

BEAR RIVER COMPACT

Abstract of Reports

Sept. 10, 1953

*Does Not Include  
Reports 28 & 29, 1948 - G.A.S.*

Report #1: June 23, 1948: Report on Compact and Analysis of Stream-Flow Records

A preliminary report to the Commission which included under separate binding a tabulation of Main Stem Water rights and a tentative Draft (Report #2) of the Bear River Compact prepared by Leshar S. Wing and W. V. Iorns. The report explains the source of tabulated water rights and maps of irrigated acreages. A study of deliveries on a strict priority was made using 1944 and 1946 supplies. Essentially, priority of Rights was used as a basis of division in the tentative Draft. (Report refers to 29 plates and other hydrographs, Report #3, which are not printed. Originals on file in Logan Office).

Report #2: Mar. 31, 1948: Tentative Draft of Bear River Compact

First draft of Compact as referred to in Report #1. Based principally on Priority of Rights and without provision for upstream storage during the non-irrigation season it was not fully acceptable to the Upper states and has been revised several times.

Report #3: June 23, 1948: Plates and Hydrographs

This Report comprises the Plates and Hydrographs referred to in Report #1 and for which extra copies have not been printed. Originals are on file in the Logan U.S.G.S. Office.

Report #4: October, 1948: Compact Draft Revisions and Analysis of Stream Flow Records

Several recommended revisions were incorporated in the first tentative draft and dated July 29, 1948 (Report #5). The revisions are briefly explained in this

report. They did not materially change the fundamental concepts in the first draft. New hydrographs were prepared showing Compact deliveries by State section for 1944, 1946 and 1947, based on one cfs for each 50 acres and also one cfs for each 35 acres.

Report #5: July 29, 1948: Revised Tentative Draft

A new draft of the Compact incorporating revisions as explained in Report #4.

Report #6: Jan. 16, 1950: Revised Tentative Draft

Further revisions as suggested at Dec. 1948 meeting in Preston. Division of natural flow still based principally on relative priorities and computed as percentages of the Total Daily Divertible Flow. No upstream storage provisions during the non-irrigation season.

Report #7: Apr. 12, 1949: Summary & Storage data for Engineering Committee

Plates and tables showing hydrographic data for Bear Lake. Monthly canal diversions (1944-47) for entire river. Supplies, diversions and gains by sections. Supplies, diversions and suggested allocations by sections.

Report #8: June 15, 1949: Report of Engineering Committee to Commission

A study of supplemental needs above Bear Lake under two general sets of conditions. (A) An assumed headgate requirement (from 2.80 to 3.40 ac.ft/acre), and a diversion pattern similar to actual pattern observed in good water years. (B) Requirement assumed to be a full diversion demand through July 31 (maximum rate of 1 cfs to 50 ac.).

Also included is a brief summary of potential development below Bear Lake and an investigation of the effect of future storage on existing rights.

Report #9: Nov. 21, 1950: Report of Legal Committee to Commission

A brief analysis from a legal aspect of existing water rights, the various decrees under which they were acquired and a resume of the law pertaining to water rights on interstate streams.

Report #10: Sept. 12, 1950: Analysis of Bear Lake Storage

✓ A more complete and detailed analysis of Bear Lake storage than studied in Report #7, on which certain conclusions were reached in Report #8.

For a 25-year period (1924-48), this study indicates the following:

1. If Bear Lake were dedicated entirely to irrigation purposes the maximum average annual storable would be 254,500 acre-feet.
2. Of this amount, 191,600 acre-feet is derived from Bear River.
3. The average annual irrigation storage requirement of canals dependent on Bear Lake is 159,800 acre-feet.
4. This leaves an average surplus of storable water arriving at Stewart Dam, considering only present irrigation storage requirements of 94,700 ac.ft.
5. In past operation Bear Lake storage or storable to the extent of 103,000 acre-feet annually has been used for power production.

Report #11: Dec. 13, 1950: Historical Reports

A brief summary of early investigations and studies (1878 - 1903) on Bear River.

Report #12: Dec. 14, 1950: Stream Flow Depletion & Consumptive Use

Depletion and consumptive use study on a valley basis using Inflow - Outflow determinations. The Blaney-Criddle equations were utilized in checking the computed valley Consumptive Use and in arriving at Consumptive Use Coefficients.

Average Consumptive Use (inches per acre) for period 1944-49:

Upper Wyoming,	36,000 acres	-	18.5 in. per ac.
Middle Utah,	51,800 acres	-	18.9 in. per ac. (1944-48)
Lower Wyoming,	27,000 acres	-	22.6 in. per ac. (1944-48)

Report #13: Dec. 15, 1950: Water Rights in the Bear River Basin

A brief discussion of the elements of a water right and the various Decrees on Bear River. Comparisons are made of decreed descriptions with land now irrigated. Compiled water rights as assembled for Report #1 are included. Rights are prepared on a common duty for all lands.

Report #14: Dec. 16, 1950: Analysis of Rights, Supplies and suggested methods of Compact Apportionment

A continuation of the discussion on recorded water rights and priorities. Earlier studies have shown that if canals were held to decreed amounts the river could be divided into three independent divisions, in which rights would not at any time have to be cut in an upper division for the benefit of a lower division right. The two points of division being above the mouth of Smiths Fork and at Stewart Dam. This would confine the negotiations to two states in each Division. Tributary Rights are, in general, earlier than the Main Stem and Smiths Fork. It was concluded, therefore, that the division between states would need apply only to the Main Stem and Smiths Fork.

Two general methods of apportionment might be possible:

1. Operate the entire river as a unit on a priority of rights schedule.
2. Allocate to each state division a portion of the daily or weekly supplies.

The latter method appears to be more applicable to Bear River.

Report #15: May 22, 1951: Limiting Flows at Border for allowance of Upstream Storage

A report by the Engineering Committee to determine how much of the natural flow passing Border could be stored upstream (during irrigation season) without affecting downstream direct flow irrigation rights. This report indicates that canals at Cutler Dam are usually the first to have natural flow rights cut. The average equivalent flow at Border when these rights are first reduced would be about 750 cfs.

Report #16: May 22, 1951: Daily Stream Flow Depletions

A preliminary study to determine the feasibility of dividing the flow by using stream flow depletion on a section basis.

1. Upper Division: The relationship between water applied and/or supplies with depletion is not consistent enough to form a basis for division studies.
2. Middle Division: Somewhat better relationship following high water. If Lower Wyoming were allowed to deplete the supply from 20 to 30 percent their resulting apportionment would reasonably conform to the relative rights between Wyoming and Idaho. If a critical flow of 400 cfs at Border were used as a time to begin limiting depletion in Lower Wyoming, Last Chance Canal rights in Idaho would not be injured. Lower Wyoming would have some regulation in average years. In years well below normal, Wyoming diversions would be materially restricted.

Report #17: Aug. 20, 1951: Supplement #1 to Daily Stream Flow Depletions

Additional data on Report #16 including tables (1944-48) showing Lower Wyoming's share of supplies based on allowable depletions of 25%, 30% and 35%. Also comparison of Main river flow passing Border and Harer, showing that Harer = 120% Border.

Report #18: July 6, 1951, Available Supplies at Potential Reservoir Sites

✓ Bureau of Reclamation preliminary surveys including cost estimates of potential dam sites above Bear Lake.

On a basis of available records of supplies from Oct. 1 to Apr. 30:

1. A Hilliard reservoir of 10,000 ac.ft. would fill in all years.
2. For storage aggregating 30,000 ac.ft. at and above Woodruff Narrows supplies would be adequate (Oct. 1 - Apr. 30) except in 4 years

of the 25-year period, '1924-48. (Tables of supplies and deficiencies prepared for a range from 25,000 to 50,000 ac.ft. storage).

3. Woodruff Creek: 5,000 ac.ft. capacity would fill in 11 of 13 years.
4. Big Creek: 4,000 ac.ft. reservoir would fill in 9 of 14 years (1938-1951).
5. Otter Creek: About 5,000 ac.ft. annual supply (Oct. 1 - Apr. 30).
6. Smiths Fork: Supplies are more than adequate for two dam sites studied totalling 31,000 ac.ft.
7. Thomas Fork: A 5,000 ac.ft. reservoir would fill in practically all years.

Report #19: Aug. 19, 1951: Supplemental Storage Requirements above Bear Lake

An additional study on supplemental needs under different assumed conditions than were studied in Report #8.

A segregation of lands by source of supply is made. Also a brief resume of the findings in Report #8 and the Bureau of Reclamation diversion requirement studies using the Lowry-Johnson method.

The Blaney-Criddle method previously used (Report #12), was modified to compute the Consumptive Use, Consumptive Use Factor and Headgate Efficiency Coefficient on an irrigation-growing period from May 1 to July 31, for Application of irrigation water ending in Mid-July. Based on 1944, 1945 and 1950, the following average values were recommended for this section:

Consumptive Use Coefficient "K" = 1.03  
Headgate efficiency Coefficient = 0.50  
Headgate Requirement = 2.66 acre feet per acre

By the methods used in Report #12, the Headgate Requirement equalled 2.78 ac.ft. per acre for this section. Because of the close agreement in Middle Utah, it was assumed the findings for the Upper Wyoming Section in the previous report would be

reliable ( $U = 0.855 F \div 2.90$ ). Upper Wyoming headgate requirement = 2.30 ac.ft./acre.

Table on page 30 gives 25-year storage requirement for 15,000 acres from Myers Narrows to Woodruff Narrows.

Table on page 35 shows the same information for land likely to be included under a reservoir at Woodruff Narrows.

Table on page 39 summarizes the total storage requirements and available storable supplies at and above Woodruff Narrows.

Report #20: Oct. 30, 1951: Segregation of Storage and Natural Flow below Bear Lake

This study prepared to analyze natural flow rights below Bear Lake. To provide detailed data for further studies by segregation between natural flow and storage below Bear Lake.

Report #21: Jan. 8, 1952: Chapman Canal and Neponset Reservoir (Revised)

This report supercedes a preliminary report dated Aug. 8, 1951 on the Chapman Canal and Neponset reservoir. It incorporates water rights, acreages claimed and recommended acreages from field determinations. Also records of diversions in Chapman Canal.

Report #22: Nov. 28, 1951: Existing irrigation reservoirs above Bear Lake

Results of a field study on all existing irrigation storage in Bear River Basin above the Lake.

The following is a summary of storage by states:

Wyoming - 2,746 ac.ft. adjudicated; 1,745 ac.ft. existing.

Utah - 11,448 ac.ft. adjudicated; 12,526 ac.ft. existing.

Idaho - 121 ac.ft. adjudicated; 324 ac.ft. existing.

Report #23: Dec. 7, 1951: Comparison of suggested methods of division & acreage tabulation

Reviews the important premise or condition by which the River can be divided into 3 independent Divisions for Compact operation:

1. In general, tributary rights, excepting Smiths Fork, are earlier dated than Main Stem rights. Supplies generally are insufficient to fill as late dated rights on tributaries, excepting Smiths Fork, as can be filled on the Main Stem.
2. Later dated rights can be filled below Smiths Fork than above. Likewise, later dated rights can be filled below Stewart Dam than from Smiths Fork to Stewart Dam.
3. Statements above were true from 1944 to 1948 if canals were held to their rights placed on a common duty of one cfs for each 50 acres. This report compares the division of water in the Central Division as between (1) Priority principle as in the first tentative Draft (2) The Depletion method and (3) The present irrigated acreage method. Plates 13, 14 and 15 at the end of the report show graphically Wyoming's share for 1944, 1946 and 1948 under the three methods.

Report #24: Apr. 10, 1952: Upstream Storage Supplies, Assumed Allowances and Effects on Bear Lake

Two types of upstream storage are studied in combination, and defined as follows:

1. Basic - is future storage confined to the period Oct. 1 - Apr. 30 and not subordinate to existing or future storage in Bear Lake or below.
2. Secondary - is additional storage of the type above but which could only be stored when the elevation of Bear Lake is above a certain minimum and the flow of Bear River at Border is above 700 cfs.

The study covered a range in basic storage from 10,000 ac.ft. to 50,000 ac.ft. using a maximum secondary storage of 20,000 ac.ft.

Tables on pages 4 and 5 show annual shortages of supplies for various amounts of basic storage.

The Engineering Committee concluded in this study that supplies physically



available at Woodruff Narrows and above would permit basic storage up to 50,000 acre feet without too many years of shortage. The inclusion of secondary storage for the 25-year period (1924-48) would have been of little value to the upper interests. Secondary storage would require certain limitations on the use of Bear Lake as between power and irrigation.

Report #25: (No Date): A Bear Lake irrigation reserve & A Method of Compacting on Upstream Storage

An Engineering Committee report on a suggestion by E. K. Thomas for compacting on upstream storage. Lower users have been reluctant to agree to substantial amounts of upstream storage due to the effect on their water supplies which are dependent on Bear Lake. The Thomas method involves dividing the active storage capacity of Bear Lake (1,421,000 ac.ft.) into two parts, the bottom portion referred to as an "irrigation reserve". This portion subject to demand for irrigation and such incidental power as may be developed in transit to irrigation diversions. The top portion would be subject to the same demand as above and also a demand solely for power.

Summaries of the correlation between assumed amounts of storage and irrigation capacity required in Bear Lake are shown on page 6. Graphical analysis of the relationship and supplies available are shown on plates 1 and 2, following page 7.

Report #26: Nov. 1, 1952: Suggested Allocations & Supplemental Upstream Storage Data

1. A comparative study of Compact deliveries in the Central Division, dividing divertible flow as follows:
  - (a) 43% to Wyoming and 57% to Idaho (acreage basis)
  - (b) 35% to Wyoming and 65% to Idaho (Idaho suggestion)
  - (c) Relative Priority of Rights. Tables and graphs of this comparison are shown.

2. An analysis of assumed storage allowances, similar to Report #25, for 30,000 and 36,000 ac.ft., except that an "irrigation Reserve" in Bear Lake was established at 787,500 acre-feet (elevation 5,914.50). Available storable water was computed from Oct. 1 to Apr. 30 with no allowance after Apr. 30th.

With the above limit on Bear Lake a shortage to past irrigation releases from the Lake would have occurred in 1935 for both amounts of storage (in the 25-year period).

Supplies at Woodruff Narrows would be fully available in 21 of 25 years for 30,000 acre-feet and 20 of 25 years for 36,000 acre-feet.

Three additional parts of this report have, for the most part, been covered in previous reports.

Report #27: May 8, 1953: Storage Requirements and Supplies above Bear Lake

This report covers an assignment made to the Engineering Committee for a more comprehensive study on upstream storage. It's scope includes:

1. Tabulation of acreages by source of supply on a strict State line basis.
2. Computation of supplemental requirements, again on a State line

basis and extended to include all tributaries. This was based on previous supplemental requirement studies, extended where necessary.

3. Possible limitations on potential storage to satisfy these requirements due to deficient supplies or lack of available sites.
4. Based on existing conditions of regulation except on Smiths Fork where the effect of possible Compact regulation was included in the study of Supplemental needs.
5. The inclusion of all irrigated acreage above Stewart Dam.

Table I (following page 2) summarizes the findings of this study.

With the exception of Seleratus Drainage, in all sections having a supplemental requirement, storable supplies and available sites were adequate to meet the requirement.

Total irrigated acreage and requirements for Wyoming and Utah are:

<u>State</u>	<u>Acreage</u>	<u>Percent</u>	<u>Supplemental Requirement</u>	<u>Percent</u>
Utah	58,738	47%	24,680	64%
Wyoming	<u>65,301</u>	<u>53%</u>	<u>14,000</u>	<u>36%</u>
Total	124,039	100%	38,680	100%