REPORT NO. 1

REPORT TO BEAR RIVER COMPACT COMMISSIONERS

on

BEAR RIVER COMPACT

and

ANALYSIS OF STREAM FLOW RECORDS

June 23, 1948

Prepared By

W. V. Iorns, Project Engineer
U. S. Geological Survey

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Jackson, Wyoming
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BEAR RIVER COMPACT COMMISSION:

Gentlemen:

In accordance with your request of April 12, 1946 made at the Tri-State Compact Committee meeting in Montpelier, Idaho, a tentative draft of the Bear River Compact has been prepared for your consideration. To accompany the tentative draft, other pertinent data have been compiled by W. V. Iorns for your information, in the form of a combined report consisting of the following:

Part I: Foreword.

Part II: Discussion of Tabulation of Water Rights.

Part III: Tabulations of Water Rights on Main Stem of Bear River and Smiths Fork.

Part IV: Tentative Draft of Bear River Compact as prepared by Lesher S. Wing, Regional Engineer, Federal Power Commission and W. V. Iorns, Project Engineer, U. S. Geological Survey.

Part V: Discussion of Tentative Draft - Bear River Compact.

Part VI: Discussion of Hydrographs showing Resultant Compact allocations to each State if the Compact had been in effect during the years 1944 and 1946.

Part VII: Plates and Tables for Bear River Compact Report.

It may be noted from the foregoing that the report consists of factual data, a tentative draft of a compact, and discussions of the allocations of water which would have resulted from operations under the tentative compact, if it had been in effect during the years 1944 and 1946.

In drafting the compact it was necessary to adopt specific criteria as a guide for making water allocations. Although every effort was made in drafting the compact to accord equitable treatment to each State, it is fully realized that the final allocations of water and the terms of the compact can only be written after full discussion and consideration by all interested parties. The tentative draft submitted herewith is intended to serve only as a basis for such discussions.

Sincerely,

Lesher S. Wing, Regional Engineer
Federal Power Commission

W. V. Iorns, Project Engineer
U. S. Geological Survey

THE BEAR RIVER COMPACT - TENTATIVE DRAFT

PART I - FOREWORD

Before going into details of the tentative plan and other data, it would be well to first consider a few basic principles governing division of interstate waters. Decisions by the Supreme Court of the United States and other courts outline these basic principles. Such principles as derived from court decisions have been adequately set forth in the "Report and Recommendations of the Special Committee to the National Reclamation Association in October 1943, as follows:

1. Each State is entitled to its equitable share of the benefits derived from the waters of an interstate stream.

2. There must be an equitable limit to conflicting sovereignties, a fair adjustment of their otherwise complete and entire right of assertion, and an apportionment not of water, but of natural benefits.

3. Each State is obligated to conserve the common supply of an interstate stream, which lays on each State the duty to exercise her right reasonably and in a manner to conserve the common supply.

4. Existing economic developments should be protected and preserved wherever possible.

Further, the same report contains the following summary by Wells A. Hutchins, of principles in the Supreme Court decision on the validity of interstate water compacts in the case of "Hinderlider, et al., V. LaPlatte River and Cherry Creek Ditch Company."

1. "As each State is entitled only to an equitable share of the water of an interstate stream, an adjudication decree in either State cannot confer rights in excess of such share, and parties in the other State are free to challange claims that under the decree all the water can be taken from the stream."

2. "Adjustment of controverted rights may be made by compact without a judicial or quasi-judicial determination of existing rights, as well as by a suit in the Supreme Court. The Court has recommended that such matters be adjusted by compact, in order to avoid the difficulties incident to litigation."

3. "Whether such apportionment be made by compact with the consent of Congress, or by decree of the Supreme Court, the apportionment is binding upon the citizens of each State and upon all water claimants, even where the State had previously granted water rights."

4. "The apportionment may provide either for a continuous equal division of water or for rotation in use of the stream."

5. "As no claimant has any right greater than the equitable share to which the State is entitled, no vested right is taken away by the apportionment if there was no vitiating infirmity in the proceedings leading up to the compact or in its application."

6. "The assent of Congress to a compact does not make it a 'treaty or statute of the United States' within the meaning of the Judicial Code, so that a decision of a State court against its validity is not appealable to the Supreme Court, nor is a claim based on the equitable interstate apportionment of water the subject of appeal. However, the decision of the Colorado Supreme Court restraining the State Engineer from taking action required by the compact, denied by an important claim under the Constitution, which may be reviewed on certiorari. Whether the waters of an interstate stream must be apportioned between two States presents a Federal question, and the fact that the States are not parties to the suit does not deprive the Supreme Court of jurisdiction."

It is to be noted that in the LaPlatte River Compact, on which the above principles applied, allocations were made to two states, predicated to a large extent, on priority of rights, although it was not expressly stated. A study of other interstate compacts and court decisions definitely establishes the principle that where the doctrine of appropriation and priority of rights is recognized in the states involved, it should be a guiding principle in making an equitable apportionment among the states. Other factors should be considered, including irrigated acreage, potential development, physical and climatic conditions, the character of the supply, the consumptive use of water in the several sections of the river, the character and rate of return flows, established practices and usage, the availability of storage water, the practical effect of wasteful uses on downstream areas, and the damage to upstream areas

as compared to benefits to downstream areas, if a limitation is imposed on the former. In conjunction with all these, there should be considered the practicability of any apportionment as related to administration.

A more complete study of court decisions, compacts, and other already published discussions, establish the fact that there is no exact formula for division of interstate waters. Each decision is a problem of its own. Each is designed for its own special case, and a compact for Bear River is no exception.

PART II

DISCUSSION OF TABULATION OF WATER RIGHTS

At a meeting of the Bear River Tri-State Committee held in Denver, Colorado on November 13, 1944 a resolution was passed requiring the three states to compile and submit to the Chairman, for distribution, a list of water rights on Bear River and tributaries, showing:

1. The names of water users.
2. Priority dates.
3. Quantity of water appropriated.
4. Points of diversion.
5. Description of use of water which, in case of irrigation use, shall include a description of the land irrigated.

The states of Idaho, Utah and Wyoming have furnished the following compilations:

Idaho:

Bear River - Border to Stewart Dam - Copy of Decree "Preston-Montpelier Irrigation Company vs. Dingle Irrigation Company et al," Fifth Judicial District of the State of Idaho, March 7, 1924.

Bear River - Stewart Dam to Idaho-Utah State Line near Preston - and including Georgetown Creek, Nounan Creek, Skinner and Jewett Creeks, Co-op or Dairy Canyon Creek, Pearl Creek, Trail Creek, Eight Mile Creek, Bailey Creek, Big Spring Creek, Soda Creek, Whiskey Creek, Trout Creek, Warm Creek, Williams Creek, Cottonwood Creek, Mink Creek, Battle Creek, Weston Creek, and various small streams and springs tributary to Bear River between Georgetown Creek and Weston Creek. Copy of decree, "Utah Power & Light Company vs. The Last Chance Canal Company et al," District Court of the United States for the District of Idaho, Eastern Division, July 14, 1920.

Thomas Fork - Copy of Decree "W. A. Fawsett et al, vs. Thomas Fork Irrigation and Canal Company et al," Fifth Judicial District of Idaho, February 20, 190[illegible]

Montpelier Creek - Copy of Decree "E. Strong, R. Livingston and Sidney Stevens vs. The Montpelier Irrigation Company et al," Fifth Judicial District of Idaho,February 20, 1902.

Bloomington Creek - Copy of Decree "George T. Thornock, Herbert Bateman, and Stafford Cleveland vs. Bloomington Irrigation Company et al," Fifth Judicial District of Idaho, July 25, 1923.

Paris Creek - Copy of Decree "Pioneer Irrigation and Manufacturing Company vs. Southfield Ditch and Canal Company et al," Fifth Judicial District of Idaho, July 27, 1932.

North, Emigration and Mill Creeks - Copy of Decree "C. H. Brown, et al, vs. Joseph M. Wixom, et al," Fifth Judicial District of Idaho, February 5, 1902.

Ledge Creek - Copy of Decree "C. H. Wetzel et al, vs. George Nichols et al," Fifth Judicial District of Idaho, March 6, 1902.

Ledge Creek - Copy of Decree "Mary Thuet vs. Grace Beus et al," Fifth Judicial District of Idaho, April 7, 1941.

Formation Springs - Copy of Decree "Daniel J. Lau et al, vs. Chris Panting et al," Fifth Judicial District of Idaho, November 6, 1919.

Cub River - Copy of Decree "Henry T. McErvan vs. Franklin County Sugar Company et al," Fifth Judicial District of Idaho, July 9, 1924.

Maple Creek - Copy of Decree "J. J. Flack vs. Franklin Maple Creek Pioneer Irrigation Company," Fifth Judicial District of Idaho, October 16, 1905.

Maple Creek - Copy of Decree "Village of Fairview vs. Franklin Maple Creek Pioneer Irrigation Company et al," Fifth Judicial District of Idaho, August 31, 1937.

Weston Creek - Copy of Decree "Anchor Kofford et al, vs. Warner Hoops et a., Third Judicial District of Territory of Idaho, October term of 1883.

In addition, the State Reclamation Engineer of Idaho furnished a tabulation of Water Rights, land descriptions, and points of diversions of all diversions from Bear River Main Stem in Idaho.

Utah:

The State Engineer of Utah furnished copies of Water Users Claims Nos. 1 to 91 in Summit County and Nos. 1 to 766 in Rich County. These include claims of Water users for diversions from the main stem of the river and tributaries in the two counties for which a state adjudication is to be eventually made. Utah also furnished a copy of decree "Utah Power & Light Company vs. Richmond Irrigation Company et al," dated February 21, 1922.

Wyoming:

The State Engineer of Wyoming furnished a tabulation of Adjudicated Water Rights in Water Division No. 4 which contained all water rights in that division adjudicated by the State Board of Control since its organization in 1891. In addition, Wyoming furnished detailed tabulations of water rights, land descriptions, points of diversion, and other data of adjudicated and unadjudicated water rights for all diversions in Wyoming from the main stem of Bear River and main stem of Smiths Fork.

Land Use Maps and Summary Tabulations of Water Rights

The State Reclamation Engineer of Idaho and the State Engineer of Wyoming plotted the lands described for individual rights on Bureau of Reclamation Land Use maps. The irrigated acreages were then measured with a planimeter as a check on acreage actually irrigated, as compared to acreage described in the adjudications. The Logan office plotted the lands described in the Utah Water Users Claims and measured the acreages with a planimeter.

All this work was later checked by the Logan office, and final tabulations prepared which are summarized in mimeographed form "Water Rights - Main Stem of Bear River and Smiths Fork, March, 1948" and included as Part III of this report.

Base data including decrees, water users claims, maps, and other miscellaneous information on which the summary tabulation is based are to be delivered to the Compact Commission. They will undoubtedly find much future need for this material.

The water rights tabulation in Part III is arranged by dividing the river into state sections, in downstream order. Canals in each state section are first listed in downstream order and for each right there is shown:

1. The name of canal.
2. Name of original appropriator.
3. Date of Priority.
4. Acreage described in decree.
5. Amount of adjudication in cubic feet per second.
6. Accumulated total second feet for each canal.
7. Acreage of lands now actually served by canal as determined on land use maps by measuring outlined areas with a planimeter.

The rights are next listed in each section in order of priority, and for each right is shown:

1. Name of canal.
2. Date of priority.
3. Acreage described in adjudication.
4. Amount of adjudication in cubic feet per second.
5. Accumulated total of adjudicated water in cubic feet per second.
6. Amount of right, if allotment was on the basis of one cubic foot per second for each fifty acres of land described in the adjudication.

The irrigated acreages below Stewart Dam were not given allotments of

second foot to each fifty acres of land, as these lands either already have adjudications on this basis or are partially supplemented by storage.

It is to be noted that there are differences in the measured acreage served by many of the canals and the acreage described in the adjudications. Part of these differences may be due to errors in mapping and erros in the descriptions. However, since the deviations are both plus and minus the total in any one state is compensating and it is believed advisable to use the total figure for each state, rather than attempt to adjust each individual canal.

Lands described in the water users claims in Utah, for the most part, included only lands actually cultivated, and did not include the border strips of willow and waste lands under the canals or bordering the streams. As such lands are included in Wyoming and Idaho, these were also included in the measured acreage for Utah.

The following summary shows a comparison of the acreages described in the adjudications and as determined on the land use maps.

	Adjudicated Or Water Users Claims ACRES	Planimetered Or Land Use Maps ACRES	%
Utah: Summit County	5,843	5,869	+ 0.4
Wyoming: Uinta County	28,756 *	29,130	+ 1.3
Utah: Rich County	33,285	34,597	+ 4.0
Wyoming: Lincoln County (Above Sm. Fk.)	8,457	8,278	- 2.1
Wyoming: Lincoln County (Below Sm. Fk.)	4,969	5,476	+10.0
Idaho: Border to Stewart Dam	22,734	23,073	+ 1.5
Wyoming: Smiths Fork	10,299	10,159	- 1.3
Idaho: Stewart Dam to Preston	71,707	72,463	+ 1.5

* Excludes Chapman Canal lands in Utah.

Utah in Cache County and Box Elder County are not included due to the large areas served by stored water.

The 4.2 percent difference in Rich County, Utah is due to including willow lands which were not included in the water users claims. The 10.0 percent difference in Wyoming below mouth of Smiths Fork is caused as follows: Garrett Canal, large area of willow lands are included which probably were not originally intended to be included; Sights Canal, bottom lands along river which are naturally sub-irrigated were included and are not believed to have been in the original adjudicated acreage; Wyman West Side Canal, acreage has apparently been greatly extended without filing for additional water rights; and the Rocky Point Canal, for which large acreages of willow lands were included that were not intended to be covered by the decree.

Considerable difficulty was encountered in plotting lands in Lincoln County, Wyoming because of the errors made in the original General Land Office Surveys. This area has been resurveyed into tracts in such a patchwork manner that it is practically impossible to correlate the old water adjudication land descriptions with present land boundaries.

Many parcels of land were found in Wyoming and Idaho, on which water is now being used, for which there is no water right. However, since the total acreage in each state agrees quite closely with the total acreage now found to be irrigated, it was agreed at an informal meeting at Idaho Falls, Idaho on May 15, 1947 that the present recorded adjudications, decrees, and claims would be used as the legal basis for the division between the states. It would be the responsibility of each state and the water users therein to correct their adjudications. Water for the corrected adjudications would have to be derived from the allocation allowed the state under the Compact.

The Wyoming adjudication for the Chapman Canal lands in Utah describes 14,276.1 acres of lands as noted below:

Adjudication				Measured Acres Actually Being Irrigated
Appropriator	Date	Acreage	c.f.s.	
Neponset Co. & Rees	8-13-86	13,240	189.13	6,785
Deseret L. S. Co.	5-3-12	239.8	3.43	240
Deseret L. S. Co.	5-21-12	796.3	11.39	796
Totals		14,276.1	203.95	7,821

If an allotment of one cubic foot per second for each 50 acres was allowed for lands now under irrigation, it would amount to 156.42 cubic foot per second. The maximum carrying capacity of this canal is about 120 cubic feet per second at the Saleratus Basin divide. It is therefore evident, that this adjudication is grossly in error, and it is deemed advisable that it be corrected. This has been done in the Compact by allotting to that canal 120 cubic feet per second with a priority date of August 13, 1886 for delivery at the Saleratus Basin divide. The lesser rights of 1912 ~~and 1913~~ priority were eliminated and water for these descriptions are taken as being included in the 120 cubic feet per second allotment.

Water for 519 acres under the Francis Lee Canal in Utah was included in the tabulation, with a priority date of 1879. The Wyoming State Engineer has recommended the adjudication be corrected to include these lands.

To provide convenient tables to study the relative priorities of the three states, all rights have been summarized in tables shown on Plates 1 and 2. These are shown by years only, as tables using individual dates of priority would be much too voluminous.

On Plate 1 are shown all rights and accumulative totals on the main stem of Smiths Fork and Bear River above Stewart Dam. This table is on the basis of one cubic foot per second for each fifty acres of land described in the adjudications, decrees, and water users' claims.

On Plate 2 are shown all rights on the main stem of Bear River below Stewart Dam and including Rainbow Canal. The power rights are not included in the accumulative totals for the Middle and Lower Idaho sections, while in the Lower Utah Section they are included in the accumulative figures. They are set up in this manner to show the diversion demand on the river.

PART III

See accompanying copy

of

WATER RIGHTS - MAIN STEM OF BEAR RIVER

AND SMITHS FORK

March, 1948

PART IV

See accompanying copy

of

TENTATIVE DRAFT OF BEAR RIVER COMPACT

March 31, 1948

PART V

DISCUSSION OF TENTATIVE DRAFT - BEAR RIVER COMPACT

General

The general plan followed in the tentative draft was to allot each state, during the irrigation season, a portion of the available daily divertible flow. The allotments, generally, have been based on priority of rights. In the daily divertible flow method, return flows, natural channel accretions, channel losses, and other variables not easily or readily determined are automatically taken into account. While the divertible flow figure may be hard to obtain, it is much safer and will stand the acid test of time. Future changes in water use, crops, and climatic changes will not change the relation of the allocations to the states.

After the river system has been in operation under a compact distribution for a number of years, data and experience will be obtained, on which reliable short cuts can be introduced for determining the daily divertible flow figures. Until then, the application of compact control will be a laborious job. Some diversion headings should be combined to simplify the control of the river system and cut down on waste of water. The Bear River system today as an irrigation system is in a sad state.

Considerable time has been spent in attempting to work out reliable formulas whereby the allocations may be determined from supplies at selected gaging stations. Fairly consistent results can be obtained for individual years, but considerable adjustment is necessary to apply the same formula to other years. Also average results for several years may result in gross errors. This will be especially true if an attempt is made to apply past years' data to future conditions, after a change in water use, irrigation methods, and climatic conditions have taken place. Return flows play such a large part in the total amount available for diversion in the Bear River System, that serious inconsistencies would

result if even only moderate errors were made in determination of its magnitude. Allocations to the states, based on supplies recorded at selected gaging stations, are therefore not recommended for Bear River.

A study was made on paper, using 1944 and 1946 supplies, operating the river as a unit on a strictly priority of right basis. Return flows were based on amounts of water applied in the various areas. Canals were allowed their full decrees, but not exceeding the decree while their priority was good. At no time in those two years was it necessary to cut a right on the main stem of the river above the mouth of Smiths Fork to supply water for an older right downstream. Supplies were sufficient in the downstream divisions to fill rights of later dated priority than could be filled in the upstream division. This indicates that the main river above Smiths Fork can be operated separately from the balance of the river so long as canals are limited to their rights.

The same circumstances prevailed for the division of the river from the mouth of Smiths Fork and including Smiths Fork to Stewart Dam in its relation to the lower river division below Stewart Dam and including Rainbow Canal.

While water supplies in these two years were about normal, it is believed a low water year would show the same results, using present recorded water rights and applying the same duty of water in each state.

Considering these river system characteristics, in the relation of water supply and priority of rights, together with other factors and administrative features involved, the tentative draft was set up, dividing the river system into three divisions. The divisions being subdivided into smaller units, or sections, conforming to state lines.

Paragraphs "R" to "Y" in Article II of the tentative compact define the various sections of the river system. The Upper Wyoming, Middle Utah and Middle

Wyoming sections comprise the Upper division. The Lower Wyoming and Upper Idaho sections comprise the Middle division. The Lower Idaho and ~~Upper~~ Lower Utah sections comprise the Lower division.

It is to be noted that the state sections, do not in all cases, conform exactly with the state lines. The deviations are for administrative and control purposes as it is necessary to include some interstate canals under the state in which their lands are either all, or principally located.

The Hillard East Fork, Lannon, and Hilliard West Side canals all divert in Utah but serve lands entirely in Wyoming. As these are interstate canals, it is only logical that they would be included with other Wyoming canals in the Upper Wyoming section.

The Chapman Canal supplies storage water for Neponset Reservoir and lands in Utah, and in addition, serve considerable lands in Wyoming. This canal has been placed in the Upper Wyoming section, with a special provision providing for the delivery of water to Neponset Reservoir and to Utah lands.

The Francis Lee and Bear River canals divert immediately below Woodruff Narrows, serve small segments of land in Wyoming, then cross the state line and irrigate large acreages in Utah. As the Narrows is a natural division point, these canals have been placed under the administration of the Middle Utah section. The Beckwith Quinn West Side Canal is placed under the administration of the Middle Utah section, even though it serves some lands in Wyoming.

The Cook Canal, although serving more lands in Idaho than in Wyoming, has been included in the Lower Wyoming section.

Articles I to IV

It is not believed any special discussion is needed for Articles I to IV. These articles are self-explanitory but should be closely studied for ambiguities and omissions of essential definitions. Much that has already been discussed and

more that will follow, explain many of the definitions in Article II.

Article V

This article is devoted to the division of the waters of the Bear River System between the states. As previously stated, the allocations, for the most part, are based on priority of rights allowing the same duty of water in each State. The State administrative sections between which the allocations are made have already been discussed and are defined in Article II. The mechanics of how the specific allocations shown in the tentative draft were derived, will now be explained.

On Plate 3 are shown the rights and accumulative rights in each State administrative section for the two divisions above Stewart Dam. The column headings are the sections as defined in Article II.

Upper Utah Section - Article V A-1-a

This section is on the headwaters. The area is of high elevation and lands suitable for irrigation are rather limited. The two rights shown on Plate 3 are for the Wright Transmountain and Hovarka East Fork canals. In addition, there are a number of small permits and claims for stock watering purposes which are not shown. To forestall any increased irrigation in this sub-marginal area and still provide for present development a limitation of 10 cubic feet per second has been placed on total diversions in this section.

Upper Division - Article V A-1-b

This division includes the Upper Wyoming, Middle Utah, and Middle Wyoming sections. On Plate 3 are shown the rights and accumulative rights for these three sections. Plate 4 shows a graphical representation of the accumulative rights as listed on Plate 3.

If on a completely diverted stream all canals are receiving water according

to their priorities, the total water diverted is the total divertible flow. The same amount would be obtained by a summation of all rights in effect. Therefore, the figures of accumulative rights in the table on Plate 3 are equivalent to divertible flows. By totaling accumulative rights for the three sections, total divertible flows necessary to fill any selected date of priority can be obtained. On a priority basis, the relation of the accumulative right in each section to the total for the division would be a measure of each sections share of the total divertible flow. Since the relation of priorities in the three sections are variable, this relation can best be shown graphically.

Plate 5 is a graphical representation of the accumulative rights in each section to the total accumulative rights in all three sections. An inspection of Plates 4 and 5 reveals a similarity between the rights in the Upper Wyoming and Middle Utah Sections. The total acreage served in each of the two states are about equal and they are both believed to have been settled at about the same time and rate. Both sections are situated along old western migration routes and have much the same topography. It is felt that the present day adjudication of the rights in Utah gives that section some advantage. Considering these factors it is logical to allocate an equal amount of water to each section.

On Plate 5 the dotted line is the average of the accumulative rights in the Upper Wyoming and Middle Utah sections. The solid line which practically coincides with the dotted line, is a plotting of the allocations to the sections as they appear in the table of the compact.

A study of gains and losses in the two sections during the low water periods in late summer, shows there is a net channel loss in the Upper Wyoming section of 10 to 15 cubic feet per second, while in the Middle Utah section there is a gain of 30 to 35 cubic feet per second. 25 to 30 cubic feet per second of this

gain, in the Middle Utah section, occurs above the lowest Utah canal. Available supplies which are divertible in the two sections therefore are out of balance during low flow periods. To correct this condition, a lower limit has been placed on the equal division of divertible flow between the two sections by including a provision that when the divertible flow at the Utah-Wyoming State Line above Evanston is less than 50 cubic feet per second, each section may divert all divertible natural flows in its respective reach of the river.

The allocations for the Middle Wyoming section are based on allowing that section a flow sufficient to fill a priority of an equal date as the average priority filled in the upper two sections. The short dashed line on Plate 5 is a plotting of that section's allocation as it appears in the compact. The first conception was to use the Randolph gaging station as the delivery point, with due allowance for inflow and return flow, however, it may be advisable to have the point of determination immediately below the last diversion in this section. In the latter case the table and definition of the point of determination of divertible flow would need be changed in the tentative draft.

The paragraph following the table of allocations in the Compact places a limitation on the maximum flow that can be diverted in the upper division. The 3,340 acre-feet daily figure is equivalent to the total water rights on record for the division with a duty of water of one cubic foot per second for each fifty acres of land. This limitation is necessary, otherwise late dated rights downstream would be seriously affected. This paragraph further allows any section to divert unused parts of flows allocated to another section up to the maximum allocation for the section.

Western irrigation history is full of instances in which later date settlers have been allowed to move into upper areas, establish irrigation works and farms.

Almost invariably, at the same time developments are going on downstream, which take up all available storage sites and storable waters. After a lapse of many years regulation of the stream is started. Usually the upstream user finds himself without water and no opportunity to obtain supplemental storage to cover his shortage, while the downstream user is well fortified. This may be attributed to a lack of foresight on the part of the water user but the fault basically lies in the water laws of the individual states and the lack of understanding of the Congress in earlier years. The situation is much more complicated where interstate waters are concerned.

If because of conditions now prevailing, a water user cannot obtain storage water but has a valid right during the early part of the season when crop growing conditions are bad, why should he not be allowed to accumulate a portion of his right in storage. He could thus provide himself with storage water to apply during the growing season. Such a practice would result in a conservation of the common supply and lower users would not be materially injured. This would be especially true if sufficient of his right were allowed to pass on downstream to compensate for return flow that would have occurred if he had applied the water to the land.

To fit such circumstances there has been included in the Compact, a storage provision allowing the sections to store fifty percent of their unusued allocations and the other fifty percent to pass on downstream to compensate for return flow.

Interstate Tributaries - Article V A-2-a

Practically all of the watershed of Mill Creek lies in Utah while the major portion of the lands irrigated are located in Wyoming. Of the nineteen canals diverting from Mill Creek, three divert in Utah and irrigate lands located entirely in that state. The balance divert in Wyoming and serve lands in Wyoming.

Of the fourteen canals diverting water for irrigation from Yellow Creek, all but three divert in Wyoming and serve lands in that state. Two canals divert in Utah and serve lands in Utah while one canal diverts in Utah and supplies lands principally in Wyoming.

The Compact provides that the waters in these creeks shall be apportioned among the various users on the basis of priority of rights, and sets up a common duty of water.

Middle Division - Article V A-3-a

This division includes the Lower Wyoming and Upper Idaho sections. On Plate 3 are shown the rights and accumulative rights for these two sections. Plate 6 shows a graphical representation of the accumulative rights as listed on Plate 3. Plate 7 is a graphical representation of the accumulative rights in each section to the total accumulative rights in both sections.

In this division according to the listing of water rights on Plate 3, the Idaho section would receive practically all of the first 300 second-feet of divertible flow. There has been considerable development in the Wyoming section during relatively recent years. These later day developments have been principally on Smiths Fork or on the river bottoms where Smiths Fork waters have been utilized. In normal years supplies are more than sufficient to fill the needs of these two sections and no material cutting of rights are necessary. However, drouth years which have been experienced many times have caused much concern in the Idaho section.

To allocate the first 300 cubic feet per second to the Idaho section, would in drouth years, put the Wyoming section in dire straits. There must therefore, need be a deviation from the purely priority principle in the allocations, which must be equitable, but at the same time give consideration to the Idaho rights.

No well based formula is offered [illegible] how a division should be made as in the end the division will be made by agreement between the commissioners and water users of the two states.

We have recommended that Wyoming be allowed 73 second feet when Idaho receives 295 second feet. For lesser divertible flows the division will be proportional to these figures. This Wyoming allotment is approximately one fourth of its total right and one fourth of Idaho's first right.

Above this first allotment to each section the relation of the allocations follow the priority of rights schedule. On Plate 7 the solid lines show the relation of the allotments.

In studying the relation of diversions and rights in this division to those below Stewart Dam, considering probably inflow, it is apparent that only the Last Chance Canal rights must be affected, so far as priority of rights are concerned. With the maximum limitation of one cubic foot per second for each fifty acres and the schedule as set up in the Compact for this division, it is not believed this canal will be deprived of any material flows to which it is entitled. At least the records since 1944 indicate such to be the case.

During 1944 and 1946 more or less water passed Stewart Dam and into the Rainbow Canal throughout the irrigation season. At the same time strict application of the Compact schedule would necessitate decreasing the allotments of the sections in the ~~Upper~~ Middle division. As will be illustrated later, canals in the Idaho section did not demand a flow equal to the supply available which was still less than their allocation. This lesser demand resulted in the flows which passed Stewart Dam in the later part of the season. This represents water to which the Wyoming section should be entitled to divert if they so desired, providing downstream priorities were not injured. A study of inflows below Stewart Dam in 1944 and 1946 and resultant flows that would occur under Compact regulation indicate

that the Lower Wyoming section should not be cut below its 1901 priority of 192 cubic feet per second when any recoverable water is passing Stewart Dam. Canals which might demand release of water past Stewart Dam are the Budge, Johnson, Last Chance, and Bench "B". In the first analysis, the Gentile Valley Canal rights were included which made the 1897 right of 184 cubic feet per second the limiting right. This was the amount shown in the tentative draft. However, the Gentile Valley Canal should not have been included. Springs shortly upstream from that canal, supply flows sufficient to fill most of the rights of that canal. The figure of 365 acre feet daily in the Compact should be changed to 380 acre-feet daily.

The Lower Wyoming section has rights amounting to 295 second feet older than the Bear Lake storage right. The maximum diversion right of this section is 308 second feet. The allocations, as provided in the Compact, would not injure the storage right more than 13 cubic feet per second.

A maximum diversion limitation is also provided for this division. However, it may be advisable to place the maximum limitation on each section. The Compact should not set up an allocation for one part of a State which may result in violation of rights decreed to another section in the same state. The paragraph in the tentative draft - a part of which has already been struck out - will need be revised accordingly.

A similar storage provision to that for the Upper division is provided. The intent of this storage provision is to allow storage to be accumulated through conservation of the early season flows. The provision should be so ~~constructed~~ drawn to carry out this intent and not allow water to be stored in the later part of the season when a section does not have need for its full allocation.

Interstate Tributaries - Article V A-4 (a) - (b)

Thomas Fork and Raymond Creek are the only interstate tributaries in this

section on which future problems might arise. The stipulation in the Compact regarding these two streams are in accordance with present rights and usage. However, there might be a few small rights on Upper Thomas Fork Tributaries which should be investigated although they are now believed to have been abandoned.

Lower Division - Article V A-5

The decree of the District Court of the United States "Utah Power & Light Company vs. The Last Chance Canal Company et al," dated July 14, 1920, defines the rights in Idaho below Stewart Dam and including the Rainbow Canal. This decree contains a paragraph as follows.

> "The plaintiff, Utah Power & Light Company, and the defendant, Utah-Idaho Sugar Company, have certain rights to the use of the waters of Bear River with points of diversion in Utah below the Utah-Idaho state line, which rights are included in the schedule of rights herein decreed. The inclusion of said rights in the said schedule is not to be construed as a decree in rem, establishing said rights, or as an adjudication of title to said rights, which have attached in a state or district beyond the jurisdiction of this court, but merely as a recognition of said rights to the extent that in the administration of that part of the river within the jurisdiction of this court, and the operation of this decree as hereinbefore defined, the watermaster, commissioner or other official charged with the administration of the decree, shall see that there is delivered at the Utah state line such quantity of water as is necessary, together with natural increment below said Utah state line, to satisfy said rights in accordance with their dignity and priority as herein recognized."

The decree of the District Court of the First Judicial District of the State of Utah "Utah Power & Light Company vs. Richmond Irrigation Company et al," dated February 21, 1922 contains the following reference to the United States District Court Decree:

> "The quantity of water released from such storage and to which the plaintiff is entitled, flowing in Bear River at the Utah-Idaho State Line at any given time shall be determined as provided in the final decree of the District Court of the United States for the District of Idaho, Eastern Division, in Equity No. 203, wherein Utah Power & Light Company, Limited, et al, were defendants, a copy of which decree has been introduced in evidence in this cause; that is to say by deducting from the quantity of water being released from the Bear Lake Reservoir, consisting of Bear and Mud or North Lakes, at any given time, - - - "

This decree also schedules the same rights for the power plant at Wheelon Dam, the West Side Canal, and the Hammond Canal as are included in the decree of the United States District Court.

It thus appears that there is little more that can be done in defining the rights of these two states in the Lower division except possibly to place a limitation on total decreed rights in each. If there should exist any additional storable waters in this Lower division, it may be well to set forth in the Compact a proportional division of such waters between the two states. No attempt has been made to include any limitations or division of surplus waters between the two states in the tentative draft as prepared.

Article V A-6-a refers to Cub River, the only interstate tributary in the Lower division.

Article V A-7 and 8 refer to the natural flow of Bear River during the non-irrigation season.

The balance of the Articles in the tentative draft are rather standard statements which are included in most compacts but made applicable to Bear River. These should be examined closely to be sure there are no ambiguties or conflicting statements.

PART VI

HYDROGRAPHS SHOWING RESULTANT COMPACT ALLOCATIONS TO EACH STATE IF THE COMPACT HAD BEEN IN EFFECT DURING THE YEARS 1944 and 1946

This part of the report concerns the resultant effect of the tentative Compact in operation. Plates 8 to 29 in Part VII show comparative hydrographs of resultant flows under Compact regulation if it had been in effect during the years 1944 and 1946. Plates 30 to 43 in Part VII contain the data on which these hydrographs have been prepared. The sections in downstream order for 1944 will be examined first and then followed in like order for 1946.

1944 UPPER DIVISION

Upper Wyoming Section - 1944 - Plate 8

The solid line shows the total flow actually diverted and the dashed line represents allocation under the Compact.

Prior to the time the diversions exceeded the allocation 15,346 acre-feet could have been stored under the Compact storage provision. The maximum allocation was exceeded only a small amount for two days. From June 22 to July 10, this section could have diverted 3,228 acre-feet more than it actually diverted. Under the Compact the allowable diversions July 11 to August 26, would have been 4,230 acre-feet less than actually diverted. After August 26, the flow at the State Line was less than 50 cubic feet per second and the section could divert all divertible flow.

Summary in acre-feet of actual diversion and resultant Compact deliveries without storage provision.

	Actually diverted Acre-feet	Compact Allocation Acre-feet
1944		
May	15,534	15,534
June	36,972	37,745
July	22,407	21,060
August	3,842	3,332
September	2,011	2,011
Total	80,766	79,682
Acre-feet per acre	2.0	2.0
39,949 Acres.		

Middle Utah Section - 1944 - Plate 9

The solid line shows the total flow actually diverted and the dashed line represents allocation under the Compact.

Prior to May 17 when diversions began exceeding the allocation only 1,747 acre-feet could have been stored under the storage provision.

From May 17 to June 29 this section diverted more than its allocation much of the time. The total allocation for this period would have amounted to 64,155 acre-feet, while the flow actually diverted totaled 66,289 acre-feet. If headgates had been properly regulated, this section would have received only 2,134 acre-feet less under the Compact, than was actually diverted.

Between June 30 and August 26 the section would have received 6,813 acre-feet more water under the Compact than it actually diverted. After August 26 this section could have diverted all divertible flow in its reach of the river.

Bear River at Woodruff Narrows was practically dry after August 1 in 1944 and under the Compact would be dry after August 26.

Summary in acre-feet of actual diversions and resultant Compact deliveries without storage provision.

1944	Actually Diverted Acre-feet	Compact Allocation Acre-feet
May	36,000	35,480
June	46,520	44,985
July	16,961	21,060
August	307	2,993
Sept.	399	399
Total	100,187	104,917
Acre-feet per acre	2.7	2.9

36,572 Acres

Middle Wyoming Section - 1944 - Plate 10

The solid line shows the total flow actually diverted except the unmeasurable flow to the Pixley East Side lands and the dashed line represents the allocation under the Compact.

Prior to the time the diversions exceeded the allocation 1,458 acre-feet could have been stored under the Compact provision.

After May 17 the section exceeded its maximum allotment most of the time. The maximum diversions were as much as 2.7 times the maximum allotment and this did not include the Pixley East Side water.

From May 30 to July 2, there were 6,290 acre-feet more diverted than allotted. From July 3 to July 31, the section could have diverted 6,508 acre-feet more than was actually diverted.

Summary in acre-feet of actual diversions and resultant compact deliveries without storage provision.

1944	Actually Diverted Acre-feet	Compact Allocation Acre-feet
May	7,446	7,382
June	16,701	10,175
July	1,725	8,822
August	0	0
September	0	0
Total	25,872	26,379
Acre-feet per acre	3.1	3.1

8,457 Acres.

The figures in the "Actually Diverted" column do not include the unmeasured flow to the Pixley East Side lands, but those in the "Compact Allocation" column include that diversion.

Flow above Mouth of Smiths Fork - 1944 - Plate 11

This hydrograph shows the computed resultant flows above the Mouth of Smiths Fork. The solid line represents the actual computed flow that occurred. The dotted line which first coincides with the solid line, then separates to later coincide with the dashed line, represents the resultant Compact flow without storage upstream. The dashed line represents the resultant flow under the Compact with storage upstream.

Flows after August 1 would consist only of channel accretions below the Enberg Dam near Randolph.

Comparative summaries of the flows in acre-feet are as follows:

1944	Actual Computed Flow Acre-Feet	Resultant Compact Flow With Storage Provision Acre-feet	Resultant Compact Flow Without Storage Provision Acre-feet
May	41,879	27,360	42,288
June	40,619	39,860	43,482
July	13,751	6,296	6,296
Total	96,249	73,516	92,066

Middle Division - Lower Wyoming and Upper Idaho Sections - 1944 - Plates 12 to 14

Plates 12, 13 and 14 show the sections in the Middle division and resultant flows at Stewart Dam. This group of plates represent the resultant effect of the Compact in 1944 if the Lower Wyoming and Upper Idaho sections had demanded their full allocations.

On Plate 12 for the Lower Wyoming section, the solid line shows the actual diversions and the dashed line represents the Compact allocations. The Lower Wyoming section would have diverted 22,276 acre-feet more than its allocation after June 1.

On Plate 13 for the Upper Idaho section the solid line shows the actual diversions and the dashed line represents the Compact allocations. Between May 27 and June 28 this section diverted 2,011 acre-feet more than its allocation. However, after June 28 it drew 26,408 acre-feet less than the amount to which it was entitled.

Plate 14 shows the resultant flows passing Stewart Dam and into Rainbow Canal. The solid line shows the actual flow and the dashed line represents the resultant flow which would have occurred if both sections upstream had demanded their full allocations. From May 30 to June 30, 3,753 acre-feet more would have passed this point due to the limitation on maximum diversions in the upstream sections. From July 1 to September 30, the flow would have been 16,951 acre-feet less if the two sections had demanded and used their full allocations.

Middle Division - Lower Wyoming and Upper Idaho Sections - 1944 - Plates 15 to 17

The true picture of effect of the Compact when one section or the other does

not demand its full allotment is represented on Plates 15 to 17. These plates represent the Compact as it would apply in actual practice.

Lower Wyoming Section - 1944 - Plate 15

On Plate 15 is shown the Lower Wyoming section when the provision relating to divertible flow passing Stewart Dam is in effect. Under the storage provision, 6,464 acre-feet could have been stored between May 1 and June 2. Between June 2 and August 6, diversions would be restricted a total of 9,249 acre-feet less than actually diverted. After August 6, the demand was slightly less than would have been available under the Compact.

Summary in acre-feet of actual diversions and resultant Compact deliveries without storage provision.

1944	Actually Diverted Acre-feet	Compact Allocation Acre-feet
May	6,028	6,028
June	22,153	18,327
July	21,178	15,963
Aug.	10,750	10,542
Sept.	8,614	8,614
Total	68,723	59,474
Acre-feet per acre	4.5	3.9

15,268 Acres

Upper Idaho Section - 1944 - Plate 16

On Plate 16 is the Upper Idaho section as it would have received water under the Compact and according to its demand in 1944. Under the storage provision, 3,316 acre-feet could have been stored. The section would have received 2,300 acre-feet less during late May and early June by the restriction on maximum diversion. After June 28 this section would have received the flow it demanded.

Summary in acre-feet of actual diversion and resultant Compact deliveries without storage provision.

1944	Actually Diverted Acre-feet	Compact Allocation Acre-feet
May	21,453	21,285
June	28,832	26,696
July	14,747	14,747
Aug.	8,521	8,521
Sept.	6,982	6,982
Total	80,535	78,231
Acre-feet per acre	3.5	3.4

22,734 Acres.

Resultant flows at Stewart Dam - 1944 - Plate 17

Plate 17 shows resultant flows at Stewart Dam in 1944 if storage provision had been in effect in the Lower Wyoming and Upper Idaho sections and these two sections had received their allocated flows as shown on Plates 15 and 16.

The solid line shows flow as actually recorded and the dashed line the resultant flow under the Compact. A resultant flow under Compact provisions without storage provision can be obtained by using the solid line May 1 to May 30 and the dashed line for the balance of the season.

Summary of resultant flows at Stewart Dam in 1944.

1944	Actual Recorded Flow Acre-feet	Compact Resultant Flow With Storage Provision Acre-feet	Compact Resultant Flow Without Storage Provision Acre-feet
May	51,989	42,389	51,989
June	58,545	62,573	62,573
July	23,070	25,674	25,674
August	6,601	6,704	6,704
September	2,630	2,620	2,620
Total	142,835	139,960	149,560

These figures do not refelct the result of Compact regulation above the Mouth of Smiths Fork. Compact regulation in the Upper division would change the above table as noted below:

1944	Actual Recorded Flow Acre-feet	Compact With Storage Acre-feet	Compact Without Storage Acre-feet
May	0	-14,490	≠ 409
June	0	- 759	≠ 2,863
July	0	- 7,455	- 7,455
August	0	0	0
September	0	0	0
Total	0	-22,704	- 4,183

Lower Idaho Section - 1944 - Plate 18

This Plate shows five day average normal flows at the Alexander gaging station which would have occurred if Bear Lake storage did not exist. It was prepared to determine effect of the tentative Compact on normal flows at this point during 1944. The actual flow past Stewart Dam and into the Rainbow Canal was used as the normal flow supply at the upper end of the section.

The solid line represents the five day average normal flow that would have occurred if Bear Lake storage did not exist. The dashed line represents the five day average inflow between Stewart Dam and Alexander. The short dashed line hydrograph is the total diversions into the Budge, Johnson, Last Chance and Bench "B" canals. The horizontal long dashed lines are total accumulative water rights of the Budge, Johnson, Last Chance and Bench "B" canals. The light dotted lines represent increases or decreases that would result due to Compact regulation in the Lower Wyoming and Upper Idaho sections. Those in May show effect of the storage provision in the Compact.

This graph shows there was not sufficient water to fill all of the Last Chance Canal 1901 right after July 15. On August 5, the 1901 right would be entirely off and cutting would be started on the Last Chance 1897 right. A glance at Plate

15 shows the Lower Wyoming section was filling all rights on July 15, but between July 18 and 20 rights in this section would have had to be cut to the 1902 right and down to the 1897 right by July 24. This was the basis on which the provision allowing the Lower Wyoming section to divert up to 192 cubic feet per second when divertible flow is passing Stewart Dam was based. It also illustrates that the allocations as provided in the Compact do not materially injure water rights below Stewart Dam. That the benefits of the limitations on the upper diversions almost equals the effect of the storage provisions, as indicated by the small dotted lines.

UPPER DIVISION

Upper Wyoming Section - 1946 - Plate 19

The solid line shows the total flow actually diverted and the dashed line represents the allocation under the Compact.

Prior to the time the diversions exceeded the allocation 9,818 acre-feet could have been stored under the Compact storage provision.

The maximum allocation was exceeded seven days for a total of 1,995 acre-feet. During the period June 12 to 20, the allocation would have been 623 acre-feet more than actually diverted. Under the Compact the allocation June 20 to August 30, would have been 8,331 acre-feet less than actually diverted. After August 30 the flow at the State Line station was less than 50 cubic feet per second and the section could divert all divertible flow.

Summary in acre-feet of actual diversions and resultant Compact deliveries without storage provision.

1946	Actually Diverted Acre-feet	Compact Allocation Acre-feet
May	25,438	25,438
June	36,948	33,507
July	12,899	7,319
August	3,896	3,382
September	1,974	1,974
Total	81,155	71,620
Acre-feet per Acre	2.0	1.8

39,949 Acres.

Middle Utah Section - 1946 - Plate 20

The solid line shows the total flow actually diverted and the dashed line represents allocation under the Compact.

Prior to May 20 when diversions began exceeding the allocation, 6,089 acre-feet could have been stored under the storage provision.

The maximum allocation was exceeded only a few days in May for a total of 490 acre-feet. The two days in June are not counted as the amount is too small. 702 acre-feet more could have been diverted between May 28 and June 9 and 8,400 acre-feet more would have been available June 12 to August 28 under the Compact. After August 28 the section could have diverted all divertible flow in its reach of the river.

Summary in acre-feet of actual diversions and Compact deliveries without storage provision.

1946	Actually Diverted Acre-feet	Compact Allocation Acre-feet
May	34,379	34,548
June	31,676	34,830
July	3,096	7,319
August	843	3,290
September	585	585
Total	70,579	80,572
Acre-feet per Acre	1.9	2.2

36,572 Acres.

Middle Wyoming Section - 1946 - Plate 21

The solid line shows the total flow actually diverted except the unmeasurable flow to the Pixley East Side lands and the dashed line represents allocation under the Compact. Prior to the time the diversions exceeded the allocation only 254 acre-feet could have been stored.

Between May 6 and June 22 the canals diverted 4,522 acre-feet more than the allotment. After June 22 they could have diverted 4,627 acre-feet more under the Compact than was actually diverted.

Summary in acre-feet of actual diversions and resultant Compact deliveries without storage provision.

1946	Actually Diverted Acre-feet	Compact Allocation Acre-feet
May	13,815	10,001
June	9,854	10,020
July	359	4,116
August	0	0
September	0	0
Total	24,028	24,137
Acre-feet per Acre	2.8	2.8

8,457 Acres.

The figures in the "Actually Diverted" column do not include the unmeasured flow to the Pixley East Side lands, but those in the "Compact Allocation" column include that diversion.

Flow above Mouth of Smiths Fork - 1946 - Plate 22

This hydrograph shows the resultant flows above the Mouth of Smiths Fork. The solid line represents the actual computed flow that occurred. The dotted line which first coincides with the solid line, then separates to later coincide with the dashed line, represents the resultant Compact flow without storage upstream. The dashed line represents the resultant flow with storage upstream.

Flows after July 21 would consist only of channel accretions below the Enberg Dam near Randolph.

Comparative summaries of the flows in acre-feet are as follows:

1946	Actual Computed Flow Acre-feet	Resultant Compact Flow With Storage Provision Acre-feet	Resultant Compact Flow Without Storage Provision Acre-feet
May	35,399	21,953	35,959
June	11,699	11,201	11,861
July (1-21)	2,886	2,705	2,705
Total	49,984	35,859	50,525

Middle Division - Lower Wyoming and Upper Idaho Sections - 1946 - Plates 23 to 26

Plates 23 to 26 show the sections in the Middle division and resultant flows at

Stewart Dam. This group of plates represent the resultant effect of the Compact in 1946 if the Lower Wyoming and Upper Idaho sections had demanded their full allocations.

On Plate 23 for the Lower Wyoming section, the solid line shows the actual diversions and the dashed line represents the Compact allocations. The Lower Wyoming section would have diverted 22,414 acre-feet more than its allocation after June 1.

On Plate 24 for the Upper Idaho section the solid line shows the actual diversions and the dashed line represents the Compact allocations. Between May 25 and June 21 this section diverted 3,007 acre-feet more than its allocation. However, after June 21 it drew 32,007 acre-feet less than the amount to which it was entitled.

Plate 25 shows the resultant flow passing Stewart Dam and that diverted into Rainbow Canal. The solid line shows the actual flow and the dashed line represents the flow which would have occurred if both upstream sections had demanded their full allocations. From May 25 to June 28, 6,371 acre-feet more would have passed this point due to the limitation on maximum diversions in the two upstream sections. From June 29 to September 30, the flow would have been 24,652 acre-feet less if both sections had demanded and used their full allocations.

Middle Division - Lower Wyoming and Upper Idaho Sections - 1946 - Plates 26 to 28

Again in 1946 this division did not demand all of the divertible flow available. Even more flow passed Stewart Dam than in 1944, the flow increasing in the later part of the season. Plates 26 to 28 illustrate the flows as they would have occurred under the provisions of the Compact.

Lower Wyoming Section - 1946 - Plate 26

On Plate 26 is shown the Lower Wyoming section when the provision relating to divertible flow passing Stewart Dam is in effect. Under the storage provision 4,588 acre-feet could have been stored. From June 1 to August 3, diversions would

have been restricted 13,875 acre-feet. After August 3, the demand was slightly less than would have been available under the Compact.

Summary in Acre-feet of actual diversions and resultant Compact deliveries without storage provision.

1946	Actually Diverted Acre-feet	Compact Allocation Acre-feet
May	9,759	9,749
June	26,410	18,327
July	19,450	13,706
August	9,654	9,604
September	4,056	4,056
Total	69,329	55,442
Acre-feet per acre	4.5	3.6

15,268 Acres.

Upper Idaho Section - 1946 - Plate 27

This Plate shows the water that the Idaho section would have received under the Compact in 1946, or as limited by the demand. The section could have stored 3,469 acre-feet under the storage provision. From May 25 to June 21, the diversions would have been restricted a total of 3,014 acre-feet. After June 21, the demand was less than its allowable flow and the section would have received the flow it demanded.

Summary in acre-feet of actual diversions and resultant Compact deliveries without storage provision.

1946	Actually Diverted Acre-feet	Compact Allocation Acre-feet
May	21,824	20,983
June	28,451	26,277
July	14,801	14,801
August	8,460	8,460
September	5,129	5,129
Total	78,665	75,650
Acre-feet per acre	3.5	3.5

22,734 Acres.

Resultant Flows at Stewart Dam - 1946 - Plate 28

This Plate shows resultant flows at Stewart Dam if the storage provision had been in effect in the Lower Wyoming and Upper Idaho sections and these two sections had received their allocations as shown on Plates 26 and 27.

The solid line shows flow as actually recorded and the dashed line resultant flow under the Compact. An approximate resultant flow without the storage provision can be obtained by using the solid line May 1 to May 26 and the dashed line for the balance of the season.

Summary of resultant flows at Stewart Dam in 1946.

1946	Actual Recorded Flow Acre-feet	Compact Resultant Flow With Storage Provision Acre-feet	Compact Resultant Flow Without Storage Provision Acre-feet
May	92,606	85,394	93,451
June	24,446	30,655	30,655
July	9,618	12,494	12,494
August	8,309	8,333	8,333
September	10,243	10,243	10,243
Total	145,222	147,119	155,176

These figures do not reflect the result of Compact regulation above the Mouth of Smiths Fork. Compact regulation in the Upper division would change the above table as noted below:

1946	Actual Recorded Flow Acre-feet	Compact With Storage Acre-feet	Compact Without Storage Acre-feet
May	0	-13,446	∠ 560
June	0	- 498	∠ 162
July	0	- 181	- 181
August	0	0	0
September	0	0	0
Total	0	-14,125	∠ 541

Lower Idaho Section - 1946 - Plate 29

This Plate shows five day average normal flows at the Alexander gaging station

which would have occurred if Bear Lake storage did not exist. It was prepared to determine the effect of the tentative Compact impact on normal flows at this point in 1946. The actual flow past Stewart Dam and into the Rainbow Canal was used as the normal flow supply at the upper end of the section.

The solid line represents the five day average normal flow that would have occurred if Bear Lake storage did not exist. The dashed line represents the five day average inflow between Stewart Dam and Alexander. The short dashed line hydrograph is the total diversions into the Budge, Johnson, Last Chance, and Bench "B" canals. The horizontal long dashed lines are total accumulative water rights for these canals. The light dotted lines represent increases or decreases that would result due to Compact regulation in the Lower Wyoming and Upper Idaho sections.

Records for this year indicate there was not sufficient water to fill all of the Last Chance Canal 1901 right after June 25. At no time during the balance of the summer was all of the 1901 right entirely off and the season ended with it being practically filled. Plate 26 for the Lower Wyoming section shows all rights filled in that section until July 8. However, by July 11 the Wyoming rights were cut to about the 1902 right and by July 14 to the 1897 right. This year again demonstrates that the Wyoming right should not be cut below its 1901 right of 192 cubic feet per second when divertible flow is passing Stewart Dam.

PART VII

See accompanying set of Plates, Summaries of Water Rights, Graphs of Compact Allocations and Bear River Hydrographs for 1944 and 1946.