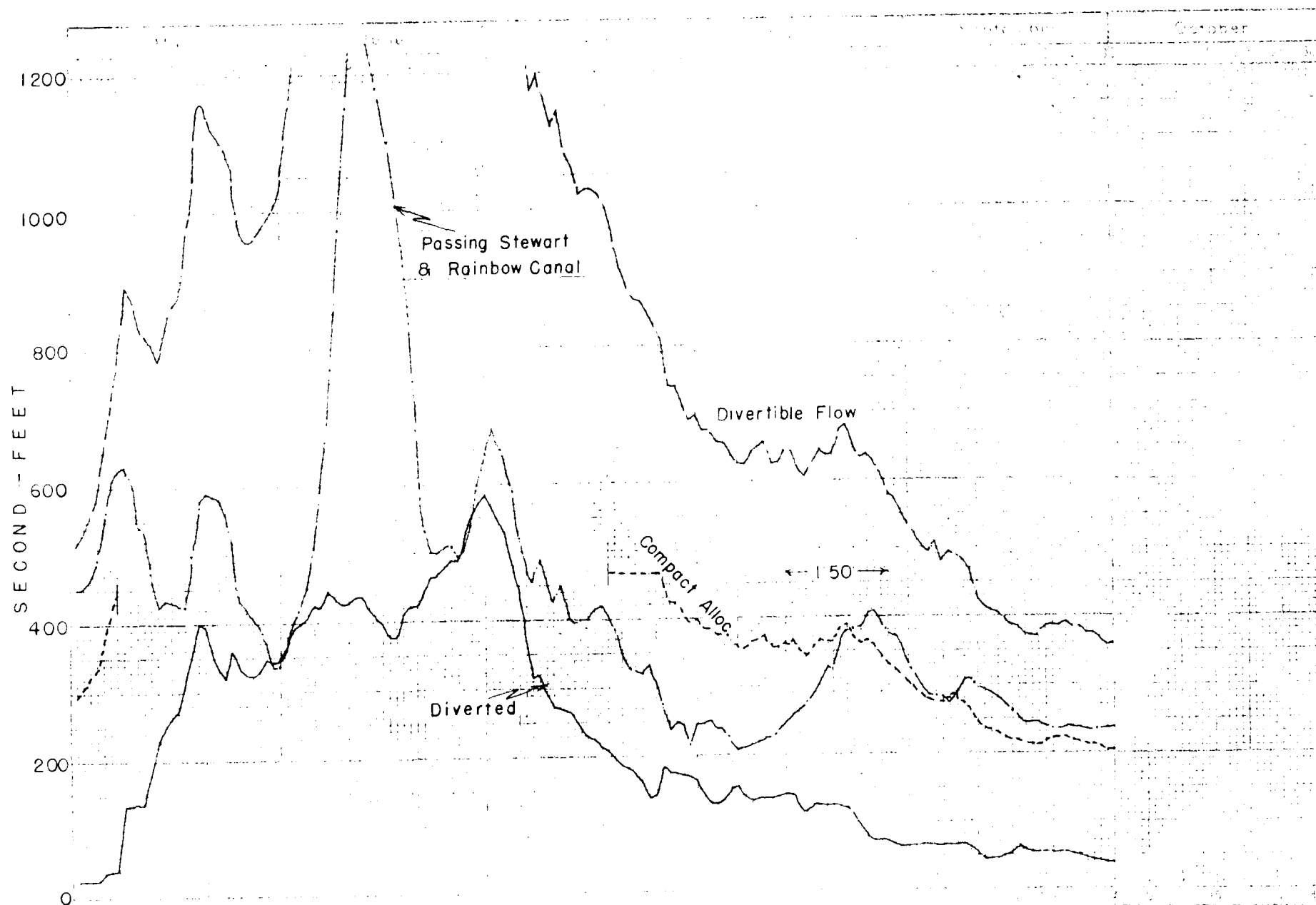
1954-CENTRAL DIVISION - Wyoming



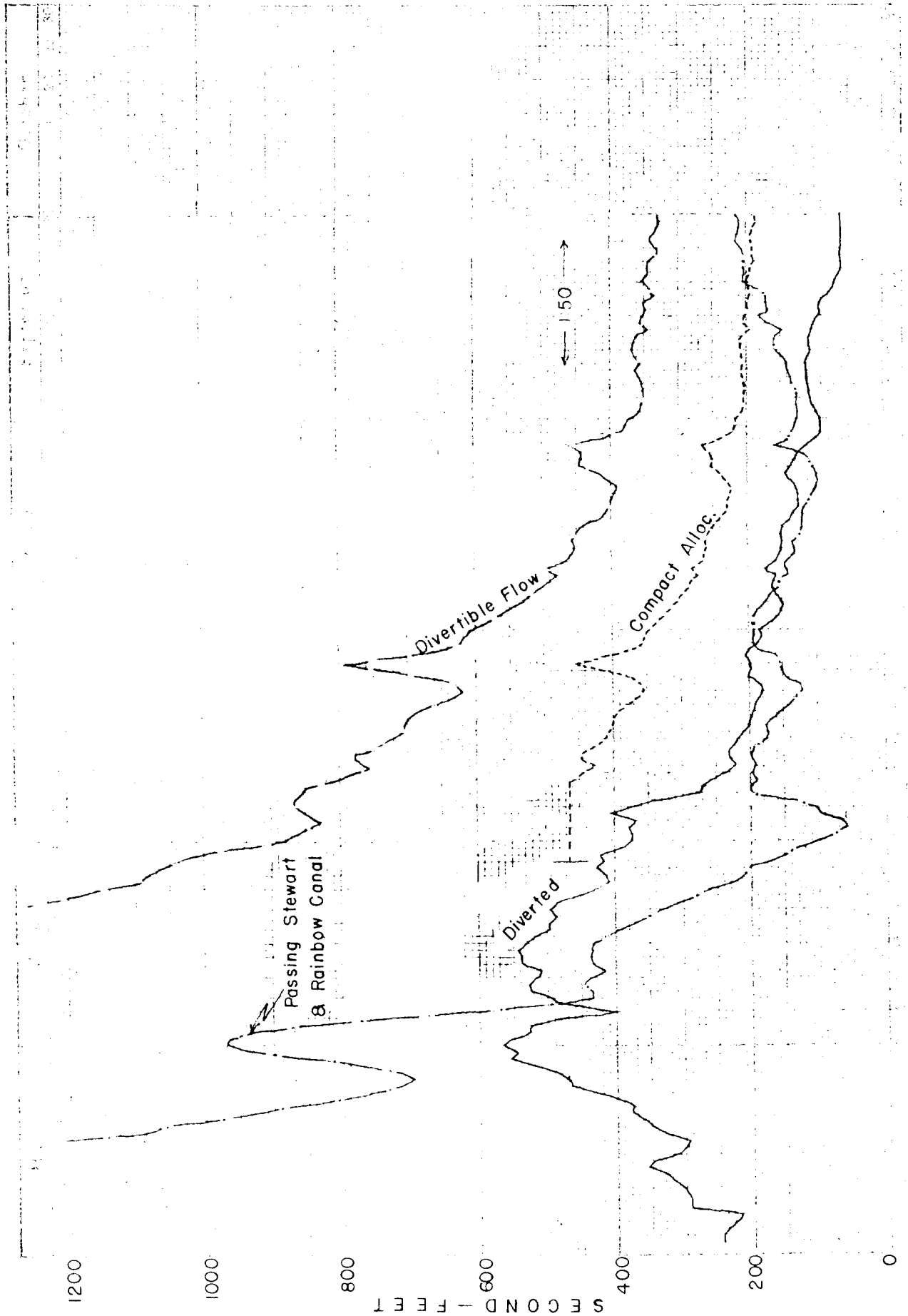
1944 - CENTRAL DIVISION - Idaho



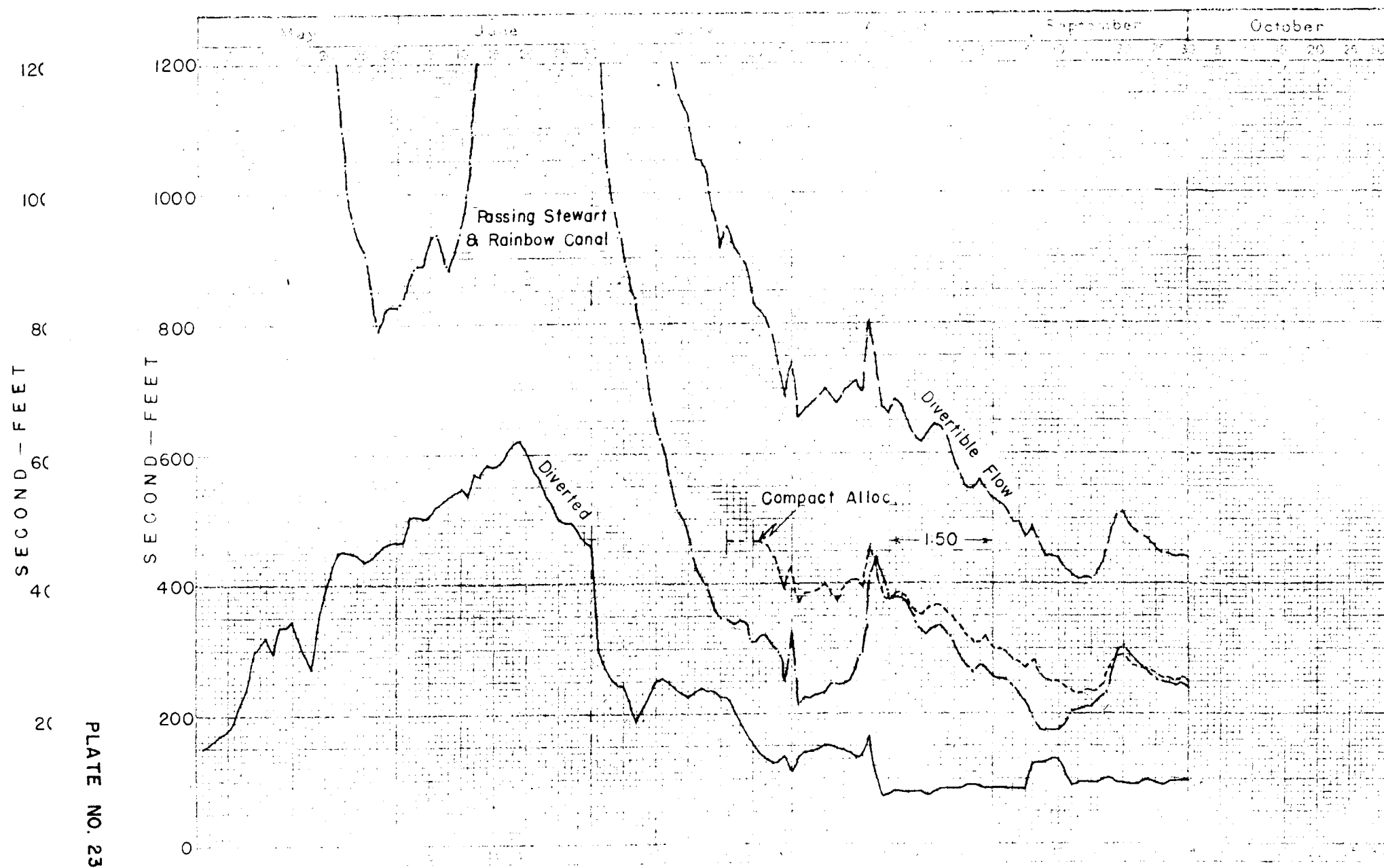
1945 - CENTRAL DIVISION - Idaho



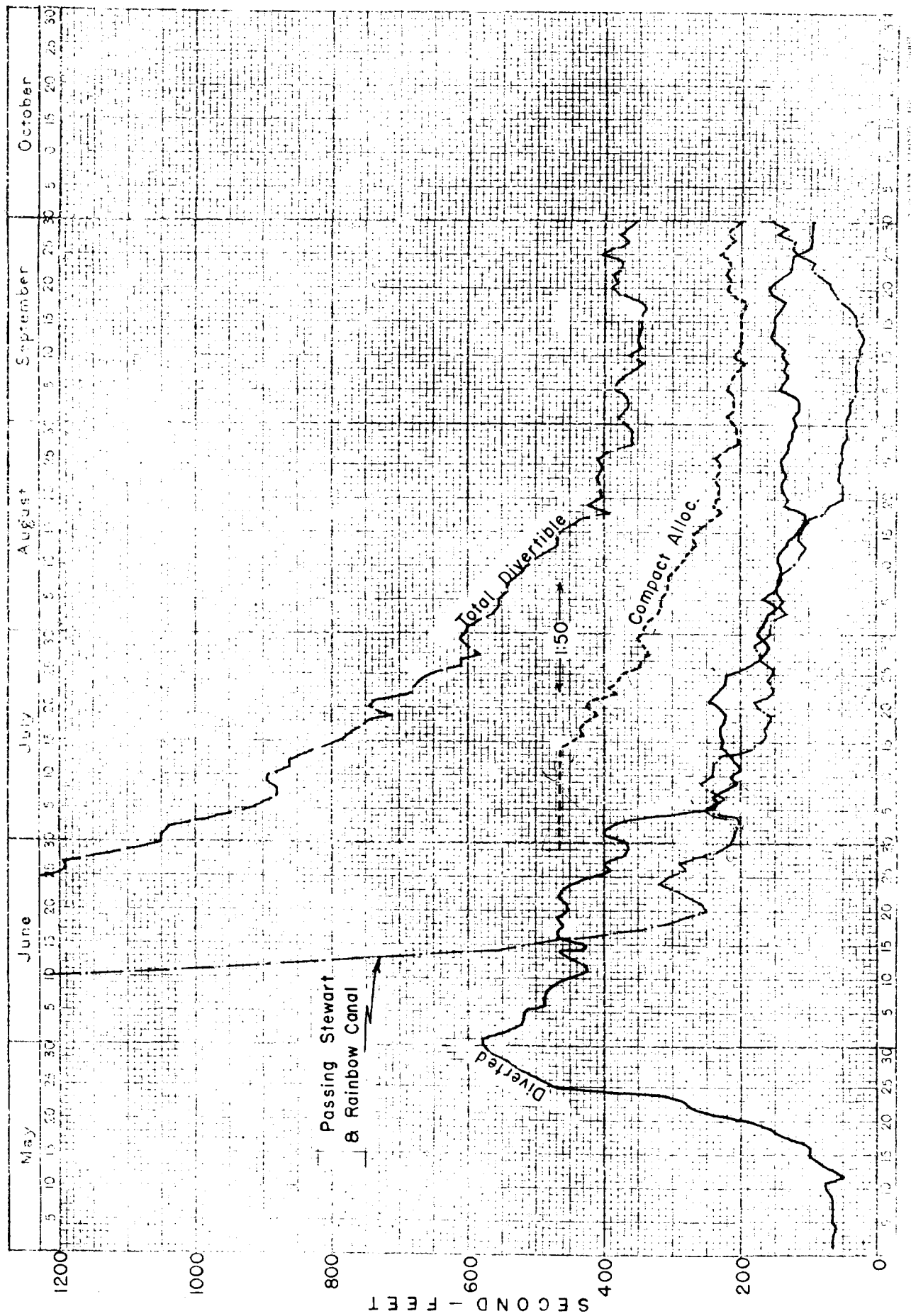
1946 - CENTRAL DIVISION - Idaho



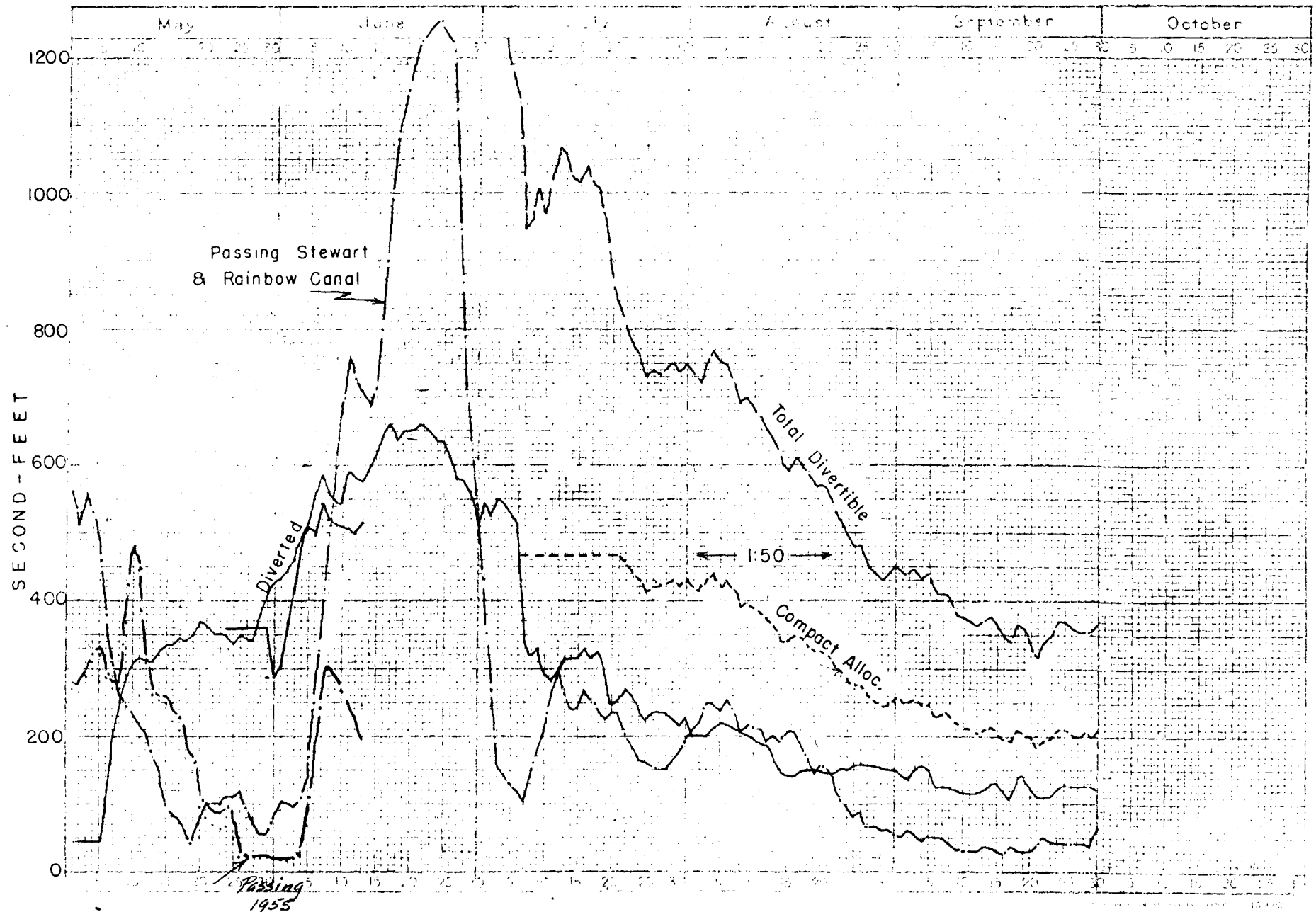
1947 - CENTRAL DIVISION - Idaho



1948 - CENTRAL DIVISION - Idaho



1953 - CENTRAL DIVISION - Idaho



1954 - CENTRAL DIVISION - Idaho

