MINUTES OF THE

BEAR RIVER COMMISSION

REGULAR MEETING

DECEMBER 16, 1968

THOSE PRESENT

Bear River Commission Meeting — Dec. 16, 1968

NAME	ORGANIZATION	ADDRESS
x Don F Lawrence	UTAH - Comm -	S.L.C.
x Gordon Peart	Utah Comm -	Randolph, Ut.
x Stephen L. Smith	Idaho Comm.	Malad Idaho
x Peter M Kunz	Idaho Comm.	Montpelier Idaho
x Cecil Foster	Idaho Comm	Preston, Idaho
x J.W. Myers	Bear River Comm	Evanston Wyo
x S. Reed Dayton	" "	Cokeville Wyo
x John A Teichert	" " (acting)	Cokeville, Wyoming
x E J Skeen	Legal consultant	Salt Lake City
x A J Fagson	Chairman	" " "
x Calvin Funk	Utah alt	Richmond, Utah
x Lewis R. Harper	Tremonton Ut Comm	Tremonton Utah
x Wallace N. Tibson	Ass't Sec'y	Logan, Utah
x Reed Budge	[illegible]	[illegible]
x [illegible] Kackley		[illegible]
x Lafe Holbrook		Bo[illegible]
x [illegible]	[illegible]	[illegible]
x [illegible]	[illegible]	[illegible]
x [illegible]	[illegible]	[illegible]
x [illegible]	District Supt of Reclam.	Salt Lake City
x [illegible]	U.S. [illegible]	[illegible]
x [illegible]	[illegible]	[illegible]
x [illegible]	[illegible]	[illegible]
x [illegible]	[illegible]	[illegible]
x [illegible]	[illegible]	Sanpete

x Harold E. Nitz	Pres. Black-Otter Irrig. Co.	Montpelier Idaho
x A. D. Oakley	Bear Creek Irrig. Co.	Dingle Idaho
x Cliff Stimmers	Dingle Irrigation Co.	" "
x Fenton R. Allred	Bear River Commission	Montpelier Idaho
x Elmer Ahmann	Utah Water Resources	Salt Lake City
x Earl Dewitt	U.S. Bureau of Reclamation	—
+ Roy Lanyon	Idaho Water Div., Boise	Idaho Falls, Idaho
x R. J. Burkhalter	U.S.B.R.	[illegible]
x E. K. Thomas	U.S.B.R.	S.L.C.
x PAUL WILLMORE	USBR	SLC
+ Clyde Ritchie	Utah Water Users	Heber Utah
x Edwin Haycock	Utah Division of Water Resources	Salt Lake City
x John Paraskevas	Soil Conservation Service	SLC
+ Farrell Keatson	Bear River Water	Preston Idaho
Raoul		

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BEAR RIVER COMMISSION

Minutes of the Regular Meeting held in the Water Conference Room
Utah State Capitol
December 16, 1968

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The Regular Meeting of the Bear River Commission convened in the Water Conference Room of the Utah State Capitol Building, Salt Lake City, Utah, on Monday, December 16, 1968, at 9:35 a.m. with Chairman E. O. Larson presiding.

Voting Commissioners Present:

IDAHO

Stephen L. Smith, Malad
Ferris M. Kunz, Montpelier
Cecil Foster, Preston

UTAH

Daniel F. Lawrence, Bountiful
Grover R. Harper, Corinne
Gordon H. Peart, Randolph

WYOMING

J. W. Myers, Evanston
S. Reed Dayton, Cokeville

UNITED STATES

E. O. Larson, Chairman and U.S. Representative, Salt Lake City

Alternate Commissioners and Advisors Present:

IDAHO

Reed Budge, Soda Springs (Alternate)
R. Keith Higginson, Boise (Ex Officio Member)

UTAH

Calvin Funk, Richmond (Alternate)
Robert B. Porter, Salt Lake City (Advisor)
Clyde Ritchie, Heber City (Advisor)

WYOMING

John A. Teichert, Cokeville (Alternate for Floyd Bishop)

LEGAL CONSULTANT TO THE BEAR RIVER COMMISSION

E. J. Skeen, Attorney, Salt Lake City

Others Present:

Wallace N. Jibson, Ass't. Secretary, Bear River Commission, Logan, Utah
Gordon E. Harmston, Executive Director, Department of Natural Resources, Salt Lake City, Utah
Marion Olsen, Utah Board of Water Resources, Paradise, Utah
Edward H. Southwick, Utah Board of Water Resources, Ogden, Utah
Orson A. Christensen, special Utah Bear River Committee, Brigham City, Utah
Edwin B. Haycock, Division of Water Resources, Salt Lake City, Utah
Ethan F. Axtmann, Division of Water Resources, Salt Lake City, Utah
Sonya Ames, Division of Water Resources, Salt Lake City, Utah
LeRoy Stanger, Idaho Water Resource Board, Idaho Falls, Idaho
Evan M. Kackley, Wayan, Idaho
Fenton R. Allred, Montpelier, Idaho
Lafe Holbrook, Bancroft, Idaho
Harold E. Nate, Black-Otter Irrigation Company, Montpelier, Idaho
A. D. Oakey, Ream-Crockett Irrigation Company, Dingle, Idaho
Cliff Skinner, Dingle Irrigation Company, Dingle, Idaho
Raoul Westinsen, Bear River water user, Bancroft, Idaho
Ted Arnow, U.S. Geological Survey, Salt Lake City, Utah
Donald J. Watkins, Utah Power & Light Company, Salt Lake City, Utah
John Bradshaw, U.S. Soil Conservation Service, Salt Lake City, Utah
Ellis Armstrong, U.S. Bureau of Reclamation, Salt Lake City, Utah
E. K. Thomas, U.S. Bureau of Reclamation, Salt Lake City, Utah
Paul Willmore, U.S. Bureau of Reclamation, Salt Lake City, Utah
Dean E. Bischoff, U.S. Bureau of Reclamation, Logan, Utah

CHAIRMAN LARSON: If you will come to order, we will go ahead with the regular meeting of the Bear River Commission. First, we will ask someone from each State to introduce his delegation.

(Mr. Kunz introduced those present from Idaho. Mr. Lawrence introduced representatives from Utah.)

MR. LAWRENCE: Since our last Commission meeting, Commissioner Lawrence Johnson passed away. The Utah Board of Water Resources, with the concurrence of Governor Rampton, has officially appointed Gordon Peart to be the Commissioner from the Upper Region. The Board has not filled the vacancy caused by the elevation of Mr. Peart from Alternate to Commissioner.

(Mr. Teichert introduced Mr. J. W. Myers and Mr. S. Reed Dayton, Bear River Commissioners from Wyoming.)

MR. TEICHERT: Mr. Floyd Bishop sends his regrets. He was unable to attend this meeting because he is down with the flu, and he asked that I represent him here today.

(Chairman Larson then introduced others who were in attendance representing the various Federal agencies. He also introduced Mr. Wallace Jibson, Assistant Secretary to the Bear River Commission.)

RESOLUTION OF CONDOLENCE

CHAIRMAN LARSON: Before we begin with the first order of business, I think it would be nice if this Commission passed on and prepared a resolution of condolence to be sent to Mrs. Johnson. It has been two months since Commissioner Johnson passed on, but this is the first meeting this Commission has held since then.

MR PEART: I would like to make the motion that we offer our condolences to Mrs. Johnson for the fine things that President Johnson did while being a member of the Bear River Commission.

MR. KUNZ AND MR. MYERS: I second the motion.

Motion carried.

REVIEW OF MINUTES OF ANNUAL MEETING APRIL 15, 1968

CHAIRMAN LARSON: We will now ask the Assistant Secretary to give us a general brief review of the April 15, 1968, minutes.

MR. JIBSON: I am sorry, gentlemen, that we were a little late in getting the minutes distributed, but I hope that you received them last Friday or Saturday. We mailed the minutes last Wednesday to those on the regular mailing list.

Summary of Minutes:

All voting commissioners were present at the Annual Meeting, and the first order of business was the review of the minutes of the previous Regular Meeting held December 18, 1967.

Introductions were then made of representatives from each State, and some discussion took place on the status of State Engineers as Ex Officio members.

Reed Dayton of Cokeville was re-elected Vice-Chairman of the Commission and Dan Lawrence was elected Secretary-Treasurer.

The Chairman then called on Mr. Crandall of the Bureau of Reclamation to give a report on appraisal of upstream storage. His report dealt with costs and benefits of upstream storage under the condition that upstream interests would also pay the cost of replacement storage below Bear Lake. Total capital costs of providing this type of storage, including cost of replacement storage, would be about $400 an acre-foot with equivalent annual cost of $13.60 an acre-foot.

Discussion on the report lead to the conclusion that upstream interests could not justify storage if replacement storage also had to be provided. Mr. Crandall

emphasized that without a change in the Compact, water would not be available upstream unless replaced to the system.

Mr. Bishop then questioned Mr. Jibson on the practical effect on downstream uses of increasing upstream storage by modification of the Compact. A motion was then made that Mr. Jibson investigate this effect and prepare a study for the next meeting.

Mr. Skeen stated that without modifying the Compact, additional storage above Bear Lake might be permitted if, by exchange or otherwise, there would be no violation of other rights in the system.

Mr. Higginson then discussed the ground-water potential in Cache Valley, maintaining that it should be considered in dividing the resource between Idaho and Utah. Mr. Lambert took issue with this statement because of Utah water law.

The Assistant Secretary then gave his report which indicated that a below-normal runoff was expected in the 1968 season, but all reservoirs were full or nearly so to supplement natural flow supplies. Budget estimates were presented for the 1970-71 Biennium and subsequently approved by the Commission.

Mr. Page gave a financial report for the Secretary-Treasurer showing a cash balance of about $24,000, of which about $17,000 would be obligated as of the end of June. It was agreed that surplus funds should be placed on three-month saving certificates, and the Secretary-Treasurer was requested to do so.

There were no committee reports, but Mr. Lambert discussed briefly stock-water impoundments, and the meeting adjourned at 12:05 p.m.

CHAIRMAN LARSON: What's your pleasure? Are there any corrections on the minutes?

MR. DAYTON: I move that we approve the minutes of the April 15, 1968, meeting as printed.

MR. KUNZ: I second the motion.

Motion carried.

REPORT OF CHAIRMAN

CHAIRMAN LARSON: I would like to read a letter I received from the Acting Director of the U.S. Geological Survey, Washington, D.C., dated November 19, 1968.

"Dear Mr. Larson:

The cooperative agreement between the U.S. Geological Survey, United States Department of the Interior and the Bear River Commission, dated July 1, 1968, stated that the Geological Survey would contribute $28,814 and the Bear River Commission would contribute $36,800 during the period July 1, 1968 to June 30, 1969.

We are now pleased to inform you that the Geological Survey is able to provide an additional $1,186 of Federal matching funds to further the program of water resources investigations in the Bear River drainage area during the 1969 fiscal year. This will leave $6,800 of your offering not matched with Federal funds."

MR. JIBSON: Mr. Chairman, might I clarify that letter just a little? Since our last meeting, we had our Federal appropriation cut and this was discussed first with the Secretary-Treasurer to see if we might call on the surplus in the bank balance to the extent necessary to cover this cut. So we prepared a new budget estimate and breakdown, and just about the time I was ready to get this out to the Commission for your consideration, the initial amount of the cut had been restored. This letter that the Chairman received is a notice of the restoration, so it is not additional funds.

CHAIRMAN LARSON: Another item I thought would be well to discuss at this meeting concerns this new Federal-State agency that has been organized. Since I have been invited to be a member of the overall general committee, I thought it would be a good thing to have it explained, so I asked our Secretary to be prepared to have someone explain this later under New Business.

I would like to stress one point, when we have comments from the group, please state your name so that the Secretary gets it.

I have no other business at this time.

REPORT OF SECRETARY-TREASURER

CHAIRMAN LARSON: The next item on our agenda is the report of our Secretary-Treasurer.

MR. LAWRENCE: Mr. Chairman, I'll pass out a Statement of Income and Expenditures. I notice that my Controller is showing the period of July 1 to November 30, so I will account for the time from our last meeting to July 1, 1968.

We had, as of July 1, a cash balance of $6,462.96. We had an operating expense through the U.S. Geological Survey of $9,216.00 and through the Commission $245.40, leaving us a net unexpended cash balance as of November 30, 1968, $26,251.56.

If there were any expenditures during the interim between our last Commission meeting and July 1, I will supplement and report to that extent by letter to the Commission. The Commission's income was $35,712.96.

MR. MYERS: I don't have any questions on the report, but I was wondering if you were able to put any of this money out in connection with our bonding proposal?

MR. LAWRENCE: Mr. Bert Page, our Controller, was prepared to report on that, but called in this morning with the flu. He and I haven't discussed it in final detail, and I don't know just exactly where he has invested funds. I may be able, before the meeting is over, to call him and find out more specifically on that. But we did invest those funds.

BEAR RIVER COMMISSION
STATEMENT OF INCOME AND EXPENDITURES
FOR THE PERIOD OF JULY 1, 1968 TO NOVEMBER 30, 1968

INCOME	Cash On Hand	Approved Budget	Assessment Outstanding	Total Revenue
Cash Balance 7/1/68	$6,462.96	$	$ - - -	$ 6,462.96
State of Wyoming	- - -	11,700.00	- - -	11,700.00
State of Idaho	- - -	11,700.00	5,850.00	5,850.00
State of Utah	- - -	11,700.00	- - -	11,700.00
TOTAL INCOME TO APRIL 15, 1968	$6,462.96	$35,100.00	$5,850.00	$35,712.96

DEDUCT OPERATING EXPENSE

EXPENDED THROUGH U.S.G.S.	Approved Budget	Unexpended Balance	Total Expenditure
Stream Gaging	$30,000.00	$22,375.00	$7,625.00
Personal Service	5,150.00	3,947.00	1,203.00
Travel	450.00	357.00	93.00
Fiscal Charge	280.00	212.00	68.00
Washington Office Charge	620.00	468.00	152.00
General Office	300.00	225.00	75.00
Sub-Total	$36,800.00	$27,584.00	$9,216.00
EXPENDED THROUGH COMMISSION			
Printing Annual Report	$ 500.00	$ 305.60	$ 194.40
Treasurer Bond & Audit	300.00	284.00	16.00
Transcription of Minutes	100.00	65.00	35.00
Miscellaneous	- - -	- - -	- - -
Legal Consultant	300.00	300.00	- - -
Office Expense & Supplies	100.00	100.00	- - -
Sub-Total	$ 1,300.00	$ 1,054.60	$ 245.40
Total Disbursements	$38,100.00	$28,638.60	$9,461.40
UNEXPENDED CASH BALANCE AS OF NOVEMBER 30, 1968			$26,251.56

BEAR RIVER COMMISSION

DETAIL OF EXPENDITURE

FOR PERIOD ENDING NOVEMBER 30, 1968

Voucher Number		
141	The Beacon Insurance Agency	$ 16.00
143	Rose Printing Company	194.40
144	U.S. Geological Survey	9,216.00
145	Sonya Ames	35.00
	TOTAL EXPENDITURES PER PAGE 1	$9,461.40

BANK RECONCILIATION

NOVEMBER 30, 1968

Cash in Bank Per Statement 11-30-68	$26,251.56
Less: Checks Outstanding	None
TOTAL CASH ON HAND AND IN THE BANK	$26,251.56

CHECKS OUTSTANDING

(NONE)

MR. KUNZ: I move that we receive and file the financial report as given by the Secretary-Treasurer.

MR. MYERS: I second the motion.

Motion carried.

REPORT OF ASSISTANT SECRETARY

CHAIRMAN LARSON: We will now have the report of the Assistant Secretary.

MR. JIBSON: Mr. Chairman, I have two reports today. One is our usual report on Compact operation for the past season, and the other is the study that was requested at our last meeting. I will first discuss the report on 1968 Water Supply and Compact Operation. (Mr. Jibson's written report is attached.)

(After Mr. Jibson presented his written report, the following discussion took place:)

MR. JIBSON: There is one other water right that I would like to discuss. You may recall in our last meeting that I mentioned the fact that in 1961 we brought before the Commission an application to store 2,000 acre feet on Woodruff Creek. This is the only application on Woodruff Creek storage that has come before the Commission. As you know, Woodruff Creek Dam was started this fall, and the total storage capacity of the reservoir is going to be in excess of 4,000 acre-feet. I brought this question (of water rights) to the Utah group and received copies from their file of the facts relating to the Woodruff Irrigation Company reservoir. I won't go into very much detail on it, but Mr. Zenger summarized these facts in a discussion of four applications that apply to the Woodruff Creek project. They are as follows: (1) Application #33821 for 2,000 acre feet of storage from allocation under the Bear River Compact. This is the application that was brought before the Commission. (2) Then we have Change Applications #4175 and #4176 that provide for an additional 1,200 acre-feet of water to be stored in Woodruff Creek Reservoir. Part came with a transfer from a reservoir called Woodruff Town Reservoir that we recognized as an existing reservoir at the time of the signing of the Bear River Compact. The balance is a transfer of direct-flow right to Woodruff Creek reservoir. This particular reservoir was for 126 acre feet, I believe, with a right to fill 10 times yearly, or a total right of 1,260 acre feet. Most of this right was transferred to the Woodruff Reservoir. I might say here, that even though this is a Change Application, it should have come before the Bear River Commission in accordance with the requirement in the Compact that not only applications for new appropriations, but any application for change of point of diversion, place, and nature of use affecting Bear River water should have a copy of such application filed with the Commission. Since I failed to include them in this report today, they will be included in the copy incorporated in the minutes. (3) The third application is Change Application # 4772 providing for the transfer of 400 acre-feet from Birch Creek Reservoir, which is tributary to Woodruff Creek and on which a reservoir has existed for a number of years. Actually, it was built before the Compact became law and it was also a recognized reservoir at the time of the Compact. This transfer to Woodruff Creek Reservoir is for a fish conservation pool of 400 acre-feet. (4) The fourth increment will be a dead-storage

pool in Woodruff Creek of 450 acre-feet for fish culture. Thus, the right to divert to storage each year would be either 3,200 or 3,600 acre-feet rather than 4,050 acre-feet. (Question on storing and releasing the 400 ac-ft each year)

However, there is an additional point here that also came up in the rights in Woodruff Narrows Reservoir. Until such time as the entire 36,500 acre-feet allocated to the area above Bear Lake is developed, technically there would be no violation of the Bear River Compact if less than this amount in total is stored. However, the Irrigation Company would be diverting more to storage than allocated under the Compact in that first year. These rights and changes are a matter of record. We have a copy here also of an agreement between Utah Power & Light Company and the Woodruff Creek Irrigation Company.

CHAIRMAN LARSON: Has the Change Application been approved?

MR. JIBSON: To my knowledge, yes. I have some information here summarizing it, but I don't have the Change Application showing its approval.

MR. LAWRENCE: The Change Application had to be approved before the Board of Water Resources could help finance the project and start construction.

MR. JIBSON: There's just one other point I want to make, then if you have any discussion on this report or on the water rights, we can then discuss them. The Hatch Land & Livestock Company, which has now been sold to a Denver company, has a diversion in Wyoming above the State line on the West Fork of Bear River. The diversion is open to the stream, and the allocated right is only for one second-foot which was transferred from Deer Creek a few years ago. There is no diversion dam or diversion headgate installed. Now that Whitney Reservoir is developed, it will be impossible to bring water out of the reservoir without some control and regulation of this diversion. Even though, under a technicality in the Compact, after Rich County ceases diverting her allocation of about 40% of the total divertible flow it automatically reverts to the other section in Utah which is this small upper section in Summit County comprising only a few irrigated acres. Under the Compact then, there can be no regulation on the Hatch Ditch after Rich County ceases diverting. The intent was to release water out of Whitney Reservoir this past season, although it didn't materialize. But, permission was given to the Wyoming Commissioner to make the release, and he measured something over 11 second-feet of water being taken out through this diversion as he was proceeding to Whitney Dam. I know this is a problem with the State Engineer of Utah and I think it will be taken care of, but I want to bring it to the Commission's attention so that proper control works will be required on this diversion. We will work with Mr. Lambert and Mr. Hansen of the State Engineer's Office.

That is all I have, gentlemen, on the Compact operation. If you have any questions I will attempt to answer them at this time, and then I'll discuss the other report.

MR. TEICHERT: Before the Compact was actually set up on these reservoirs, did you recognize 10 filings of this particular reservoir (Woodruff Town Reservoir).

MR. JIBSON: Right. We recognized this as an existing right for 1260 acre-feet.

MR. AXTMANN: This filing for the city of Preston in Cub River for municipal, is that the reservoir they already have?

MR. JIBSON: No. The city of Preston has a filing on Cub River both for storage and direct flow, the direct flow right is to the storage development (on page 16) for 80 cfs and 3,500 acre-feet of storage. This filing has been protested and is pending approval on the settlement of the protest. The copy of the filing we received didn't show the location of the reservoir. Perhaps Mr. Higginson can clarify this filing for us.

MR. HIGGINSON: I can't tell you the exact location right off hand, but it isn't on a channel.

MR. JIBSON: As you might know, there is a diversion out of Cub River across the divide, one we call the Cub River-Worm Creek Canal, that drops water into Worm Creek and then into Glendale Reservoir and also carries water down to the new Foster Reservoir by the radio station. Whether or not this is to be an increase in that diversion, I don't know.

MR. AXTMANN: You don't know whether that's part of the already existing facility or something new?

MR. JIBSON: No, I don't really know.

MR. LAWRENCE: Mr. Chairman, I move that we receive and file the report of the Assistant Secretary.

MR. KUNZ: I second the motion.

Motion carried.

Report on Storage above Bear Lake

MR. JIBSON: I am sorry that Mr. Bishop isn't here today, and I was hoping that Dean Person of the University of Wyoming might be here also, but I don't see him either. The Dean is back in the saddle again working on Bear River after quite a few years of layoff. Some of the old timers here will remember that he was the Engineering Committee representative from Wyoming on the Negotiating Commission, and knows a good many details of the old studies prepared for the Negotiating Commission. But we have Mr. Teichert sitting in for Mr. Bishop, and we'll get a copy of this report over to Mr. Bishop for his comments.

MR. TEICHERT: I have taken an extra copy of this study and I will see that Mr. Bishop gets it.

(Mr. Jibson's written report is attached.)

(Additional comments were made as Mr. Jibson presented his written report as follows:)

(comments on pages 4 & 5)

I am speaking here of storage allocation to Utah and Wyoming. The 1,000 acre-feet allocated to Idaho has not been included in this study, and so this 28,800 acre-feet is now developed of a total allocation of 35,500 acre feet.

I might give a few words of explanation about yield, diversion to storage, depletion, and requirement. Yield, as we use it, is the net release from the reservoirs, the water that would be put into a system immediately below a dam, available to the irrigators but not measured at the headgates. It is the net water released after evaporation and other reservoir losses. Diversion to Storage is the total diversion to the reservoir (inflow-outflow). It exceeds the water stored by evaporation and other losses through the storage period. Requirement, as we have used it, would be the same as yield if we had no shortages. If we have a shortage, then the yield is less than the requirement by the amount of that shortage whether we are considering it on a yearly basis or an average basis. Depletion to the river system (in this case we have been considering the system down to Bear Lake) would be the water diverted to storage in a particular year minus any return flow from irrigation of storage release for the same year.

On page 11 you will notice in the table that we show some negative figures on depletion and we also show that in dry years for a larger storage allowance there was less depletion to Bear Lake than for the smaller allowance, which seems inconsistent. The fact is that in dry years we have a very large release and consequently a larger return flow. Also, during the storage season we may have had a rather small diversion to storage because of holdover from the previous year, so actually we could have greater return flow than we had diverted into storage for a particular water year. It follows that with a larger storage allowance we have a larger release and therefore a larger return flow, so it is possible to have less depletion to Bear Lake in any particular year under a 60,000 acre-foot allowance than we do under a 30,000. (Note years 1931, 1934, 1940, 1954, 1958, 1961, 1966.)

(Comments on earlier studies, page 3, and last paragraph, page 4)

This bears out the fact that as far as supplemental requirement – and there may be some other related circumstances in the case of Sulphur Creek Reservoir – a larger requirement has not been evident, and the actual and simulated releases from these reservoirs are not much greater with a larger storage allowance.

(Comments on last paragraph, page 5)

In other words, when the water is needed in a dry year they do divert closely in conformance to the pattern that we assumed (in earlier studies) and cease diverting by about July 15, particularly from Woodruff Narrows Reservoir. And then the stored water is depleted so there is no water available for fall pasturage, which isn't nearly as important a requirement of course as that for making the meadow hay crop.

(Comments on page 6)

You will recall that Mr. Bishop mentioned, in presenting his motion to the Commission at the last meeting, the effect of doubling the upstream storage allowance;

and so, I have chosen 70,000 acre-feet as approximately double the allocation that we now have to Utah and Wyoming.

(Comments on report)

I think this about covers what Mr. Bishop asked for in his motion. If you have any questions, I will be glad to try to answer them.

MR. AXTMANN: On the chart on page 11 you have an average of 275,700 acre-feet storable in Bear Lake. Would it be a fair statement to say that based on the Harer record, 275,000 is storable in Bear Lake?

MR. JIBSON: Not entirely, because adjustments (for depletion from upstream storage) from 1958 to 1968 were significant in a few years, and also you will notice at the head of that column it reads "Storable in Bear Lake from All Sources". Now this means from the Bear Lake source also, so it would not be equivalent to the flow at Harer. In other words, as you recall in our segregation studies, we deduct all evaporation and other losses then compute remaining storable water to Bear Lake from its own tributaries as well as Bear River.

MR. AXTMANN: So actually the Decree would recognize about 11,000 acre feet as the outflow from Bear Lake and give that to Last Chance Canal Company, as I understand it, so perhaps the storable water in Bear Lake passing Harer is something in the order of 260,000 acre feet?

MR. JIBSON: On this basis, yes.

MR. PEART: These 43,000 new acres here, are they actually arable? All they need is water to irrigate them?

MR. JIBSON: That is my understanding from Mr. Olsen of the Bureau of Reclamation who is a soil specialist. He said that these are lands that we call arable - actually tillable lands that could either be converted from dry farm land or virgin land that could be tilled for irrigation and without pumping. For the most part, it is land that could be irrigated under gravity systems from known storage sites.

DR. KACKLEY: Mr. Chairman, first I want to congratulate our Assistant Secretary for doing an excellent job in his familiarity with the hydrology and management of the river. I think he brought out very consistently that to enter into any plans or changes on Bear River, for anyone to go into that who doesn't have a background of many years on the Bear River and fully understand the precarious position of Bear Lake as a reserve in the drought years - and there is no reason not to believe that it will come to recurring cycles again - that any changes on reserves up there are fraught with difficulty. This is particularly true, so we have massive filings on the river - a good bit of which is for exportation out of the basin - and also which are carried over to take over and exchange the present holdings on Bear River in exchange for those waters. Any difficulty or any error of 2%, 3% or 4% in the amount of water needed in these filings and over prolonged canals and dry years would make serious inroads upon the reserves of Bear Lake. It is very difficult in times of drought, as we learned during the drought of 1930-1935, for anyone to close the headgates on anybody who has

been using the water. We found that out in dealing with California when they took the water in larger canals out of Parker Dam. At the time of the drought we had to throw it together and divide up our water. This is particularly true with exportation out of the Basin which when taken out would be just as hard to get it back as you folks have had to get any reconciliation on any large canal that came out of Parker Dam a while back on the Colorado River. I was very much interested in this analysis of Wyoming and what I like to call the Uinta, Utah area which is actually a part of the upper stream which has very great rights in the river. 50,000 to 75,000 acre-feet of additional storage were cut down and, of course with the return flow, these two areas were given considerable water. We know that under the changed plans and changing tempo in the handling of the water that we are faced with a complete rethinking in water - it must be used up higher and that nonconsumptive use must give way to consumptive uses because the production of electric power is certainly substantially well founded now that we can go to the fossil for atomic fuel for electricity. Also we have municipal and industrial development that we must look forward to. The Upper States and you folks down below here, you are looking at on your Salt Lake area, are facing tremendous involvement on chemical development which are dependent upon water. We have an estimate in our Bear River portion of Idaho of only 20,000 acre feet needed for M & I to the year 2080. Actually Senator Budge and myself know that within the next 10 years our demand will be for 75,000 to 80,000 acre feet.

May I caution you. You gentlemen have a Compact, I was in the background of it, I did not help directly on it, but I had the pleasure of knowing good men like Dr. Person and my late friends Fred Cooper and Mr. Johnson who have been into this. That when you chose your advisors and commissioners that you chose men who have been long familiar with Bear River, and that this water is Compact water. You have the right to it, you have the right to management and I am sure the Federal government will back you up on it. Once water is taken out of the basin or once it is overappropriated we all will suffer.

Again, I would like to congratulate the Assistant Secretary for the excellent job he has done.

For the 60,000 or 70,000 acre feet of water that you can give to Uinta, Utah and Wyoming, just think what a replacement dam for the water that is brought into Utah from its origin in Idaho and Utah. Idaho and Wyoming and Uinta, Utah would help on this, a replacement storage low down where water is now copious, and very lucious underground supply of 100,000 or 150,000 acre-feet would return quite a bit of this water.

MR. TEICHERT: On behalf of Wyoming I think we ought to thank Wally for the effort he had made on this study. I am sure we'll give it considerable study and thought. I know Mr. Bishop was anxious to be in on this, and I am sure he would have expressed his appreciation.

MR. LAWRENCE: Utah also wished to express her appreciation. I think the report has been very carefully prepared and will be of value to the Commission and other interests in the State in deliberations.

MR. KUNZ: Idaho wished to express appreciation to Mr. Jibson for a fine job done, and I am sure this report that has been prepared will be studied by all of us.

MR. JIBSON: I might say for Reed's benefit (Reed Dayton) - I know he and I probably will get in a corner and argue a little about Smiths Fork - but in a study of this nature, it wouldn't matter too much whether we did or did not include Smiths Fork as an area of need. This in no way is attempting to tell you where to put your storage. Personally, I would be very happy to see water being stored on Smiths Fork. A number of times we and the Bureau of Reclamation people have discussed this matter together, and it is very difficult under the usual methods of assessing supplemental requirements on land to come up with enough requirement in enough years on Smiths Fork to justify setting up a storage operation or study. But I realize your problem of a large headgate requirement on gravelly soils, though it wouldn't have made any particular difference in this kind of an analysis.

MR. DAYTON: I am sure we all realize that one of the great sources of the Bear River is Smiths Fork and it does have the water to store and that is always an important factor.

MR. JIBSON: This 150,000 acre-feet that I mentioned above known sites - you will notice that 83,000 of that is above Woodruff Narrows and most of the balance, 35,000 to 40,000 acre-feet is storable from Smiths Fork, so there certainly is a large supply there.

MR. AXTMANN: There is a problem perhaps in finding uses directly for Smiths Fork storage but it seems to me that there is a lot of opportunity to provide storage to the uses downstream out of Smiths Fork and Wyoming that would appropriately perhaps come out of storage above Woodruff Narrows, and there is no other storage potential that wasn't mentioned here today I believe. In other words, Smiths Fork storage could be exchanged for storage in other areas.

MR. JIBSON: There could be some exchange, but we do have to keep in mind when considering exchange between the Upper Division and the Central Division, that under a priority system there would seldom be a time when the Upper Division would owe water to the Central Division under direct-flow rights. This is one reason we divided the basin at Pixley Dam. So, exchange between the Upper Division and the Central Division in exchanging direct-flow rights for storage (on Smiths Fork) would not be applicable, but I agree that there are possibilities for storage on Smiths Fork for other users below Smiths Fork.

MR. DAYTON: Certainly any storage on Smiths Fork or on the upper stream for that matter would be a great service to the Bear Lake area because they are dependent upon that water, as we are.

MR. JIBSON: In connection with this study - I didn't include anything in the report, but I did a little preliminary investigating as to flow changes we observe in the river system over the period of record, particularly with respect to changes in flow pattern since the Compact came into effect. This was done by comparing supply flow with flow at points farther down the river by means of double mass or accumulative curves. We note that the regulation in Wyoming (Central Division) in the drier years brings about more equal diversion rates with Idaho, and its the drier years in which we are particularly concerned. But rather surprising, since about 1940 if we plot the supply against flow farther down the river we don't see a great deal of increased use showing up in these curves of comparison, not as much as we might expect. In one section though, between Border and Stewart Dam the curve

indicated an increased depletion in this section which is puzzling because Idaho hasn't brought in much additional acreage. They have increased sprinkling in recent years in the section above Stewart Dam, but this is also true in the Wyoming Section of this division.

This isn't particularly pertinent to what I was asked to do, but it is of interest in the long-range hydrology of the system.

MR. DAYTON: I have noted in the report that in dry years the water that is allocated to Wyoming is nearly always used in our area, in the Smiths Fork area, although it hasn't always been so in the portion of the Idaho section, which definitely demonstrates our need of that water.

MR. JIBSON: That is right, There is another factor however that we've mentioned before. Under State law, Idaho diversions are reduced about the first of July when meadow rights are terminated which puts some water down the Rainbow Canal. It doesn't mean that the water users there wouldn't be using it in those dry years the same as they do in Wyoming if they were allowed to divert, but under their law the meadow right ceases about the first of July, so water has to go on down for other rights below Stewart Dam.

MR. DAYTON: Of course, this appears even before the July period, Wally.

MR. JIBSON: In better years it does. You will notice in my reports on Compact operation, the Idaho allocation is generally above their diversion, but because the water isn't there. When Wyoming is staying under its allocation, obviously Idaho's allocated water is going to be there, but part of the divertible flow (that is allocated) is in the Rainbow Canal which is considered as an Idaho diversion in computing divertible flow but is plotted separately in our hydrographs of Idaho diversions. (This could be misleading in the hydrographs on page 14 of Compact operation report, but as Rainbow Canal does not divert water for irrigation of land in the Central Division, it is preferable to show it separately from other Idaho diversions. With Wyoming diverting her allocation, Idaho can divert her allocation only if Rainbow Canal and Bear River below Stewart Dam are dry.)

MR. DAYTON: One more thought, I think the better advised we are on the whole system, the more wisely we can act in the future - the more knowledge we have, the better.

MR. HARPER: I would like to hear from Bob Porter, Utah Power & Light Company, at this time.

MR. PORTER: I would rather not commit myself until I have reviewed this a little further.

MR. MYERS: Let me say for the Wyoming group, I look on this as a very valuable start in getting together the necessary information that we will have to have if we are going to take a complete look at the whole river system and make the best use of it. I want to add my personal thanks to Wally for the job he has done. I am sure it is a fair unbiased report.

On page 4 of your report on the yield from Sulphur Creek Reservoir, I am a little at a loss of just what this net yield is.

MR. JIBSON: I didn't break down the yield from Sulphur Creek (in the 20,000 ac-ft). This is Sulphur Creek, Woodruff Narrows, and other Compact reservoirs.

MR. MYERS: What I was wondering about, what does this indicate that your yield by the enlargement was very little more than your original reservoir?

MR. JIBSON: So far, the use of the additional amount in Sulphur Creek Reservoir hasn't materialized. In other words, Marvin was taking just about as much out of the reservoir before it was enlarged as he is taking out now. (Release, 1958-64, 3,000 ac-ft - Release, 1965-68, after enlargement, 2,600 ac-ft.) There are several factors involved here.

MR. MYERS: I know what the chief factor is immediately, of course, We've had good water years since the enlargement (1964) and poor water years before.

MR. JIBSON: We've had some good ones and some bad ones; 1961 in the first period was extremely dry but 1962 & 1964 were good, 1965 was exceptionally good (after enlargement), but 1966 was dry, 1967 and 1968 were both good years. We've had two dry years, one in each period, but more below-average years before enlargement. But I wondered also if all of the reservoir shares have been sold yet.

MR. MYERS: Yes, I am sure all of the reservoir shares (below the reservoir) have been sold. There are still a few shares above the reservoir. (These are for exchange water and some delay due to the complexity of their canal system.) (Note: Part of parenthetical statement missed when transcribing.)

MR. JIBSON: It does tend to bear out this yield curve flattening off under present requirements, present supplies and present use. Of course, supply has been no problem in the reservoirs developed to date - Woodruff Narrows and Sulphur Creek have filled each year, and so the tendency to level off without much increase in yield as we increase capacity is primarily due to requirement. Actually, if we take the years from 1958 to 1964 and average the actual releases from Sulphur Creek Reservoir, then the years since 1964 we find that they average about the same.

MR. TEICHERT: Does this represent holdover storage?

MR. JIBSON: Yes, there is large holdover. Not only from designated holdover storage but there is holdover from nonuse of active storage. Holdover from the year just prior to each dry year is one reason, on page 11, we can pick out the dry years and see that the depletion from 70,000 acre feet is less than the depletion from 40,000 acre feet.

MR. MYERS: If you put the Sulphur Creek history, which of course if very short, on the same base period as you do the Bear Lake reserve - this period of dry years - I am sure that the picture there would be entirely different because this is a series of pretty good years, whereas the base period used there were the driest years ever on record.

MR. JIBSON: Our conclusions and the figures that are significant here are on the 1924 to 1968 period. The Bear Lake reserve is based on the 1930-35 period, the five driest consecutive years of record.

MR. MYERS: When you use Sulphur Creek as an example, the original allocation was on the basis of 1 acre-foot per acre of storage water, whereas all of our other lands are less than $\frac{1}{4}$ an acre-foot per acre. In other words, if we could get for all of our other lands the same thing that Sulphur Creek has now for irrigation, with no looking ahead to future industry, we would have all we need. So Sulphur Creek yield, you can explain on good water years and four times the allocation per acre.

MR. JIBSON: I was a little hesitant to bring the new land picture into this report. I don't want to add complications to issues, but it is a reality. I was a little surprised that we had this much arable land that is not irrigated. But, even though this was a reconnaissance study by the Bureau (Reclamation), it was fairly detailed and probably reliable, and I felt that new land should be considered in such a study because there is nothing in the Compact, gentlemen, that says additional storage must be used as supplemental supply on existing irrigated lands. Though it has been sort of understood that storage was going to be used on existing irrigated land. The old timers here will remember the discussions that came up years ago as to whether any limitation should be put in the Compact on new land, and it was thought advisable that no limitations be included.

So I thought it best to include it in this study. Whether it is something that is feasible or something that will become feasible, I don't know.

MR. MYERS: I think it certainly should be included. All facets of it is just an exploration, you are not deciding anything, you are just getting the picture.

MR. SKEEN: I have a couple of questions on this tabulation on page 11. Would you explain these minus figures, 1966 for example.

MR. JIBSON: The previous year 1965 was very wet, 1966 was a fairly dry year. This means that in the storage period for 1966, from October 1, 1965 through the spring high water, there would have been (under a similated operation) a large holdover from 1965 in these reservoirs, so they stored only a relatively small amount. Maybe under this 70,000 acre-foot allocation they might have stored only 5,000 or 6,000 acre-feet because of holdover from a real good year in 1965. Yet in 1966, being dry, there would be a release of all available water to take care of the large supplemental requirement. From this large release there would be a high return flow. To calculate depletion, we subtract return flow (from released water) from the diversion to storage in the previous winter and spring. So, the diversion to storage may have been about 5,000 acre-feet, and we may have had 20,000 acre-feet return flow from 70,000 acre-feet released or more return flow than was diverted to storage in that particular year. So it is possible to come up with a minus figure of depletion in a few years. The more storage allocation the larger the minus figure in a year such as 1966 because you have more water in the reservoirs to release for this extra need in the dry year which results in a higher return flow.

MR. AXTMANN: On page 1, speaking of Bear Lake irrigation draft during the critical historic period and the amount of inflow, the only comment I would make is what I would consider the present operation of Bear Lake where the total river is diverted into the Rainbow Canal and not allowed to spill over Stewart Dam, I think your 860,300 acre feet that is delivered from storage could have very well have been increased by some 500,000 or 530,000 acre-feet more. In other words, under today's operation you could have gone into that drought period with another 500,000 acre-feet in Bear Lake as storage.

MR. JIBSON: We know from our earlier studies in formulating the Compact that quite a lot of water was used for power prior to this critical period and this started the lake on its downward trend. They were good years, then to, our hindsight of course is always better than our foresight. My main purpose in citing these figures (leading to the irrigation reserve) was for the benefit of all the new commissioners to show you how we arrived at the reserve, and by your seeing this derivation, you can see not only its value but also its limitations. We know that history would have to repeat itself exactly, not only supply but requirement, if we had exactly the same conditions on the Lake. Of course, this is so remote that we don't even consider it. But, the reserve is an amount that irrigation has first claim to, and it is an important quantity. But still, the actual quantity is based on a condition that won't be repeated again.

MR. AXTMANN: If we were to take today's demand on the storage in the lake, have you given any thought to the firm yield the present level of storage would provide?

MR. JIBSON: Had time permitted, I would have gone into this concept in this report. I did have the intention of exploring this a little and seeing what changes in the reserve, if any, might be warranted. We weren't assigned to do this in the study, but it is of interest, and I am sure there would be some interesting information come out of such a study.

CHAIRMAN LARSON: I would assume that this Commission would like to receive this report.

MR. KUNZ: Mr. Chairman, before we receive this report may we have a brief recess for discussion in our groups?

(The Commission recessed for approximately four minutes.)

MR. KUNZ: Mr. Chairman, I move that we receive this report for study and request, inasmuch as Mr. Jibson has indicated that there is other information available where this ended to Bear Lake, that that be forthcoming in another meeting.

MR. LAWRENCE: I'll second that motion.

Motion carried.

MR. SKEEN: This in essence then is a request for Mr. Jibson to make a similar report on the next section of the river?

MR. LAWRENCE: I seconded the motion on the assumption that he may have some supplemental information that would add to the value of the report, and if he does, we would welcome it.

MR. JIBSON: You are referring to the irrigation reserve and perhaps land (increased usage) between Stewart Dam and the Wyoming border?

REPORT OF LEGAL CONSULTANT

Mr. Skeen had no report to make to the Commission at that time.

REPORT OF COMMITTEES

None of the committees had any report to make.

NEW BUSINESS

Report of Great Basin Framework Studies

CHAIRMAN LARSON: Under New Business, Mr. Lawrence, I believe you have someone prepared to inform the Commission as to this new State-Federal Committee that has been set up, how it is organized, and its purpose.

MR. LAWRENCE: The State-Federal group studying the comprehensive framework studies for the Great Basin is headed and chaired by the States of Utah and Nevada. This year Mr. Ed Haycock who is the Planning Director for the Division of Water Resources of Utah is the Chairman of this study group, and we are prepared to have Mr. Haycock make a report.

Prior to doing that, Mr. Chairman, I would just like to say that if Idaho or Wyoming desire to have a caucus, or if your planes don't leave until this afternoon and you want to meet together, we would be glad to furnish you some meeting rooms.

We will turn the meeting over to Mr. Haycock now as Chairman of the Great Basin Study Group.

(Mr. Haycock passed out a brochure entitled, THIS LAND, THIS WATER, THIS WEST, published by the Pacific Southwest Inter-Agency Committee, Coordinated Planning Subcommittee.)

MR. HAYCOCK: Let me start by passing out some of these brochures. I think they will be helpful, and I'll talk a bit from them.

I asked Mr. John Bradshaw of the Soil Conservation Service to come up today to keep me out of trouble if I should say something I shouldn't. Mr. Bradshaw is chief of the staff that is associated with this activity and is quite close to it on a day-to-day basis.

I know that some of you here are well acquainted with the Type I studies that are underway in the nation, but I am going to assume that not all are familiar with it, and take you back to the beginning. Along in the early 1960's Senator Kerr from Oklahoma was Chairman of the Senate Select Committee on water, and held a number of hearings around the country and wrote a series of reports on the nation's water problems as he saw them at that time. One of the things they recognized was that, even with all the work we've done, we still don't know enough about our water resources, especially we don't know about them on a basin-wide basis. We've got lots of individual studies, individual projects in individual areas, but we need a broader understanding of water supply and water use. So they recommended that the nation undertake a series of studies of each of its stream basins. You people in Idaho, of course, are involved directly in the Columbia River Basin study. Wyoming sits right on the divide and it is about equally divided between the studies underway now in the Missouri Basin, the Colorado Basin and the LaPlatte River Basin. These studies are underway all over the nation in line with the recommendation of the Kerr Committee.

The Pacific Southwest area is made up of four different regions: The Upper Colorado Region covers those parts of the Colorado River basin in the States of Arizona, Colorado, New Mexico, Wyoming and Utah above Lee Ferry, Arizona, plus the Great Divide closed basin of Wyoming. The Lower Colorado Region covers most of Arizona plus adjoining portions of New Mexico, Nevada and Utah. The California Region covers the State of California plus the portion of the Goose Lake, Klamath River and Smith River basins extending into Oregon. The Great Basin Region covers nearly all of Nevada and the western half of Utah, it also includes the Bear River Basin portions of Wyoming and Idaho.

These studies are being done under the general direction of the Pacific Southwest Inter-Agency Committee which in the northwest area is comparable to the Columbia Basin Inter-Agency Committee that was in existence before the river basin commission was established. We've set up under the parent Pacific Southwest Inter-Agency Committee an association or group of State and Federal agencies to direct each of these four studies. We have a State-Federal group for the Great Basin with each of the interested States as members and each of the interested Federal agencies as members. The direction which we have from the Water Resources Council in Washington is that all inter-state compact committees and inter-state bodies are also to be members of the group that guides these studies. We have the Bear River Commission as one of these groups. We see that the Bear River Commission is invited to all meetings and receive copies of the minutes of all meetings. We are trying, as a group, to involve everyone who has any interest or concern in the Great Basin, and that includes the Bear, in this activity. Idaho has designated representatives to the State-Federal group and to some of the work groups. Wyoming is also participating. But the bulk of the area is Utah and Nevada, and so Idaho and Wyoming have relatively less interest in this in terms of total area, but they have a very strong interest insofar as the Bear River is concerned.

Just to give you an idea of what's in these studies, this brochure lists the goals and elements of the study. These are standard, each of the studies are being done in much the same way. There will be a projection of economic development in the basin from 1980 to 2000 and 2020. There may be more than one projection depending on different ideas as to what the future looks like, we will

try to appraise what the alternatives may be. We will translate those economic projections into a water requirement, so much per capita, so much for the various kinds of industries, etc, so then we will have an estimate of the water which will be needed at each of these three time periods, assuming the growth materializes as projected. There will be an inventory of the quantity of water which is available as well as the quality also. We will address ourselves to an inventory and projection of available land and other resources: minerals, timber, electric energy, etc. An outline of water and related land resource problems. These problems could be be anywhere from interstate problems, land drainage, or salinity problems, water quality problems, transportation as a deterrent to economic growth or other kinds of problems. Then there will be a general, and rather preliminary, outline of how the needs will be met, how the problems will be solved, and what kind of works will be required in the region.

Under "Facts and Figures" in the brochure there is a list of appendices that will be developed, and these will be done as a cooperative effort by the States and Federal agencies. There is a decided effort to pay attention to all of the resources, to all of the future needs, and to all of the opportunities for growth and development in the region. The subjects for these appendices are:

The Region and its History
Economic Base and Projections
Irrigation and Drainage
Mineral Resources
Navigation
Water Quality, Pollution and Health
Fish and Wildlife
Watershed Management
Legal and Institutional Environments
Water Resources
Land Resources and Use
Electric Power
Flood Control
Shoreline Projection
Recreation
Municipal and Industrial Water
General Program and Alternatives

The Department of Agriculture; the Corps of Engineers, the Department of Army; the Department of Commerce; Federal Power Commission; Health, Education and Welfare; Housing and Urban Development; Department of the Interior; Labor and Transportation are all participants to a greater or lesser degree in the study. Some of the departments such as Labor and Transportation, don't participate very much. Interior, Department of the Army, Agriculture are very active participants, and then there are four or five states are also active participants in this.

As Chairman this year of the State-Federal group, we encourage the participation of this Commission to whatever extent it can and wishes to do. Certainly we want the Commission to know that you are welcome to participate with us and give us the benefit of your knowledge. Certainly we will want to draw upon the data in the files as time goes on. One of the appendices that has to be prepared

is one called "Legal and Institutional Environments", and the Bear River Compact and operation of the Bear River Commission will be one of the matters that has to be covered in this appendix to identify what the restraints are on this basin, how we are operating it, and what problems, if any, there are.

CHAIRMAN LARSON: The main interest, of course, is to receive the reports that are prepared that relate to the Bear River System. You have many, many committees working on different subjects. I have received a letter, but not many copies. As I understand it all of your appropriate state agencies will have copies of certain reports, so I never answered that letter pending this meeting to see what your ideas of what reports ought to be received by members of this Commission.

MR. HAYCOCK: The Commission is on the mailing list to receive specified copies of appendices, drafts, whatever is generated. There's going to be a lot of paper.

CHAIRMAN LARSON: One to each State? As you know there are three commissioners from Utah.

MR. HAYCOCK: If I remember correctly, there is a copy going to the Chairman. I don't believe they are sending copies to each member of the Commission. I think we would look to the Chairman to keep the Commission itself advised of any problems that the Commission felt it need involve itself with or any contributions.

CHAIRMAN LARSON: This brings up another point, the Commission has no operating fund at all.

MR. HAYCOCK: Yes, I understand this. Each State, through its water agency, or designated agency, also receives all of this material, and is invited to participate in the work groups wherever it can and feels it should.

CHAIRMAN LARSON: Then the main point would be the Chairman of this Commission see that they are informed through the State agencies, or how am I going to get reports to them?

MR. HAYCOCK: Now we could agree to send this material to each member of the Commission. I think 90% of this material is just stuff that the Commission wouldn't be interested in.

CHAIRMAN LARSON: Then if one person received all this material and decided that something would be of interest to the Commission, could they request additional copies for Commission members?

MR. HAYCOCK: We would certainly, if the Chairman felt he would like additional copies, we would see that additional copies of this material were made available. We are still away from the report stage. Now in due course we will start getting material available for review. When that time comes then you will receive copies for review, and I would assume that you would probably want to refer one to your attorney, one to the Secretary-Treasurer, and Assistant Secretary and get some feedback from them. Perhaps we should, at that time, consider one copy for each of the State delegations.

MR. LAWRENCE: Ed, is some member of the Commission directly involved in each of the States like Floyd Bishop?

MR. HAYCOCK: Bishop's office is directly involved. Robert Lee's office is directly involved.

MR. LAWRENCE: So we could carry the main burden of notifying the members individually through the States, couldn't we?

MR. HAYCOCK: I would think so. However, the Commission is a member and a member of the Commission could be designated as a liaison with us to come to our meetings whenever the agenda for that particular meeting seemed to be important to the Commission.

CHAIRMAN LARSON: I was just anxious to keep the Commission informed at the least expense to everyone.

MR. HAYCOCK: I think we would do this, anything we thought was of concern to the Commission, as we go along and a work group begins to put out some material that deals with the Bear River and we recognize some the interstate kinds of problems we have, we would make a special effort to make sure you were aware of this material or of this meeting or that you received enough copies for use. I think we could assume this kind of responsibility, but beyond that I think we would want to look to the Chairman or someone the Chairman designated.

CHAIRMAN LARSON: Any comments from the three States? If there are no objections, the Chairman will operate that way.

Discussion of meeting dates for Bear River Commission

CHAIRMAN LARSON: We have one more item on the agenda and that is a discussion of meeting dates.

MR. LAWRENCE: Mr. Chairman, as Mr. Jibson has mentioned we had a meeting scheduled for November 25th this year and it was postponed at the request of Wyoming because I understand that Wyoming has a Statutory water hearing by the State Board of Controls. So the thought occurred to me that maybe we could select officially a meeting date that would not conflict with that and we would not have to rearrange the meeting.

MR. JIBSON: It is statutory now that the Commission meet on the fourth Monday in November. That was changed from the fourth Monday in October at my request to give us more time to get the yearly compact operational data summarized, so it should not be a date earlier than this. If you want to change, I would suggest a date sometime in December.

MR. LAWRENCE: Maybe the attorney should tell us if we can legally do this or not.

MR. SKEEN: The meeting dates are established by the Bylaws of the Bear River Commission. Article IV, under the heading "Meetings" provides that the annual

meeting of the Commission shall hold a regular meeting on the fourth Monday of November of each year. That's subject to change by a vote of the Commission.

MR. TEICHERT: We've had a couple of problems the last couple of years, but its really been the Western State Engineers' meeting that has fouled us up on our Board of Control meeting, so we don't anticipate that we'll have a conflict next year with the Bear River Commission meeting.

MR. LAWRENCE: In that case, I withdraw my recommendation.

(The meeting adjourned at 12:00 noon.)

REPORT TO BEAR RIVER COMMISSION
December 16, 1968

Wallace N. Jibson
Assistant Secretary

1968 Water Supply and Compact Operation

Water Supply

Total irrigation season supply above Bear Lake exceeded a longtime average by about six percent with most of the snowmelt runoff being delayed until June (See figures 1 & 2). Late snowmelt usually results in a larger portion of the peakflows being used for irrigation and a smaller portion reaching Bear Lake. For instance, in the hydrographs of Bear Lake (figure 3) is shown the small gain made by the Lake after May 1 as a result of Bear River supply reaching the Lake amounting to only 58 percent of that in 1967. Yet, for the same period, the runoff above diversions from Bear River and Smiths Fork was 82 percent of that in 1967.

Extreme contrast is noted this year in the runoff from Bear River main stem and from Smiths Fork in that the river yielded 128 percent of average against 82 percent from Smiths Fork. This trend toward lower comparative runoff from Smiths Fork has continued for the past four years and apparently is due to some change in storm pattern. The following table shows seasonal and water-year runoff at gaging stations representative of upper, middle, and lower portions of the basin.

Runoff in Acre-Feet

May - September

	1967	1968	Average 1943-68	1968 as Percent of Average
Upper Bear River	155,300	146,700	114,800	128%
Smiths Fork	129,100	87,200	106,700	82%
Logan River	141,400	113,400	117,700	96%

Runoff in Acre-Feet

1968 Water Year

	1967	1968	Average 1943-68	1968 as Percent of Average
Upper Bear River	176,200	169,600	136,900	124%
Smiths Fork	157,200	120,400	138,600	87%
Logan River	189,600	172,000	177,000	97%

Forecasts of runoff as of May 1 compared with measured runoff are shown in the table below. Variation between the forecasts and actual runoff is somewhat less than in recent years but again reflects the importance of late-season precipitation.

May - September Runoff in Acre-Feet

	Measured	Weather Bureau Forecast	SCS-Coop Forecast
Upper Bear River	146,700	124,000 (-15%)	126,000 (-14%)
Smiths Fork	87,200	--	91,000 (+ 4%)
Logan River	113,400	104,000 (- 8%)	100,000 (-12%)

Reservoirs

Bear River water storable in Bear Lake was bypassed from October 1 until mid-January, and in addition about 114,000 acre-feet of storage was released from the Lake. Storage in the Lake began when the corresponding level of 1967 was reached as shown in figure 3, but as mentioned before, early gain from snowmelt was less than would be expected, and the Lake peaked at 5,921.23 feet (1,251,000 acre-ft) which was lower than in recent years (See inset graph). Even so, large inflow after the draft began coupled with below-average irrigation requirement resulted in an end-of-season level almost equal to that of 1967.

Woodruff Narrows Reservoir filled to spillway crest early in March (figure 4) after some storage was released in November to compensate Bear Lake for storing in 1967 in excess of the allocation. Storage of more than 7,000 acre-feet from mid-August through September 30 ordinarily would have been in violation of some

direct-flow irrigation rights below Bear Lake and thus in violation of Article V of the Compact. August storms however, resulting in unusually high inflow to Woodruff Reservoir, eliminated irrigation demand on Bear Lake until mid-September and resulted in over 35,000 acre-feet being diverted through the Cutler Power Plant. Thus, it is unlikely in this instance that any direct-flow irrigation rights were affected, but closer regulation of Woodruff Reservoir should be maintained to balance inflow and outflow during the irrigation season when stored water is not being released.

Sulphur Creek Reservoir was utilized for only a small supplemental supply this past season, and Whitney Reservoir remained full throughout the season.

Streamflow Distribution

As would be expected in the Upper Division with above-average supply and late runoff, no problems in regulation were evident. Figure 5 shows diversion and compact allocation in Upper Wyoming Section in which interstate regulation was in effect for most of May and after July 16. Allocation in the latter period was increased by the unused 9.6 percent from Lower Wyoming, and compliance was obtained without restricting any individual diversions.

Figure 6 shows similar data in Lower Utah Section and in figure 7 for Lower Wyoming Section. Here, as frequently occurs, Lower Wyoming was unable to divert her full allocation for a short period in May while Utah was diverting in excess of her allocation. This occurred from May 19 to 27, but regulation in Utah for these short periods is difficult and quite impractical, especially with the time lag in flow movement between the sections and the necessary delay in collection and computation of diversion records and total divertible flow in the entire division. We feel that in most years nothing is gained in regulating during this short period of delay while the increasing supply is filling Utah canals before reaching the Lower Wyoming Section.

Central Division hydrographs are shown in figures 8 and 9 in which about the same dates of regulation are shown to be in effect as in the Upper Division. Divertible flow was below 870 cfs during most of May and again after July 20. Flow passing the Border gage was below 350 cfs the last half of May and after July 23. Wyoming diversions were below compact allocations during both periods of regulation and, for the most part, compliance was accomplished with a normal rate of diversion. This is a little unusual with only 82 percent supply out of Smiths Fork but this shortage was offset by late runoff and the 128 percent supply from the Upper Bear River which was reflected in the high flow passing Pixley Dam in July (See figure 7).

Stream-Gaging Program

Gaging stations operated for Utah Water Research Laboratory were discontinued this year (with one exception) as funds were stopped as of July 1. One of these stations on Little Bear River above Davenport Creek is being continued for a few years as a secondary station for correlative purposes in determining the flow from Davenport Creek. No other changes were made in operation of regular gaging stations, but additional structures with recorders were installed on canals in the Upper Wyoming Section, and a marked improvement in 1968 records has been noted.

Applications for Appropriation

On the last three pages is summarized applications to appropriate water as submitted by the State Engineers. Most of the Utah applications are for underground water development of relatively small amounts in Cache and Box Elder Counties. The largest amount is by the Richmond Irrigation Company to divert 5.0 cfs from Cub River a short distance above its confluence with Bear River.

Among the Idaho applications is one for municipal use by the City of Preston to divert from Cub River 80 cfs for storage in a 3,500 acre-foot reservoir. This application has been protested and is pending. The summary form submitted does not show location of the dam. In addition, an aggregate of 33 cfs has been filed on for irrigation in Bear Lake, Caribou, and Oneida Counties.

Footnotes below the Wyoming tabulation indicate that only the last two applications are being presented to the Commission for the first time. One of these is for a rather large stock reservoir but it is still within the 20-acre-foot limitation of the Compact.

UPPER DIVISION - BEAR RIVER SUPPLY

Cubic Feet Per Second

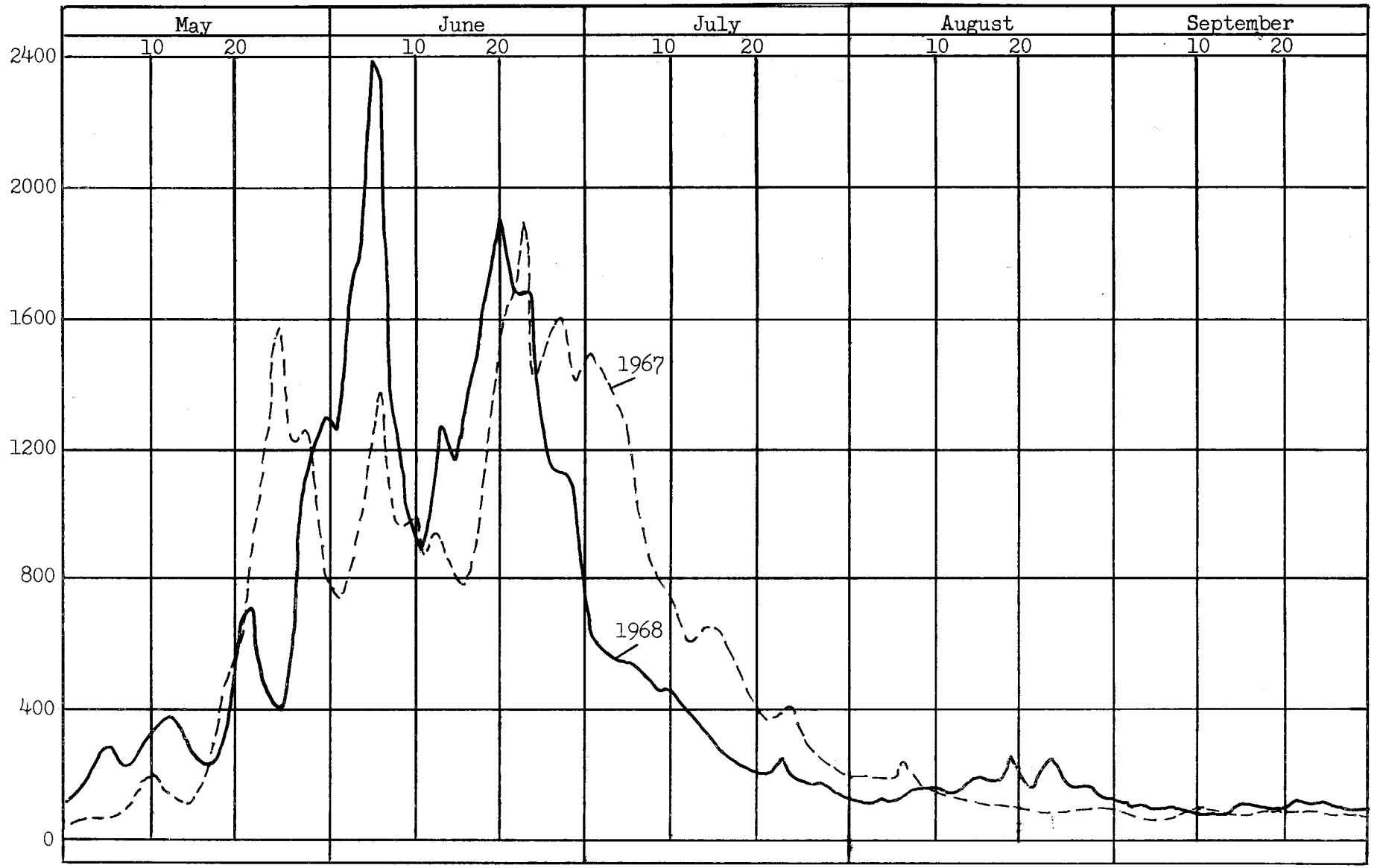

Figure 1

CENTRAL DIVISION - SMITHS FORK SUPPLY
Cubic Feet Per Second

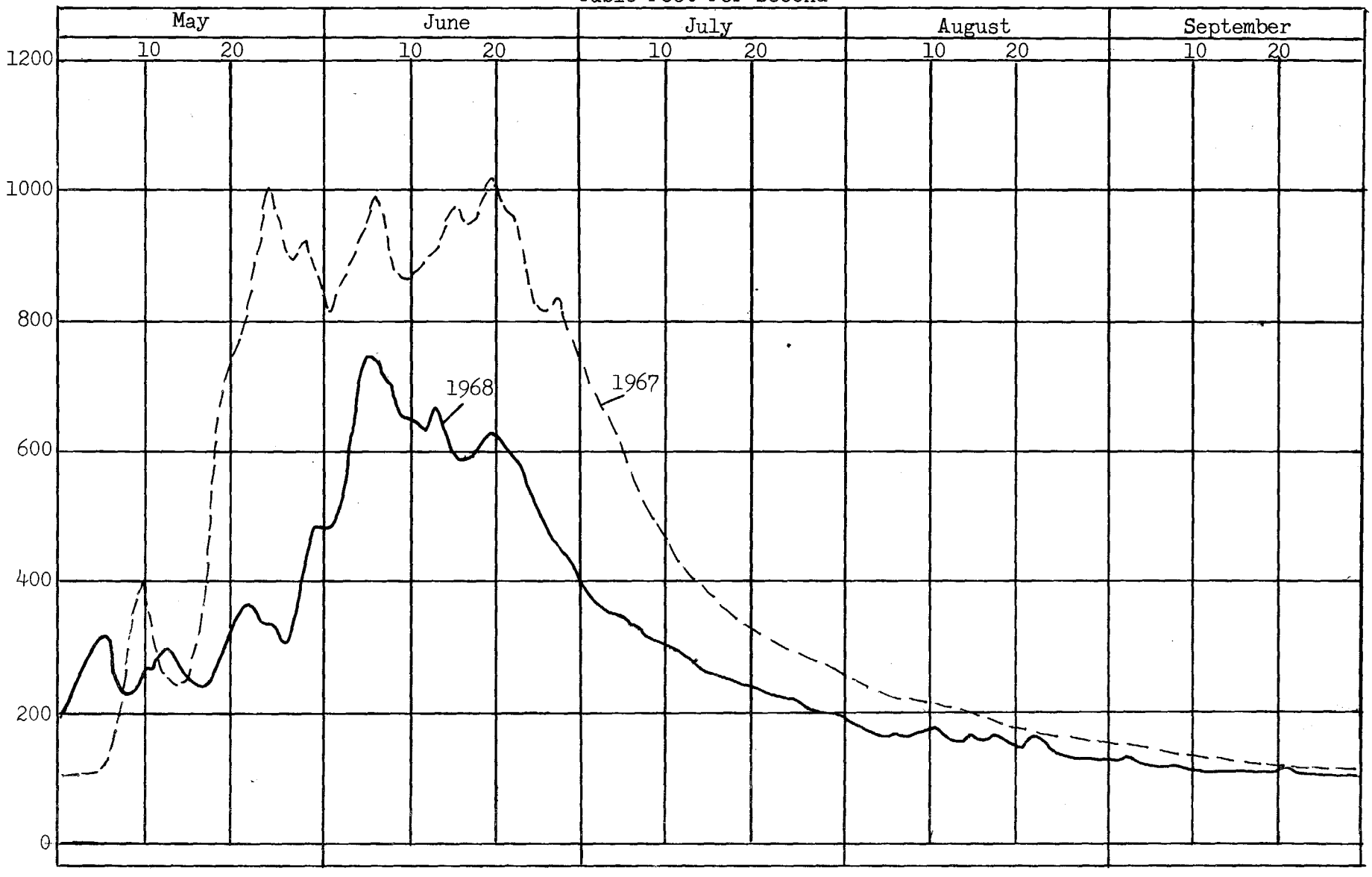

Figure 2

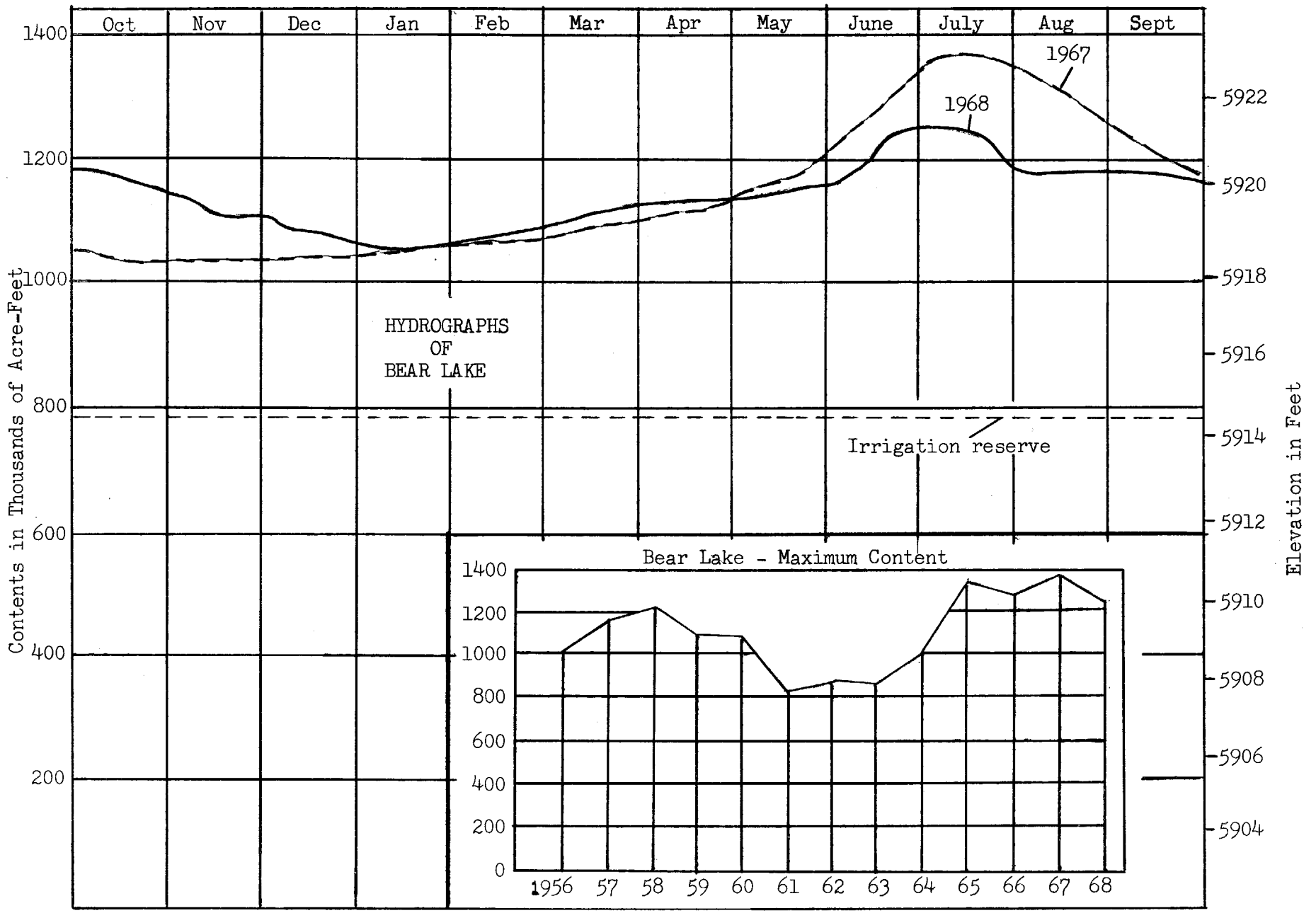
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
June
July
Aug
Sept
1400
1200
1000
800
600
400
200
Contents in Thousands of Acre-Feet
5922
5920
5918
5916
5914
5912
5910
5908
5906
5904
Elevation in Feet
1967
1968
HYDROGRAPHS
OF
BEAR LAKE
Irrigation reserve
Bear Lake - Maximum Content
1400
1200
1000
800
600
400
200
0
1956
57
58
59
60
61
62
63
64
65
66
67
68

Figure 3

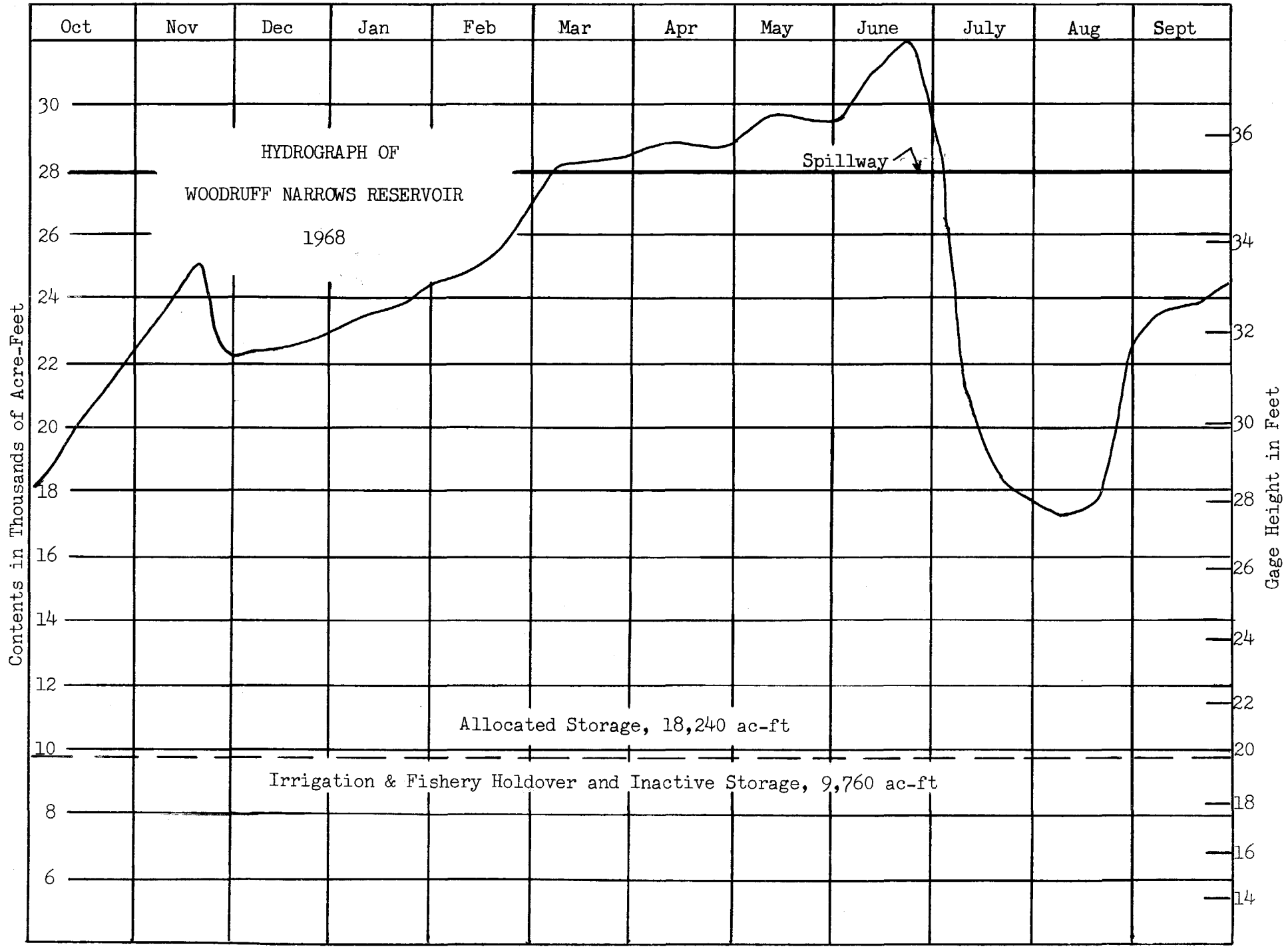
HYDROGRAPH OF
WOODRUFF NARROWS RESERVOIR
1968
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
June
July
Aug
Sept
Spillway
Allocated Storage, 18,240 ac-ft
Irrigation & Fishery Holdover and Inactive Storage, 9,760 ac-ft
Contents in Thousands of Acre-Feet
30
28
26
24
22
20
18
16
14
12
10
8
6
Gage Height in Feet
36
34
32
30
28
26
24
22
20
18
16
14

Figure 4

UPPER DIVISION - UPPER WYOMING SECTION

Cubic Feet Per Second

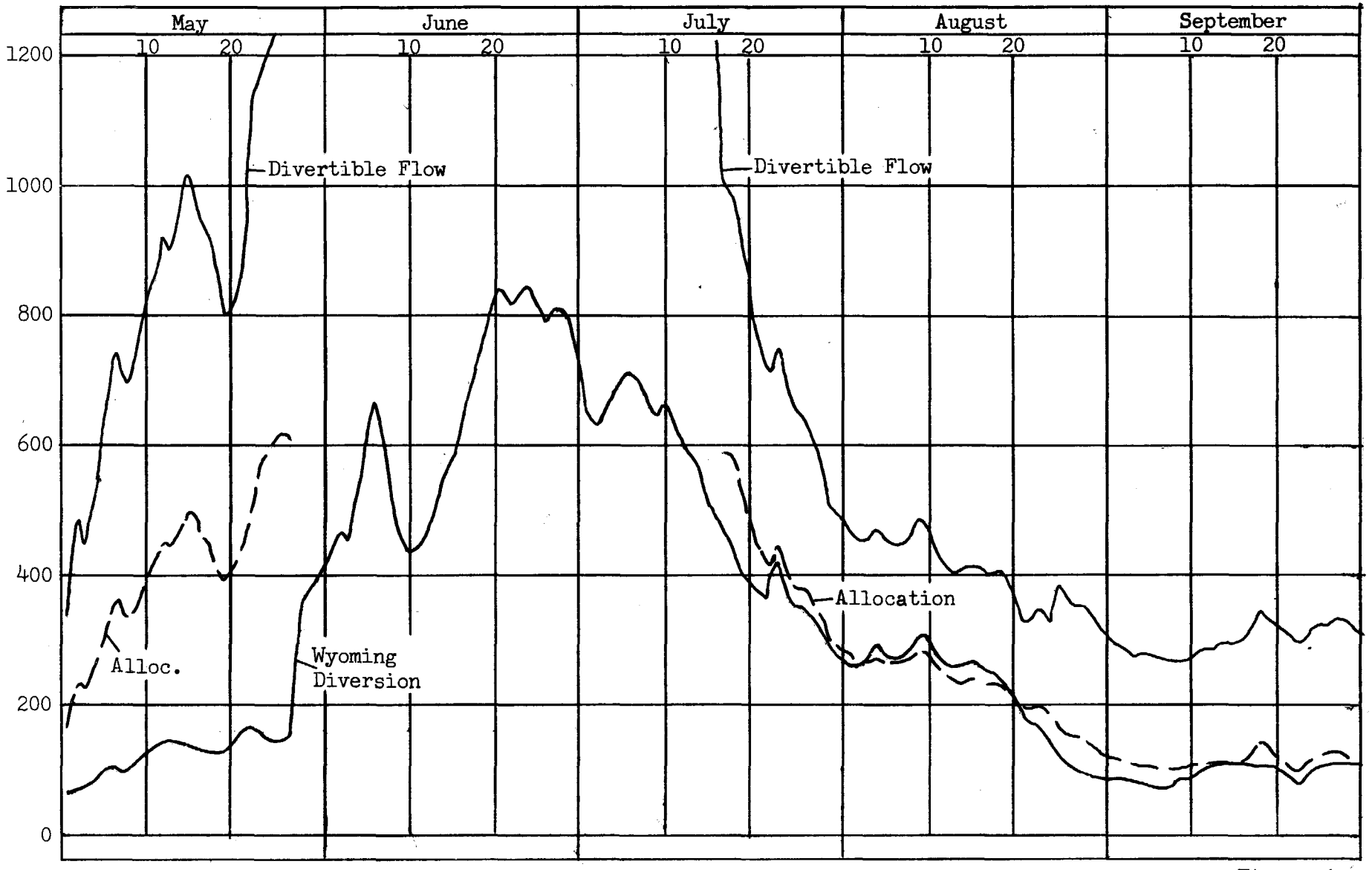

Figure 5

UPPER DIVISION - LOWER UTAH SECTION

Cubic Feet Per Second

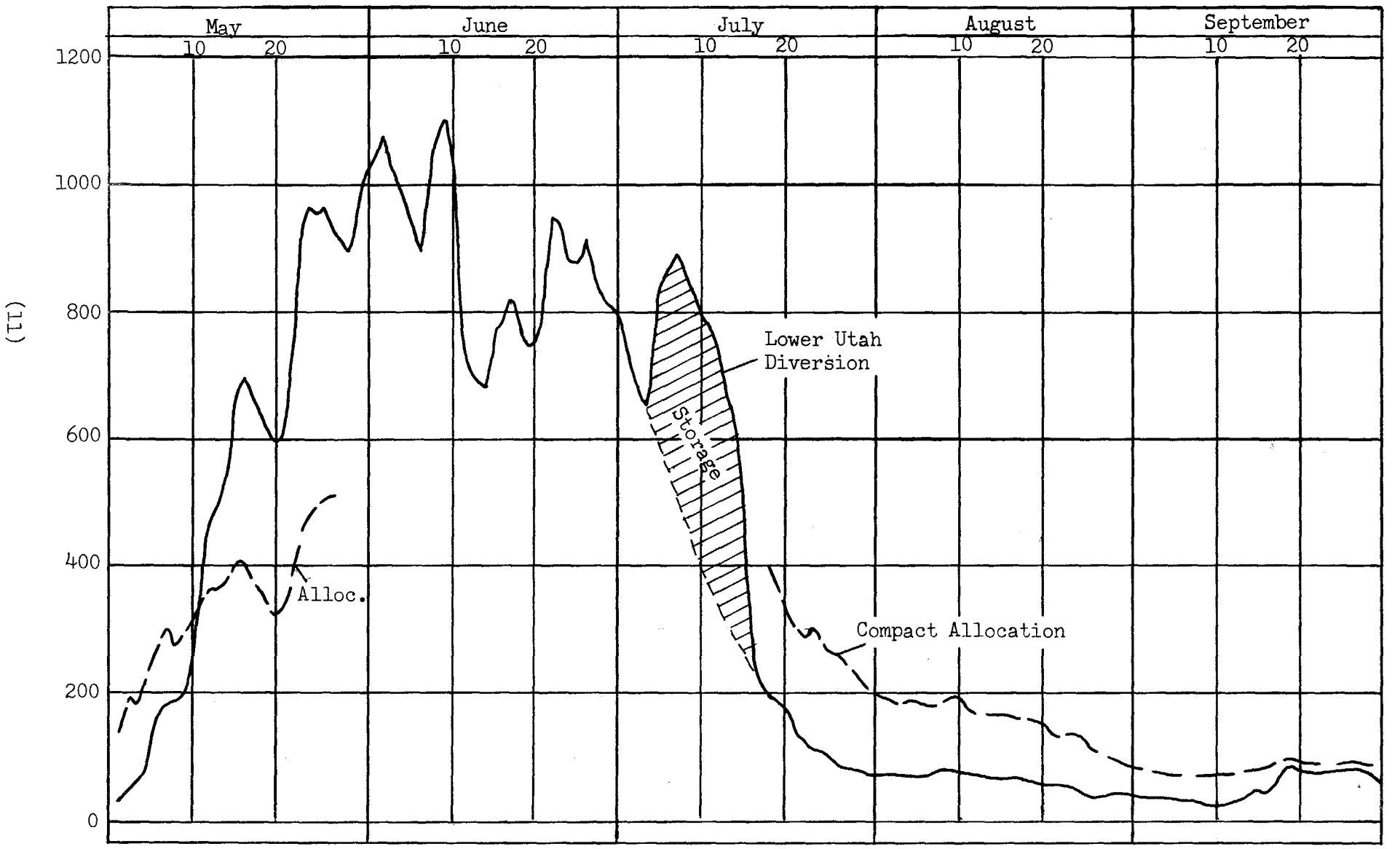

Figure 6

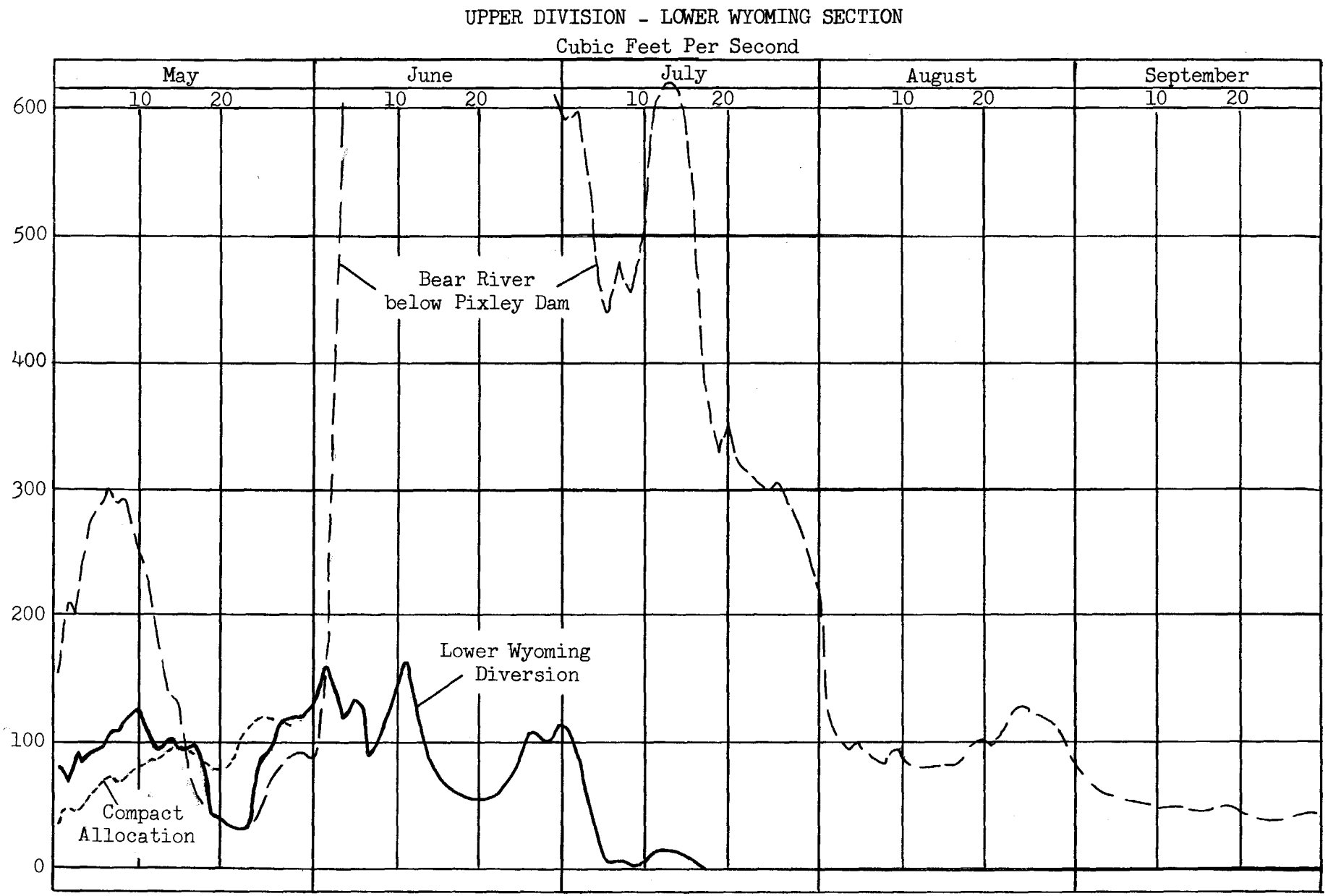
UPPER DIVISION - LOWER WYOMING SECTION
Cubic Feet Per Second
May
June
July
August
September
10
20
600
500
400
300
200
100
0
Bear River
below Pixley Dam
Lower Wyoming
Diversion
Compact
Allocation

Figure 7

CENTRAL DIVISION - WYOMING SECTION

Cubic Feet Per Second

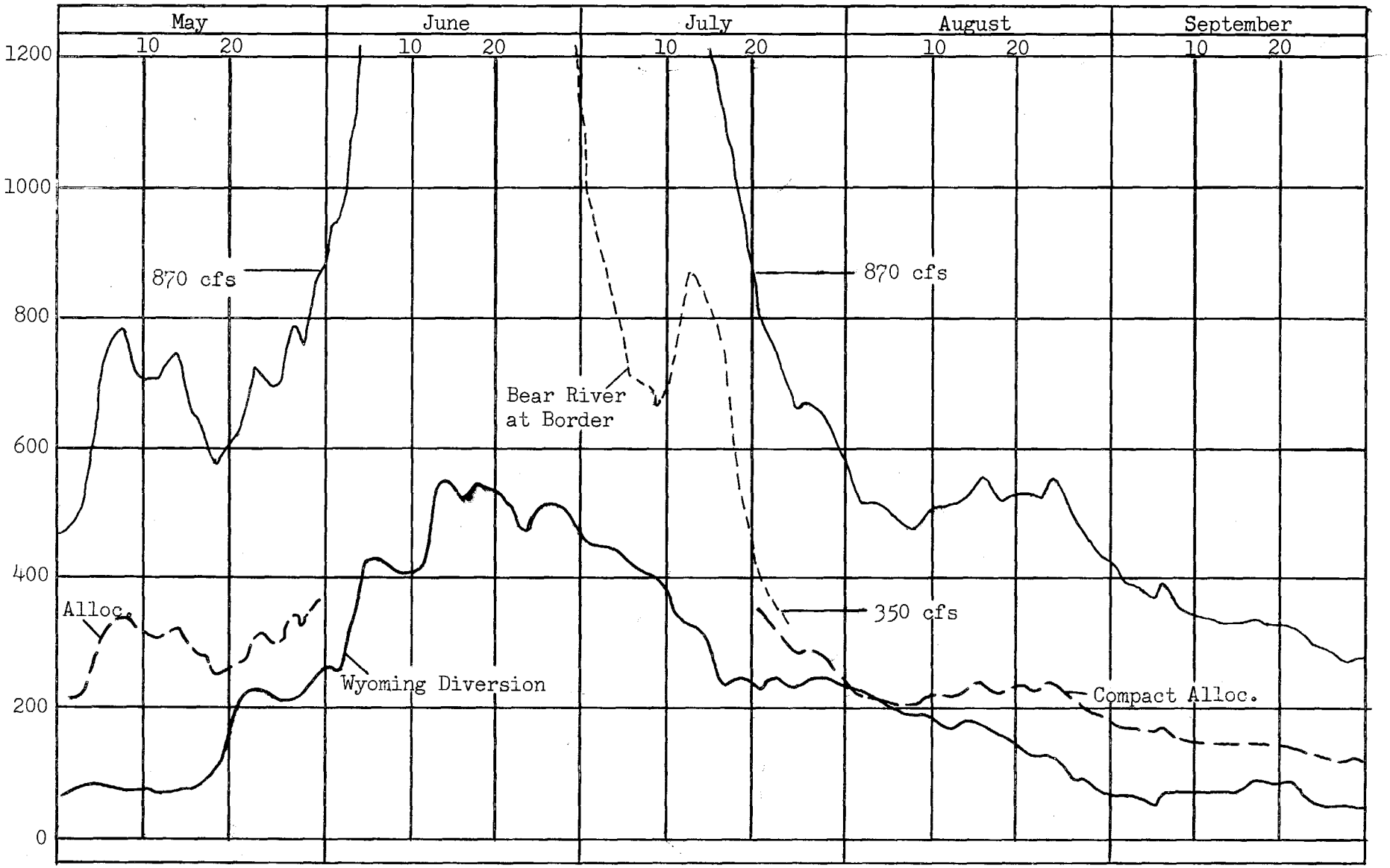

Figure 8

CENTRAL DIVISION - IDAHO SECTION

Cubic Feet Per Second

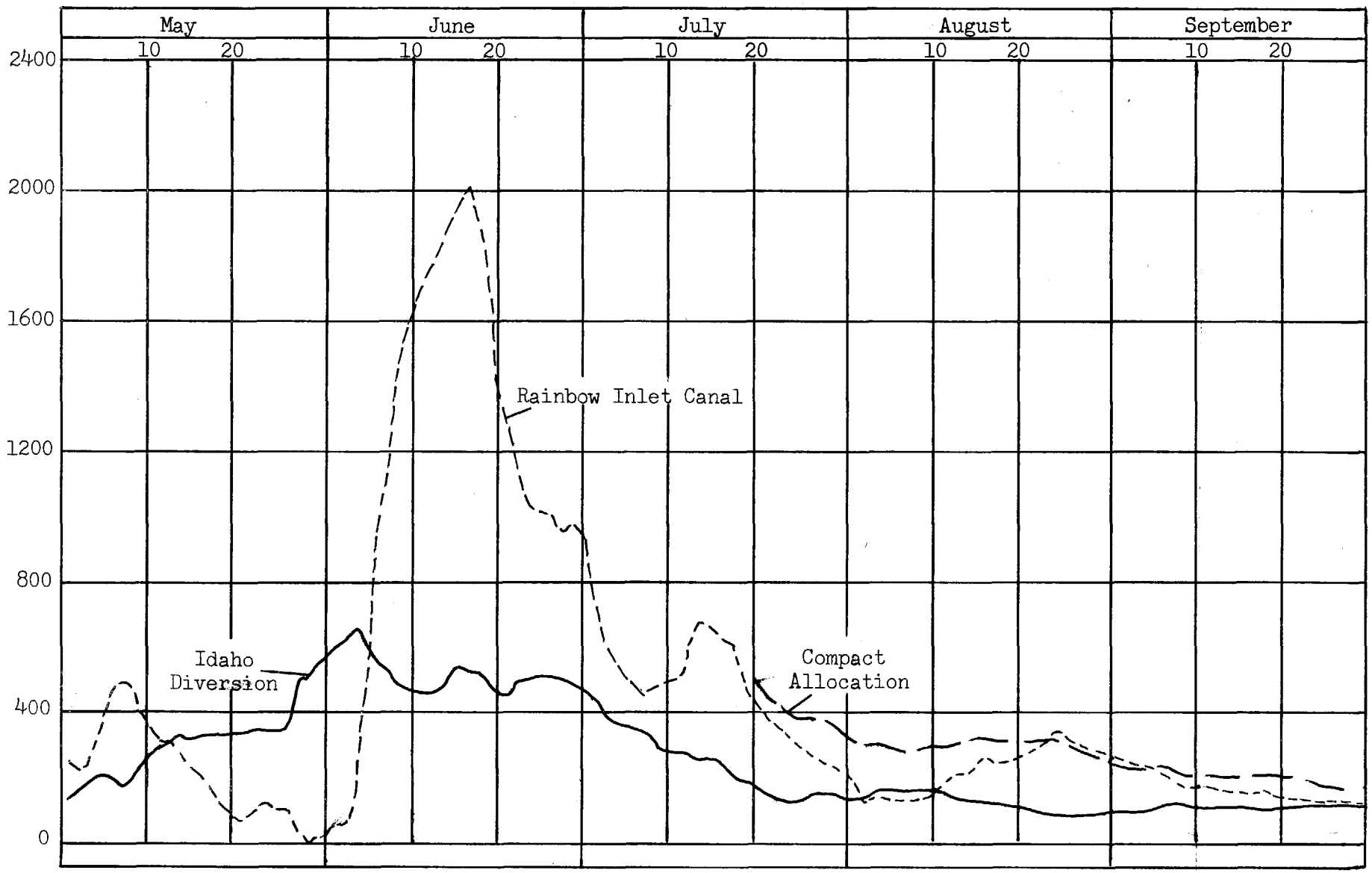

Figure 9

Appl. No.	Date of Filing	Name	Source	Use	Location	Amount (cfs)
			STATE OF UTAH			
38743	4-10-68	Brent & Jeanenne Nielsen	Underground	Irrig. dom. stock	S 7 T10N R 1E Cache	0.015 (a)
38770	4-25-68	Cove Water (G. Larsen)	Underground	Irrig. dom. stock	S11 T14N R 1E Cache	0.10 (a)
38771	4-23-68	Smithfield City	Underground	Municipal	S28 T13N R 1E Cache	3.0 (a)
38795	5-10-68	Alonzo D. Blanchard	Underground	Irrigation	S32 T12N R 1E Cache	0.25 (a)
38799	5-15-68	Raymond W. Short	Underground	Domestic	S19 T13N R 6E Rich	0.015 (a)
38816	5-21-68	Woodrow Smith	Unnamed drain	Domestic	S16 T 2N R10E Summit	0.015
38817	5-21-68	Shirley B. Hadley	Underground	Domestic	S20 T13N R 6E Rich	0.015 (a)
38818	5-20-68	John M. Hardy	Underground	Irrig. stock	S17 T10N R 2W Box Elder	0.1 (a)
38825	5-24-68	Leland S. Capener	Unamed drain	Irrig. stock	S 2 T12N R 3W Box Elder	2.0
38834	5-24-68	LDS Church	Spring	Recreational Park	S 7 T11N R 2W Box Elder	0.03 (a)
38844	6- 5-68	Earl Lewis Petersen	Drain	Irrig. stock	S30 T11N R 2W Box Elder	0.5 (a)
38854	6- 7-68	Richmond Irrig. Co.	Cub River	Irrigation	S33 T14N R 1E Cache	5.0
38859	6-18-68	Boyd H. Smart	Underground	Irrig. dom.	S20 T13N R 6E Rich	0.015
38874	6- 2-68	R. G. Field	Underground	Dom. stock	S31 T 9N R 5E Rich	0.015
38899	7-10-68	D. Farrell Balls	Underground	Irrig. dom. stock	S11 T12N R 1E Cache	0.015
38949	8- 5-68	Robert Gillis	Underground	Domestic	S 9 T 2N R10E Summit	0.015
38953	8- 2-68	A. F. Turley	Underground	Irrigation	S 2 T11N R 3W Box Elder	0.015
38971	8-13-68	Grant L. Nelson	Underground	Irrig. dom. stock	S17 T11N R 1E Cache	0.015
38972	8-13-68	La Grand Mouritsen	Dunn Canyon	Irrig. stock	S30 T 9N R 1E Box Elder	0.5
38978	8-12-68	Glenn Grover	Underground	Irrig. dom. stock	S22 T12N R 1E Cache	0.015
38995	8-20-68	Francis H. Worley	Underground	Irrig. dom. stock	S 6 T11N R 1E Cache	0.015
38999	8-30-68	Little Valley dairy	Underground	Irrig. stock	S14 T 9N R 1W Box Elder	3.0
39000	8-28-68	Cache Co. Parks & Rec.	Underground	Irrig. dom.	S 9 T12N R 1W Cache	0.015
39032	9-18-68	Terry Griffin	Underground	Stock. Dairy use	S13 T13N R 2W Cache	0.10
39033	9-19-68	Larry Goodsell	Underground	Irrig. dom. stock	S 7 T11N R 1E Cache	0.015
39051	10- 4-68	Vance Hendricks	3 unnamed springs	Irrigation	S10 T14N R 1E Cache	2.0
39052	10- 3-68	Harold J. Griffin	Underground	Irrig. stock	S17 T13N R 1W Cache	0.5

(a) Approved. All other applications listed for Utah are pending.

Appl. No.	Date of Filing	Name	Source	Use	Location	Amount
			STATE OF UTAH	(continued)		
33821	9-26-61	Woodruff Irrigating Co.	Woodruff Creek	Irrigation	S31 T 9N 6E Rich	2,000 ac-ft (1)
a-4175	9-20-62	Woodruff Irrigating Co.	Woodruff Creek	Irrigation	S31 T 9N 6E Rich (2)	1,200 ac-ft (4)
a-4176	9-20-62	Woodruff Irrigating Co.	Woodruff Creek	Irrigation	S31 T 9N 6E Rich (3)	
a-4772		Woodruff Irrigating Co.	Woodruff Creek	Fish Conservation	S31 T 9N 6E Rich	400 ac-ft (5)
a-5554	7- 3-68	Woodruff Irrigating Co.	Woodruff Creek	Dead Storage/Fish	S31 T 9N 6E Rich	450 ac-ft (6)
					Woodruff Cr. Reservoir Total	4,050 ac-ft

(1) Presented to Commission 10-23-61.
(2) Change Application to change direct-flow (1160.3 ac-ft).
(3) Change Application to change 839.7 ac-ft from Woodruff Town Reservoir to Woodruff Cr. Reservoir.
(4) Two Change Rights limited by agreement with UP&L Co. to total of 1,200 ac-ft.
(5) Transfer of 400 ac-ft from Birch Creek Reservoir to Woodruff Creek Reservoir for fish conservation pool.
(6) Change of direct-flow rights into dead storage for initial filling of Birch Cr. & Woodruff Cr. Reservoirs.

			STATE OF IDAHO			
11-7002	2-21-68	Kay J. Allred	Red Canyon Creek	Irrig. dom. stock	S 2 T12S R44E Bear Lake	4.0 cfs (a)
11-7003	2-21-68	Kay J. Allred	Lindsay Spring	Irrig. dom. stock	S11 T12S R44E Bear Lake	0.5 cfs (b)
11-7004	3-20-68	Evan M. Kackley	Little Sp. Creek	Irrigation	S30 T 9S R41E Caribou	2.0 cfs
11-7005	4-15-68	Evan M. or Lois Kackley	Montsanto Co.	Irrigation	S36 T 8S R41E Caribou	4.0 cfs
11-7006	6-12-68	Lee C. Ream	Unnamed spring	Irrig. fishpond	S32 T14S R45E Bear Lake	10.0 ac-ft (a)
11-7007	11- 8-68	James E. Saxton	Underground	Irrigation	S22 T13S R46E Bear Lake	3.3 cfs (c)
13-7002	3-14-68	Merrill & Abbott	Current Creek	Irrig. Storage	S33 T12S R39E Bannock	0.5 cfs 50 ac-ft
13-7003	4-26-68	City of Preston	Cub River	Municipal	S18 T15S R41E Franklin	80 cfs 3,500 ac-ft (a)
15-7000	4-26-68	Carl R. Willie	Underground	Irrigation	S36 T14S R35E Oneida	1.0 cfs
15-7002	5-14-68	Idaho Dept. of Highways	Underground	Domestic	S35 T12S R36E Oneida	0.12 cfs
17-7000	1- 8-68	C.H. Sweeten & Sons, Inc.	Underground	Irrigation	S 5 T15S R33E Oneida	6.0 cfs
17-7001	2- 6-68	Ross Anderson	Underground	Irrigation	S13 T16S R32E Oneida	5.5 cfs
17-7002	2-15-68	Rollin Showell	Underground	Irrigation	S24 T16S R32E Oneida	3.2 cfs
17-7003	7-31-68	Merle L. Neal	Underground	Irrigation	S21 T16S R32E Oneida	3 cfs

(a) Protested - pending approval on settlement of protest.
(b) Pending approval upon settlement of protest on companion application.
(c) Pending approval.

Appl. No.	Date of Filing	Name	Source	Use	Location	Amount
			STATE OF WYOMING			
19 4/170	2- 7-64	Roger F. Pierce	Cat Draw trib. Bear	Stock	S35 T16N R121W Uinta	0.6 ac-ft (a)
19 5/170	2- 7-64	Roger F. Pierce	Dog Draw trib. Bear	Stock	S35 T16N R121W Uinta	0.5 ac-ft (a)
20 5/16	12-23-66	Emil A. Zebre	Hay Hollow Creek	Irrigation	S 1 T21N R117W Lincoln	1.2 cfs (b)
20 6/16	12-23-66	Emil A. Zebre	Zebre Draw	Irrigation	S 2 T21N R117W Lincoln	1.2 cfs (b)
20 1/17	12-23-66	Emil A. Zebre	Zebre Draw	Stock	S 2 T21N R117W Lincoln	1.21 ac-ft(b)
20 3/125	4- 2-68	Lewis Ranch	Clear Creek	Stock	S20 T21N R117W Lincoln	5.4 ac-ft (c)
20 2/131	5- 7-68	H. A. Teichert & Sons	Teichert Spring	Stock	S 4 T26N R118W Lincoln	.0057 cfs (d)
20 2/142	8- 1-68	Joseph E. Barker	Phipps Hollow	Stock	S29 T13N R119W Uinta	17.8 ac-ft(d)

(a) Presented to Commission 4-28-64. Expired for lack of notice.
(b) Approved.
(c) Previous Applic. No 20 3/19 rejected. Approved under this number.
(d) Pending (first presentation to Commission).

REPORT TO BEAR RIVER COMMISSION
December 16, 1968

Wallace N. Jibson
Assistant Secretary

Report on Storage above Bear Lake

Bear Lake Irrigation Reserve

As only one or two former members of the negotiating commission are now a part of the Bear River Commission, it is desirable to review briefly the derivation and significance of the Bear Lake Irrigation Reserve and the relationship of upstream storage, allowed by the Compact, to this irrigation reserve and to existing rights in and below Bear Lake.

Bear Lake has been utilized as an active and holdover reservoir for nearly 50 years during which time there have occurred six consecutive dry years in which demand on the Lake resulted in it reaching the lowest level on record when the point of zero usable content was reached in the fall of 1935. Five storage periods and six draft periods are included in this critical period from May 21, 1930 to September 30, 1935.

Studies of Bear Lake operation indicated that the net irrigation draft during the critical period amounted to 860,300 acre-feet while the storable inflow was only 668,700 acre-feet and lake losses amounted to 485,000 acre-feet. This left only 183,700 acre-feet available for storage from the net inflow, so 676,600 acre-feet (860,300 minus 183,700) constituted an irrigation requirement on holdover storage. Adding a small safety factor of 5,000 acre-feet for emergency power releases and other contingencies, we arrive at 681,600 acre-feet as an irrigation reserve under existing conditions in 1930-35, and the elevation corresponding to this amount was so designated in the Compact.

Additional storage above Stewart Dam would have further depleted storable inflow to Bear Lake during the 5-year period, so estimated depletions from

given amounts of storage were added to the initial reserve to arrive at the step increases that become applicable as new reservoir capacity is constructed. These estimated depletions will be further discussed later in this study.

A few misconceptions about the irrigation reserve have arisen during the years of operation under the Compact. The reserve provision does not require any specified amount of water to be delivered to or retained at any point in the river system. The provision only prohibits the release of Bear Lake water for the sole purpose of generating power, except in an emergency, when the lake level is below the irrigation reserve elevation.

As new commissioners and advisers are appointed to the Commission, and more frequent reference is made to the reserve in connection with storage studies, we note a tendency to attach a significance to the reserve that may be quite misleading. Obviously, the irrigation reserve is no guarantee of a specified holdover amount in the Lake, or that present or future irrigation demands will be provided for; but only that irrigation has the primary right to the lower 781,500 acre-feet (present reserve) of usable Bear Lake water.

Supplies, Requirements, and Effects of Storage

Today, after 11 seasons of operation under the Compact and with 79 percent of allocated storage now constructed, we are again requested to look at the downstream effect of storage allocated by the Compact and the probable effect of increasing such allocation. How realistic now are the estimates and projections in earlier studies of supplies, storage requirements, and estimated depletions from storage? Will annual reservoir yield, based on supply and requirement, be increased appreciably if we further increase the upstream storage allowance? What is the net effect on lower basin rights of storage now developed and the probable effect of proposed increases? What is the difference in this effect between storage supply for new land and supplemental use on existing irrigated land?

Storable supplies available at known reservoir sites were estimated in earlier studies from streamflow records as collected or in some instances as derived from correlation with collected records. Base period of record was 1924-48, further extended in later studies through 1954. Further extension now of records through 1968 shows no significant changes in average runoff with 1955-68 runoff above Bear Lake and above diversions being within 5 percent of that in the 1924-54 period. Total supplies storable at existing and potential reservoirs above Bear Lake without infringing on direct-flow irrigation rights above and below the Lake would average around 150,000 acre-feet annually. This amount would include the aggregate of winter and snowmelt runoff originating above known reservoir sites on the main stem and tributaries without regard to such considerations as feasible size of reservoirs, irrigation requirements, distribution of storage allocation, etc. Evidently the amount is not very significant when these important factors are ignored, and supply alone had relatively little bearing on the amount of upstream storage allowed by compact.

More significant was the amount of additional supply that could be developed when determined not only by storable supply but by supplemental requirements on existing irrigated acreage. Earlier studies on this basis, using assumed allowances of 20,000, 30,000 and 40,000 acre-feet, indicated a relatively small increase in additional supply developed as the storage allowance was increased above 30,000 acre-feet. For instance, in the 1924-54 period an assumed allowance of 30,000 acre-feet would have developed an average supplemental supply of 22,000 acre-feet while an allowance of 40,000 acre-feet would have increased this supply only to 24,700 acre-feet.

However, the validity of certain assumptions and estimates used in our earlier analysis should be assessed in the perspective of actual operation of Woodruff Narrows and Sulphur Creek Reservoirs. Estimated requirements

for lands served from these reservoirs were based on a full supply being made available, from natural flow supplemented by storage, from May 1 to July 15. Woodruff Narrows Reservoir has been operated in close conformance to this pattern in dry seasons but in average and better seasons storage water generally has not been needed until August when it has been used for irrigation of fall pasturage after meadow hay is harvested. A study of river flows indicates that water applied later in the season is largely consumed or goes into the ground-water reservoir. Likewise, Sulphur Creek Reservoir water seldom has been used before July 15 except in the drier years, and this later water disappears entirely in the Upper Wyoming Section, at least insofar as any channel accretions are noted immediately above Woodruff Narrows Reservoir.

As would be expected then, return flows evidently accruing to Bear Lake from applied storage water are somewhat less than had been estimated and have averaged about 7 percent of the net yield from all new reservoirs. This is of course a difficult quantity to determine being based on observed increases to channel flow within a reasonable time after application without attempting to include credit for any increase in ground water that subsequently could increase river base flow.

With total reservoir capacity of 40,400 acre-feet now developed in which 28,800 acre-feet is allocated for diversion to storage each year, we find that an average of 23,000 acre-feet actually is being diverted to storage each year, the difference or 5,800 acre-feet comprising additional holdover of unused water from the previous year. After deducting all reservoir losses, the net yield from all Compact reservoirs is around 20,000 acre-feet. It is interesting to note that the yield from Sulphur Creek Reservoir was about the same before and after its enlargement (4,614 to 7,088 acre-feet) even though the reservoir has filled each year since its enlargement.

Yield becomes a measure of requirement when no shortages occur, so adjusting for a nominal shortage to reservoir lands in 1961, the observed yield would indicate a supplemental requirement of about 21,000 acre-feet which agrees closely with the estimates of earlier studies in which an average requirement of 22,300 acre-feet was derived for the 1924-54 period, and when updated on the same basis would average 22,900 acre-feet from 1924-68. These requirements are for lands now served by reservoirs at and above Woodruff Narrows and exclude potential sites below Woodruff Narrows.

As mentioned earlier in this study, an estimated effect on Bear Lake from proposed upstream storage was necessary to arrive at the increase required in the irrigation reserve for water supply assurance to the irrigation interests below Bear Lake. This was done by adding to the existing reserve the estimated 1931-35 (critical period) depletion for each 5,000 acre-foot increment of storage allowance from 5,000 to 36,500 acre-feet, then converting these quantities to equivalent elevations as now are designated in the Compact. Present depletion to Bear Lake from new upstream storage is averaging about 22,000 acre-feet per year which is somewhat higher than our earlier estimates for the 1924-48 period in which reservoirs at and above Woodruff Narrows were expected to deplete the Lake about 18,000 acre-feet annually. The difference is due for the most part to storage water applied after July 15 for which our earlier studies showed no requirement and consequently no depletion. Also as mentioned, return flows accruing to Bear Lake appear to be negligible for the late-season storage releases. It is doubtful however that our estimated depletions to Bear Lake, for establishing the irrigation reserve, would be much different if they were made today as actual reservoir releases during the dry years, 1931-35, would likely have followed closely our assumed pattern of diversion from May 1 to July 15.

Additional allocation of storage above Bear Lake

It is evident from earlier studies and from the experience of reservoir operation above Bear Lake that the magnitude of loss to Bear Lake from a larger allocation of storage will depend primarily on whether the additional storage is used to serve new arable land not now under irrigation.

We will first assume that additional storage is to be used only for supplemental supply on presently irrigated lands. E. K. Thomas, Bureau of Reclamation, prepared in 1954 a report (no. 29) on estimated effects of additional storage development upstream from Stewart Dam. Supplemental requirements and certain other base data were taken from previous reports of the Negotiating Commission's Engineering Committee; and analysis was made, using the 1924-48 period, of 20,000, 30,000, and 40,000 acre-feet of upstream storage. Two general areas of storage development were selected; one for reservoirs at and above Woodruff Narrows, and the other for reservoirs on tributaries below Woodruff Narrows. I have updated a portion of this study to the 1924-68 period, modified supplemental requirements in certain years to reflect some fall irrigation (discussed earlier), and arbitrarily assumed two storage allocations, one for 40,000 acre-feet and one for 70,000 acre-feet. Of the first allocation, 32,500 acre-feet would be allotted to Woodruff Narrows and other reservoirs above (as in the Thomas study); and in the second allocation, 60,000 acre-feet would be allotted to these upper reservoirs leaving 10,000 acre-feet for tributaries in Utah and Wyoming below Woodruff Narrows.

In neither this study nor that of Report 29 was Smiths Fork included with the group of tributaries below Woodruff Narrows. It is difficult to determine a realistic supplemental requirement in an area where the average diversion rate is 4.7 acre-feet per acre and where in only a few of the past 35 years were serious shortages evident, even under actual and projected Compact

regulation. A supplemental requirement applicable in most years would be inconsistent with our studies of other areas above Smiths Fork in which full diversion or headgate requirements have ranged from 2.1 to 2.7 acre-feet per acre. But, we are aware of an increased requirement in the gravelly soils adjacent to Smiths Fork that require a higher rate of diversion which also results in a corresponding higher rate of return flow. No doubt, the economics of storage development in this area will be the determining factor for justification, and our conclusions are primarily for purposes of consistency in this study.

Various reservoir capacities were selected for each allowance and a simulated operation of these reservoirs was carried out for each of the 45 years (1924-68) based on historical supplies, estimated requirements, losses, etc. These operational studies and much of the other basic data are not included in this report but are available in our files. Reservoir capacity-yeild diagrams, based on 45-year average yields from the operational studies, are shown in figures 1 and 2. It is shown that for an annual allocation of 32,500 acre-feet for reservoirs at and above Woodruff Narrows, the average net yield levels off at around 20,000 acre-feet for total reservoir capacity of about 40,000 acre-feet. Allocation of 7,500 acre-feet to tributaries below Woodruff Narrows would result in average yield of less than 6,000 acre-feet for a total storage capacity of 10,000 acre-feet. For 60,000 acre-feet allocated to the upper sites in total reservoir capacity of 75,000 acre-feet average yield would be a little more than 24,000 acre-feet, and the lower tributary storage would yield about 6,000 acre-feet with allowance and capacity of 10,000 acre-feet.

Thus, under the assumed conditions that are based in part on actual operation at Woodruff Narrows, Sulphur Creek, and other developed reservoirs,

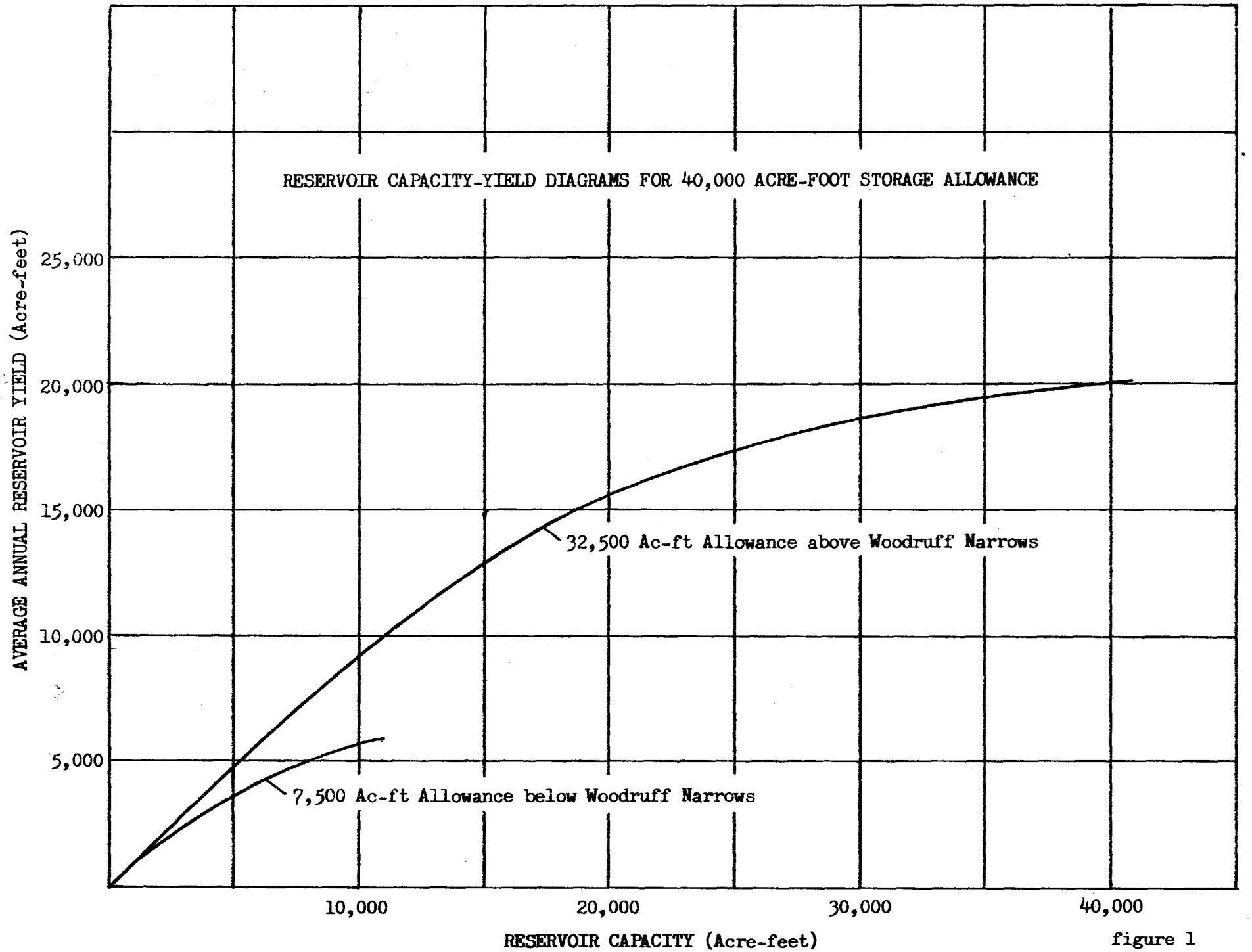
RESERVOIR CAPACITY-YIELD DIAGRAMS FOR 40,000 ACRE-FOOT STORAGE ALLOWANCE
AVERAGE ANNUAL RESERVOIR YIELD (Acre-feet)
25,000
20,000
15,000
10,000
5,000
32,500 Ac-ft Allowance above Woodruff Narrows
7,500 Ac-ft Allowance below Woodruff Narrows
10,000
20,000
30,000
40,000
RESERVOIR CAPACITY (Acre-feet)

figure 1

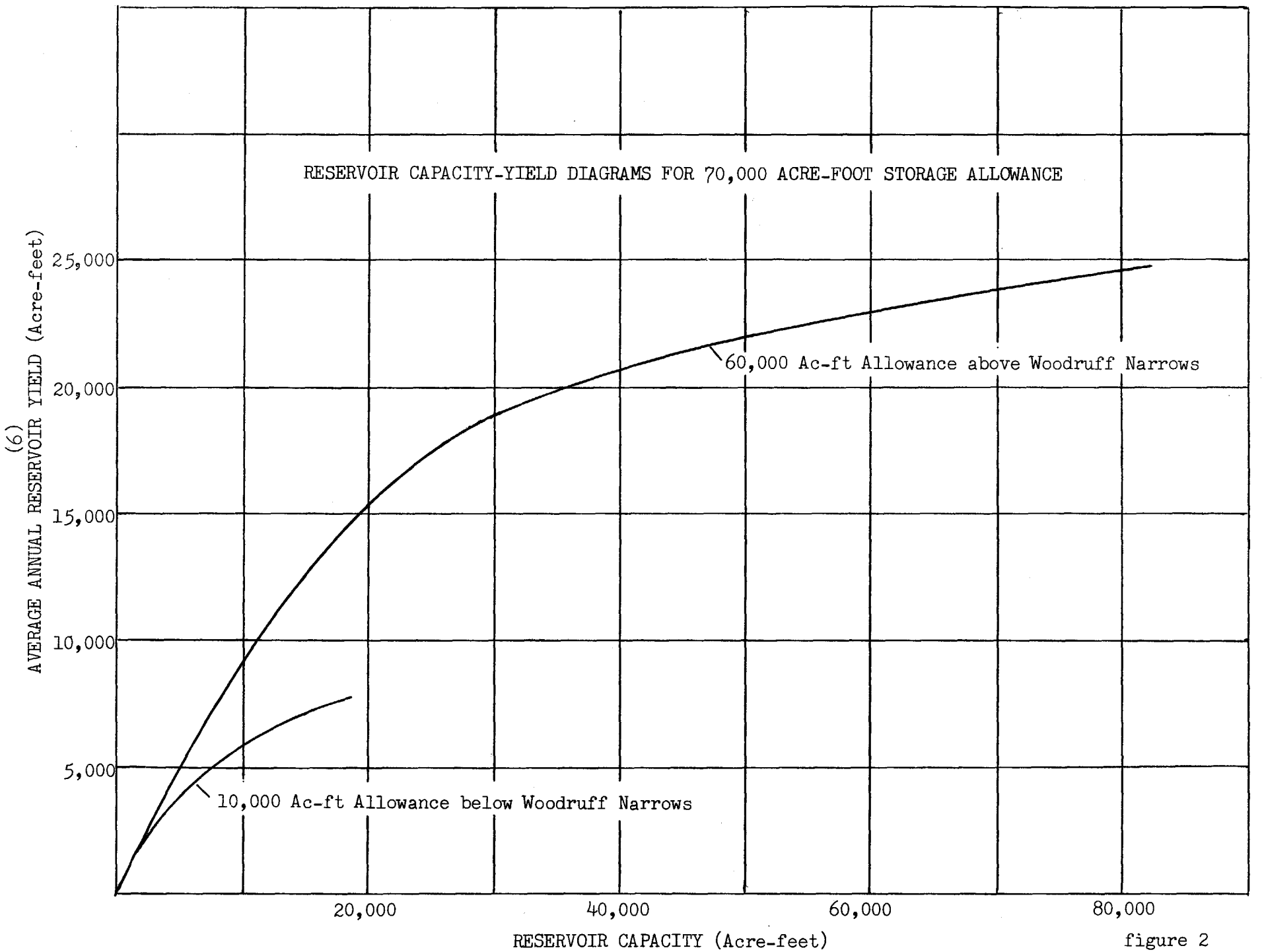
RESERVOIR CAPACITY-YIELD DIAGRAMS FOR 70,000 ACRE-FOOT STORAGE ALLOWANCE
AVERAGE ANNUAL RESERVOIR YIELD (Acre-feet)
25,000
20,000
15,000
10,000
5,000
60,000 Ac-ft Allowance above Woodruff Narrows
10,000 Ac-ft Allowance below Woodruff Narrows
20,000
40,000
60,000
80,000
RESERVOIR CAPACITY (Acre-feet)

figure 2

upstream storage allowance could be increased to twice the present compact allocation without increasing average reservoir yield by more than about 6,000 acre-feet or from 24,000 to 30,000 acre-feet. (Estimating yield from the undeveloped 6,700 acre-feet in the present allocation.) This assumes of course the serving of only present irrigated acreage with a supplemental supply.

How much reduction then could be expected in average supplies reaching Bear Lake? The tabulation on the following page shows the total water supply from all sources storable in Bear Lake from October 1 until the end of the storage period each year, then the estimated depletions that would result from the assumed storage allocations. Average annual depletion for the two storage allocations is 22,400 acre-feet and 30,600 acre-feet. Segregation studies of Bear Lake storage releases from 1924 to 1968 indicate an average excess of storable water over irrigation requirements of 119,000 acre-feet. Depletion from upstream storage then would decrease this excess, which is now available for power production, by the amounts shown.

New Land and Storage Potential

Reconnaissance of arable land conducted by Bureau of Reclamation personnel is the source of acreage used as a basis for estimating additional storage requirements for new land as summarized in the following table:

County	Location of Arable Land	Arable Acreage not irrigated	Headgate Requirement (ac-ft/acre)	Total Requirement (acre-feet)	Direct Flow and Storage Requirement
Uinta Co.	Bear River	4,500	2.3	10,400	9,000 ac-ft
Rich Co.	Bear River	3,300	2.7	30,500	24,000 ac-ft
" "	Saleratus basin	5,000			
" "	Tributaries	3,000			
Lincoln Co.	Bear River	14,500	3.0	82,500	70,000 ac-ft
" "	Twin Creek	8,000			
" "	Sublette	3,000			
" "	Smiths Fork	1,000			
" "	Misc. tribut.	1,000			
Total		43,300		123,400	103,000 ac-ft

Supply after May 1 that could be beneficially diverted: 26,000 ac-ft
Estimated storage requirement: 77,000 ac-ft
Total 103,000 ac-ft

Water Year	Storable in Bear Lake From All Sources (Acre-Feet)	Estimate Depletions Resulting From Storage Development Above Stewart Dam: 40,000 acre-foot allowance	70,000 acre-foot allowance
1924	407,200	29,400	62,600
25	276,000	39,100	48,700
26	157,100	8,400	32,300
27	289,100	34,500	37,300
28	383,800	10,700	22,600
1929	391,000	29,300	30,200
30	206,100	2,500	16,700
31	94,700	21,200	8,000
32	279,800	39,400	59,600
33	176,600	7,200	39,700
1934	27,800	20,900	5,000
35	89,800	31,800	31,600
36	394,400	24,100	77,300
37	333,300	24,200	30,900
38	338,600	29,500	30,800
1939	188,700	11,400	10,300
40	36,100	25,700	15,900
41	78,500	36,900	37,900
42	223,600	16,600	70,000
43	357,000	25,000	24,300
1944	284,200	17,000	26,400
45	202,900	11,800	23,500
46	441,600	5,700	21,000
47	384,400	36,300	38,700
48	318,500	- 900	14,400
1949	243,000	38,900	42,000
50	588,900	9,000	24,800
51	584,900	2,400	24,800
52	536,500	7,900	25,200
53	174,600	5,400	3,500
1954	97,600	7,200	5,100
55	105,400	24,900	23,000
56	395,300	37,500	73,600
57	374,900	40,000	42,100
58	257,200*	18,500	-5,100
1959	117,200*	29,600	31,200
60	155,800*	37,000	29,400
61	47,200*	22,100	9,600
62	413,600*	38,700	68,700
63	164,100*	24,100	28,900
1964	335,600*	32,300	40,600
65	551,000*	30,300	29,200
66	320,600*	-1,100	-14,600
67	356,400*	40,000	70,100
1968	224,600*	24,800	7,600
1924-68 Average	275,700	22,400	30,600

*Adjusted for depletion from upstream storage now developed.

Arable land on Bear River main stem could be supplied from reservoirs located on headwater tributaries and by enlargement of Woodruff Narrows Reservoir. Saleratus basin land would be served by Bear River water stored in an enlarged Neponset Reservoir, and land on other tributaries in Rich County would have adequate storage sites and storable supplies. There are reservoir sites on Rock Creek and other tributaries to Twin Creek for serving arable land in the Twin Creek drainage, most of which could also be served from Bear River storage. Arable land on the Sublette plateau area, Smiths Fork, and miscellaneous tributaries below Smiths Fork could be supplied from storage on Smiths Fork drainage.

An average (1924-68) of about 83,000 acre-feet could be stored at and above Woodruff Narrows without infringing on other irrigation rights. Deducting 23,000 acre-feet now being diverted to compact reservoirs would leave 60,000 acre-feet available for additional storage, an adequate supply for main stem arable land in Rich and Lincoln Counties. Storable supplies for arable lands on tributaries below Woodruff Narrows would be adequate in most years.

If we assumed again that the present allocation of storage to Wyoming and Utah were doubled, the additional 35,500 acre-feet evidently would supply less than half the total arable lands not now under irrigation. Depletion to Bear Lake would be expected to be proportionately larger than when the additional storage is used as supplemental supply because the requirement would be in effect each year and a larger part of the supply would be consumptively used. Assuming about 75 percent of the season supply coming from stored water and with average consumptive use in the basin applied to this supply from storage, we could expect about 23,000 acre-feet to be consumptively used by the crops produced. Additional losses would raise the depletion to Bear Lake to an estimated 30,000 acre-feet which would agree with an estimated depletion from an earlier Engineering Committee Report, number 25, when updated and computations made for this amount of allocation. In this report we had assumed a full

requirement each year on allowable storage at Woodruff Narrows. Total depletion to Bear Lake then for 70,000 acre-feet of storage allocation, half of which would be used as primary supply on new land, would be about 50,000 acre-feet annually compared to 30,600 acre-feet for the same allocation when used only as supplemental supply on presently irrigated acreage.

Summary

No significant changes in average runoff from the upper Bear River basin have occurred when comparing the 1924-48 period to 1924-68 period.

In general, earlier studies toward formulation of the Bear River Compact have proved to be essentially sound and valid in estimates and assumptions made.

Of a total allocation of 35,500 acre-feet of storage in Wyoming and Utah, 28,800 acre-feet is now developed and yielding about 20,000 acre-feet each year out of 23,000 acre-feet diverted to storage.

Average depletion to Bear Lake and thus to water supply available for power is now about 22,000 acre-feet annually. This is deductible from 119,000 acre-feet storable annually in Bear Lake over and above irrigation requirements during the period 1924-68.

Increasing the storage allocation to 70,000 acre-feet for supplemental use on irrigated acreage would result in a total yield of about 30,000 acre-feet annually and an estimated depletion to Bear Lake of about 31,000 acre-feet each year.

Increasing the storage allocation to 70,000 acre-feet and allowing half of this amount to be used as the primary supply on 20,000 acres (of a total of 43,000 acres) arable land would deplete Bear Lake about 50,000 acre-feet annually.