REPORT NO. 8

REPORT OF ENGINEERING COMMITTEE

to

BEAR RIVER COMPACT COMMITTEE

June 15, 1949

BEAR RIVER ENGINEERING COMMITTEE

W. V. Lorns, Chairman
Lynn Crandall, representing State of Idaho
C. O. Roskelley, representing State of Utah
R. D. Goodrich, representing State of Wyoming
E. K. Thomas, representing Bureau of Reclamation

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PART I

DETERMINATION OF SUPPLEMENTAL WATER SUPPLY NEEDED BY WATER USERS, BOTH ABOVE AND BELOW BEAR LAKE

Lands above Bear Lake

The amount of supplemental water needed for lands above Bear Lake is contingent on a number of conditions. Principal among these are: Seasonal duty of water requirement of the lands; type of crop pattern to be served; and division of natural flow waters. For the purpose of a determination, which can only be termed as very rough, two general sets of conditions, called Plan A and Plan B are assumed to prevail.

Plan A

1. Assumed seasonal requirement in acre-feet per acre for headgate delivery in each river section to be:

Upper Wyoming Section	2.80	acre-feet	per	acre	Headgate delivery
Middle Utah Section	3.00	"	"	"	
Middle Wyoming Section	3.00	"	"	"	
Lower Wyoming Section	3.20	"	"	"	
Upper Idaho Section	3.40	"	"	"	

2. The type of crop pattern to be served shall be based on the indicated average of monthly percent of total seasonal diversions (May to September) of the Lower Wyoming and Upper Idaho Sections for 1944, 1946 and 1947. The supply for the most part exceeded the demand for these sections in the years used. The 1945 season was omitted because of the effect of the abnormal precipitation which occurred during the irrigation season for these sections in the years used. In general, this plan would serve a more diversified crop pattern than now exists.

Distribution in Percent of Total Requirement

Month	Percent of Total Requirement
April	0
May	20
June	30
July	30
August	15
September	5
Season	100

as actually occurred in 1944, 46 & 47

3. The division of natural flow waters during periods of low flow shall be as set forth in the tentative draft.

4. Supplemental requirement to be determined only for the years 1944, 1946, and 1947.

PLAN B

1. Assumed seasonal requirement to be that necessary to furnish an estimated full diversion demand through July 31 in each year.

2. Type of crop pattern to be served shall be predominately wild hay as now exists. Rate of diversion shall be limited to a maximum of one cubic foot per second for each fifty acres. Pattern of diversion shall begin May 1, follow actual diversion until maximum rate is reached then continue at maximum rate until July 31, after which canals would cut down to present supply for balance of season.

3. The present beneficial supply is assumed to correspond to the division of natural flow waters as set forth in the tentative draft.

4. Supplemental requirement to be determined only for the years 1944, 1946, and 1947.

Summary of Supplemental Requirement
Acre-Feet

	Plan A			Plan B		
Section	1944	1946	1947	1944	1946	1947
Upper Wyo.	31,200	46,800	21,600	24,820	47,220	23,300
Middle Utah	31,900	46,700	21,400	24,820	47,220	23,300
Middle Wyo.	5,560	8,780	1,595	1,520	6,140	730
Lower Wyo.	1,520	1,520	340	5,130	6,560	3,170
Upper Idaho	0	0	0	0	0	0
Total	70,180	103,800	44,935	56,290	107,140	50,500

COMPUTATIONS AND HYDROGRAPHS - PLAN A

Upper Wyoming Section - Plan A

40,000 acres @ 2.80 ac.-ft. per acre

112,000 acre-feet delivery in May to September period.

Table I shows computations and summary in total acre-feet of supplemental requirement for 1944, 1946 and 1947. Plates on pages 4, 5, and 6 show hydrographs of requirements for 1944, 1946, and 1947.

TABLE I

	Total Requirement			Supplemental Requirement		
	Percent of Total	Acre-Feet	Average Daily Sec.ft.	1944 Acre-Feet	1946 Acre-Feet	1947 Acre-Feet
May	20	22,400	365	0	0	0
June	30	33,600	565	0	3,300	0
July	30	33,600	565	14,100	26,100	11,500
August	15	16,800	270	13,500	13,700	10,100
September	5	5,600	95	3,600	3,700	0
Total	100	112,000		31,200	46,800	21,600

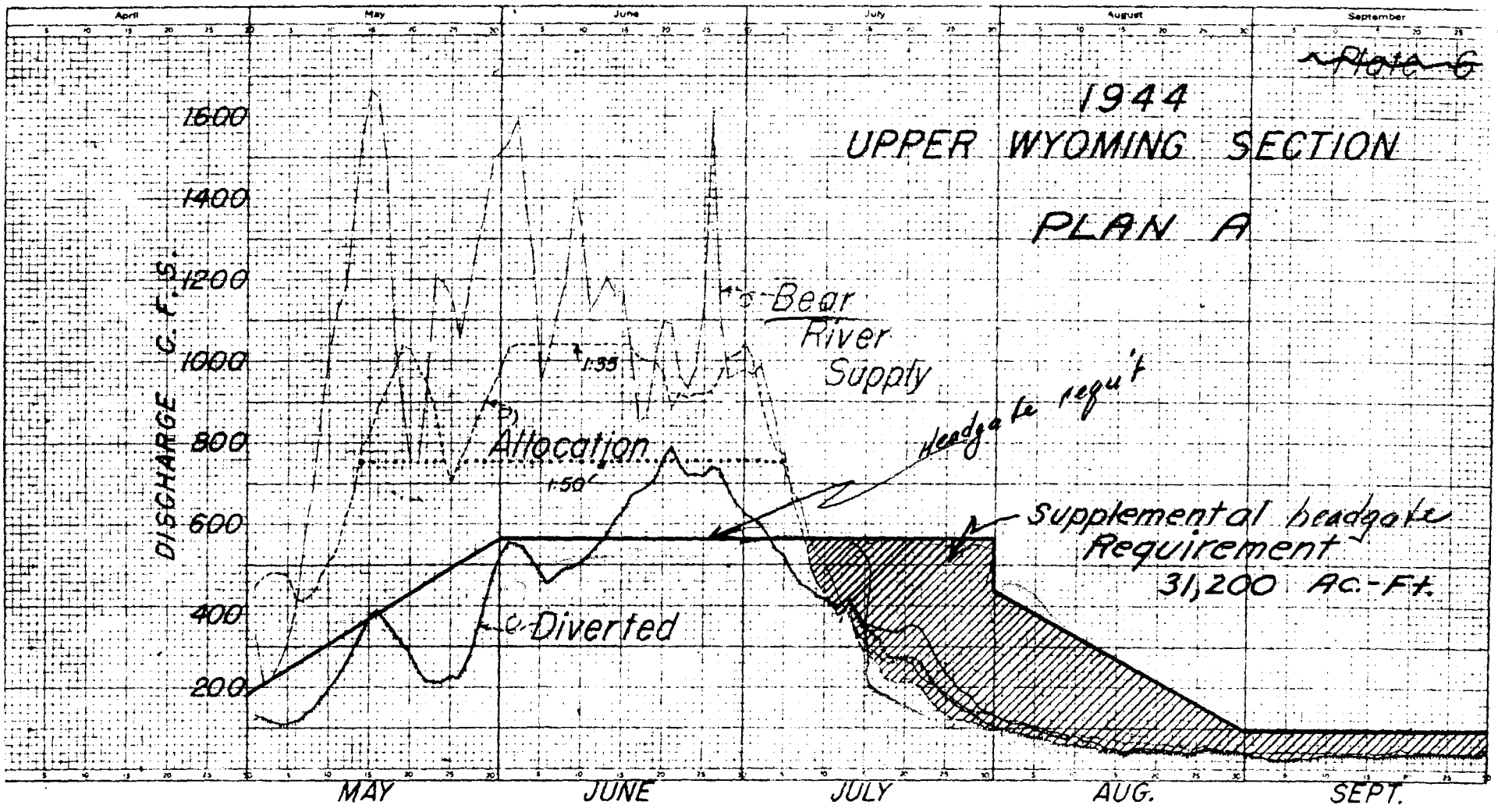


Plate 6
1944
UPPER WYOMING SECTION
PLAN A
DISCHARGE C.F.S.
1600
1400
1200
1000
800
600
400
200
a-Bear River Supply
b-Allocation
c-Diverted
headgate requ't
Supplemental headgate Requirement
31,200 Ac-Ft.
1.55
1.56
MAY
JUNE
JULY
AUG.
SEPT.

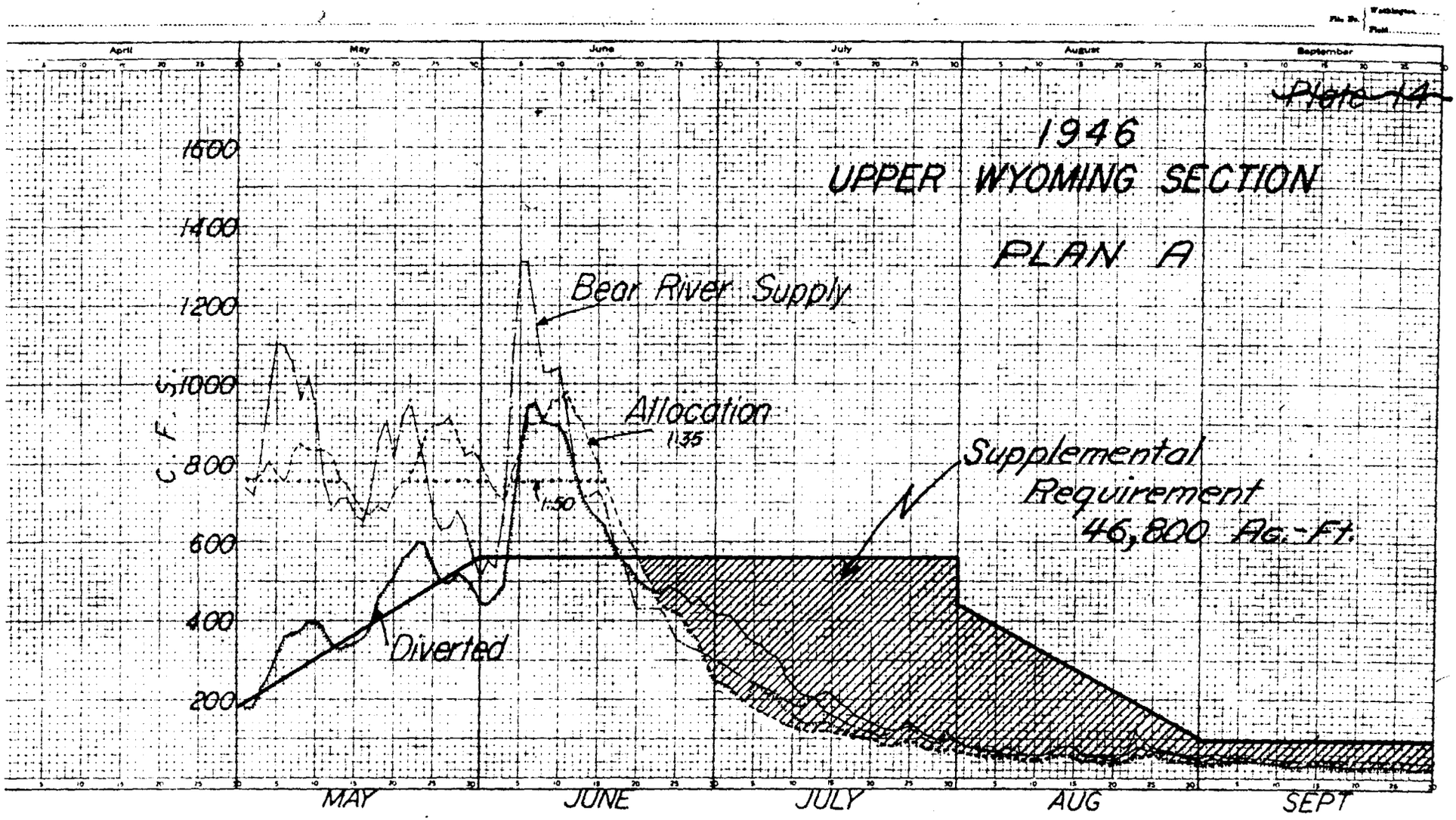


Plate 14
1946
UPPER WYOMING SECTION
PLAN A
Bear River Supply
Allocation
1135
1150
Supplemental
Requirement
46,800 Ac.-Ft.
Diverted
1600
1400
1200
1000
800
600
400
200
C.F.S.
April
May
June
July
August
September
MAY
JUNE
JULY
AUG
SEPT

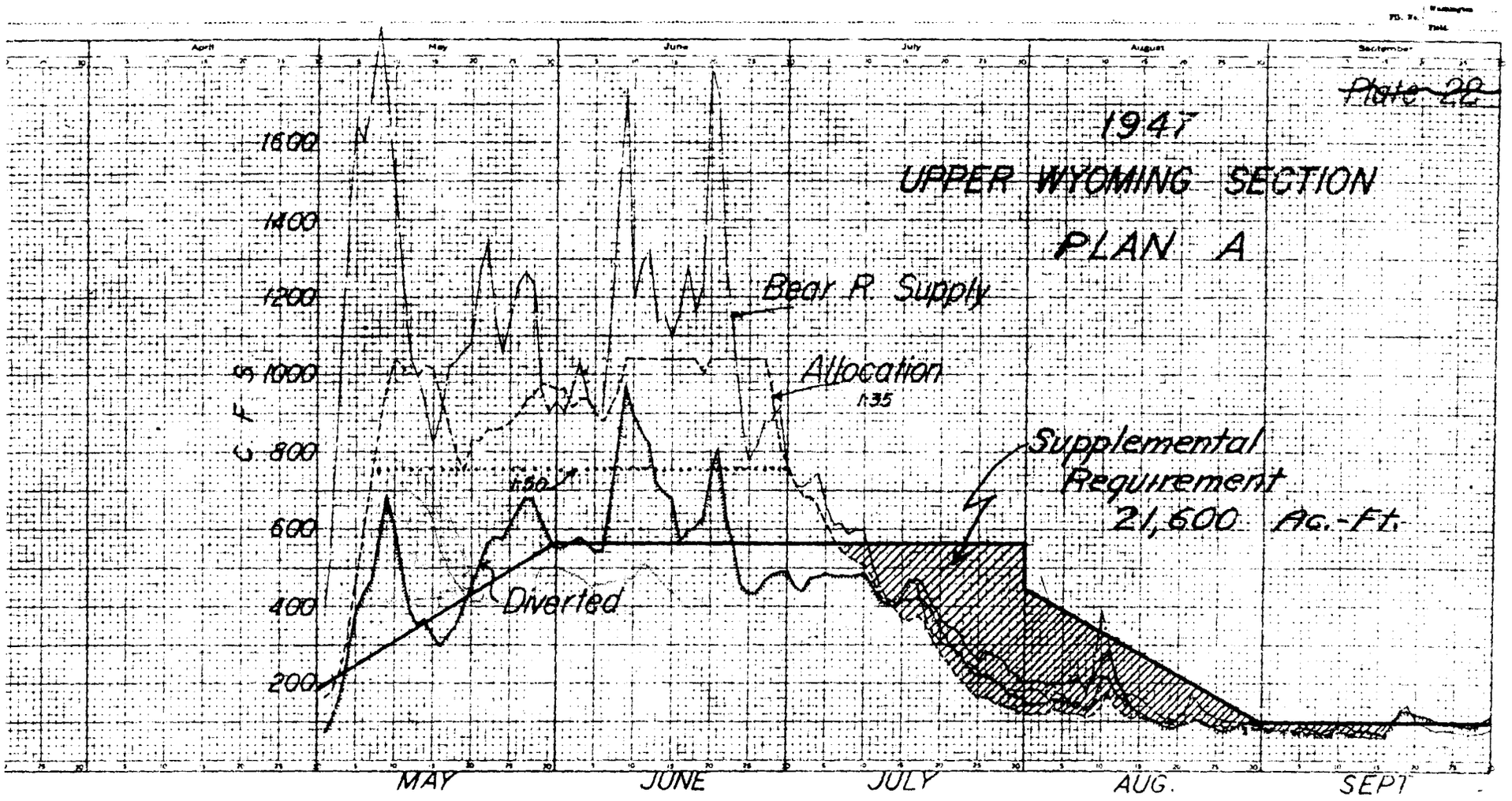


Plate 22
1947
UPPER WYOMING SECTION
PLAN A
Bear R. Supply
Allocation
1.35
Supplemental
Requirement
21,600 Ac.-Ft.
Diverted
1600
1400
1200
1000
800
600
400
200
C.F.S.
MAY
JUNE
JULY
AUG.
SEPT

37,200 acres @ 3.00 ac.-ft. per acre

111,600 acre-feet delivery ... May to September period.

Table II shows computations and summary in total acre-feet of supplemental requirement for 1944, 1946, and 1947. Plates on pages 8, 9, and 10 show hydrographs of requirements for 1944, 1946, and 1947.

TABLE II

	Total Requirement			Supplemental Requirement		
	Percent of Total	Acre-Feet	Average Daily Sec.ft.	1944 Acre-Feet	1946 Acre-Feet	1947 Acre-Feet
May	20	22,320	360	0	0	0
June	30	33,480	560	0	3,400	0
July	30	33,480	560	14,000	26,000	11,400
August	15	16,740	270	13,700	13,600	10,000
September	5	5,580	95	4,200	3,700	0
Totals	100	111,600		31,900	46,700	21,400

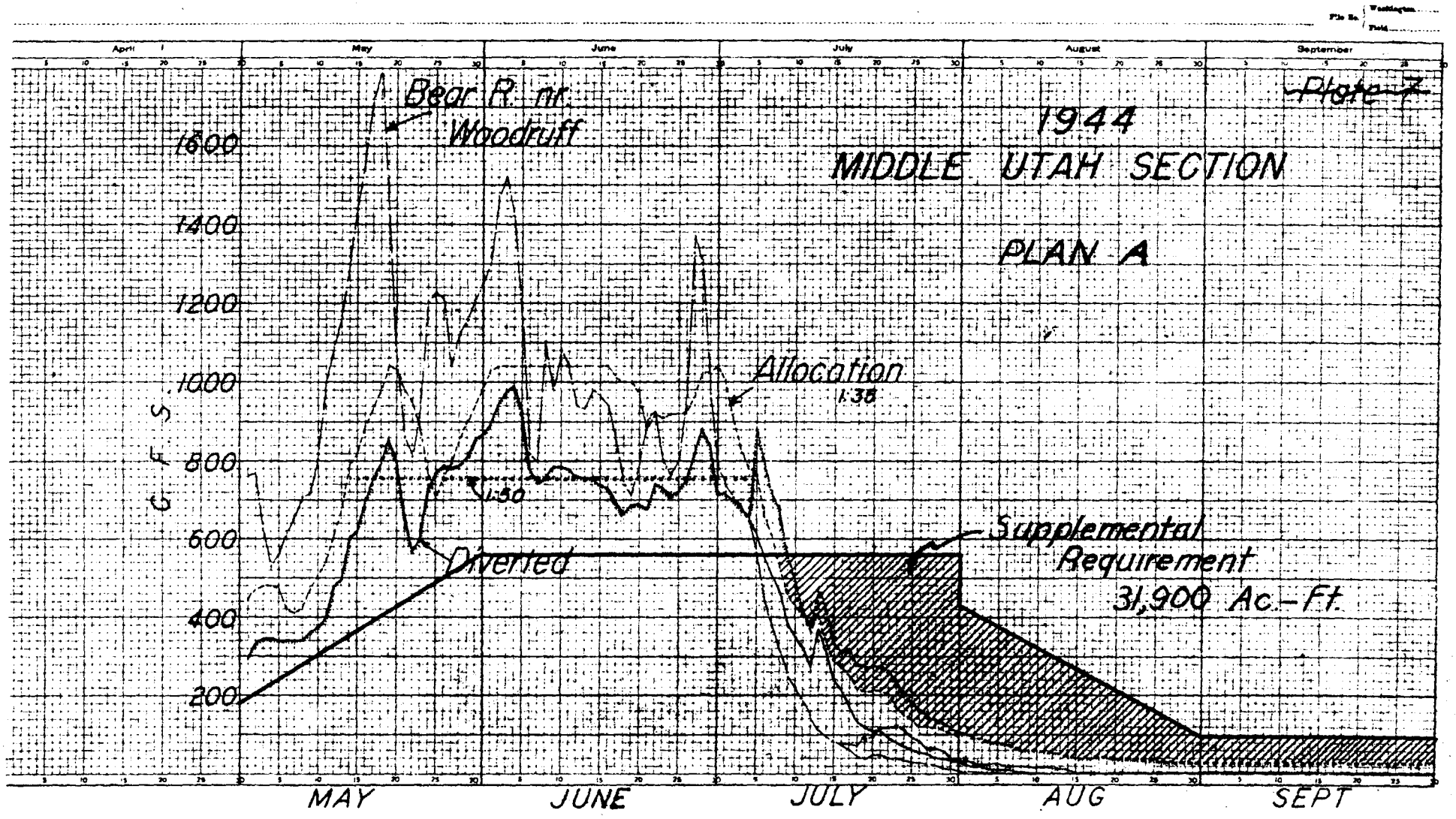


Plate 7
1944
MIDDLE UTAH SECTION
PLAN A
Bear R. nr. Woodruff
Allocation
1.35
1.50
Diverted
Supplemental Requirement
31,900 Ac.-Ft.
C.F.S.
1600
1400
1200
1000
800
600
400
200
April
May
June
July
August
September
MAY
JUNE
JULY
AUG
SEPT

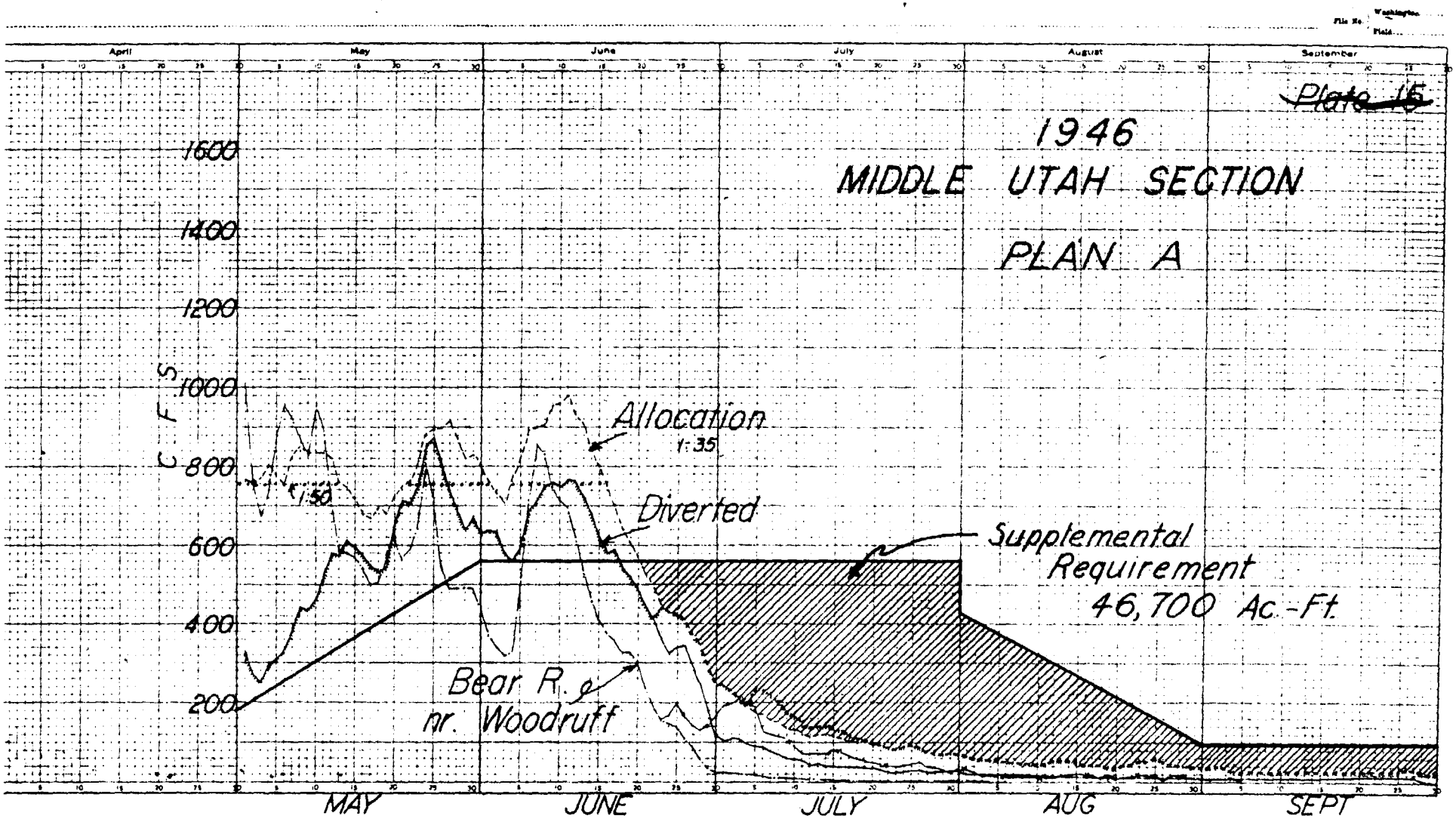


Plate 15
1946
MIDDLE UTAH SECTION
PLAN A
April
May
June
July
August
September
1600
1400
1200
1000
800
600
400
200
C F S
Allocation
1:35
1:50
Diverted
Supplemental
Requirement
46,700 Ac.-Ft.
Bear R. @
nr. Woodruff
MAY
JUNE
JULY
AUG
SEPT

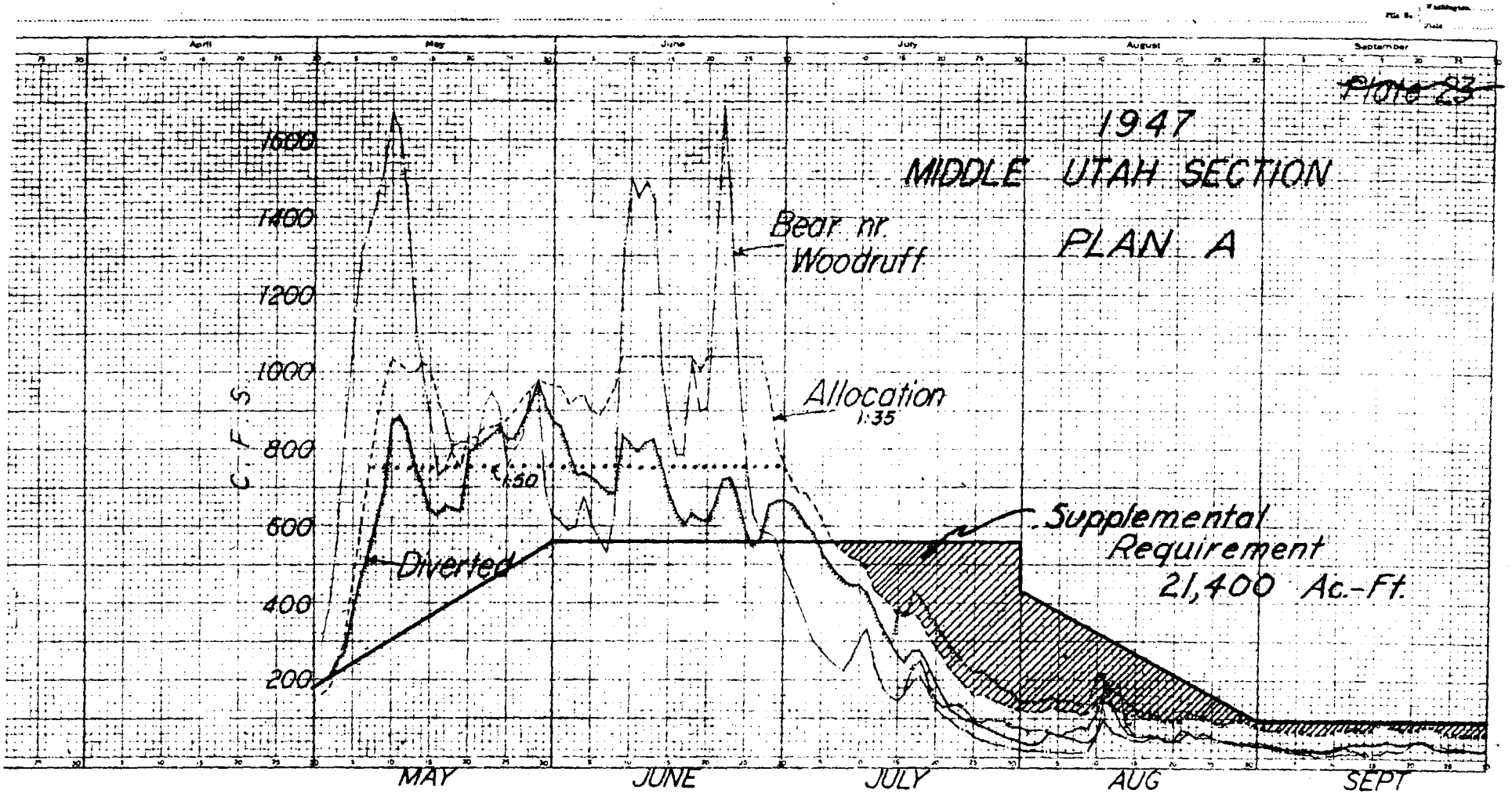


Plate 23
1947
MIDDLE UTAH SECTION
PLAN A
Bear nr. Woodruff
Allocation 1:35
1:50
Diverted
Supplemental Requirement 21,400 Ac.-Ft.
C.F.S.
1600
1400
1200
1000
800
600
400
200
April
May
June
July
August
September
MAY
JUNE
JULY
AUG
SEPT

8,300 acres @ 3.00 ac.-ft. per acre

24,900 acre-feet delivery in May to September period.

Table III shows computations and summary in total acre-feet of supplemental requirement for 1944, 1946 and 1947. Plates on pages 12, 13, and 14 show hydrographs of requirements for 1944, 1946, and 1947.

TABLE III

	Total Requirement			Supplemental Requirement		
	Percent of Total	Acre-Feet	Average Daily Sec.ft.	1944 Acre-Feet	1946 Acre-Feet	1947 Acre-Feet
May	20	4,980	80	0	0	0
June	30	7,470	125	0	0	0
July	30	7,470	125	580	3,800	0
August	15	3,735	60	3,735	3,735	350
September	5	1,245	20	1,245	1,245	1,245
Totals	100	24,900		5,560	8,780	1,595

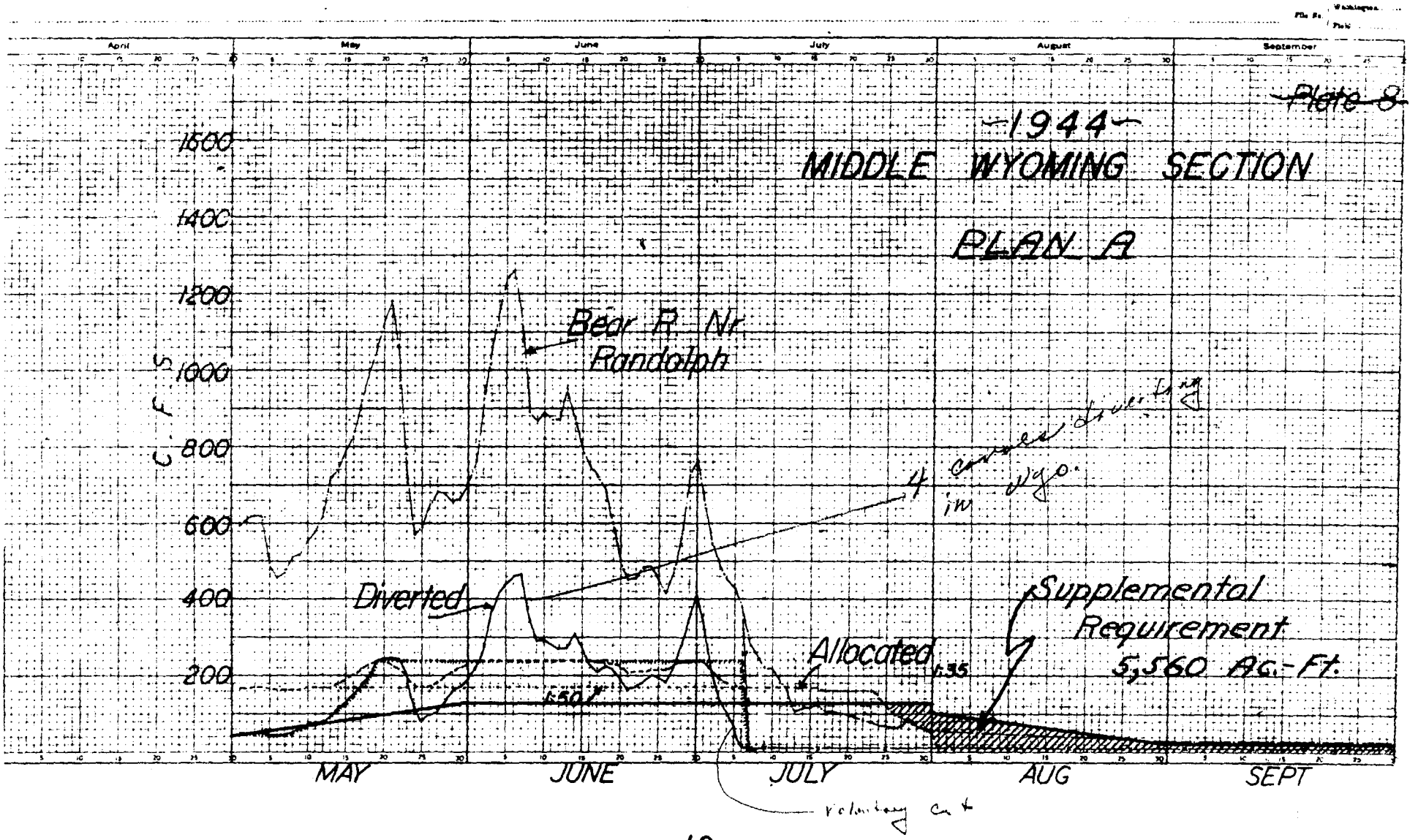


Plate 8
-1944-
MIDDLE WYOMING SECTION
PLAN A
Bear R. Nr. Randolph
Diverted
Allocated
650
435
Supplemental Requirement
5,560 Ac.-Ft.
4 cases in Wyo.
voluntary cut
C. F. S.
1600
1400
1200
1000
800
600
400
200
April
May
June
July
August
September
MAY
JUNE
JULY
AUG
SEPT

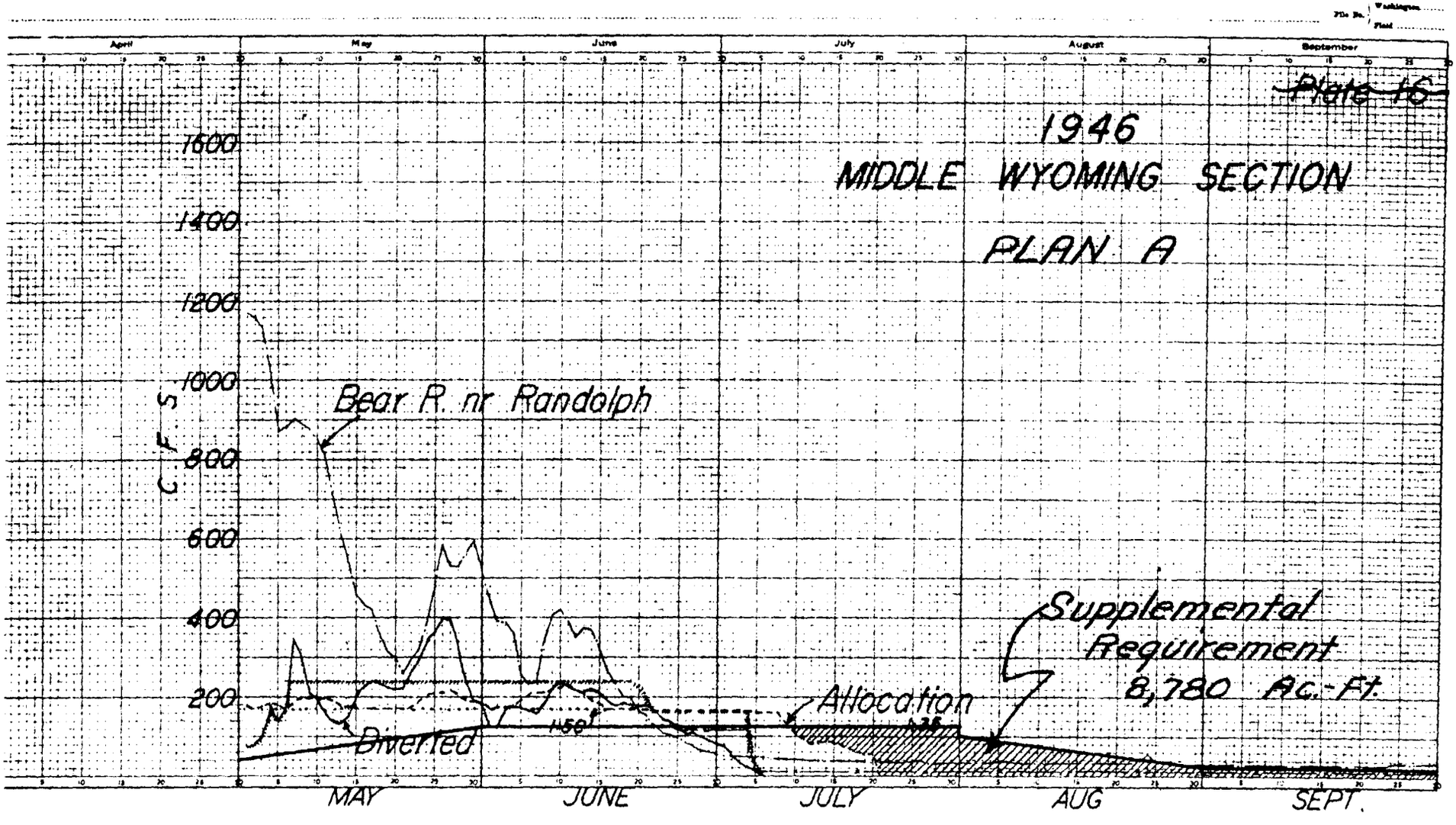
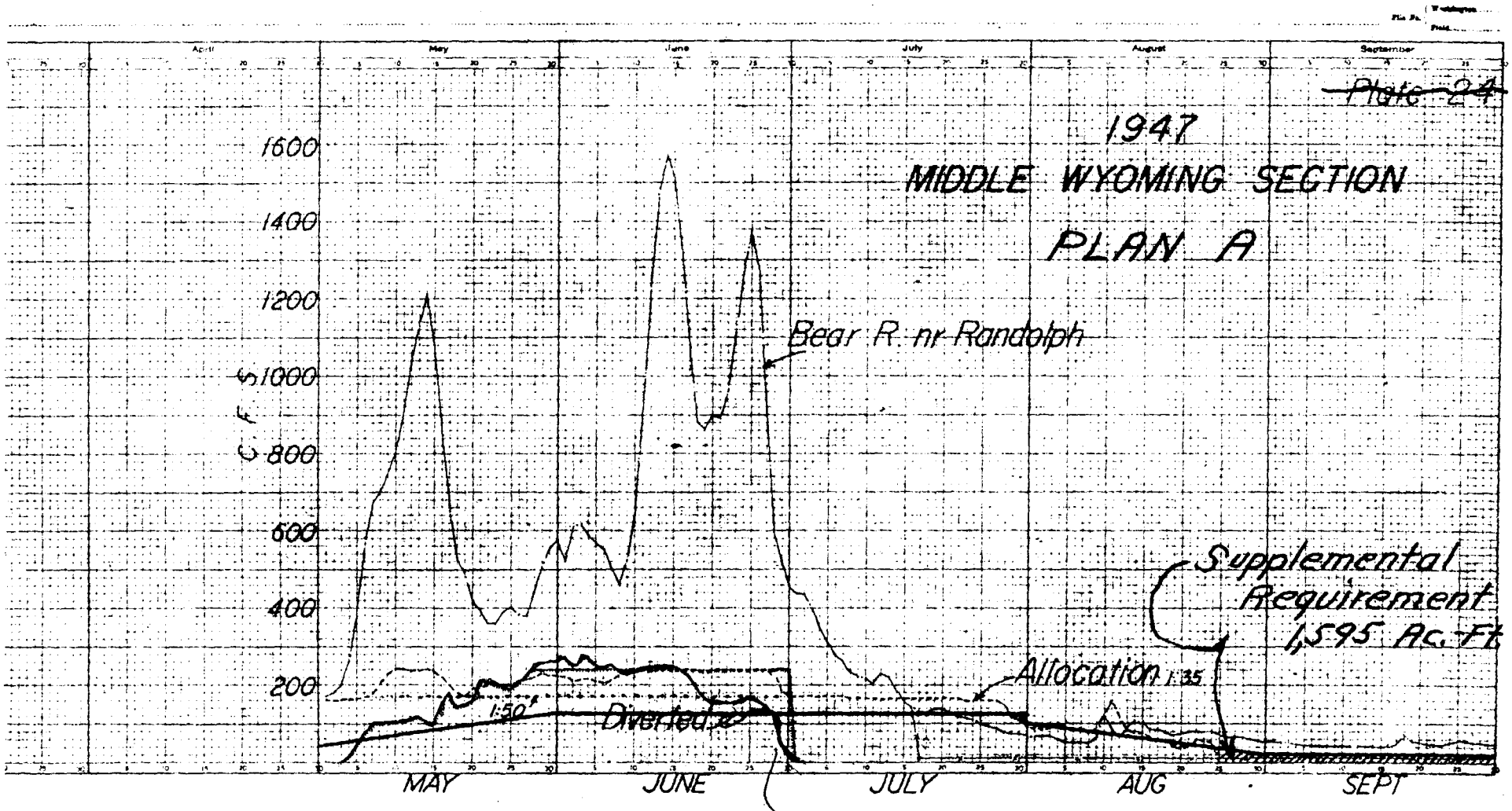


Plate 16
1946
MIDDLE WYOMING SECTION
PLAN A
Bear R. nr Randolph
Diverted
Allocation
1150
Supplemental Requirement
8,780 Ac.-Ft.
1600
1400
1200
1000
800
600
400
200
C F S
MAY
JUNE
JULY
AUG
SEPT.

~~Plate 24~~



Pixley diversions cut off purposely here

Lower Wyoming Section - Plan A

15,200 acres @ 3.20 ac.-ft. per acre

48,640 acre-feet delivery in May to September period.

Table IV shows computations and summary in total acre-feet of supplemental requirement for 1944, 1946 and 1947. Plates on pages 16, 17 and 18 show hydrographs of requirements for 1944, 1946, and 1947.

TABLE IV

	Total Requirement			Supplemental Requirement		
	Percent of Total	Acre-Feet	Average Daily Sec.ft.	1944 Acre-Feet	1946 Acre-Feet	1947 Acre-Feet
May	20	9,730	158	0	0	0
June	30	14,590	240	0	0	0
July	30	14,590	240	1,520	1,520	340
August	15	7,300	119	0	0	0
September	5	2,430	41	0	0	0
Totals	100	48,640		1,520	1,520	340

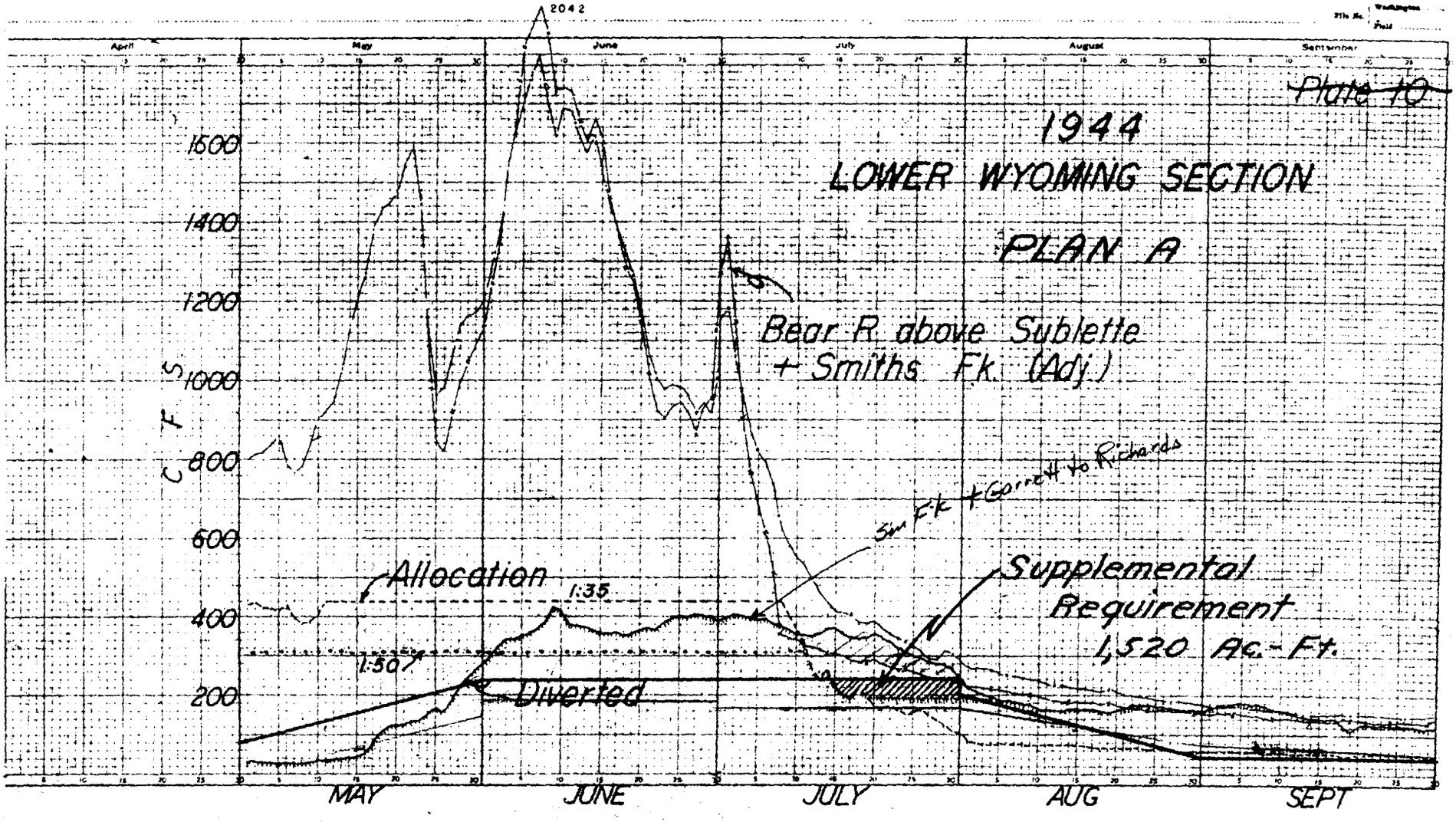


Plate 10
1944
LOWER WYOMING SECTION
PLAN A
2042
1500
1400
1200
1000
800
600
400
200
C F S
April
May
June
July
August
September
Bear R. above Sublette
+ Smiths Fk. (Adj.)
Sim F-F + Correct to Richards
Allocation
1:35
1:50
Diverted
Supplemental
Requirement
1,520 Ac.-Ft.
MAY
JUNE
JULY
AUG
SEPT

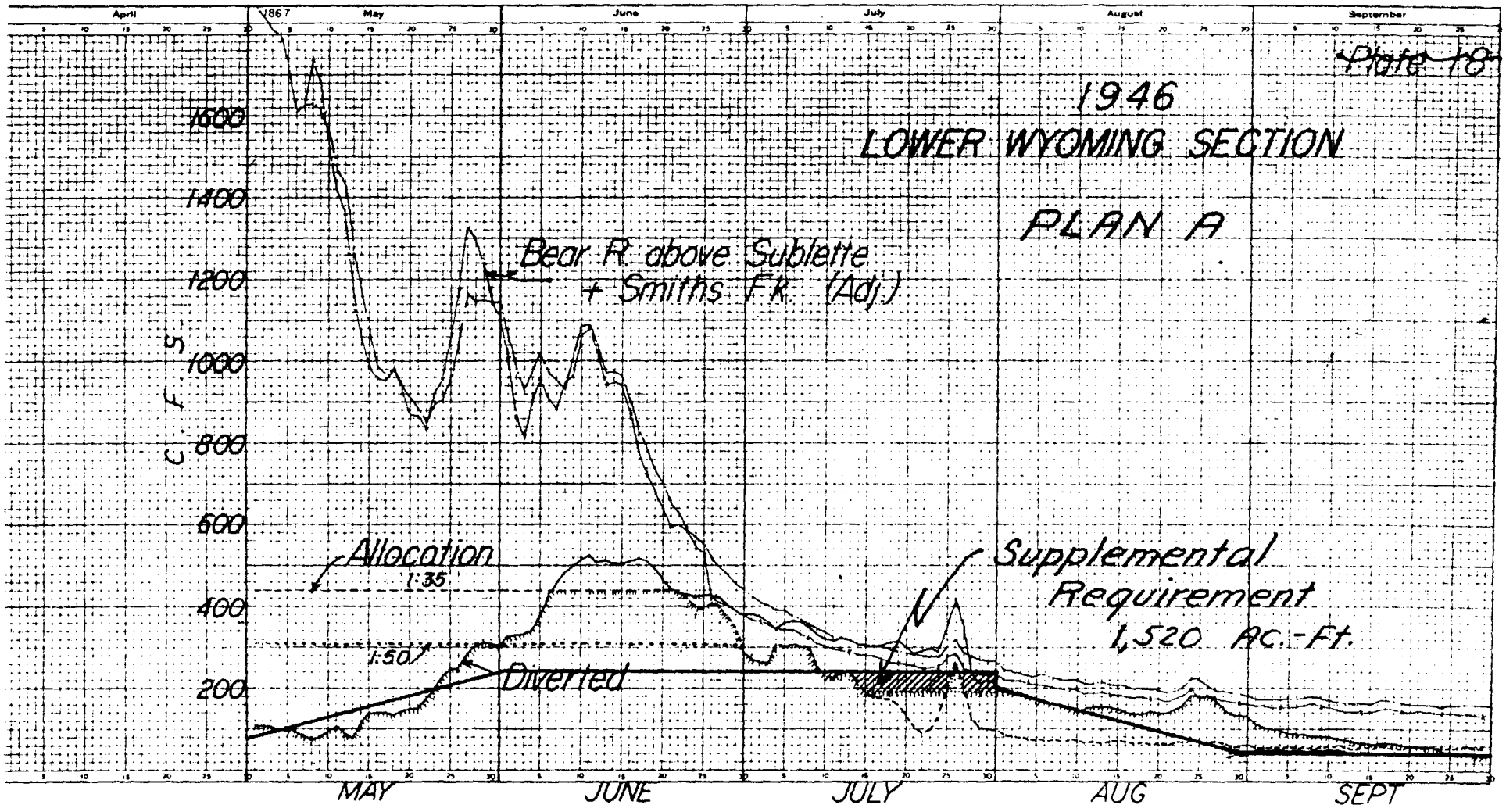


Plate 18
1946
LOWER WYOMING SECTION
PLAN A
Bear R. above Sublette
+ Smiths F.K. (Adj.)
Allocation
1:35
1:50
Diverted
Supplemental
Requirement
1,520 AC.-Ft.
C.F.S.
1600
1400
1200
1000
800
600
400
200
April
May
June
July
August
September
MAY
JUNE
JULY
AUG
SEPT

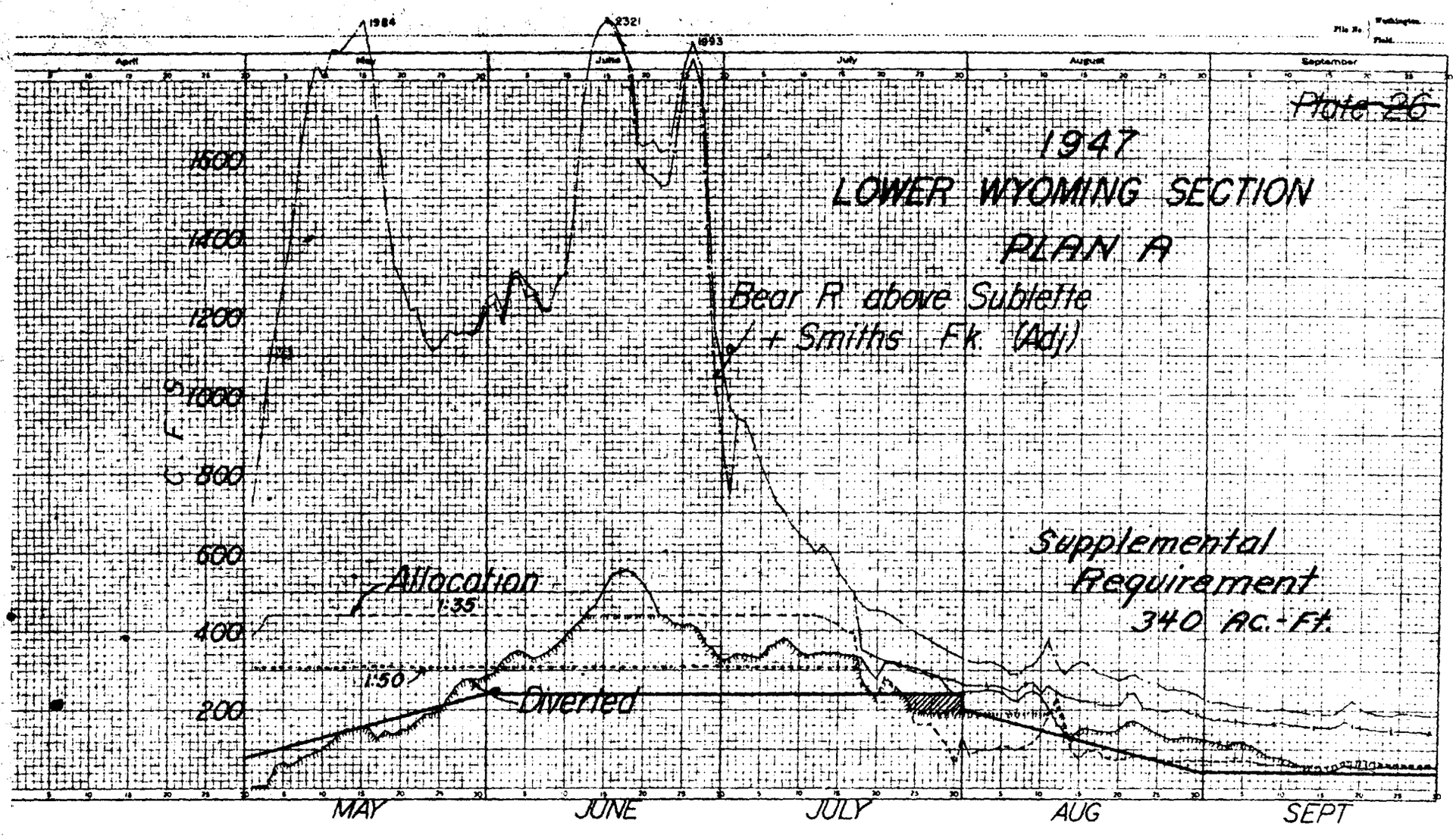


Plate 26
1947
LOWER WYOMING SECTION
PLAN A
Bear R. above Sublette
+ Smiths Fk. (Adj)
Supplemental
Requirement
340 Ac.-Ft.
Allocation
1:35
1:50
Diverted
1984
2321
1693
1600
1400
1200
1000
800
600
400
200
C.F.S.
April
May
June
July
August
September
MAY
JUNE
JULY
AUG
SEPT

Upper Idaho Section - Plan A

23,300 acres @ 3.20 ac.-ft. per acre

79,220 acre-feet delivery in May to September period.

Table V shows computations and summary in total acre-feet of supplemental requirement for 1944, 1946 and 1947. Plates on pages 20, 21 and 22 show hydrographs of requirements for 1944, 1946 and 1947.

TABLE V

	Total Requirement			Supplemental Requirement		
	Percent of Total	Acre-Feet	Average Daily Sec.ft.	1944 Acre-Feet	1946 Acre-Feet	1947 Acre-Feet
May	20	15,840	258	0	0	0
June	30	23,770	400	0	0	0
July	30	23,770	400	0	0	0
August	15	11,880	193	0	0	0
September	5	3,960	66	0	0	0
Totals	100	79,200		0	0	0

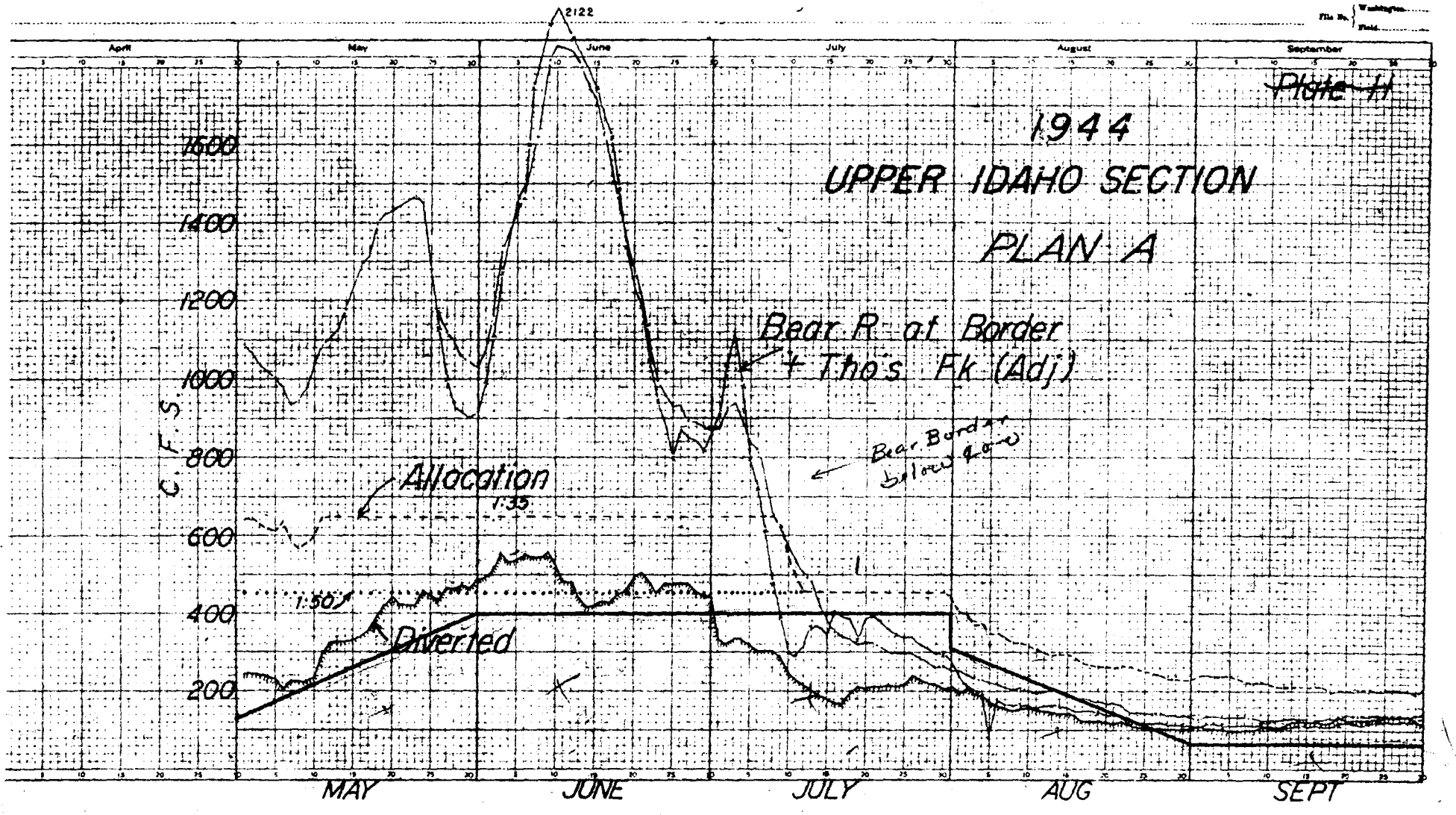


Plate H
1944
UPPER IDAHO SECTION
PLAN A
Bear R at Border
+ Tho's Fk (Adj)
Bear Border below 40
Allocation
1:35
1:50
Diverted
2122
C.F.S.
1600
1400
1200
1000
800
600
400
200
April
May
June
July
August
September
MAY
JUNE
JULY
AUG
SEPT

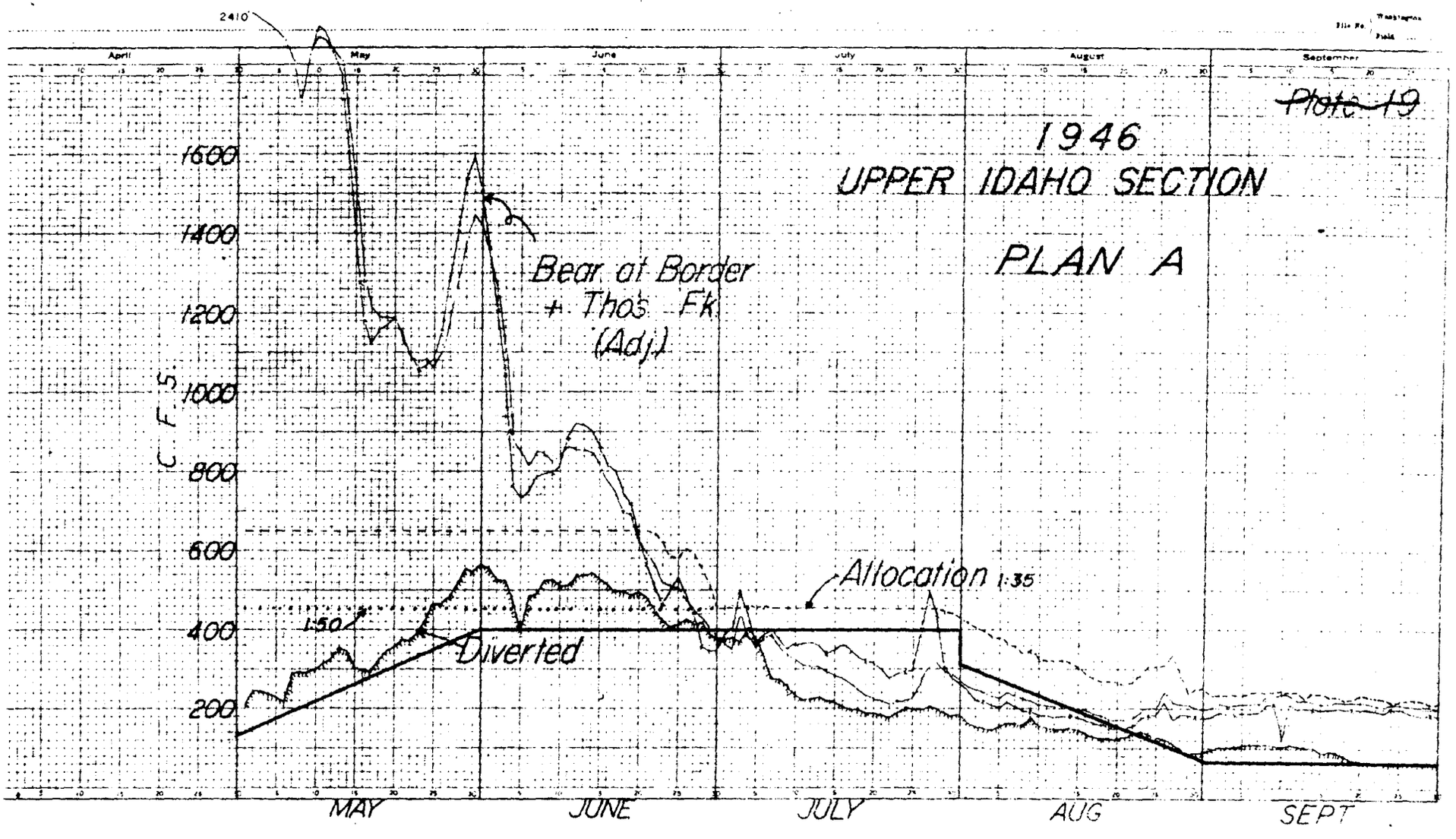


Plate 19
1946
UPPER IDAHO SECTION
PLAN A
2410
Bear at Border
+ Thos Fk
(Adj.)
Allocation 1:35
1:50
Diverted
C F S
1600
1400
1200
1000
800
600
400
200
April
May
June
July
August
September
MAY
JUNE
JULY
AUG
SEPT

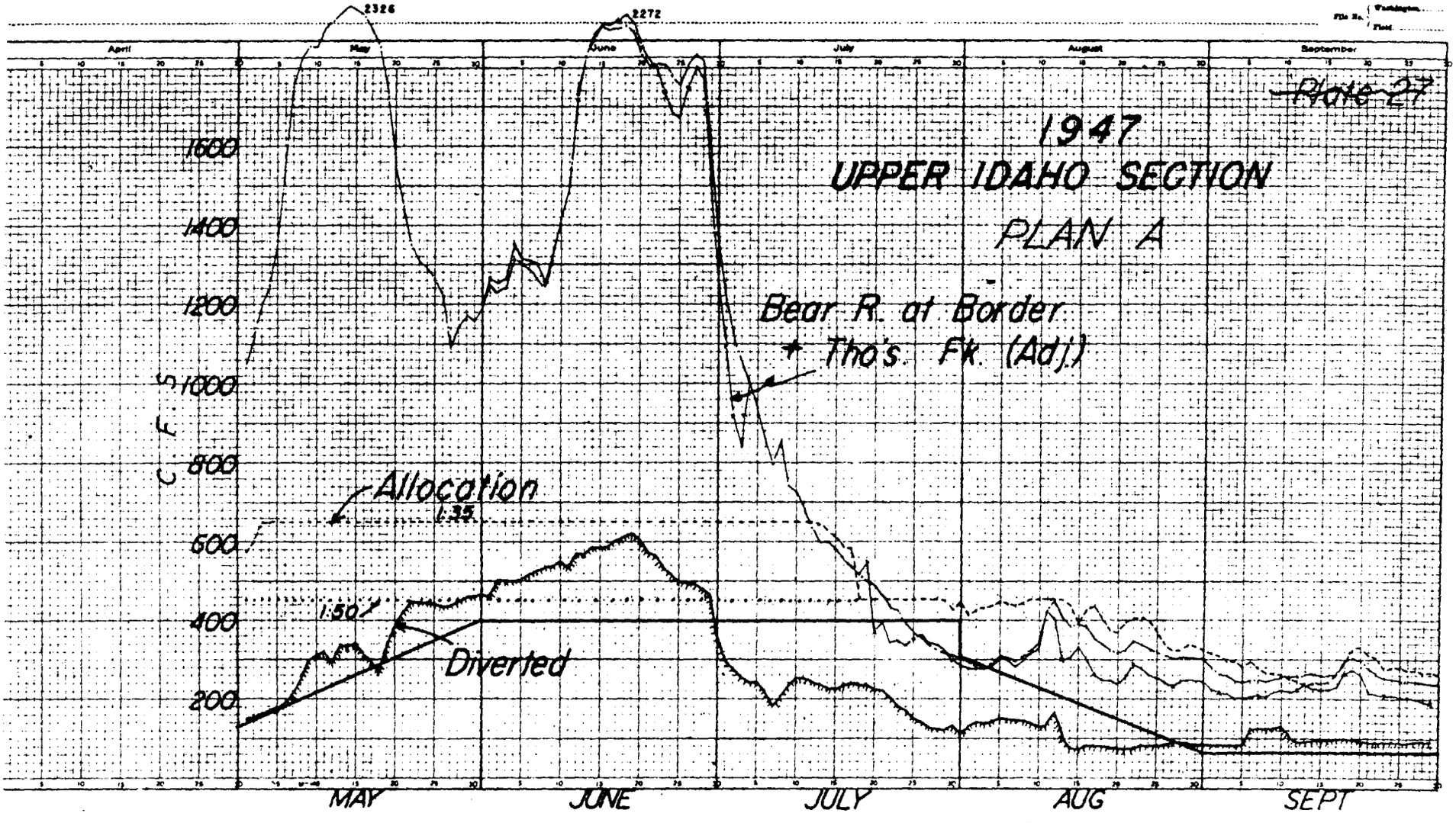


Plate 27
1947
UPPER IDAHO SECTION
PLAN A
Bear R. at Border
+ Tho's Fk. (Adj.)
Allocation
1.35
1.50
Diverted
2326
2272
1600
1400
1200
1000
800
600
400
200
C F S
April
May
June
July
August
September
MAY
JUNE
JULY
AUG
SEPT

Upper Wyoming Section - Plan B

40,000 acres. Delivery rate not to exceed 756 cubic feet per second. No supplemental requirement after July 31. Table VI shows computations and summary in acre-feet of present supply, supplemental requirement, and total requirement for 1944, 1946 and 1947. Plates on pages 24, 25, and 26 show hydrographs of requirements for 1944, 1946, 1947.

TABLE VI

Month	Present Supply Ac.-Ft.	Supplemental Requirement Ac.-Ft.	Total Requirement Ac.-Ft.
1944			
May	15,530	0	15,530
June	37,660	0	37,660
July	21,660	24,820	46,480
August	3,320	0	3,320
September	2,010	0	2,010
1944 Total		24,820	105,000
	2.62 acre-feet per acre		
1946			
May	25,440	0	25,440
June	34,940	8,250	43,190
July	7,510	38,970	46,480
August	3,090	0	3,090
September	1,920	0	1,920
1946 Total		47,220	120,120
	3.00 acre-feet per acre		
1947			
May	28,080	0	28,080
June	43,870	0	43,870
July	23,180	23,300	46,480
August	6,740	0	6,740
September	5,140	0	5,140
1947 Total		23,300	130,310
	3.26 acre-feet per acre		

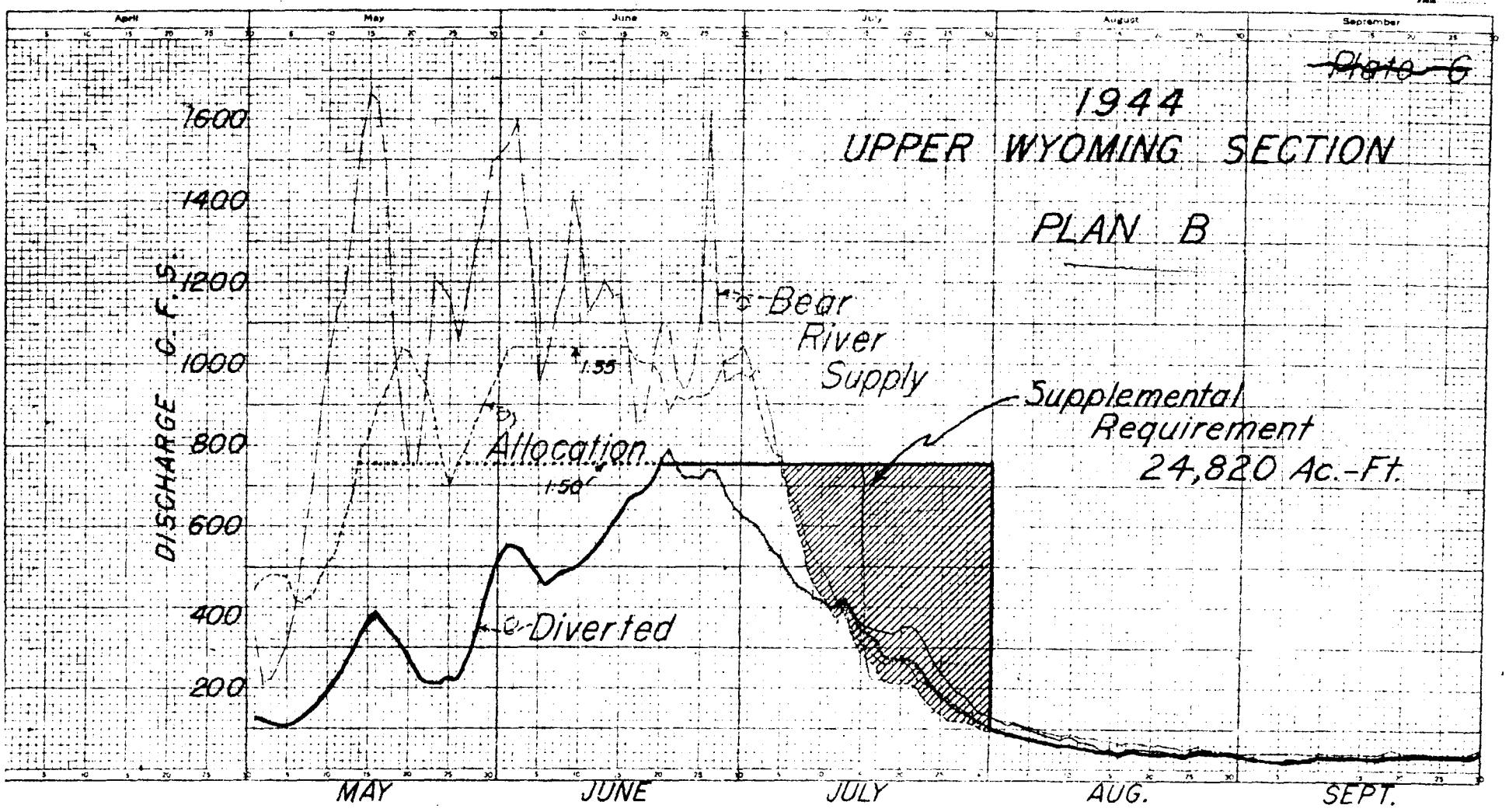


Photo-G
1944
UPPER WYOMING SECTION
PLAN B
Bear River Supply
Allocation
1.55
1.50
Supplemental Requirement
24,820 Ac.-Ft.
Diverted
DISCHARGE C.F.S.
1600
1400
1200
1000
800
600
400
200
MAY
JUNE
JULY
AUG.
SEPT.

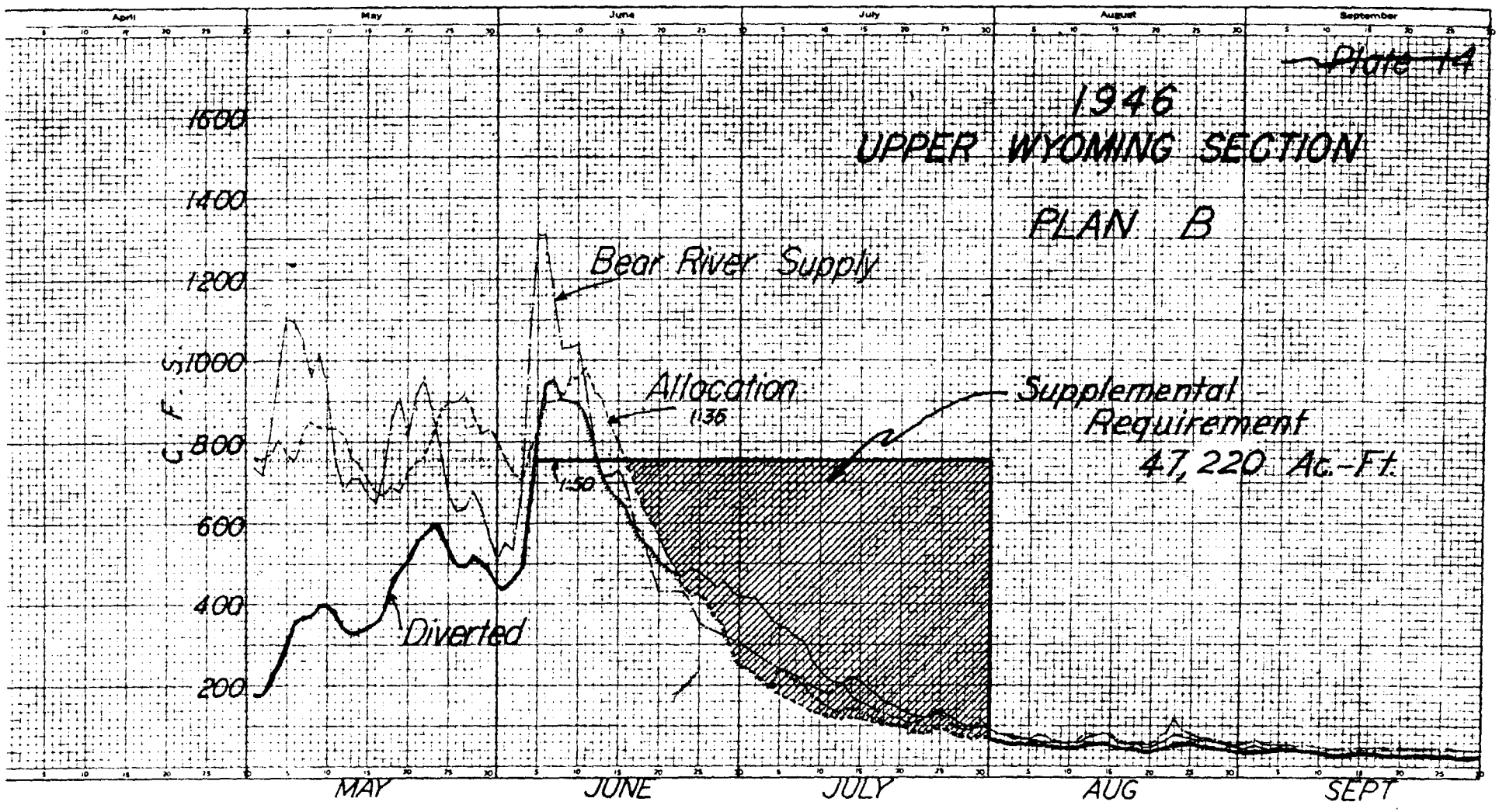


Plate 14
1946
UPPER WYOMING SECTION
PLAN B
Bear River Supply
Allocation
1136
150
Supplemental
Requirement
47,220 Ac.-Ft.
Diverted
1600
1400
1200
1000
800
600
400
200
C.F.S.
April
May
June
July
August
September
MAY
JUNE
JULY
AUG
SEPT

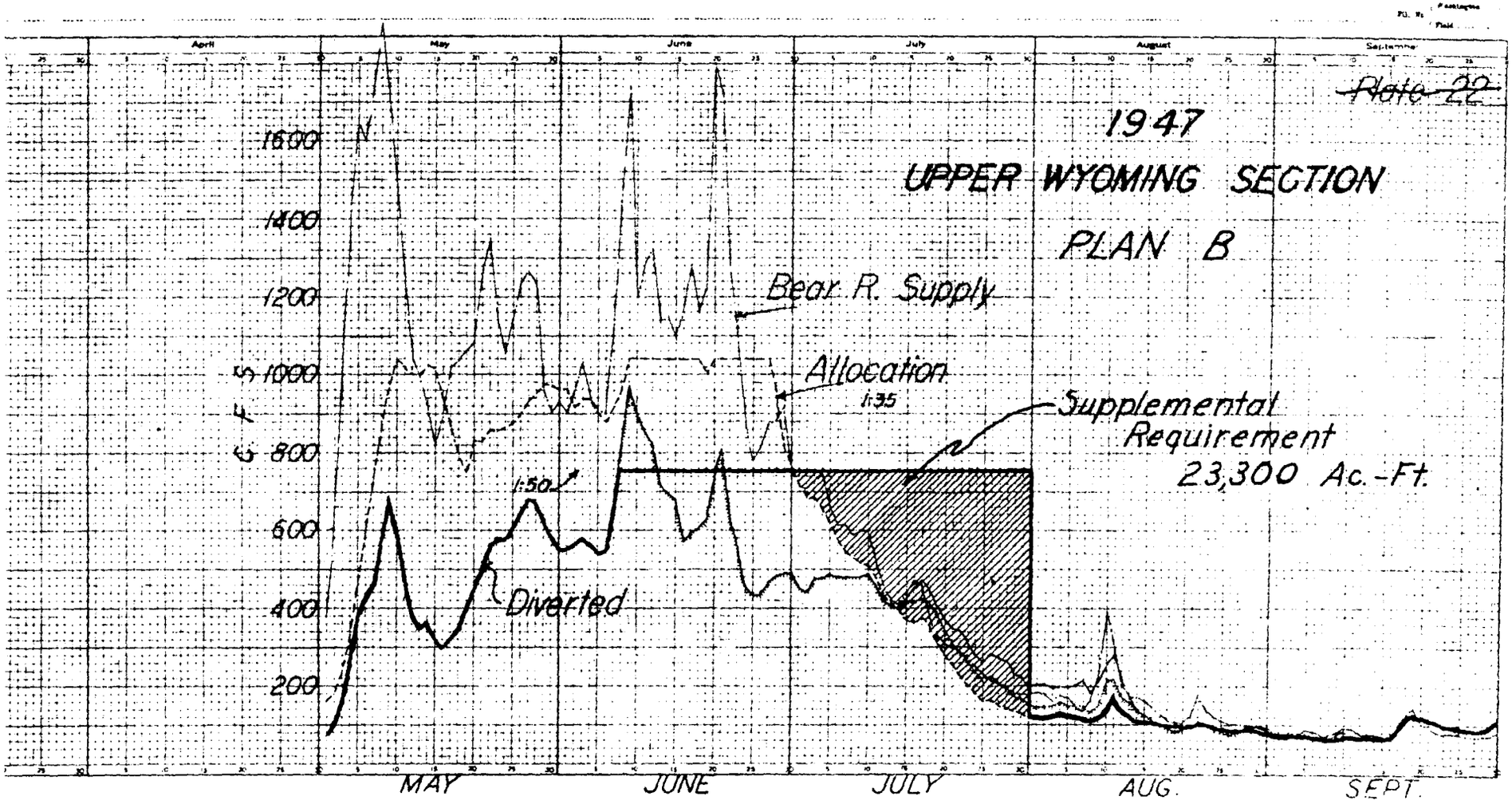


Plate 22
1947
UPPER WYOMING SECTION
PLAN B
Bear R. Supply
Allocation
1:35
Supplemental
Requirement
23,300 Ac.-Ft.
1:50
Diverted
1600
1400
1200
1000
800
600
400
200
April
May
June
July
August
September
MAY
JUNE
JULY
AUG.
SEPT.

37,200 acres. Delivery rate not to exceed 756 cubic feet per second. No supplemental requirement after July 31. Table VII shows computations and summary in acre-feet of present supply, supplemental requirements and total requirements for 1944, 1946 and 1947. Plates on pages 28, 29, and 30 show hydrographs of requirements for 1944, 1946, 1947.

TABLE VII

Month	Present Supply Ac.-Ft.	Supplemental Requirement Ac.-Ft.	Total Requirement Ac.-Ft.
1944			
May	35,810	0	35,810
June	44,980	0	44,980
July	21,660	24,820	46,480
August	3,080	0	3,080
September	1,390	0	1,390
1944 Total		24,820	131,740
	3.54 acre-feet per acre		
1946			
May	34,450	0	34,450
June	36,730	8,250	44,980
July	7,510	38,970	46,480
August	3,090	0	3,090
September	1,860	0	1,860
1946 Total		47,220	130,860
	3.73 acre-feet per acre		
1947			
May	40,100	0	40,100
June	44,980	0	44,980
July	23,180	23,300	46,480
August	6,740	0	6,740
September	5,140	0	5,140
1947 Total		23,300	143,440
	3.86 acre-feet per acre		

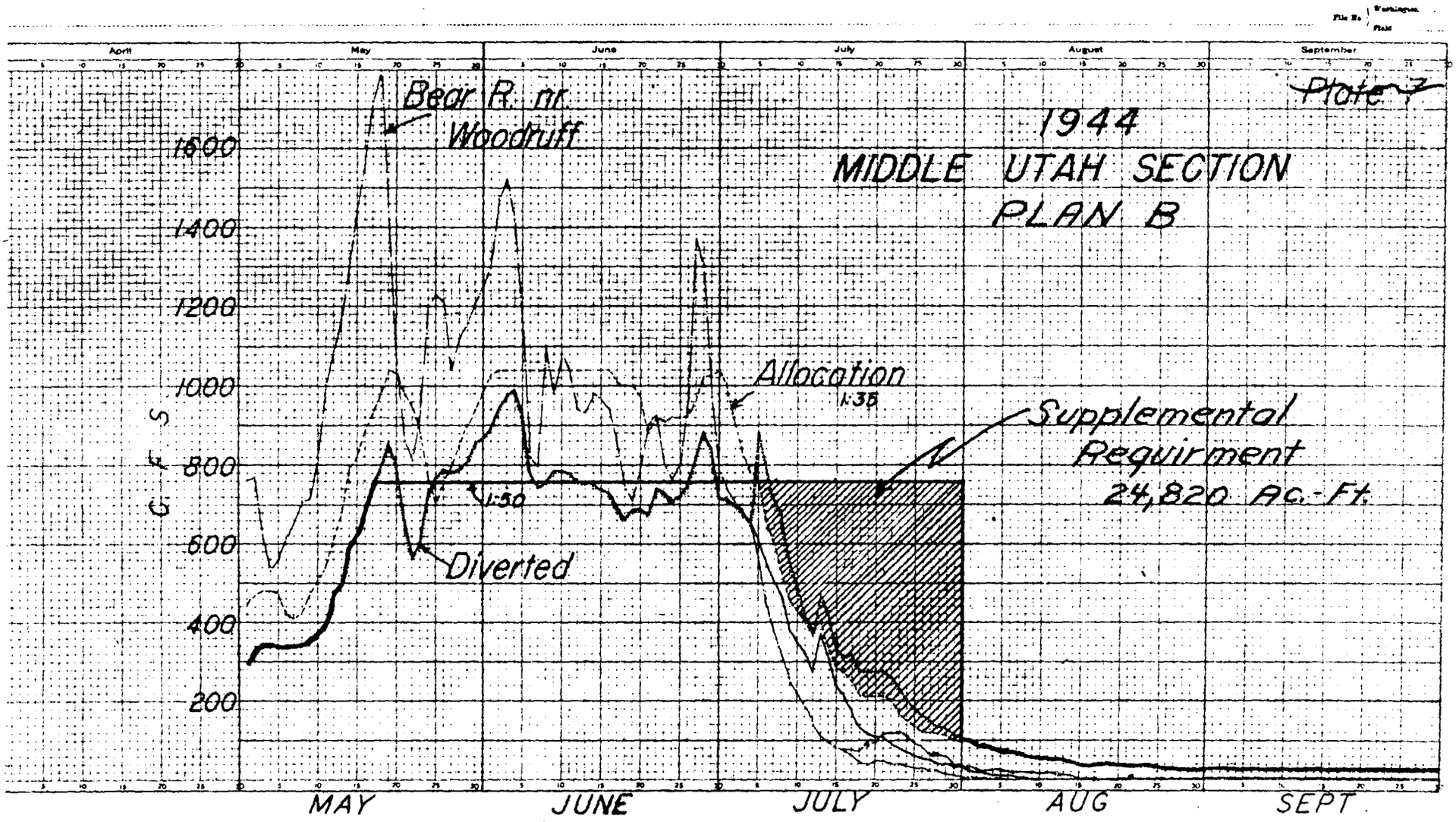


Plate 7
1944
MIDDLE UTAH SECTION
PLAN B
Bear R. nr. Woodruff
Allocation
1:35
1:50
Diverted
Supplemental Requirment
24,820 Ac.-Ft.
C.F.S.
1600
1400
1200
1000
800
600
400
200
April
May
June
July
August
September
MAY
JUNE
JULY
AUG
SEPT

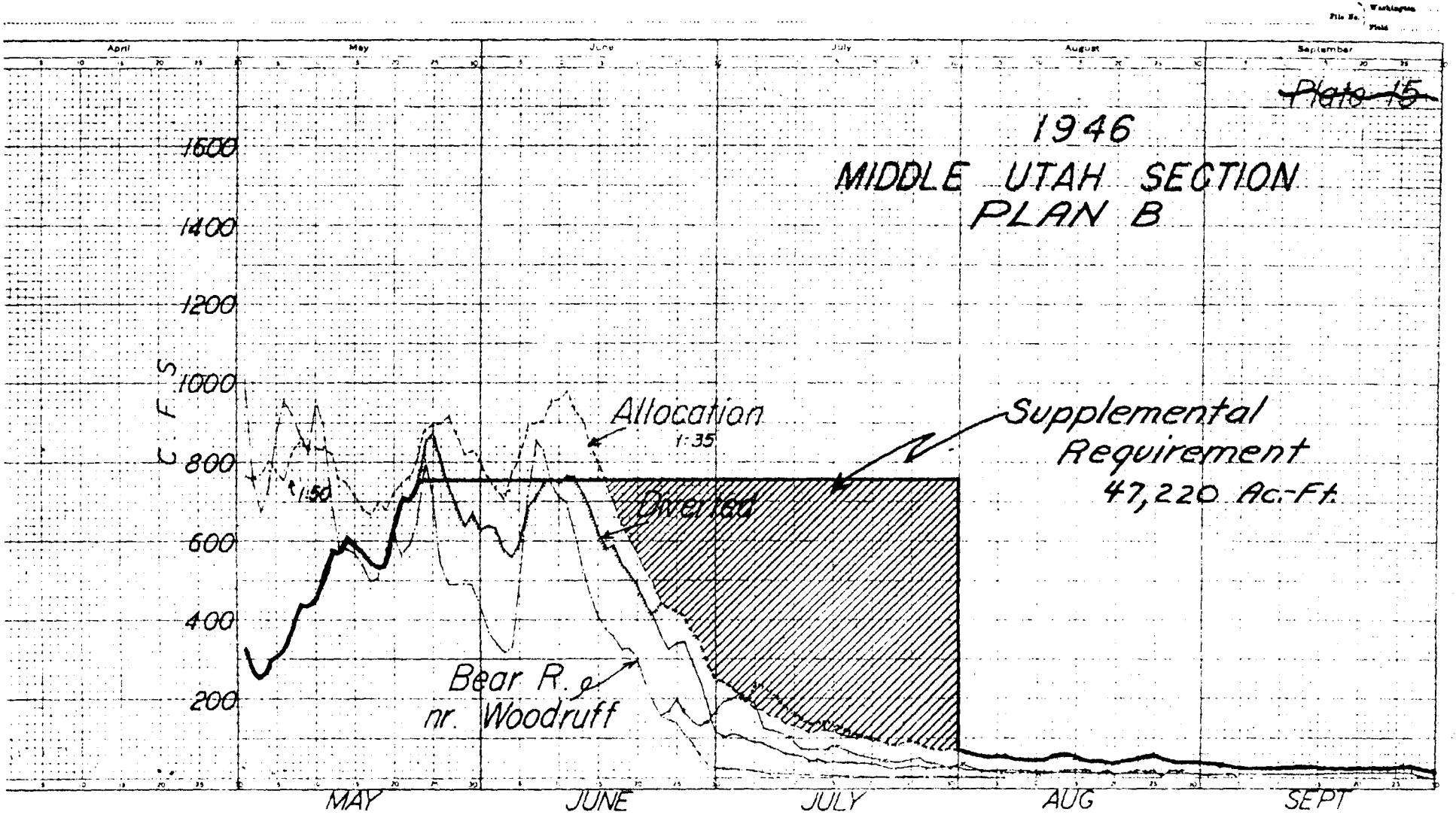


Plate 15
1946
MIDDLE UTAH SECTION
PLAN B
1600
1400
1200
1000
800
600
400
200
C F S
April
May
June
July
August
September
Allocation
1:35
1:50
Supplemental
Requirement
47,220 Ac.-Ft.
Diverted
Bear R. @
nr. Woodruff
MAY
JUNE
JULY
AUG
SEPT

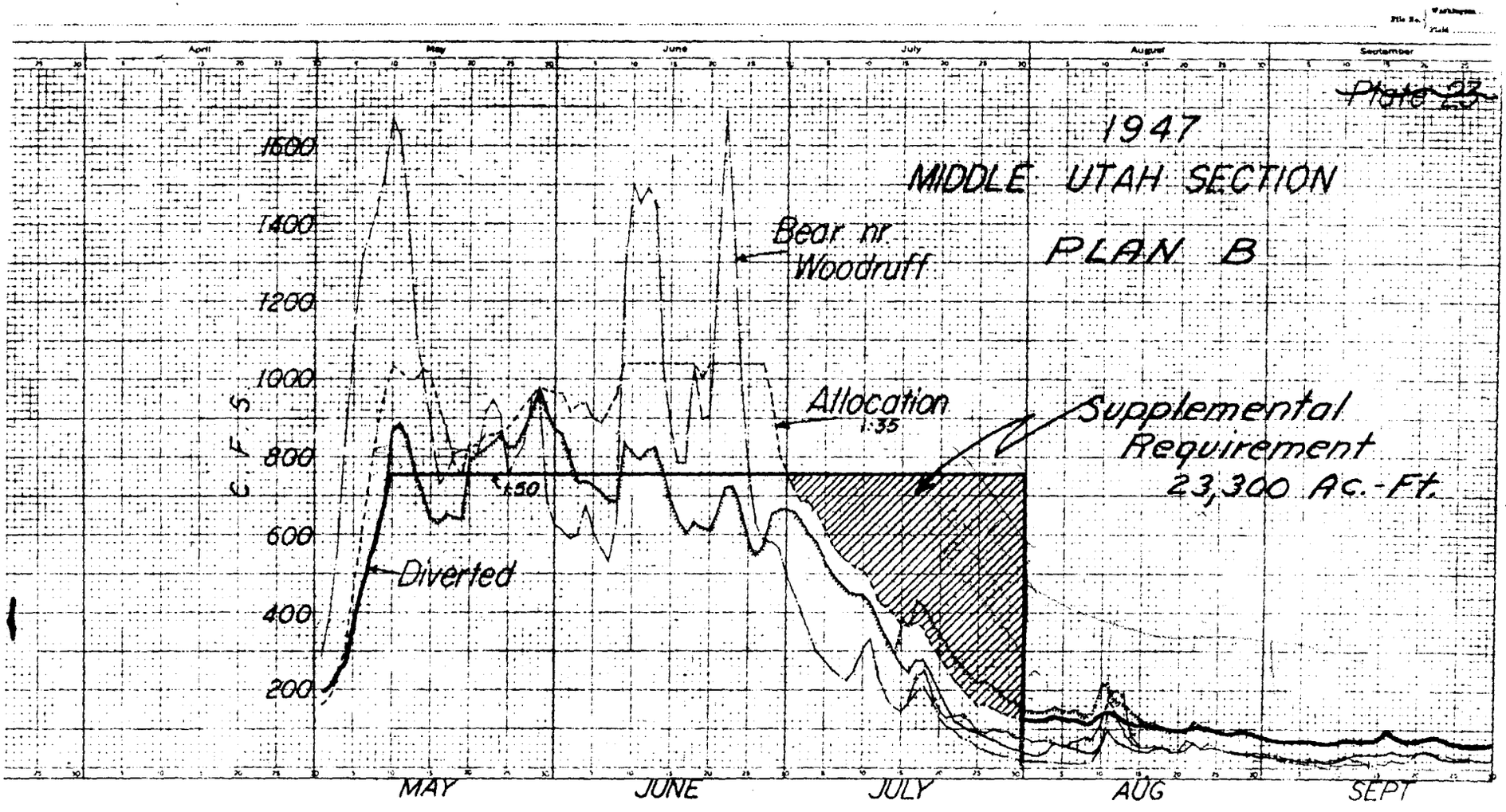
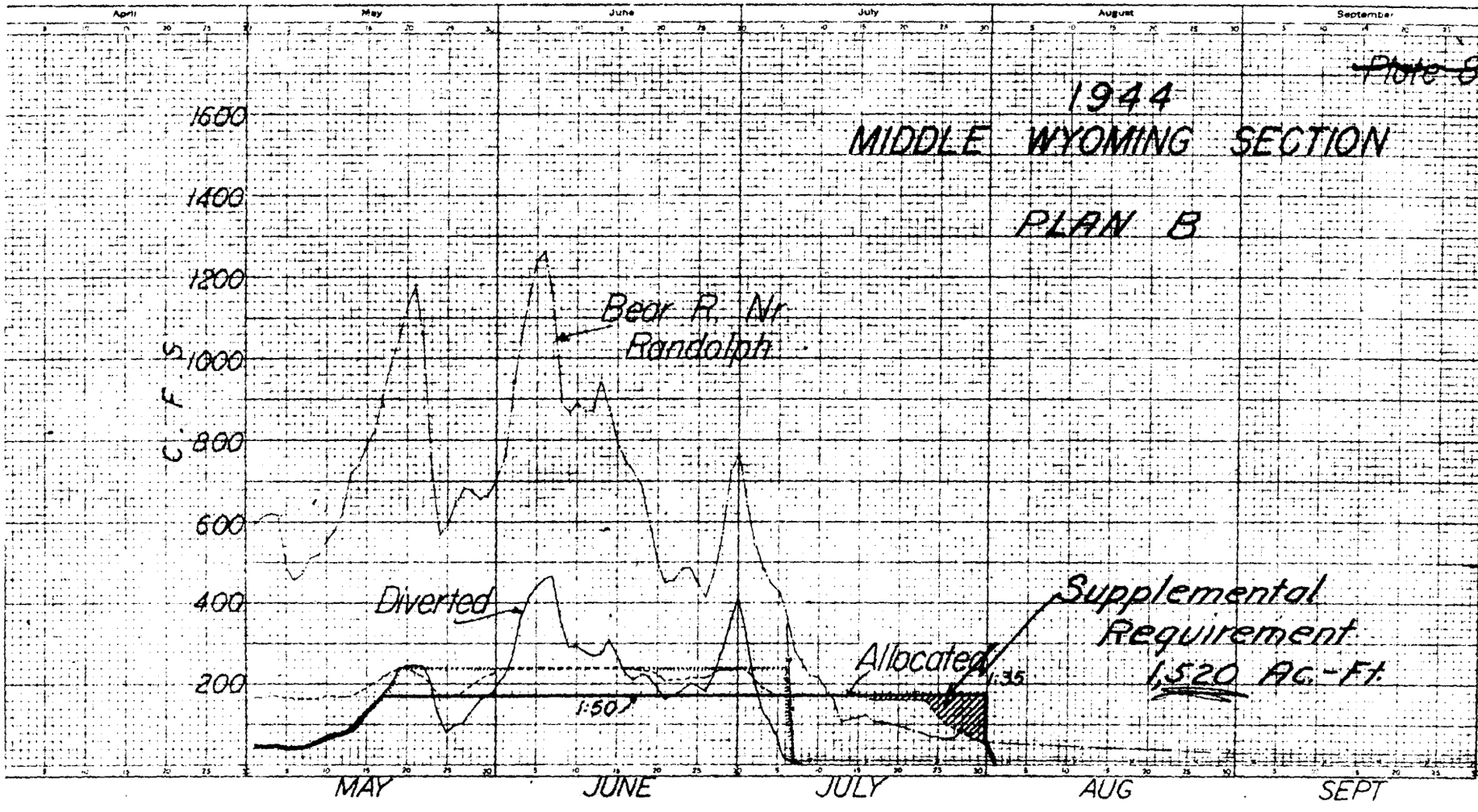


Plate 23
1947
MIDDLE UTAH SECTION
PLAN B
Bear nr. Woodruff
Allocation 1.35
Supplemental Requirement 23,300 Ac.-Ft.
Diverted
1600
1400
1200
1000
800
600
400
200
C.F.S.
MAY
JUNE
JULY
AUG
SEPT

8,300 acres. Delivery rate not to exceed 171 cubic feet per second. No supplemental requirement after July 31. Table VIII shows computations and summary in acre-feet of present supply, supplemental requirements and total requirements for 1944, 1946, and 1947. Plates on pages 32, 33, and 34 show hydrographs of requirements for 1944, 1946 and 1947.

TABLE VIII

Month	Present Supply Ac.-Ft.	Supplemental Requirement Ac.-Ft.	Total Requirement Ac.-Ft.
1944			
May	7,380	0	7,380
June	10,180	0	10,180
July	8,990	1,520	10,510
August	0	0	0
September	0	0	0
1944 Total		1,520	28,070
	3.38 acre-feet per acre		
1946			
May	10,000	0	10,000
June	10,050	130	10,180
July	4,500	6,010	10,510
August	0	0	0
September	0	0	0
1946 Total		6,140	30,690
	3.70 acre-feet per acre		
1947			
May	7,540	0	7,540
June	10,180	0	10,180
July	9,780	730	10,510
August	3,760	0	3,760
September	0	0	0
1947 Total		730	31,990
	3.85 acre-feet per acre		


April
May
June
July
August
September
~~Plate 8~~
1944
MIDDLE WYOMING SECTION
PLAN B
1600
1400
1200
1000
800
600
400
200
C.F.S.
Bear R. Nr. Randolph
Diverted
Allocated
1:35
1:50
Supplemental Requirement
1,520 Ac.-Ft.
MAY
JUNE
JULY
AUG
SEPT

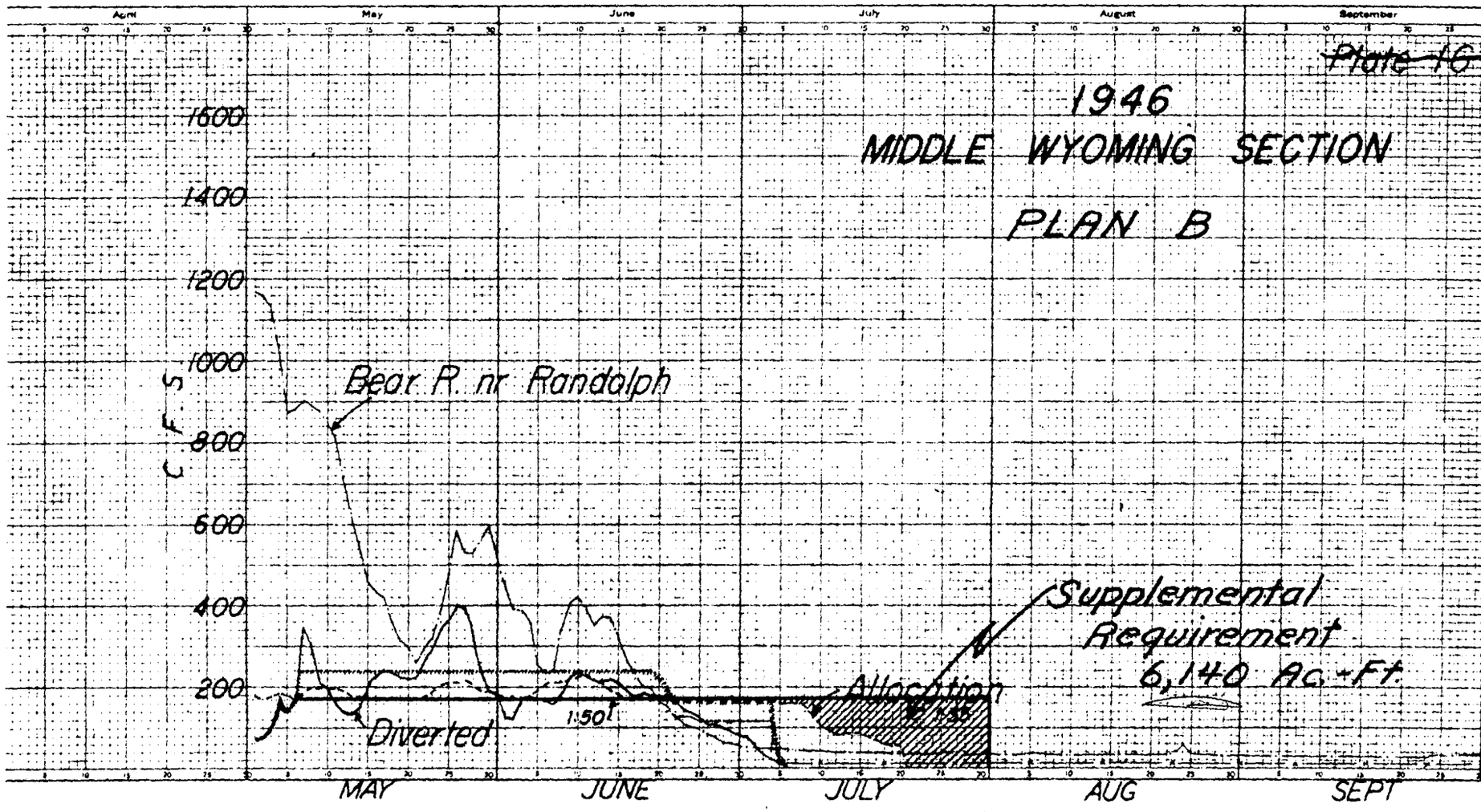


Plate 16
1946
MIDDLE WYOMING SECTION
PLAN B
Bear R. nr Randolph
Diverted
1150
Allocation
Supplemental
Requirement
6,140 Ac.-Ft.
C.F.S.
1600
1400
1200
1000
800
600
400
200
April
May
June
July
August
September
MAY
JUNE
JULY
AUG
SEPT

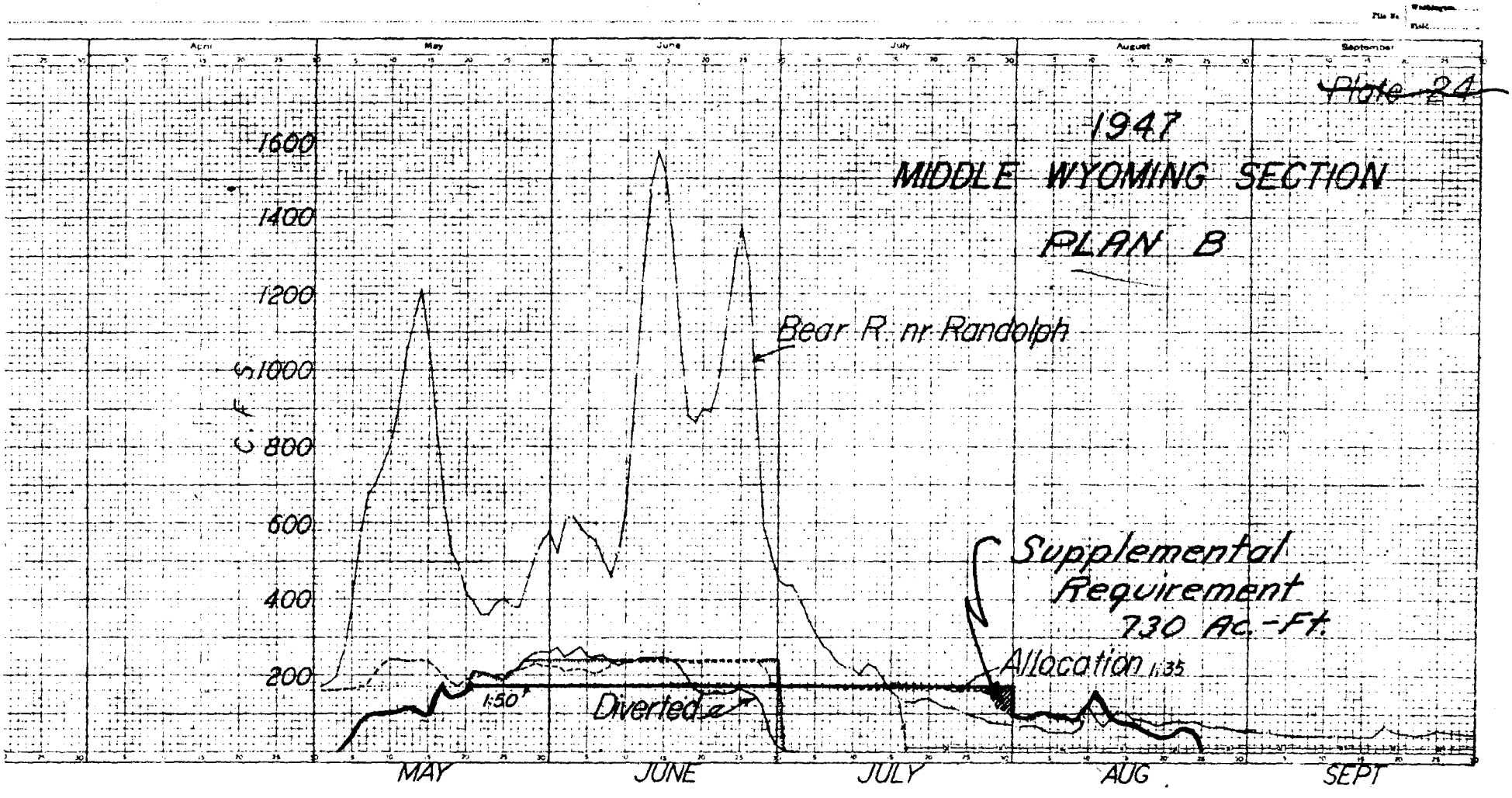


Plate 24
1947
MIDDLE WYOMING SECTION
PLAN B
Bear R. nr Randolph
Supplemental Requirement 730 Ac.-Ft.
Allocation 1.35
Diverted
1:50
1600
1400
1200
1000
800
600
400
200
MAY
JUNE
JULY
AUG
SEPT

15,200 acres. Delivery rate not to exceed 308 cubic feet per second. No requirement after July 31. Table IX shows computations and summary in acre-feet of present supply, supplemental requirements, and total requirements for 1944, 1946 and 1947. Plates on pages 36, 37 and 38 show hydrographs of requirements for 1944, 1946 and 1947.

TABLE IX

Month	Present Supply Ac.-Ft.	Supplemental Requirement Ac.-Ft.	Total Requirement Ac.-Ft.
1944			
May	6,030	0	6,030
June	18,300	0	18,300
July	13,800	5,130	18,930
August	4,280	0	4,280
September	3,220	0	3,220
1944 Total		5,130	50,760
	3.34 acre-feet per acre		
1946			
May	9,760	0	9,760
June	18,290	30	18,320
July	12,400	6,530	18,930
August	4,320	0	4,320
September	3,320	0	3,320
1946 Total		6,560	54,650
	3.59 acre-feet per acre		
1947			
May	8,900	0	8,900
June	18,300	0	18,300
July	15,760	3,170	18,930
August	5,940	0	5,940
September	3,860	0	3,860
1947 Total		3,170	55,930
	3.68 acre-feet per acre		

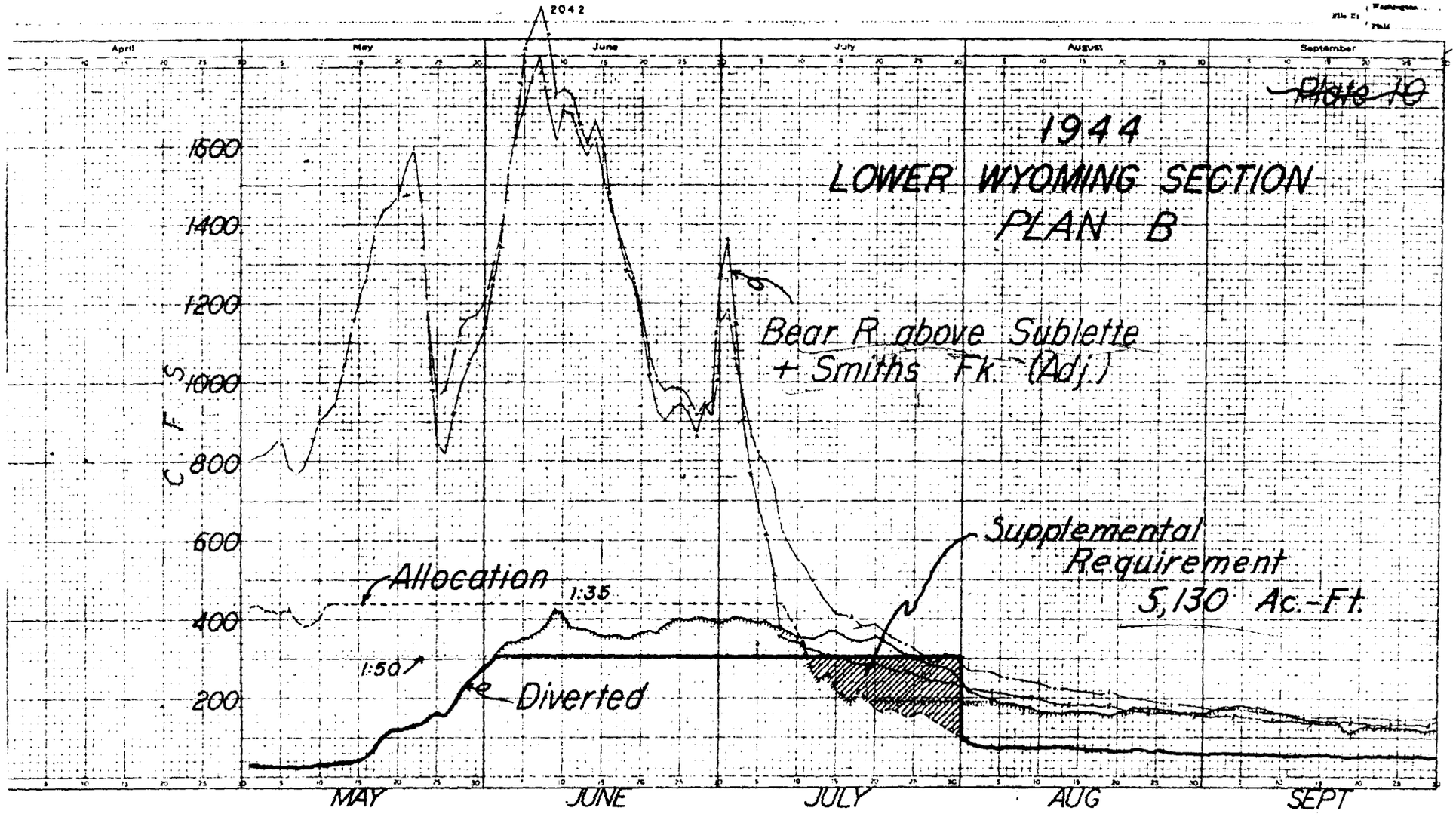


Plate 10
1944
LOWER WYOMING SECTION
PLAN B
2042
April
May
June
July
August
September
1500
1400
1200
1000
800
600
400
200
C F S
Bear R. above Sublette
+ Smiths Fk. (Adj.)
Allocation
1:35
1:50
Diverted
Supplemental
Requirement
5,130 Ac.-Ft.
MAY
JUNE
JULY
AUG
SEPT

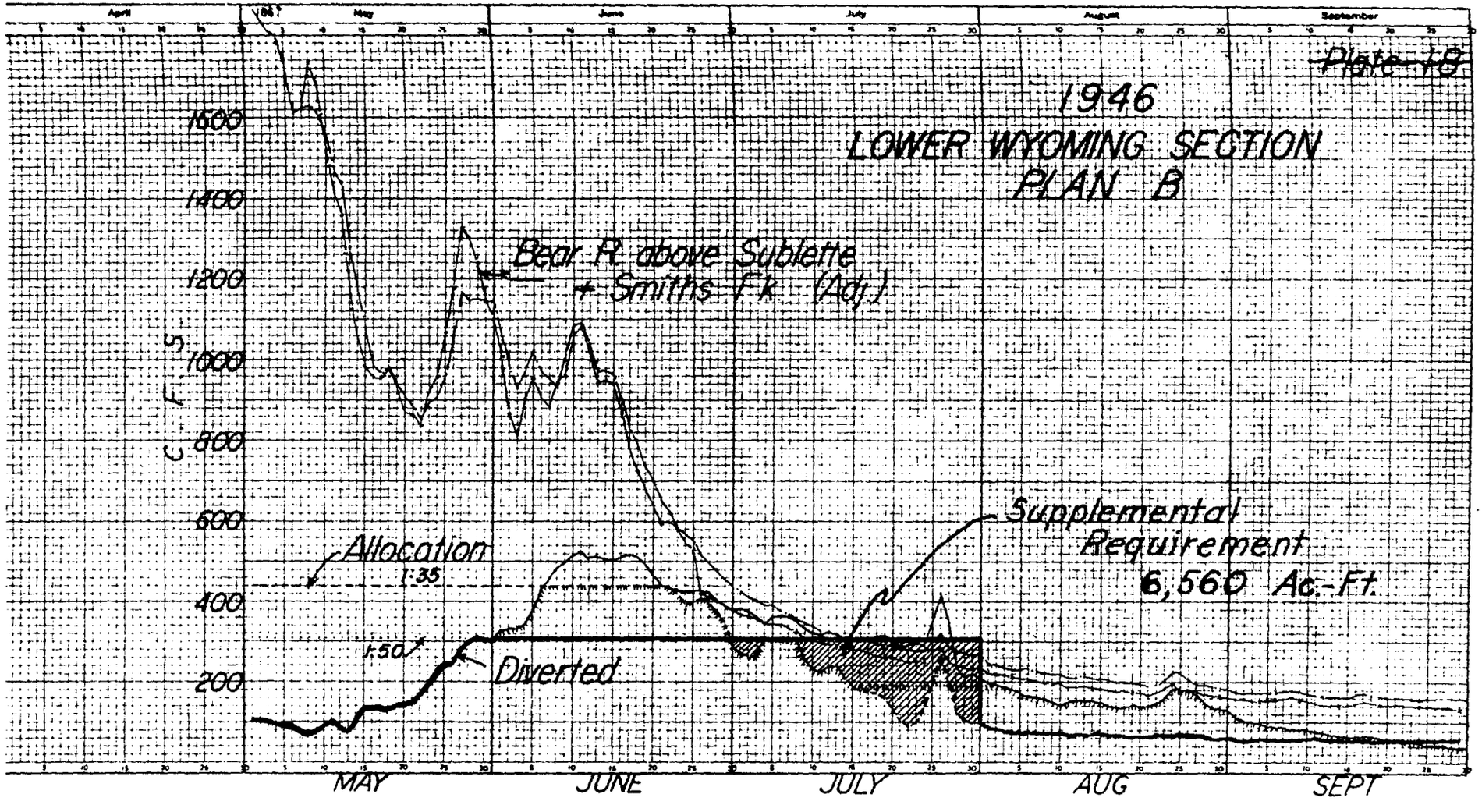
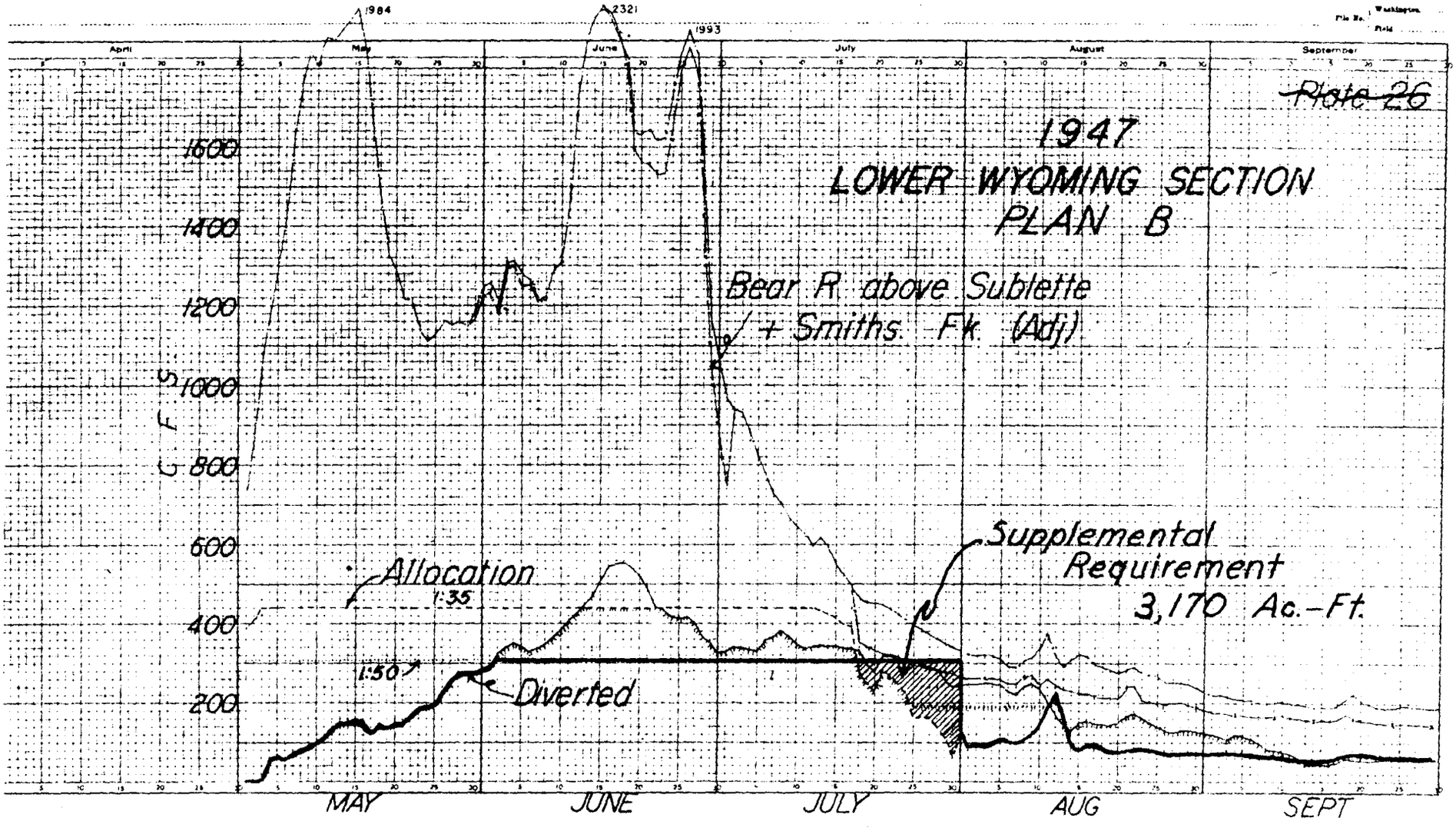


Plate-18
1946
LOWER WYOMING SECTION
PLAN B
Bear R. above Sublette
+ Smiths Fk. (Adj.)
Allocation
1:35
1:50
Diverted
Supplemental
Requirement
6,560 Ac.-Ft.
C.F.S.
1600
1400
1200
1000
800
600
400
200
MAY
JUNE
JULY
AUG
SEPT

~~Plate 26~~


1947
LOWER WYOMING SECTION
PLAN B
Bear R. above Sublette
+ Smiths. Fk. (Adj.)
1984
2321
1993
April
May
June
July
August
September
1600
1400
1200
1000
800
600
400
200
C F S
Allocation
1:35
1:50
Diverted
Supplemental
Requirement
3,170 Ac.-Ft.
MAY
JUNE
JULY
AUG
SEPT

Upper Idaho Section - Plan B

Under Plan B, there would be no supplemental requirement for the Upper Idaho Section in the years 1944, 1946 and 1947. Reference to the hydrographs on pages 20, 21 and 22, illustrate that the present supply is sufficient to fill the requirements.

Supplemental Requirements on Tributaries above Bear Lake

In general, practically all lands irrigated from tributaries above Bear Lake, except possibly the Smiths Fork drainage, need supplemental water. Run-off occurs early in the spring, before real beneficial use can be made of the supply. As a result, much very early irrigation is practiced and full value of the water so applied is not obtained. Approximately one acre-foot of supplemental water for each acre of land now served is needed. ? based on what

Maps of all irrigated lands on tributaries are not available. For this reason an accurate accounting of acreage irrigated cannot be given. However, the following approximate acreages for the major tributaries have been compiled from incomplete tabulations of water rights and irrigated areas.

Stream	Acreage
Mill Creek (Wyoming)	1,900
Sulphur and Willow Creeks	2,900
Yellow Creek	900
Woodruff Creek	5,700
Big Creek	2,500
Otter Creek	2,500
Twin Creek	2,300 — ?
Thomas Fork	10,800

Too high

29500 Suppl-Req'd

NEW AND SUPPLEMENTAL IRRIGATION REQUIREMENTS BELOW BEAR LAKE BASED ON POTENTIAL DEVELOPMENT PLANNED BY THE BUREAU OF RECLAMATION

Land Unit and Location	New Lands (acres)	Supplemental Irrigation (acres)	Seasonal Requirements: Average diversion requirement (af/ac.)	Seasonal Requirements: New Lands (a.f.)	Seasonal Requirements: Supplemental Irrigation (a. f.)
IDAHO					
Cache Valley west of Bear River	10,300		2.9	29,900	
Franklin County, Idaho		23,100	0.9		20,800
Cache Valley east of Bear River	6,100		2.8	17,100	
Franklin County, Idaho		17,400	1.0		17,400
Malad Valley	20,400		3.4	69,400	
Oneida County, Idaho		3,400	1.7		5,800
Total Idaho - - -	(36,800		3.16	116,400	44,000
	(	43,900	1.00		
UTAH					
Cache Valley west of Bear River	6,800		3.0	20,400	
Cache County, Utah		11,000	0.7		7,700
Cache Valley east of Bear River	3,800		2.9	11,000	
Cache County, Utah		31,000	1.2		37,200
South Cache Valley	6,900		3.0	20,700	
Cache County, Utah		6,000	1.0		6,000
Malad Valley	40,200		3.4	136,700	
Box Elder County, Utah		400	2.4		1,000
Curlew Valley	34,000		4.4	149,600	
Box Elder County, Utah		500	2.5		1,300
Total Utah - - -	(91,700		3.69	338,400	
	(	48,900	1.08		53,200

SUMMARY

Idaho - -	New Land	36,800 acres	116,400 acre-feet
	Supplemental Irrigation	43,900 acres	44,000 acre-feet
	Total	80,700 acres	160,400 acre-feet
Utah - -	New Land	91,700 acres	338,400 acre-feet
	Supplemental Irrigation	48,900 acres	53,200 acre-feet
	Total	140,600 acres	391,600 acre-feet
Idaho & Utah - -	New Land	128,500 acres	454,800 acre-feet
	Supplemental Irrigation	92,800 acres	97,200 acre-feet
	Total	221,300 acres	552,00* acre-feet

* Estimated total new water supply that can be developed. Land acres shown in table are based on this amount of water. There are additional lands suitable for irrigation, but these are not shown since the water supply that can be developed appears to be sufficient only for the lands that are listed.

PART II

INVESTIGATION OF THE EFFECT ON EXISTING WATER RIGHTS OF FUTURE STORAGE PROJECTS ON THE MAIN STEM OF BEAR RIVER AND ITS TRIBUTARIES, BOTH ABOVE AND BELOW BEAR LAKE.

1. Future storage on Main Stem of Bear River above Bear Lake.

Existing storage rights to divert Bear River natural channel flow to storage in Bear Lake, total 5,500 cubic feet per second. (See page 47 for transcript of Bear Lake Storage Decree). The Dingle Inlet Canal and Rainbow Inlet Canal were designed to have a combined capacity sufficient to carry this flow. Since their completion in 1914, a maximum discharge of 5,500 second feet has not as yet been experienced in the supply available at the headworks. On April 20, 1917, the recorded combined flow in the two canals was 4,172 cubic feet per second. At that time 395 cubic feet per second was passing through the ice gate at Stewart Dam for the purpose of carrying away the ice. This 395 cubic feet per second was the only water passing down the river below the diversion works. The maximum divertible flow of (4,567) second feet on this date appears to be the highest of record.

The maximum storage space in Bear and Mud Lakes was not limited by the court decree granting storage privileges in these natural lakes. The present capacity of 1,421,000 acre-feet between elevations 5902.0 and 5923.65 feet is between the lower limit of the existing pumping installation and the top of the existing outlet works at the dike.

Bear Lake reservoir has sufficient capacity to fully regulate and absorb the entire flow of Bear River at Stewart Dam in all except a long series of wet years. In a number of years of above average runoff, some stored water from Bear Lake has been used strictly for power production, being passed through the turbines at Cutler Dam and flowing to Great Salt Lake. During

a series of dry years, the Bear Lake storage was entirely used by irrigation canals, except for a few thousand acre-feet annual leakage at Cutler Dam. (See Page 48 for Bear River Storage operation 1924 to 1947).

Shown on page 50 is a comparison of the maximum storable waters at Bear Lake and the irrigation demand for storage water below Bear Lake. The total storable water is the sum of the ~~divertible~~ storable flow at Stewart Dam between October 1 and March 31, ~~the net accumulative inflow into Bear Lake from its tributary watershed~~ and the amount actually diverted to Bear Lake storage between April 1 and the day of beginning of storage draft on Bear Lake. Computing the total storable water in this manner allows for the diversion loss at Stewart Dam and flows that have been passed to fill prior rights downstream. The total storable figure thus obtained represents the maximum amount of water which could be stored in Bear Lake in each year from Bear River supply.

The total draft for irrigation is the sum of the storage released from Bear Lake for irrigation and diversion loss at Cutler Dam. This diversion loss is the flow at the Bear River near Collinston gaging station during the storage delivery period, when no water is being released past Cutler Dam for power purposes or other downstream uses. In computing the diversion loss for the years 1924 to 1930 and 1945 to 1947, when water was released past Cutler Dam for power purposes during the storage delivery period, a storage loss of 45 acre-feet daily was allowed throughout the storage delivery period.

Tributary inflow into Bear Lake, other than inflow from Bear River, is in some years greater than the evaporation losses from the lake, and in some years considerably less. Shown on page 49 are monthly and annual figures of net gains and losses in Bear Lake from tributary inflow and evaporation, if Bear River water were not diverted into the lake or water withdrawn from the lake. In comparing Bear Lake storable waters and irrigation storage requirements below Bear Lake, these net gains and losses are taken into account in

the comparison on Page 50.

It is to be noted in this comparison of storable supply and irrigation storage demand, that during the ten year period from October 1, 1930 to September 30, 1940, the irrigation demand averaged 6,900 7,600 acre-feet annually more than the storable supply after taking into account the evaporation losses on Bear Lake. During a fourteen year period extending from October 1, 1930 to September 30, 1944, the storable supply, after taking into account the evaporation losses, averaged only 17,300 14,900 acre-feet annually more than the irrigation demand. During the twenty-four year period from October 1, 1923 to September 30, 1947 the storable supply, including a long time net gain of inflow over evaporation, averaged 91,300 80,400 acre-feet annually more than the irrigation demand.

Bear River water reaching Stewart Dam, in excess of that necessary to fill older dated downstream rights than the Bear Lake storage right, is the principal source of water for storage in Bear Lake. Any future storage project on Bear River above Stewart Dam, which would decrease this supply, would interfere with existing rights. It has been shown, considering irrigation storage rights alone, that the supply is insufficient in periods of drought to fill present needs and new storage above Bear Lake would increase this deficiency. Only by utilizing the large holdover capacity to tide it over drought periods can the present storage system provide storage water for power purposes. Upstream storage may also affect downstream irrigation rights in addition to the storage right in Bear Lake. The extent of the effect on existing rights would be dependent on the magnitude of upstream storage and such restrictions as might be placed on the maximum rate of diversion allowed.

In the event supplemental water should be made available for lands above Bear Lake, the effect on existing rights of return flows from late season

application of this supplemental water would be dependent on the pattern of use of such water and such regulations as may be adopted for credit of these return flows. To evaluate the probable magnitude of these return flows is a most complex problem and at best only a very rough estimate could be made, even if a set storage and delivery plan were adopted.

Each of the annual Bear River Hydrometric Data reports contained studies of daily gains in the various sections of the river above Bear Lake. These studies show that the river channel gains, which include return flows from water diverted and applied in irrigation as well as natural river gains, follow closely the pattern of water application. The studies also indicate that the amount of water retained in temporary groundwater storage, under the irrigated areas, for later relase through seepage to drains and to the river channel is relatively small. In the area above Woodruff Narrows, the river channel gain practically ceases at the end of the heavy water application period, while in the areas between Woodruff Narrows and Border, only moderate river channel gains continue to occur after the heavy water application period. It thus appears probable that most of the return flow from supplemental water applied under Plan A or Plan B would return during the irrigation period. This river characteristic is in sharp contrast to some other river basins where the return flows from irrigation have produced relatively large continuous year round flows, when prior to irrigation the channels below were dry in the late summer and winter months.

Usable supplemental water return flows, occurring during the period of application of supplemental water from storage, could be utilized in decreasing the apparent amount of supplemental storage required. Some of the return flows from supplemental waters might occur too far downstream to be reused by the areas needing supplemental water. In this case, some rights not participating,

Hodgson Report

might receive benefit of supplemental water return flow. Return flows from supplemental water, occurring during the non-irrigation after ? season, would be available for filling downstream storage rights, thus partially compensating for rights affected during the storage period.

2. Future storage on Main Stem of Bear River below Bear Lake.

Present natural flow irrigation rights, excluding storage rights from Bear River Main Stem between Stewart and Cutler Dams, total 1,762 cubic feet per second. Present power rights for Bear River waters at the Cutler Dam total 3,540 cubic feet per second. Inflow in this reach of the river exceeds these rights for periods of short duration only in occasional years. The total amount of unappropriated water is relatively small in most years and non-existent in dry years.

Future storage of any great magnitude on Bear River between the Stewart and Cutler Dams would conflict with the power rights of the Utah Power & Light Company and possibly with the right of the Fish and Wildlife Service below Cutler Dam.

Return flows, occurring during the irrigation season, from supplemental storage and storage water on new lands, applied in the area between Bear Lake and Cutler Dam, would increase the flows available for irrigation and have the net effect of decreasing the apparent total requirement. Return flows from this source, occurring during the non-irrigation season, would increase the flows available for power and water fowl refuge rights. Return flows from new lands below Cutler Dam would increase the supply available for filling the rights on the Water Fowl Refuge.

3. Future Storage on Tributaries above Bear Lake.

Storage on tributaries which contribute surface water to the main stem of

the river above Bear Lake would result in an increased depletion of the supplies which have already been shown to be insufficient to fill existing rights. Such storage would occur during the high water period and would have the net effect of decreasing the flow available for storage in Bear Lake to an extent practically equal to the amount stored on the tributaries. Return flows, occurring during the irrigation season, resulting from later release and use of this storage, would be consumed by earlier dated rights than those affected during the period in which the storing of water would occur. Return flows, occurring during the non-irrigation season, would be available for filling Bear Lake storage rights, thus partly compensating for the rights previously affected.

Storage on tributaries above Bear Lake, which are entirely diverted throughout the year and do not contribute surface flows to the main stem of the river, would result in a decrease in the groundwater contribution to the river during the irrigation season. Groundwater return flow from later application of such storage, would only partially compensate for this, since the consumptive use would be greater. The return flow, occurring at a later date, would contribute to rights which may not be the existing rights affected from such change in use, although its late date of return may improve the late season flows in the river.

4. Future Storage on Tributaries below Bear Lake.

Storage on tributaries below Bear Lake would decrease flows available for filling power rights on Bear River during the storage period and possibly, to a small extent, the flow available for filling the Bear River Water Fowl Refuge right, but would not affect irrigation rights. Return flows from tributary storage application would increase the flows available for filling irrigation, power, and water fowl rights during the period from about July 1 through about December 31.

TRANSCRIPT OF BEAR LAKE STORAGE DECREE

District Court of the United States for the District of Idaho, Eastern Division.

Utah Power & Light Company vs. The Last Chance Canal Company in Equity No. 203, final decree before Hon. F. S. Dietrich, District Judge, filed July 14, 1920.

"The plaintiff, Utah Power & Light Company, is entitled to divert from the main channel of Bear River, from the natural flow thereof, for storage purposes, the following amounts:

3,000 c.f.s. with date of priority of March 1, 1911

2,500 c.f.s. with date of priority of Sept. 11, 1912

Said water to be diverted from Bear River through what is known as the Rainbow and Dingle Inlet Canals, the headworks of which are located respectively in the Northeast Quarter of Section 34, Township 13 South, Range 44 East, B.B.M., and the Northwest Quarter of Section 17, Township 14 South, Range 45 East, B.B.M., in Bear Lake County, Idaho, and to be carried into and stored in what is known as the Bear Lake Reservoir and withdrawn therefrom from time to time as needed or required by said Utah Power & Light Company, or its successors in interest, for the development of power or generating electricity energy in any power plant which it may now have, or hereafter construct or acquire in or along Bear River, in the states of Idaho and Utah, and for irrigation purposes in what is generally known as Bear River Valley in said states."

SUMMARY OF BEAR RIVER STORAGE OPERATION EXCLUDING TEMI

(Quantities

Water Year	Oct. 1 to Mar. 31				April 1 to start of storage draft				Start of storage draft Sept. 30, whichever		
	Flow at Stewart (Below Stewart + Rainbow + Dingle)	Stored in Bear Lake	Draft on Bear Lake	By-passing Bear Lake (1) - (2)	Date Storage Ended	Flow at Stewart	Stored in Bear Lake	By-passing Bear Lake (6) - (7)	Date Storage Draft Started	Date Storage Draft Ended	Flow at Stewart
	1	2	3	4	5	6	7	8	9	10	11
24	143,858		148,740	143,858	May 25	192,660	149,810	42,850	May 26	Sept.30	46,076
25	82,546		113,384	82,546	*	113,912	59,884	54,028	*	Sept.30	67,764
26	100,858		66,052	100,858	Apr 30	41,100	16,726	24,374	May 1	Sept.30	63,977
27	56,544		164,306	56,544	July 4	173,309	129,861	43,448	July 5	Sept.30	40,429
28	119,191	67,801		51,390	June 26	202,139	171,211	30,928	June 27	Sept.30	31,150
29	70,441		58,409	70,441	July 5	213,893	177,878	36,015	July 6	Sept.23	42,160
30	111,022	26,502		84,520	May 21	70,432	51,553	18,879	May 22	Sept.30	78,101
31	77,450		4,340	77,450	May 6	12,482	8,489	3,993	May 7	Sept.30	5,245
32	29,372	14,787		14,585	**	188,721	165,865	22,856	**	Sept.30	21,674
33	60,727	52,935		7,792	June 27	79,997	68,051	11,946	June 28	Sept.30	17,524
34	43,931	28,507		15,424	Apr 19	1,350	1,019	331	Apr 20	Sept.30	2,671
35	18,770	10,183		8,587	June 23	40,652	30,541	10,111	June 24	Sept.30	15,701
36	35,989	28,609		7,380	June 21	258,291	252,436	5,855	June 22	Sept.30	44,548
37	67,259	35,008		32,251	June 16	177,786	170,767	7,019	June 17	Sept.27	29,714
38	72,940	58,554		14,386	***	209,789	196,610	13,179	***	Sept.26	28,652
39	105,780	41,717		64,063	May 15	69,055	64,317	4,738	May 16	Sept.30	24,425
40	47,245	31,499		15,746	May 6	3,557	2,774	783	May 7	Sept.30	3,058
41	45,118	21,959		23,159	****	36,652	26,100	10,683	****	Sept.21	37,458
42	69,244	33,493		35,751	June 6	109,909	106,161	3,748	June 7	Sept.30	22,915
43	66,557	27,075		39,482	June 25	200,175	182,250	17,925	June 26	Sept.30	49,752
44	61,104	28,750		32,354	July 8	186,300	163,016	23,284	July 9	Sept.30	22,702
45	58,556	48,073		10,483	July 5	104,655	98,066	6,589	July 6	Sept.6	41,127
46	110,624	99,036		11,588	June 11	213,420	206,552	6,868	June 12	Sept.30	41,363
47	120,391	39,750		80,641	July 7	217,643	179,975	37,668	July 8	Sept.30	53,721
Total	1,775,517	694,238	555,231	1081279		3117879	2679912	437,967			831,907
Average	73,980	28,926	23,135	45,053		129,912	111,663	18,249			34,663

* Storage draft periods - April 30 - May 7; June 13 - Sept. 30.

*** Storage draft periods - June 21-29; July 13 - Aug. 30; Sept. 10-26.

RY PONDAGE IN SODA, ONEIDA AND CUTLER RESERVOIRS

cre-feet)

~~PLATE~~ Page 4

end of storage draft or mes first.				End of storage draft to Sept. 30.				Annual			
Draft on Bear Lake	By-passing Bear Lake Col. (11)	Storage passing Collinston	Storage to Irrigation (12) - (14)	Day after end of Storage Draft	Flow at Stewart	Stored in Bear Lake	By-passing Bear Lake (17) - (18)	Flow at Stewart (1) + (6) + (11) + (17)	Stored in Bear Lake (2) + (7) - (12) + (18)	Draft on Bear Lake (3) - (7) + (12) - (18)	Annual Storage Release for Power past Collinston
2	13	14	15	16	17	18	19	20	21	22	23
,800	46,076	127,328	134,472	-	-	-	-	382,594		260,730	276,068
,062	67,764	95,344	31,718	-	-	-	-	264,222		180,562	208,733
,483	63,977	126,954	110,529	-	-	-	-	205,935		286,809	193,006
,971	40,429	56,845	54,126	-	-	-	-	270,282		145,416	221,151
,970	31,150	62,704	84,266	-	-	-	-	352,480	92,042		62,704
,298	42,160	16,233	61,065	Sept.24	4,646	2,078	2,568	331,140	44,249		74,642
,448	78,101	55,709	81,739	-	-	-	-	259,555		59,393	55,709
,597	5,245	8,646	214,951	-	-	-	-	95,177		219,448	12,986
,456	21,674	5,470	56,986	**	3,565	454	3,111	243,332	118,650		5,470
,724	17,524	8,244	127,480	-	-	-	-	158,248		14,738	8,244
,100	2,671	7,577	222,523	-	-	-	-	47,952		200,574	7,577
,962	15,701	5,334	114,628	-	-	-	-	75,123		79,238	5,334
,646	44,548	4,205	42,441	-	-	-	-	338,828	234,399		4,205
,666	29,714	4,931	72,735	Sept.28	401	40	361	275,160	128,149		4,931
,097	28,652	6,171	42,926	Sept.27	1,547	119	1,428	312,928	206,186		6,171
,997	24,425	14,145	140,852	-	-	-	-	199,260		48,963	14,145
,843	3,058	8,901	196,942	-	-	-	-	53,860		171,570	8,901
,180	37,458	6,323	77,857	Sept.22	2,382	1,031	1,351	121,610		35,090	6,323
,639	22,915	7,751	127,888	-	-	-	-	202,068	4,015		7,751
,668	49,752	21,531	60,137	-	-	-	-	316,484	127,657		21,531
,664	22,702	5,921	101,743	-	-	-	-	270,106	84,102		5,921
,302	41,127	27,394	16,908	Sept.7	12,548	5,580	6,968	216,886	107,417		27,394
,594	41,363	69,161	43,433	-	-	-	-	365,407	192,994		69,161
,013	53,721	80,656	52,357	-	-	-	-	391,755	86,712		80,656
,180	831,907	833,478	2270702		25,089	9,302	15,787	5750392	Net 24 yr. total.		1388714
341	34,663	34,728	94,612		1,045	387	658	239,600	Draft → 275,959		57,863

** Storage draft periods - July 23 - Aug. 29; Sept. 9 - 30.

**** Storage draft periods - May 25-29; June 23 - Sept. 21.

Net Bear Lake Evaporation and Tributary Inflow other than inflow from Bear River Change in contents in
Monthly and annual ~~discharge~~, in _____, of _____ River at near ~~1924 to 1947.~~, Bear Lake Storage - Bear R.
[Drainage area, _____ square miles] diversion to Bear Lake Storage.

YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	ANNUAL
1924				+ 5,740	+14,205	+21,057	+14,365	+ 7,321	- 3,400	- 8,893	-17,570	- 23,310	+22,760
1925	+ 1,424	- 21,939	+ 12,520	+12,760	+13,520	+27,399	+18,870	+25,439	+ 7,690	- 8,676	-20,634	- 8,311	+60,110
1926	- 25,960	- 9,720	+ 5,923	+ 5,747	+14,419	-28,889	+16,674	+ 8,047	- 17,835	-18,658	-15,371	- 26,600	- 46,240
1927	- 14,509	- 9,948	- 18,407	+ 17,280	+18,750	+34,440	+18,041	+20,571	+14,123	- 21,903	-30,180	+ 780	+29,040
1928	- 8,882	+ 870	+ 49	- 2,001	+ 5,421	+34,472	+13,493	+18,710	+21,272	-19,092	-25,894	-32,979	+ 5,710
1929	+ 10,401	- 6,351	+ 7,675	+11,385	+13,690	+26,809	+35,239	+17,240	+11,471	-16,336	-14,676	- 6,487	+90,070
1930	- 17,403	- 17,785	- 409	+ 6,897	+13,539	+22,059	+21,161	+14,612	- 8,169	- 21,279	+ 486	-18,216	- 4,510
1931	- 6,160	- 15,190	- 5,500	+ 7,450	+ 7,370	+15,070	+12,539	+ 2,120	-19,903	-34,996	-26,020	-24,532	- 87,751
1932	- 9,067	- 13,170	+ 5,760	+ 12,070	+13,130	+18,490	+38,515	+ 9,855	+18,202	- 1,073	-1[illegible],120	-24,437	+50,147
1933	- 14,539	- 7,335	- 5,507	+ 7,793	+11,721	+ 6,623	+27,301	+23,102	+ 6,580	-32,530	-34,450	-25,630	- 26,859
1934	- 12,680	- 14,035	+ 3,715	+ 3,406	+ 7,943	+ 6,844	- 3,030	- 7,952	-26,067	-24,397	-28,150	-38,223	- 132,630
1935	- 13,370	+ 1,670	+ 520	- 1,480	+14,508	+12,669	+24,968	+ 2,500	+ 8,900	-23,396	-27,824	-33,327	- 33,669
1936	- 17,577	- 7,371	- 942	+ 14,564	+ 22,163	+ 14,054	+33,879	+30,124	+27,247	-11,423	- 8,522	-22,394	+ 73,840
1937	- 2,828	+ 4,702	+ 2,344	+ 4,250	+11,312	+17,512	+27,753	+31,990	+10,060	+ 1,350	-32,824	-24,270	+51,320
1938	- 8,247	- 1,986	+ 3,751	- 219	+ 5,146	+23,901	+25,380	+27,369	+ 7,718	- 9,335	-23,524	-14,440	+35,510
1939	- 17,004	- 11,945	- 552	+ 7,669	+ 7,650	+21,365	+13,680	+11,560	-15,010	-21,660	-26,015	-16,280	- 46,530
1940	- 16,470	- 13,033	- 2,313	+ 3,193	+ 7,405	+14,119	+ 2,574	- 7,853	-21,986	-26,935	-31,012	- 6,122	- 101,403
1941	- 5,107	- 10,423	+ 267	+ 2,406	+ 3,202	+15,496	+ 9,288	+ 8,390	- 18,455	+ 6,416	-17,908	-24,856	- 31,290
1942	- 3,393	- 6,718	- 911	+ 1,746	+13,113	+18,976	+18,928	+15,104	- 3,694	-29,441	-[illegible]9,126	-15,490	- 10,270
1943	- 9,890	- 7,830	- 4,530	+ 1,800	+10,640	+36,525	+35,595	+23,175	+23,650	-11,250	-2[illegible],597	-21,456	+55,780
1944	- 12,803	- 6,489	- 3,823	+ 4,377	+11,865	+19,823	+32,618	+15,220	+ 12,606	- 26,690	-36,131	-23,170	- 12,606
1945	- 14,053	- 2,220	- 4,284	+ 2,057	+ 7,887	+10,740	+15,376	+20,404	+18,368	- 6,959	+79,066	- 119,997	+ 6,390
1946	- 8,569	+ 11,074	+ 4,790	+ 9,197	+ 7,818	+26,754	+40,420	+35,257	+ 4,556	-18,352	- 9,564	-23,172	+80,180
1947	- 9,277	- 2,857	+ 14,092	- 437	+18,910	+20,029	+ 4,[illegible]75	+24,047	+16,135	- 5,231	- [illegible],378	-13,023	+58,460
												Total	+85,844
												Mean	+ 3,577

COMPARISON OF BEAR LAKE STORABLE WATER AND IRRIGATION DEMAND BELOW BEAR LAKE

Year	Bear Lake Contents Oct. 1	Flow at Stewart Oct.1 to Mar. 31	Stored in Bear Lake Apr. 1 to Beginning of Draft	Estimated Diversion Loss Oct. to March	Total Storable in Bear Lake	Bear Lake Gain or Loss	Storage Draft for Irrigation	Diversion Loss	Total Draft for Irrigation
1931	646,700	77,450	8,489	7,200	78,739	-87,751	214,951	8,646	223,597
1932	339,500	29,372	165,865	7,200	188,037	50,147	56,986	5,470	62,456
1933	508,300	60,727	68,051	7,200	121,578	-26,859	127,480	8,244	135,724
1934	466,700	43,931	1,019	7,200	37,750	-132,630	222,523	7,577	230,100
1935	133,500	18,770	30,541	7,200	42,111	-33,669	114,628	5,334	119,962
1936	20,600	35,989	252,436	7,200	281,225	73,840	42,441	4,205	46,646
1937	328,800	67,259	170,767	7,200	230,826	51,320	72,735	4,931	77,666
1938	508,300	72,940	196,610	7,200	262,350	35,510	42,926	6,171	49,097
1939	750,000	105,780	64,317	7,200	162,897	-46,530	140,852	14,145	154,997
1940	654,500	47,245	2,744	7,200	42,789	-101,403	196,942	8,901	205,843
1941	381,500	45,118	26,100	7,200	64,018	-31,290	77,857	6,323	84,180
1942	315,100	69,244	106,161	7,200	168,205	-10,270	127,888	7,751	135,639
1943	308,800	66,557	182,250	7,200	241,607	55,780	60,137	21,531	81,668
1944	492,300	61,104	163,016	7,200	216,920	-12,606	101,743	5,921	107,664
1945	563,800								
10 year period 1931 to 1940 - Storable Bear River supply after deducting Bear Lake net loss averages 7,600 acre-feet annually less than irrigation demand. recomp -6,900 "									
Totals		559,463	960,839	72,000	1,448,302	-218,025	1,232,464	73,624	1,306,088
Averages					144,800	-21,800			130,600
14 year period 1931 to 1944 - Storable Bear River supply after deducting Bear Lake net loss averages 14,900 acre-feet annually more than irrigation demand. recomp +17,300									
Totals		801,486	1,438,366	100,800	2,139,052	-216,411	1,600,089	115,150	1,715,239
Averages					152,800	-15,400			122,500
24 year period 1924 to 1947 - Storable Bear River supply after adding Bear Lake net gain averages 80,400 acre-feet annually more than irrigation demand. recomp 91,300									
Totals		1,775,517	2,679,912	172,800	4,282,629	85,844	2,270,702	166,945	2,437,647
Averages					178,400	3,600			101,600

PART III

STUDY OF POTENTIAL IRRIGATION OF NEW LANDS BOTH ABOVE AND BELOW BEAR LAKE

Lands Above Bear Lake

New lands above Bear Lake far exceed the area that can be irrigated from the available water supply. It has been shown in Part II of this report that there are long periods in which the available supply is inadequate, to supply lands needing supplemental water. Irrigation of new lands above Bear Lake, therefore, appears impractical.

Lands Below Bear Lake

On page 40 are shown the acreages of new land that could be brought under irrigation below Bear Lake. Also shown on page 40 are the water supplies that would be made available for irrigation of these new lands. Most of this water supply is water made available through change in use.

PART V

STUDY OF THE QUESTION AS TO WHETHER THE SCOPE OF THE COMPACT SHOULD BE ENLARGED TO INCLUDE THE MAIN STEM OF BEAR RIVER TO GREAT SALT LAKE AND THE MALAD RIVER

Change in use of water involving storage above Cutler Dam may affect the supply available for filling existing water rights of the Bear River Water Fowl Refuge. Storage on Malad River in Idaho may also affect the supply available for filling this right. Existing irrigation rights on the main stem of the Bear River below Cutler Dam would not be affected by upstream storage as return flows would be more than sufficient to fill them. These irrigation rights are entirely for small areas served by pumping from the river channel.

Other features of this question should be referred to the Legal Committee.