UPPER COLORADO RIVER BASIN COMPACT COMMISSION

OFFICIAL RECORD

VOLUME III

Final Draft of Engineering Advisory Committee Report

and

Inflow-Outflow Manual

FINAL REPORT

ENGINEERING ADVISORY COMMITTEE

to

UPPER COLORADO RIVER BASIN COMPACT COMMISSION

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November 29, 1948

Denver, Colorado

November 29, 1948

Upper Colorado River Basin Compact Commission

Gentlemen:

Pursuant to instructions given at your September 17, 1946, meeting, and subsequent meetings, a final report on the activities and findings of your Engineering Advisory Committee in regard to the water supply of the Upper Colorado River Basin has been prepared and is enclosed herewith.

Respectfully submitted,

(Signed) J. R. Riter, Chairman, Federal
J. R. Riter

(Signed) R. Gail Baker, Arizona
R. Gail Baker

(Signed) R. I. Meeker, Arizona
R. I. Meeker

(Signed) R. J. Tipton, Colorado
R. J. Tipton

(Signed) R. M. Gildersleeve, Colorado
R. M. Gildersleeve

(Signed) F. C. Merriell, Colorado
F. C. Merriell

(Signed) J. H. Bliss, New Mexico
J. H. Bliss

(Signed) J. R. Erickson, New Mexico
J. R. Erickson

(Signed) C. O. Roskelley, Utah
C. O. Roskelley

(Signed) R. D. Goodrich, Wyoming
R. D. Goodrich

(Signed) H. T. Person, Wyoming
H. T. Person

(Signed) H. P. Dugan, Federal
H. P. Dugan

REPORT OF ENGINEERING ADVISORY COMMITTEE

TO THE

UPPER COLORADO RIVER BASIN COMPACT COMMISSION

<u>Engineer Advisors</u>

J. R. Riter, Chairman	Federal
R. Gail Baker	Arizona
R. I. Meeker	Arizona
F. C. Merriell	Colorado
R. M. Gildersleeve	Colorado
R. J. Tipton	Colorado
J. H. Bliss	New Mexico
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C. O. Roskelley	Utah
R. D. Goodrich	Wyoming
H. T. Person	Wyoming
H. P. Dugan	Federal

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SYNOPSIS

A temporary Engineering Advisory Committee met in Cheyenne, Wyoming, on August 30 and 31, 1946. This Committee prepared a report which embodied the engineering problems which it believed should be studied and reported upon in order that the Upper Colorado River Basin Compact Commission might be adequately informed on these matters during the negotiation of the Compact. The report was presented and accepted by the Compact Commission in Santa Fe, New Mexico, on September 17, 1946. A permanent Engineering Advisory Committee was appointed at that time and was instructed to proceed with the solution of problems outlined in the report of the temporary Engineering Advisory Committee.

Assignments

The work assigned to the Engineering Committee was:

a. Preparation of base maps to show the locations of present and potential irrigation developments within the limit of the Colorado River system upstream from Lee Ferry and stream gaging stations and drainage areas.

b. Determination of water contributions by states, involving the tabulation of streamflow records at key gaging stations, the extension of records by estimates, and estimation of runoff from unmeasured areas.

c. Estimation of present depletions above key gaging stations, state lines and Lee Ferry.

d. Estimation of channel losses along the main Colorado River and principal tributaries above Lee Ferry.

e. Determination of the extent to which the Upper Basin can make its apportioned water uses during drought cycles and the Upper Division still meet its compact obligation at Lee Ferry.

In addition to the above items the Compact Commission has asked the Engineering Advisory Committee to report on special problems from time to time. These items have been reported on, and have been made a matter of record in the proceedings of the Compact Commission.

Specifically these items were as follows:

a. Prepare a formula for incorporation in Article XIII pertaining to the Yampa River.

b. Prepare a formula for incorporation in Article XIV pertaining to the San Juan River.

c. Prepare a study of the future flows of the Green River at Linwood, Utah, above the mouth of Henry's Fork as requested by Commissioner Watson of Utah.

A report on these items was presented to the Compact Commissioner at Santa Fe, New Mexico, October 4, 1948, and a copy is included in Appendix D.

Maps

Maps of the states of Arizona, Colorado, New Mexico, Utah and Wyoming, showing the locations of present irrigated areas and potential irrigation projects, as envisioned by the Bureau of Reclamation within the Colorado River Basin and published as a part of the report on "The Colorado River" (House Document 419, 80th Congress, first session) have been mounted on cloth and distributed to the Compact Commissioners. This report contains a general map of the Upper Colorado River Basin, prepared for the Committee by the Colorado Water Conservation Board.

Water Contributions by States

Water contributions by states were determined by the Committee for the period 1914-45 at key gaging stations, state lines and Lee Ferry. The period 1914-45 was chosen because it was found to be most reliable from the standpoint of available records, and was believed to be representative of the longtime water supply to be expected from the Upper Colorado River Basin. During this 32-year period the irrigated acreage has remained substantially constant. In order to complete this portion of the assignment it was necessary to tabulate historic streamflow records at selected gaging stations, estimate missing portions of historic records, determine present water uses in the Upper Colorado River Basin, and determine channel losses on certain sections of stream channels. It was also necessary to determine drainage areas above certain key gaging stations to a greater degree of refinement. The table on page 3 summarizes by states and at Lee Ferry the water contributions and drainage areas tributary to the Colorado River as determined by the Engineering Advisory Committee. The table on page 4 summarizes the mean historic flow for key gaging stations and gives the drainage areas which lie above them. Tables of streamflow are given in Appendix A.

Present Depletions

Determination of present depletions by man in the Upper Colorado River Basin consisted of the evaluation of the use of water by cropped lands, non-cropped lands consuming irrigation water incidental to the irrigation of the cropped lands, transmountain diversions, reservoir evaporation losses and domestic uses. Adjustment was made for one small importation. One problem encountered by the Committee was the determination of cropped and non-cropped land areas, and their rates of use of irrigation water. The areas of cropped and non-cropped lands were estimated by inspections of the Bureau of Reclamation land classification sheets, field condition, available aerial surveys and

WATER CONTRIBUTIONS (1914-45) AND DRAINAGE AREAS
BY STATES

Item	Arizona	Colorado	New Mex.	Utah	Wyoming	Total
Historic Contributions						
Historic Flow at State Lines acre-feet	133,200	10,408,400	186,100	2,022,800	1,610,600	14,361,000
Out of State channel losses acre-feet	1,000	455,600	7,700	6,000	102,200	572,500
Historic contributions at Lee Ferry acre-feet	132,200	9,952,800	178,400	2,016,800	1,508,400	13,788,600
Percent	0.96	72.18	1.29	14.63	10.94	100.00
Virgin Contributions						
Virgin Flow at State Lines acre-feet	137,200	11,451,200	257,400	2,567,600	1,837,000	16,250,400
Out of State channel losses acre-feet	1,000	482,300	9,500	6,500	112,600	611,900
Virgin Contributions at Lee Ferry acre-feet	136,200	10,968,900	247,900	2,561,100	1,724,400	15,638,500
Percent	0.87	70.14	1.58	16.38	11.03	100.00
Drainage Area in Square Miles	6,936	38,932	9,646	37,165	17,210	109,889

UPPER COLORADO RIVER BASIN KEY GAGING STATIONS

Streamflow Stations	Mean Historic Flow Water Years 1914-45 1000 Acre-Feet	Drainage Areas Square Miles
1. Green River at Green River, Wyoming	1260.5	7670
2. Blacks Fork near Millburne, Wyoming	113.2	156
3. East Fork of Smith Fork near Robertson, Wyoming	32.5	53
4. West Fork of Smith Fork near Robertson, Wyoming	16.3	37
5. Green River near Linwood, Utah	1501.6	14300
6. Burnt Fork near Burnt Fork, Wyoming	25.1	53
7. Henrys Fork near Lonetree, Wyoming	32.4	55
8. Henrys Fork at Linwood, Utah	66.8	530
9. Little Snake River near Dixon, Wyoming	423.5	1028
10. Little Snake River near Lily, Colorado	472.4	3680
11. Yampa River at Steamboat Springs, Colorado	345.1	604
12. Yampa River near Maybell, Colorado	1189.5	3410
13. Brush Creek near Jensen, Utah#	36.0	255
14. Ashley Creek near Vernal, Utah	78.0	101
15. Whiterocks River near Whiterocks, Utah	94.1	115
16. Duchesne River at Myton, Utah	439.5	2705
17. Duchesne River near Randlett, Utah	653.3	3820
18. White River near Meeker, Colorado	461.7	762
19. White River near Watson, Utah	582.0	4020
20. Price River near Heiner, Utah	92.6	430
21. Green River at Green River, Utah	4658.4	40920
22. Colorado River at Hot Sulphur Springs, Colorado	476.7	782
23. Colorado River at Glenwood Springs, Colorado	2080.4	4560
24. Roaring Fork at Glenwood Springs, Colorado	1028.0	1460
25. Colorado River near Cameo, Colorado	3505.0	8055
26. Plateau Creek near Cameo, Colorado	186.3	604
27. Gunnison River near Grand Junction, Colorado	2054.9	8020
28. Dolores River at Gateway, Colorado	788.1	4350
29. Colorado River near Cisco, Utah	6186.0	24100
30. Sum of San Juan, Rio Blanco and Rito Blanco Rivers at Pagosa Springs, Colorado	399.5	379
31. Navajo River at Edith, Colorado	131.8	165
32. Piedra River at Arboles, Colorado	380.6	650
33. San Juan River at Rosa, New Mexico	956.6	1990
34. Pine River at Ignacio, Colorado	256.4	448
35. San Juan River near Blanco, New Mexico	1260.2	3558
36. Animas River at Durango, Colorado	654.7	692
37. Animas River near Cedar Hill, New Mexico	806.7	1092
38. Animas River at Farmington, New Mexico	753.8	1360
39. San Juan River at Farmington, New Mexico	2111.4	7245
40. La Plata River at Colorado-New Mexico State Line	30.9	331
41. San Juan River at Shiprock, New Mexico	*	12876
42. Mancos River near Towaoc, Colorado	52.0	550
43. McElmo Creek near Cortez, Colorado	41.0	233
44. San Juan River near Bluff, Utah	2275.6	23010
45. Paria River at Lees Ferry, Arizona	25.3	1550
46. Colorado River at Lees Ferry, Arizona	13763.3	108335
47. Colorado River at Lee Ferry, Arizona	13788.6	109889

*Mean for Water Years 1914-45 not computed.
#Represents flow at head of irrigation.

other detail and general maps of the irrigated areas. Rates of consumptive use of irrigation water were determined through transfer of experimental consumptive use data to various sites of use within the Colorado River Basin through empirical relationships between experimental and climatological data. The services of Mr. H. F. Blaney and Mr. W. E. Criddle of the Department of Agriculture, who are authorities on consumptive use, were secured to study the problem. The method developed by H. F. Blaney was adopted. A field inspection trip over the Colorado River Basin was arranged so they could inspect the various areas and interview local water masters, water commissioners, water users, personnel of the Soil Conservation Service, personnel of the Bureau of Reclamation, and others regarding irrigation practices and adequacy of water supply in the various areas of the basin. Using these data appropriate rates of consumptive use of irrigation water at the sites of use were computed. The rates of consumptive use of irrigation water for various crops and types of native vegetation were applied by the Engineering Advisory Committee to the irrigated and incidental areas to secure the past man-made depletions at sites of use. The following tabulation shows the average irrigated and non-cropped areas consuming irrigation water for the study period 1914-45, and the present irrigated areas as determined and adopted by the Engineering Committee:

Water Consuming Land Areas-Acres

	Arizona	Colorado	New Mex.	Utah	Wyoming	Total
Irrigated Areas Average (1914-45)	3,770	790,606	39,000	288,520	228,700	1,350,596
Irrigated Areas (Present)	9,840	790,600*	43,620	303,977	236,675	1,384,712
Non-cropped Areas Average (1914-45)	Negligible	106,812	6,482	48,625	29,100	191,019

* Assumed to be same as rounded average for period 1914-45.

The depletions at sites of use were computed and routed downstream to state lines and to Lee Ferry to determine the changes in channel losses resulting from man-made depletions. The differences between average historic channel losses and the channel losses under virgin conditions represent "salvaged" channel losses. The following table shows man-made depletions at sites of use, state lines, Lee Ferry, and the estimated salvaged channel losses.

Man-Made Depletions at Sites of Use, State Lines, and Lee Ferry
Averages for 1914-45
Acre-Feet

Type of Use	Arizona	Colorado	New Mexico	Utah	Wyoming	Total
Rounded Totals Depletions at Sites of Use	4,000	1,062,800	72,200	556,500	227,700	1,923,200
Salvaged Channel Losses Within State	0	20,000	900	11,700	1,300	33,900
Depletions at State Lines	4,000	1,042,800	71,300	544,800	226,400	1,889,300
Salvaged Channel Losses Out of State	0	26,700	1,800	500	10,400	39,400
Depletions at Lee Ferry	4,000	1,016,100	69,500	544,300	216,000	1,849,900

Channel Losses

Channel losses were computed to only such headwaters areas where influencing effects were found on the derivations of water contributions by states at state lines and at Lee Ferry. Results of channel loss studies have been previously quoted where necessary to illustrate their effect on virgin contributions of streamflow and man-made depletions at state lines and Lee Ferry. Estimated channel losses for the Colorado River and main tributaries are summarized in the table on page 7.

Equating the Flow

Reservoir operation studies were made to determine the extent to which the Upper Basin can make its apportioned water uses during drought cycles and still meet its compact obligation at Lee Ferry, as it is quite evident that holdover reservoirs must be constructed in the Upper Colorado River Basin to impound water in years of high runoff, and to release such stored water in critical periods of low runoff, such as 1931-40, to help meet the Upper Division obligation at Lee Ferry.

Such reservoirs will deplete the flow at Lee Ferry by reason of evaporation losses in excess of present stream channel losses. However, such losses, and the holdover storage capacity required to regulate the stream flow

Summary Table of Historic Virgin and Salvaged Channel Losses
for Selected River Sections
in the Upper Colorado River Basin
Average (1914-45)

Units 1000 Acre-Feet

State	Green River Above Green River, Utah	Colorado River Above Cisco, Utah	San Juan River Above Bluff, Utah	Colorado River Lee Ferry to Green River, Cisco and Bluff	Colorado River Above Lee Ferry
ARIZONA					
Historic			0.3	0.8	1.1
Virgin			0.3	0.8	1.1
Salvaged in State			0	0	0
Salvaged out of State			0	0	0
COLORADO					
Historic	93.7	279.3	168.7	151.2	692.9
Virgin	96.6	309.2	171.4	162.4	739.6
Salvaged in State	0.8	20.8	-1.6 *	0	20.0
Salvaged out of State	2.1	9.1	4.3	11.2	26.7
NEW MEXICO					
Historic			10.9	2.9	13.8
Virgin			12.7	3.8	16.5
Salvaged in State			0.9	0	0.9
Salvaged out of State			0.9	0.9	1.8
UTAH					
Historic	31.7	0.6	0.4	29.3	62.0
Virgin	36.2	0.6	0.4	37.0	74.2
Salvaged in State	4.5	0	0	7.2	11.7
Salvaged out of State	0	0	0	0.5	0.5
WYOMING					
Historic	91.8			29.1	120.9
Virgin	100.4			32.2	132.6
Salvaged in State	1.3			0	1.3
Salvaged out of State	7.3			3.1	10.4
TOTAL					
Historic	217.2	279.9	180.3	213.3	890.7
Virgin	233.2	309.8	184.8	236.2	964.0
Salvaged in State	6.6	30.8	-0.7 *	7.2	33.9
Salvaged out of State	9.4	9.1	5.2	15.7	39.4

* Negative values due to Dolores River diversion into San Juan Basin for which salvages are claimed in natural channel.

at Lee Ferry can only be approximated at this time until all storage sites have been studied in detail. It is recognized also, that upstream development of future irrigation projects and storage reservoirs will furnish some equation of streamflows, and will to some extent reduce the capacity needed in holdover reservoirs as herein reported.

Operation studies were made for the 32-year period, 1914 through 1945. For simplification, it was assumed that all holdover storage would be at the Glen Canyon reservoir site since the effect of potential upstream holdover storage and stream depletions are not known. These studies indicate a required live holdover storage capacity of not to exceed 30,000,000 acre-feet and stream depletions due to reservoir losses of approximately 500,000 acre-feet annually.

The actual amount of such holdover storage capacity will be influenced by the extent to which the streamflow will be equated by the operation of upstream holdover storage capacity needed to regulate streamflows at the sites of diversions and the equating effect of upstream irrigation developments.

The assignments of the Engineering Advisory Committee necessitated the collection, examination, and estimation of considerable climatological data. These data and their derivation are discussed in the report and tabulated in Appendix A. The report and appendices also describe in detail the means of solution to the problems assigned to the Committee and reported upon in the synopsis.

ASSIGNMENTS AND REPORTS

Formation of Advisory Committee. Pursuant to instructions received from the Compact Commission a temporary Committee of Engineering Advisors met in Cheyenne, Wyoming, on August 30 and 31, 1946, to discuss and recommend a program of engineering studies to assist the Commission in negotiating a Compact among the Upper Colorado River Basin States. The Engineering Advisory Committee was appointed as a permanent body by the Commission at Santa Fe, New Mexico, September 17, 1946. Members of that permanent Committee were as follows:

J. R. Riter, Chairman, U. S. Bureau of Reclamation,	Federal
R. Gail Baker, State Land Board,	Arizona
F. C. Merriell, Colorado River Water Conservation District,	Colorado
C. L. Patterson, Colorado Water Conservation Board,	Colorado
R. J. Tipton, Consulting Engineer,	Colorado
J. H. Bliss, State Engineer,	New Mexico
F. W. Cottrell, State Engineer's Office	Utah
H. T. Person, Consulting Engineer,	Wyoming

Some members appointed at Santa Fe have not served continuously but the Committee wishes to express thanks to C. L. Patterson who served from September 17, 1946, to January 1948, F. W. Cottrell who served as an advisor to the present Utah member of the Committee, and C. S. Jarvis who served as advisor from Utah, September 17, 1946, to January 1948.

In addition to the above, the following were appointed to serve on the Engineering Advisory Committee subsequent to September 17, 1946: R. I. Meeker, Arizona; R. M. Gildersleeve, Colorado; J. R. Erickson, New Mexico; C. O. Roskelley, Utah; R. D. Goodrich, Wyoming; and H. P. Dugan, U. S. Bureau of Reclamation. The Committee also wishes to acknowledge the assistance of Mr. C. B. Jacobson, Regional Hydrologist for Region 4, Bureau of Reclamation.

Assignments by Compact Commission. A report was prepared, dated August 31, 1946, by a temporary Engineering Advisory Committee, in Cheyenne, Wyoming. That report embodied the engineering problems to be encountered in negotiating a compact and recommended procedure for their solution as foreseen by the advisors. The commission accepted the report and instructed the Engineering Advisory Committee to complete as rapidly as possible the studies outlined therein. A copy of that report has been included in Appendix D.

A progress report was requested by the Compact Commission for presentation at their December 1947 meeting. That report, dated December 1, 1947, was prepared and presented at that time. Since the content of the progress report has been incorporated herein, it was not considered necessary to include it in Appendix D.

The Engineering Advisory Committee presented a summary report dated July 7, 1948, to the Compact Commission in Vernal, Utah. That report gave the results of the engineering studies in concise form. These data have been incorporated herein, and their derivation is explained in detail. For this reason a copy of the July 7, 1948, report has not been included in Appendix D.

At the Vernal, Utah, meeting of the Compact Commission, the Engineering Advisory Committee was instructed to:

(a) Prepare additional studies of the inflow-outflow method of measuring uses in the Upper Colorado River Basin.

(b) Prepare a formula for incorporation in Article XIII pertaining to the Yampa River.

(c) Prepare a formula for incorporation in Article XIV pertaining to the San Juan River.

Subsequent to the Vernal meeting, Commissioner Watson of Utah requested the Committee to make a study of the future flows of the Green River at Linwood, Utah, above the mouth of Henrys Fork.

The studies requested were pursued by the Engineering Advisory Committee, and all items were reported on October 4, 1948, in a report delivered to the Compact Commission in Santa Fe, New Mexico. Studies of the inflow-outflow method of measuring uses were not complete but progress was reported. The remaining assignments were completed. The October 4, 1948, report has been included in Appendix D.

Studies of the inflow-outflow method of measuring uses in the Upper Colorado River Basin are being continued. A manual will be presented to the Compact Commission for use by the administrative body when the studies are completed.

Since September 17, 1946, to date, the Engineering Advisory Committee has pursued the studies outlined August 31, 1946, continuously, working jointly and individually. Frequent meetings have been held by the whole Committee to further the work undertaken. Subcommittee and group meetings have been held at frequent intervals to discuss and work on individual studies. Field trips have been taken as necessary. The Committee has held to the prescribed course of study outlined in the report of August 31, 1946, unless change therefrom appeared warranted.

<u>Arrangement of Report</u>. The report which follows is presented under two major divisions, BASIC DATA, and ANALYSES. Maps, climatological data, historical streamflow, irrigated areas, and related items are discussed under BASIC DATA together with a discussion of procedures used to estimate these data where necessary. Results obtained in the study of stream depletions,

water contributions by states, river and reservoir operations, and other items are discussed under ANALYSES. Tables and supporting data are presented in the appendices.

BASIC DATA

Maps of the Basin

Maps Prepared by the Bureau of Reclamation. The Compact Commissioners were furnished by the Committee with two copies of state maps which show the present and potential irrigation developments within the Upper Basin on a scale of 1:1,000,000. For convenience the maps were assembled on a cloth backing. These maps are also available in the Bureau of Reclamation Report, "The Colorado River" printed in House Document 419, 80th Congress, 1st session.

Base Map Prepared by Colorado Water Conservation Board. A base map of the Upper Colorado River Basin was prepared for the Committee by the Colorado Water Conservation Board which shows in some detail tributary networks of the Colorado River, drainage area of the Colorado River above Lee Ferry, and above key gaging stations. Indicated on the map are key gaging stations, and climatological stations.

The general map shown in the report on page 13 is a reduced print of the base map prepared by the Colorado Water Conservation Board.

Climatological Data

Climatological data on precipitation, temperatures, and evaporation were needed in the evaluation of consumptive use of irrigation water by crops, estimates of channel losses, contributions from ungaged areas and estimation of reservoir losses. These data were tabulated from published records, and estimates were made where necessary to supplement published data. Climatological data used by the Committee are tabulated in Appendix A, and their derivation is discussed in following paragraphs.

Precipitation Records. (Appendix A, Table 1.) Precipitation data were compiled for selected stations dispersed throughout the Upper Colorado River Basin. In selection of stations consideration was given to their location and completeness of record during the period 1914 through 1945. Estimated or recorded mean monthly and annual precipitation for the period 1914 through 1945 are tabulated for the stations shown in Table 1. Estimates of period precipitation were obtained for stations of incomplete 1914-45 record by application of the ratio of the 1914-45 record to the concurrent record for a related station to the record of the station being estimated. Monthly estimates were made where necessary by application of a percentage of the estimated annual precipitation. Percentage factors applied were based upon long-time monthly means compared with similar long-time annual means. When necessary for certain studies published precipitation data other than those listed in Table 1 were used.

Temperature Records. (Appendix A, Tables 2, 3, and 4.) Temperature data were collected for selected stations used in the studies. For these stations the estimated and recorded mean monthly and annual temperatures during the period 1914 through 1945, and the normal monthly and the annual temperatures published by the Weather Bureau are shown in Tables 2 to 4. Estimates of mean annual period temperatures were obtained for stations of incomplete 1914-45 record by application of the ratio of the 1914-45 record to the concurrent record for a related station to the record of the station being estimated. Monthly estimates were made through use of Weather Bureau normal temperatures since relatively minor differences were noted between these values and long-time averages. Monthly percentages based on Weather Bureau normals were applied to estimated annual temperatures to derive monthly estimates.

Evaporation Records. (Appendix A, Tables 5 and 6.) Evaporation records are meager in the Upper Colorado River Basin. The records available at only six stations, are tabulated in Tables 5 and 6. Since records are available for so few years, no attempt was made to estimate and show long-time means. Estimates of evaporation records necessary to complete certain phases of the report are explained in connection with their specific use in the following pages.

Frost-Free Period Records. (Appendix B, Tables 1 and 3.) Frost-free period data were compiled by the Committee from records of the U. S. Weather Bureau for use by Mr. Blaney in his report on consumptive use. These data were compiled from published and unpublished records.

Historic Streamflow and Drainage Areas

Study Procedures & Summarized Results. The report of the Engineering Advisory Committee dated August 31, 1946, listed forty-four streamflow gaging stations believed necessary to determine streamflow contributions of each state or to provide data for solution of other studies. As work of the Committee progressed, it became apparent that some change should be made in the list of gaging stations.

The records of the following stations that were listed August 31, 1946, have been omitted in this report.

Savery Creek	near Savery, Wyoming
Battle Creek	near Slater, Wyoming
Uinta River	at Fort Duchesne, Utah
Price River	at Woodside, Utah
San Rafael River	at Hanksville, Utah highway bridge
Muddy River	near Hanksville, Utah
Escalante River	below Hanksville, Utah
Florida River	near Durango, Colorado

The records of the following stations have been added that were not listed in the August 31, 1946, report:

Henrys Fork	near Lonetree, Wyoming
Yampa River	at Steamboat Springs, Colorado
White River	near Meeker, Colorado
Whiterocks River	near Whiterocks, Utah
Colorado River	at Hot Sulphur Springs, Colorado
Colorado River	at Glenwood Springs, Colorado
Roaring Fork	at Glenwood Springs, Colorado
Sum of San Juan, Rio Blanco and Rito Blanco Rivers	at Pagosa Springs, Colorado
Piedra River	at Arboles, Colorado
San Juan River	near Blanco, New Mexico
Colorado River	at Lee Ferry, Arizona

(Sum of Paria and Colorado Rivers at Lees Ferry, Arizona)

It should be understood however, that valuable use has been made of other published streamflow data not included in this report.

The period 1914 through 1945 was chosen for estimation and tabulation of records. During this period the runoff has fluctuated through a range which appears to be fairly representative of the fluctuations of the stream. Good streamflow records exist for this period. For conservatism it is important to note that the longest and most severe drought recorded in the Colorado River Basin occurred during this period.

Considerable effort was made to eliminate errors and inconsistencies found in published records. In some cases, review of original field notes was necessary to justify a change in published data. A few records were not used which obviously were questionable or inconsistent.

Extreme care was used in estimating missing records. The best methods resulting from exhaustive study were used in making the estimates.

A detailed description of the records and estimates by stations is presented in a subsequent discussion.

Since estimation of state streamflow contributions was undertaken by the Committee it was necessary to estimate streamflow contributions from ungaged areas. This required the accurate determination of drainage areas above state lines and above key gaging stations. Careful measurement of such drainage areas was made on the best available maps. It was found that some published drainage areas are in error.

The summary table which follows gives the estimated and recorded mean 1914 through 1945 streamflow at selected stations, and the drainage area tributary to each as determined by the Committee.

UPPER COLORADO RIVER BASIN KEY GAGING STATIONS

	Streamflow Station	Mean Historic Flow Water Years 1914-45 1000 Acre-Feet	Drainage Areas Square Miles
1.	Green River at Green River, Wyoming	1260.5	7670
2.	Blacks Fork near Millburne, Wyoming	113.2	156
3.	East Fork of Smith Fork near Robertson, Wyoming	32.5	53
4.	West Fork of Smith Fork near Robertson, Wyoming	16.3	37
5.	Green River near Linwood, Utah	1501.6	14300
6.	Burnt Fork near Burnt Fork, Wyoming	25.1	53
7.	Henrys Fork near Lonetree, Wyoming	32.4	55
8.	Henrys Fork at Linwood, Utah	66.8	530
9.	Little Snake River near Dixon, Wyoming	423.5	1028
10.	Little Snake River near Lily, Colorado	472.4	3680
11.	Yampa River at Steamboat Springs, Colorado	345.1	604
12.	Yampa River near Maybell, Colorado	1189.5	3410
13.	Brush Creek near Jensen, Utah#	36.0	255
14.	Ashley Creek near Vernal, Utah	78.0	101
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16.	Duchesne River at Myton, Utah	439.5	2705
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21.	Green River at Green River, Utah	4658.4	40920
22.	Colorado River at Hot Sulphur Springs, Colorado	476.7	782
23.	Colorado River at Glenwood Springs, Colorado	2080.4	4560
24.	Roaring Fork at Glenwood Springs, Colorado	1028.0	1460
25.	Colorado River near Cameo, Colorado	3505.0	8055
26.	Plateau Creek near Cameo, Colorado	186.3	604
27.	Gunnison River near Grand Junction, Colorado	2054.9	8020
28.	Dolores River at Gateway, Colorado	788.1	4350
29.	Colorado River near Cisco, Utah	6186.0	24100
30.	Sum of San Juan, Rio Blanco and Rito Blanco Rivers at Pagosa Springs, Colorado	399.5	379
31.	Navajo River at Edith, Colorado	131.8	165
32.	Piedra River at Arboles, Colorado	380.6	650
33.	San Juan River at Rosa, New Mexico	956.6	1990
34.	Pine River at Ignacio, Colorado	256.4	448
35.	San Juan River near Blanco, New Mexico	1260.2	3558
36.	Animas River at Durango, Colorado	654.7	692
37.	Animas River near Cedar Hill, New Mexico	806.7	1092
38.	Animas River at Farmington, New Mexico	753.8	1360
39.	San Juan River at Farmington, New Mexico	2111.4	7245
40.	La Plata River at Colorado-New Mexico State Line	30.9	331
41.	San Juan River at Shiprock, New Mexico	*	12876
42.	Mancos River near Towaoc, Colorado	52.0	550
43.	McElmo Creek near Cortez, Colorado	41.0	233
44.	San Juan River near Bluff, Utah	2275.6	23010
45.	Paria River at Lees Ferry, Arizona	25.3	1550
46.	Colorado River at Lees Ferry, Arizona	13763.3	108335
47.	Colorado River at Lee Ferry, Arizona	13788.6	109889

*Mean for Water Years 1914-1945 not computed.
#Represents flow at head of irrigation.

Streamflow Records and Estimates

Streamflow records and estimates are tabulated in Appendix A. The historic mean streamflow for the period 1914 to 1945 was found to be 13,788,600 acre-feet at Lee Ferry. The flow at Lee Ferry is made up of the sum of the flows measured or estimated for the Paria and Colorado Rivers at Lees Ferry, which averaged 25,300 acre-feet and 13,763,300 acre-feet respectively. Of the total flow at Lee Ferry during the period 1914-45, 28% was estimated for the Paria and Colorado River gages at Lees Ferry. However, it is to be noted that a major part of the flow at Lee Ferry passes the key gaging stations on the Green River at Green River, Utah, the Colorado River near Cisco, Utah, and the San Juan River near Bluff, Utah. For the period 1914 to 1945 the estimated and recorded streamflows at these gages average 13,120,000 acre-feet. If streamflows recorded at these three stations are taken into account, the additional flows estimated at Lee Ferry represent only 9.4% of the total flow for the period 1914 to 1945. Some of the flows not measured at Green River, Cisco, and Bluff during these years were measured at upstream stations which were in operation. Allowance for these measurements would further reduce the 9.4% of the additional flows estimated at Lee Ferry.

Full advantage of records on the river upstream from Lee Ferry was taken in making estimates of streamflow during the period 1914 to 1945, and all estimates made were correlated with records of streamflow upstream and downstream so that full use was obtained from long-time records on the river.

Most of the estimating of streamflow records was necessary on the smaller streams, where gages have only recently been installed. Flow past these stations was usually measured at some downstream point during the period chosen for study.

Green River Streamflow Records to Green River, Utah. (Appendix A, Tables 7 to 16, and 31.) Streamflow records and estimates have been tabulated in Tables 7 to 16, and 31 for twenty-one stations including the Green River at Green River, Utah, the lowest station above the mouth.

Green River at Green River, Wyoming. (Appendix A, Table 7.) Records are available from October 1914 through September 1939. The remaining period from 1939 through water year 1945 was estimated on a monthly basis by direct correlation with the station on the Green River near Linwood, Utah. Water year 1914 record is missing at both Linwood, Utah, and Green River, Wyoming, and the estimated values were obtained by monthly correlation with the Green River at Green River, Utah.

Whiterocks River near Whiterocks, Utah. (Appendix A, Table 31.) Records are available for this station from December 1918 through April 1921 and from June 1930 through 1945. Some partial records are available in years 1921 through 1928. The remaining period was estimated on a monthly basis by correlation with the record for Ashley Creek near Vernal, Utah.

Blacks Fork near Millburne, Wyoming. (Appendix A, Table 7.) Streamflow records are available at this station from July 1939 through 1945 with the exception of missing winter months during 1942, 1943, 1944, and 1945. Missing winter months during 1942 through 1945, as estimated by the U. S. Geological Survey have been accepted by the Committee. The remaining water years in the period 1914 through 1939 were estimated by direct correlation with recorded and estimated flow of the Whiterocks River near Whiterocks, Utah.

East Fork of Smiths Fork near Robertson, Wyoming. (Appendix A, Table 8.) The record of this station extends from August 1939 through 1945 with the exception of the winter records from 1942 through 1945. Unofficial estimates of winter flows from 1942 through 1945 by the U. S. Geological Survey have been accepted by the Committee. Missing records from water year 1914 through July 1939 were estimated by monthly correlation with the Whiterocks River, near Whiterocks, Utah. The monthly estimates were checked by an annual correlation.

West Fork of Smiths Fork near Robertson, Wyoming. (Appendix A, Table 8.) The record of this station extends from August 1939 through September 1945 with the exception of some winter months unofficially estimates by the U. S. Geological Survey which have been accepted by the Committee. The period 1914 through July 1939 has been estimated on a monthly basis by correlation with the Whiterocks River near Whiterocks, Utah. Monthly estimates were checked by an annual correlation with the flow at Whiterocks.

Green River near Linwood, Utah. (Appendix A, Table 9.) The missing period of record at this station, within the period 1914 through 1945, is from water year 1914 to 1928, inclusive. Estimates were made on a monthly basis by direct correlation with the Green River at Green River, Wyoming. Because water year 1914 was also estimated at Green River, Wyoming, the Linwood estimate was checked for that year by direct correlation with the Green River at Green River, Utah.

Burnt Fork near Burnt Fork, Wyoming. (Appendix A, Table 9.) Records at this station begin in April 1943. Missing records prior to April 1943 back to and including water year 1914 were estimated by monthly correlations with the Whiterocks River near Whiterocks, Utah.

Henrys Fork near Lonetree, Wyoming. (Appendix A, Table 10.) Records are available at this station from May 1943 through water year 1945. While a correlation with the record for Henrys Fork at Linwood, Utah was unsatisfactory, the correlation with the Whiterocks River at Whiterocks, Utah proved satisfactory. Estimates were made on a monthly basis, and water year totals were checked against an annual correlation with Whiterocks River.

Henrys Fork at Linwood, Utah. (Appendix A, Table 10.) Records are available for water years 1929 through 1945. Missing water years from 1914 were estimated by correlation with the apparent gain in flow between the Green River at Green River, Wyoming and the Green River near Linwood, Utah.

Little Snake River near Dixon, Wyoming. (Appendix A, Table 11.) Records are complete for the Little Snake River near Dixon, Wyoming, during the 1914 to 1945 period from October 1913, to and including September 1923 and from March 1938 to and including September 1945, with the exception of some fractional recorded months and some total months which were estimated by the U. S. Geological Survey. Missing water years and missing months in the water year 1938 were estimated by correlation with the Little Snake River near Lily, Colorado.

Little Snake River near Lily, Colorado. (Appendix A, Table 11.) The record of the Little Snake River near Lily, Colorado from October 1921 to and including September 1945 is complete when the estimates of some missing months made by the U. S. Geological Survey are included. Missing data for the years 1914 through 1921 were estimated by correlation between the records of the Dixon and Lily Stations.

Yampa River at Steamboat Springs, Colorado. (Appendix A, Table 12.) Records at this station are complete for water years 1914 through 1945 with the exception of a few missing months. Water year records estimated and published by the U. S. Geological Survey were accepted by the Committee.

Yampa River near Maybell, Colorado. (Appendix A, Table 12.) Streamflow records at the gaging station on the Yampa River near Maybell, Colorado are published for the period May 1916 to and including September 1945. For the years 1910-1916 there are published records of runoff for Yampa River at Craig and Williams Fork at Hamilton, both upstream from Maybell. However, during the period 1910-1912 except for the year 1912, when April to September values were recorded near Maybell, there are only fragmentary concurrent records for Yampa River near Maybell.

Estimates for water years 1914, 1915, and 1916 were taken as the average of two methods: one, Yampa River near Maybell, calculated to be 108.6 percent of the sum of the Yampa River at Craig and the Williams Fork at Hamilton; two, annual correlation with Green River at Green River, Utah, minus Green River at Green River, Wyoming.

Brush Creek near Jensen, Utah. (Appendix A, Table 13.) Records are published for this station from April 1939 through September 1945, inclusive. Due to a large irrigation diversion above this station it was believed advisable to apply an irrigation diversion factor to approximate undepleted flow conditions for correlation purposes. The undepleted flow was then correlated with the undepleted flow of Brush Creek near Vernal (Tysack Ranch), Utah. Missing records for Brush Creek near Vernal from 1914 to 1924, inclusive, were obtained by correlation with Ashley Creek near Vernal, Utah. The record thus estimated represents the flow at the head of irrigation.

Ashley Creek near Vernal, Utah. (Appendix A, Table 13.) The missing records of streamflow during water years 1914, 1917, 1918, and 1929 at this station have been estimated by correlation with the Duchesne River at Myton, Utah. With the exception of a few missing months during the above years, the record is complete from 1914 through 1945.

Duchesne River at Myton, Utah. (Appendix A, Table 14.) The runoff records for water years 1914 through 1945 have been published by the U. S. Geological Survey and have been accepted by the Committee.

Duchesne River near Randlett, Utah. (Appendix A, Table 14.) Records are available for streamflow at this station for water years 1943, 1944, and 1945. The streamflow for water years 1914 through 1942 was estimated by monthly correlations with the Duchesne River record at Myton, Utah. Monthly correlations were checked against an annual correlation.

White River near Meeker, Colorado. (Appendix A, Table 15.) The record at this station is complete for water years 1914 through 1945 with the exception of a few months obtained from unpublished estimates of the Colorado State Engineer.

White River near Watson, Utah. (Appendix A, Table 15.) Runoff at the gaging station on the White River near Watson, Utah has been recorded and published for the period 1924-1945, and a few months in 1918, 1919, and 1923.

A correlation was made between the years of concurrent record at the gaging stations on the White River near Watson and near Meeker.

Another annual correlation was made between the White River near Watson, and the gain between the Green River at Green River, Wyoming and Green River at Green River, Utah.

Estimates adopted by the Committee are the average results obtained by correlation with the records of the White River near Meeker, and with the Green River at Green River, Utah, minus Green River at Green River, Wyoming.

Price River near Heiner, Utah. (Appendix A, Table 16.) The streamflow records are published for this station from June 1934 through September 1945. Prior to this time a gage was located near Helper, Utah, five miles downstream from the Heiner gage. Records have been published for the gage near Helper from October 1913 through May 1934. Because the inflow from the intervening drainage area is negligible, the streamflow recorded for the Price River near Helper, Utah, was considered to represent the streamflow for the Price River near Heiner, Utah.

Green River at Green River, Utah. (Appendix A, Table 16.) The lowest station on the Green River is the one now located at Green River, Utah. Records at this station are complete from June 20, 1924, through 1945. Records prior to June 20, 1924, were obtained at Little Valley, seven miles downstream. The records at the two points are considered comparable since the intervening drainage area is unproductive. The records for the Green River at Green River, Utah, are therefore considered complete.

Colorado River Streamflow Records to Cisco, Utah. (Appendix A, Tables 17 to 20.) Streamflow records and estimates have been tabulated in Tables 17 to 20 for eight stations on or tributary to the Colorado River above and including the station at Cisco, Utah. The station at Cisco, Utah, is the lowest on the Colorado River before it is joined by the Green and San Juan Rivers.

Colorado River at Hot Sulphur Springs, Colorado. (Appendix A, Table 17.) The record at this station has been published for water years 1914 through 1945 with the exception of water year 1925. The record at this station was useful in estimating streamflow at other stations and has been included because of the long record available there. The missing water year was estimated by comparison with the record for the Colorado River at Glenwood Springs, Colorado.

Colorado River at Glenwood Springs, Colorado. (Appendix A, Table 17.) The record is complete for all water years from 1914 through 1945. This long record was useful in estimating streamflow at other stations.

Roaring Fork at Glenwood Springs, Colorado. (Appendix A, Table 18.) Records at this station are complete for water years 1914 through 1945. This long record was helpful in estimating streamflow at other stations.

Colorado River near Cameo, Colorado. (Appendix A, Table 18.) There are published records of runoff at the gaging station on the Colorado River near Cameo, Colorado, situated a short distance above the mouth of Plateau Creek, for the period 1934-1945. For these twelve years there is a very good correlation between Colorado River near Cameo and the sum of Colorado River and Roaring Fork at Glenwood Springs. There are reliable records for the entire study period at the Glenwood Springs stations, and no important intervening contributing areas between Glenwood Springs and Plateau Creek.

Plateau Creek near Cameo, Colorado. (Appendix A, Table 19.) For a period of nine years, 1937-1945, runoff of Plateau Creek at the gaging stations near Cameo has been recorded. Flow upstream from Cameo has been measured from 1922 to 1945 on Plateau Creek and on Buzzard Creek, a tributary of Plateau Creek, both gaging stations being near Collbran, Colorado.

Annual correlation with the sum of Plateau and Buzzard Creeks near Collbran, Colorado, together with results of an annual correlation with the Gunnison River near Grand Junction, Colorado were used to obtain the estimates adopted by the Committee.

Gunnison River near Grand Junction, Colorado. (Appendix A, Table 19.) The records of runoff of the Gunnison River near Grand Junction are published for all but the first three years of the study period. Correlations were made with the record and the recorded runoff of the Gunnison River near Gunnison, Colorado, the Colorado River near Cisco, Utah, and the gain between the sum of the Colorado and Roaring Fork Rivers at Glenwood Springs, Colorado, and the Colorado River at Cisco, Utah. Results of these correlations were used to obtain the estimates of flow adopted by the Committee for missing water years.

Dolores River at Gateway, Colorado. (Appendix A, Table 20.) The Dolores River has been measured at Gateway, Colorado, for the comparatively short period since March 1937. However, runoff has been recorded for 1922-26 and 1928-45 for the Dolores River at Dolores, Colorado, approximately 150 miles upstream from Gateway. There are also records of flow for the San Miguel River, a major tributary of the Dolores, at Naturita, Colorado for the period 1918-1928 and 1941-1945.

Approximately 100,000 acre-feet annually have been diverted from the Dolores River basin throughout the 1914-1945 study period, a short distance below the gaging station at Dolores. These diversions are made for the irrigation of some 35,000 acres in Montezuma Valley, the waste and returns from the project flowing to McElmo Creek, a tributary of the San Juan River. No accurate records of the diversions are available prior to 1935, but they have apparently been of substantially the same amount each year as indicated by a satisfactory correlation between the records of Dolores at Gateway and at Dolores.

Adopted runoff estimates for the Dolores River at Gateway, Colorado, were obtained through the use of correlations with the recorded flows of; (1) the Dolores River at Dolores, Colorado, (2) the San Miguel River at Naturita, Colorado, and (3) the Colorado River near Cisco, Utah, minus the Colorado River and Roaring Fork at Glenwood Springs and the Gunnison River near Grand Junction, Colorado.

Colorado River near Cisco, Utah. (Appendix A, Table 20.) The Colorado River near Cisco, Utah is the lowest station on the river above Lees Ferry. Records are available at this station, or the comparable Moab station for the period 1914 through 1945 with the exception of water years 1918 to 1922, inclusive. Water year estimates were obtained by summation of recorded flows of the Colorado River at Fruita, Colorado, Dolores River at Bedrock, Colorado, and the San Miguel River at Naturita, Colorado. These flows represent practically all inflow to the Cisco station. Monthly distributions of these water year estimates were made on the basis of the

Fruita monthly discharges. Published estimates in Water Supply Paper 617 for these years were not adopted by the Engineering Advisory Committee. It concluded that the summation estimate was more rational than the published estimate.

San Juan River Streamflow Records to Bluff, Utah. (Appendix A, Tables 21 to 30.) Streamflow records and estimates have been tabulated in Tables 21 to 30 for fifteen stations on or tributary to the San Juan River above and including the San Juan River Station near Bluff, Utah. The station near Bluff is the lowest on the river above the mouth.

Sum of San Juan, Rio Blanco, and Rito Blanco Rivers at Pagosa Springs, Colorado. (Appendix A, Table 21.) In the study of San Juan streamflow records it became apparent that the sum of the recorded flows of the Rio Blanco near Pagosa Springs, Rito Blanco near Pagosa Springs, and the San Juan River at Pagosa Springs for the period 1914 through 1945 is significant. The records of runoff at each of these three gaging stations are published for the period 1936-1945. Since the drainage areas above each of these stations are entirely in Colorado, it was considered unnecessary to make extensions of the records at each station separately. Consequently, the combined runoff at the three points has been estimated for the period 1914 through 1935. The annual correlation between the sum of the three stations and the San Juan River at Rosa was used in making estimates for this period. Correlations were also made between four stations (Rio Blanco plus Rito Blanco plus San Juan at Pagosa plus Navajo River at Edith) and the San Juan River at Rosa, New Mexico. The recorded or estimated annual runoff of the Navajo River at Edith was then subtracted from these amounts. The results of the two correlations were used to obtain the adopted values.

Navajo River at Edith, Colorado. (Appendix A, Table 21.) Annual totals of runoff at this station are published for water years 1914 through 1928 and 1936 through 1945. This record was correlated with that for the San Juan River at Rosa, and from the resulting curve values for the period 1929 through 1935 were obtained. It was found that satisfactory correlations could be made: (1) between the sum of Rio Blanco plus Rito Blanco plus the San Juan at Pagosa Springs and San Juan at Rosa, for the period 1936-1945, when concurrent records are available; and (2) between the sum of Rio Blanco plus Rito Blanco plus San Juan at Pagosa Springs plus Navajo at Edith and San Juan at Rosa, for the same period.

The values for 1929-1935 obtained from the correlation between Navajo at Edith and San Juan at Rosa were averaged with those calculated by subtraction of values from the correlation for the sum of three stations discussed above.

Piedra at Arboles, Colorado. (Appendix A, Table 22.) Records are published for this gaging station from 1914 through 1925 and for part of 1926 and 1927. A good annual correlation was found between the Piedra at Arboles, Colorado, and the San Juan at Rosa, from which it was determined that the Piedra River at Arboles contributes forty percent of the flow of the San Juan River at Rosa. On this basis water year estimates were made for the missing years of the period 1914 through 1945.

San Juan River at Rosa, New Mexico. (Appendix A, Table 22.) Records for this station have been published from October 1920 through 1945. Prior to that date, records of the Piedra River and San Juan River at Arboles have been published from water year 1914 through October 1920. The sum of the recorded flow at these stations is nearly equivalent to the flow of the San Juan River at Rosa, New Mexico. Some published monthly values were revised by Tipton and Barrows upon review of original data and were published as corrected in a report by them dated February 8, 1934. After investigation, these revisions were adopted by the Engineering Advisory Committee. A partial estimate was made in one month by the Committee, and revisions in two other months were made after careful study pointed out apparent discrepancies. After careful examination the remainder of the published records were deemed adequate.

Los Pinos (Pine) River at Ignacio, Colorado. (Appendix A, Table 23.) The record for this station is complete and has been published throughout the period 1914 through 1945. These published records were carefully scrutinized. With few exceptions, the record, as published, was found adequate. However, a few monthly revisions were believed necessary. Two of these monthly estimates were revised in accordance with the Tipton-Barrows Report of 1934.

San Juan River near Blanco, New Mexico. (Appendix A, Table 23.) Although this station was not included in the original list of the Engineering Advisory Committee, its significance soon become evident. Streamflow records for this station have been published from January 128 through 1945. Very good relationships were found between its record and the records of stations both upstream and downstream. Water year records were estimated for the period 1914 through 1928 from a correlation between San Juan River at Blanco and San Juan River at Rosa plus Los Pinos at Ignacio streamflows. Estimates for the same period were made from a correlation between San Juan River at Blanco and San Juan River at Farmington minus the Animas River at Farmington streamflows. The results of the two correlations were used to estimate the adopted annual values.

Animas River at Durango, Colorado. (Appendix A, Table 24.) Records obtained at this station have been published for the period 1914-1945 with the exception of a few months when only partial records were available. The missing portions of the partial records have been estimated. By comparison of runoff of adjacent streams it was deemed advisable to revise records of a few other months for which published values appeared unreasonable.

Fruita monthly discharges. Published estimates in Water Supply Paper 617 for these years were not adopted by the Engineering Advisory Committee. It concluded that the summation estimate was more rational than the published estimate.

San Juan River Streamflow Records to Bluff, Utah. (Appendix A, Tables 21 to 30.) Streamflow records and estimates have been tabulated in Tables 21 to 30 for fifteen stations on or tributary to the San Juan River above and including the San Juan River Station near Bluff, Utah. The station near Bluff is the lowest on the river above the mouth.

Sum of San Juan, Rio Blanco, and Rito Blanco Rivers at Pagosa Springs, Colorado. (Appendix A, Table 21.) In the study of San Juan streamflow records it became apparent that the sum of the recorded flows of the Rio Blanco near Pagosa Springs, Rito Blanco near Pagosa Springs, and the San Juan River at Pagosa Springs for the period 1914 through 1945 is significant. The records of runoff at each of these three gaging stations are published for the period 1936-1945. Since the drainage areas above each of these stations are entirely in Colorado, it was considered unnecessary to make extensions of the records at each station separately. Consequently, the combined runoff at the three points has been estimated for the period 1914 through 1935. The annual correlation between the sum of the three stations and the San Juan River at Rosa was used in making estimates for this period. Correlations were also made between four stations (Rio Blanco plus Rito Blanco plus San Juan at Pagosa plus Navajo River at Edith) and the San Juan River at Rosa, New Mexico. The recorded or estimated annual runoff of the Navajo River at Edith was then subtracted from these amounts. The results of the two correlations were used to obtain the adopted values.

Navajo River at Edith, Colorado. (Appendix A, Table 21.) Annual totals of runoff at this station are published for water years 1914 through 1928 and 1936 through 1945. This record was correlated with that for the San Juan River at Rosa, and from the resulting curve values for the period 1929 through 1935 were obtained. It was found that satisfactory correlations could be made: (1) between the sum of Rio Blanco plus Rito Blanco plus the San Juan at Pagosa Springs and San Juan at Rosa, for the period 1936-1945, when concurrent records are available; and (2) between the sum of Rio Blanco plus Rito Blanco plus San Juan at Pagosa Springs plus Navajo at Edith and San Juan at Rosa, for the same period.

The values for 1929-1935 obtained from the correlation between Navajo at Edith and San Juan at Rosa were averaged with those calculated by subtraction of values from the correlation for the sum of three stations discussed above.

Piedra at Arboles, Colorado. (Appendix A, Table 22.) Records are published for this gaging station from 1914 through 1925 and for part of 1926 and 1927. A good annual correlation was found between the Piedra at Arboles, Colorado, and the San Juan at Rosa, from which it was determined that the Piedra River at Arboles contributes forty percent of the flow of the San Juan River at Rosa. On this basis water year estimates were made for the missing years of the period 1914 through 1945.

San Juan River at Rosa, New Mexico. (Appendix A, Table 22.) Records for this station have been published from October 1920 through 1945. Prior to that date, records of the Piedra River and San Juan River at Arboles have been published from water year 1914 through October 1920. The sum of the recorded flow at these stations is nearly equivalent to the flow of the San Juan River at Rosa, New Mexico. Some published monthly values were revised by Tipton and Barrows upon review of original data and were published as corrected in a report by them dated February 8, 1934. After investigation, these revisions were adopted by the Engineering Advisory Committee. A partial estimate was made in one month by the Committee, and revisions in two other months were made after careful study pointed out apparent discrepancies. After careful examination the remainder of the published records were deemed adequate.

Los Pinos (Pine) River at Ignacio, Colorado. (Appendix A, Table 23.) The record for this station is complete and has been published throughout the period 1914 through 1945. These published records were carefully scrutinized. With few exceptions, the record, as published, was found adequate. However, a few monthly revisions were believed necessary. Two of these monthly estimates were revised in accordance with the Tipton-Barrows Report of 1934.

San Juan River near Blanco, New Mexico. (Appendix A, Table 23.) Although this station was not included in the original list of the Engineering Advisory Committee, its significance soon become evident. Streamflow records for this station have been published from January 128 through 1945. Very good relationships were found between its record and the records of stations both upstream and downstream. Water year records were estimated for the period 1914 through 1928 from a correlation between San Juan River at Blanco and San Juan River at Rosa plus Los Pinos at Ignacio streamflows. Estimates for the same period were made from a correlation between San Juan River at Blanco and San Juan River at Farmington minus the Animas River at Farmington streamflows. The results of the two correlations were used to estimate the adopted annual values.

Animas River at Durango, Colorado. (Appendix A, Table 24.) Records obtained at this station have been published for the period 1914-1945 with the exception of a few months when only partial records were available. The missing portions of the partial records have been estimated. By comparison of runoff of adjacent streams it was deemed advisable to revise records of a few other months for which published values appeared unreasonable.

Animas River near Cedar Hill, New Mexico. (Appendix A, Table 24.) Records have been published for this station from December 1933 through 1945. Annual estimates were made for years 1914-1934 as the average between the streamflows calculated from annual relationships with the Animas at Durango, upstream, and the Animas at Farmington, downstream from the Cedar Hill station.

Animas River at Farmington, New Mexico. (Appendix A, Table 25.) Records have been published for this station from 1914 through 1945. The published records were found satisfactory with the exception of one month, when the gage height record was found to be in error, and a few other months which were corrected because comparison with other San Juan stations up and downstream demonstrated revisions were advisable.

San Juan River at Farmington, New Mexico. (Appendix A, Table 25.) The record at this station has been published from 1914 through 1945 with the exception of a missing period from 1918 through 1922, and a few partial monthly records.

Monthly correlations were made between the San Juan River at Rosa, New Mexico, the Pines River at Ignacio, Colorado, and the Animas River at Farmington, New Mexico. Correlations were also made between the records for the San Juan River at Farmington, New Mexico, and the downstream San Juan River stations at Shiprock, New Mexico and near Bluff, Utah. The missing period 1918 through 1922 and other missing months were estimated by use of the correlation with the stations above the San Juan River at Farmington. The correlations with downstream stations were used to check these estimates.

Careful examination of some published records indicated need for revision. Certain months were revised through use of records upstream and downstream from Farmington. These changes were not made unless the Committee was assured from examination of records upstream and downstream that the change was essential. A critical review was made of the records for the Animas River at Durango, Colorado, the Animas River at Farmington, New Mexico, Los Pinos River at Ignacio, Colorado, and the San Juan River at Rosa, New Mexico. Tables showing original records and revised records for the San Juan River at Farmington and other stations mentioned above are included in pages 26 and 27.

La Plata River at Colorado-New Mexico State Line. (Appendix A, Table 26.) Runoff has been recorded and published at this station from 1921 through 1945. A station was maintained on the same stream at La Plata, New Mexico and records at that gage are available for the period 1915-1925, 1929-1934 and 1937. A fair correlation was found between flows at these stations for the years during which both were maintained.

SUGGESTED REVISIONS OF CERTAIN SUMMER MONTHLY DISCHARGE VALUES BY CORRELATION WITH DISCHARGES AT NEARBY GAGING STATIONS FOR THE PURPOSE OF DERIVING MORE PROBABLE USE AND LOSS RELATIONSHIPS BETWEEN KEY GAGING STATIONS

Climatic Year	Month	San Juan-Rosa Rec.	San Juan-Rosa Rev.	Pine-Ignacio Rec.	Pine-Ignacio Rev.	Animas-Durango Rec.	Animas-Durango Rev.	Animas-Farmington Rec.	Animas-Farmington Rev.	Revised with Comparison with -
1918	July	74.9	53.0							Piedra at Arboles; Pine at Ignacio; Navajo at Edith
1924	April	226.4	185.0							Pine at Ignacio
1914	June			138.0	94.0					San Juan at Rosa; Animas at Durango
	July			69.5	41.0					San Juan at Arboles; Piedra at Arboles; Animas at Farmington
1916	Aug.			61.7	50.0					Animas at Durango; Piedra at Arboles
1920	May			125.0	152.0					San Juan at Rosa; Navajo at Edith; Florida near Durango
1924	June			65.8	43.0					Animas at Durango; Florida near Durango; Navajo at Edith
1916	Sept.					27.9	37.0			Animas at Farmington
1926	April					N.R.	56.0			Animas at Farmington
1927	April					103.0	75.0			Animas at Farmington
	July					76.2	104.0			Florida near Durango; Pine at Ignacio; Animas at Farmington
	Sept.					173.0	138.0			San Juan at Rosa; Pine at Ignacio
1916	May							167.0	216.0	Animas at Durango
1917	April							95.6	71.0	Animas at Durango
1918	Aug.							16.6	30.0	Animas at Durango
1925	June							165.5	124.0	Animas at Durango
	Sept.							129.7	106.0	Animas at Durango
1926	June							356.9	201.0	Animas at Durango
	July							N.R.	65.0	Animas at Durango
	Aug.							13.8	25.0	Animas at Durango
1927	April							91.3	95.0	Error in recorded gage heights

N.R. - No record.

Comparison of Water Year Values
Before and After Corrections and Revisions
Key San Juan River Basin Stations At and Above Farmington
(1000 AF Units)

	San Juan at Rosa		Los Pinos at Ignacio		Animas River at Durango		Animas River at Farmington		San Juan at Farmington	
	Orig.	Rev.	Orig.	Rev.	Orig.	Rev.	Orig.	Rev.	Orig.	Rev.
1913-14	1049.2	1049.2	415.5	343.0	833.0	833.0	990.6	990.6	2368.1	2552.1
15	1286.9	1286.9	375.5	375.5	686.3	686.3	857.8	857.8	2411.2	2661.8
16	P.R.	1395.7	432.0	420.3	874.3	883.4	946.3	995.3	2745.6	3019.7
17	1444.8	1444.8	434.0	434.0	988.2	988.2	1265.3	1240.7	3416.8	3407.2
18	639.9	618.0	153.6	153.6	535.1	535.1	504.4	517.8	P.R.	1357.0
19	897.8	897.8	311.7	311.7	707.4	707.4	841.3	841.3	N.R.	2175.0
1919-20	1672.3	1672.3	451.5	478.5	1022.3	1022.3	1257.7	1257.7	N.R.	3713.0
21	1081.1	1081.1	380.3	380.3	916.2	916.2	1098.9	1098.9	N.R.	2752.0
22	1010.4	1010.4	291.0	291.0	808.2	808.2	991.8	991.8	P.R.	2523.1
23	905.4	905.4	258.1	258.1	669.5	669.5	775.8	775.8	2061.3	2075.3
24	1023.6	982.2	252.3	229.5	543.3	543.3	659.7	659.7	1904.9	1904.9
1924-25	645.4	645.4	182.3	182.3	535.1	535.1	710.8	645.6	1480.6	1575.0
26	770.4	770.4	240.1	240.1	P.R.	643.2	P.R.	789.0	2279.6	1920.8
27	1231.1	1231.1	360.7	360.7	866.9	831.7	1013.5	1017.2	2813.3	2925.8
28	654.2	654.2	171.6	171.6	560.1	560.1	579.5	579.5	1485.1	1505.8
29	1081.2	1081.2	343.0	343.0	770.8	770.8	952.7	952.7	2617.4	2608.0
1929-30	637.7	637.7	178.1	178.1	541.6	541.6	562.1	562.1	1506.8	1506.8
31	451.4	451.4	116.9	116.9	291.0	291.0	297.0	297.0	908.2	908.2
32	1400.8	1400.8	362.2	362.2	742.7	742.7	885.7	885.7	3010.0	3010.0
33	528.1	528.1	118.4	118.4	431.1	431.1	444.7	444.7	1199.8	1199.8
34	320.7	320.7	58.8	58.8	249.7	249.7	218.5	218.5	629.9	629.9
1934-35	1142.8	1142.8	271.6	271.6	567.2	567.2	683.4	683.4	2296.2	2296.2
36	741.0	741.0	172.9	172.9	522.4	522.4	570.6	570.6	1513.0	1513.0
37	1148.6	1148.6	235.3	235.3	540.5	540.5	603.6	603.6	2110.3	2110.3
38	1096.3	1096.3	280.7	280.7	709.6	709.6	836.6	836.6	2417.8	2417.8
39	578.0	578.0	135.6	135.6	426.2	426.2	422.0	422.0	1256.8	1256.8
1939-40	425.0	425.0	83.7	83.7	360.6	360.6	358.5	358.5	884.8	884.8
41	1777.1	1777.1	430.8	430.8	949.0	949.0	1229.7	1229.7	3659.2	3659.2
42	1334.5	1334.5	295.2	295.2	831.6	831.6	941.9	941.9	2707.3	2707.3
43	621.8	621.8	126.7	126.7	538.2	538.2	532.7	532.7	1303.7	1303.7
44	923.5	923.4	273.5	273.5	768.0	768.0	801.4	801.4	2069.1	2069.1
1944-45	757.9	757.9	90.9	90.9	547.6	547.6	521.6	521.6	1415.6	1415.6

P.R. - Partial record N.R. - No record

As another approach it was assumed that runoff characteristics for the La Plata River are similar to those of the Animas River whose watershed is situated directly east of the La Plata. For each of the years 1914 to 1920 the percentage which the runoff for the year was of the average runoff for the period 1921-1945 was calculated for the Animas at Durango and the Animas at Farmington. The same percentages were then applied to the 1921-1945 average for the La Plata at the state line to obtain estimates of runoff at the later station for 1914 to 1920. The two methods of estimating runoff for missing years were used to arrive at adopted values.

San Juan River at Shiprock, New Mexico. (Appendix A, Table 26.) Records at this station are available from December 1915 through water year 1945 except for scattered missing months. Some additional periods of missing record have been estimated or partially estimated by the U. S. Geological Survey. Considerable study of this record indicated inconsistencies which cannot be reconciled with the records of stations upstream and downstream. For that reason no attempt was made to estimate missing portions of the record and the published record was not used as an aid in estimating missing records at other stations. Since the Shiprock gage, nevertheless, occupies a key position on the San Juan River the published record has been tabulated.

Mancos River near Towaoc, Colorado. (Appendix A, Table 27.) There are runoff records available for this station for the period 1921-1943. There is also a lack of records prior to 1921 for similar adjacent areas. A correlation with the Animas River at Durango was obtained. Five-year and 10-year progressive averages for the two stations were plotted from which the 1941-1945 average was calculated.

The Mancos at Towaoc was also correlated with the La Plata at the state line, on an annual basis as a check. Although this plotting showed some erratic years especially for the years 1921, 1924, and 1937, it was considered substantiating to the first method.

The adopted estimated annual values for 1914-1920 and 1944-1945 were obtained from the use of the direct correlations with the Animas at Durango and the La Plata at the state line.

McElmo Creek near Cortez, Colorado. (Appendix A, Table 27.) There are records of the runoff at McElmo Creek near Cortez from May 1926, through September 1929 and from April 1940 through September 1945 except for October and November of the water year 1944. Records for the water years 1926-1929 were published in the biennial reports of the Colorado State Engineer, but were not reported in U. S. Geological Survey Water Supply Papers. The station was operated by the U. S. Bureau of Reclamation for the water year 1940, and by the Geological Survey for the period 1941-1945. Discharges for the period were computed by the Durango office of the Bureau of Reclamation.

The flow at this gaging station is made up of natural runoff from the drainage area above the station and waste and return flow resulting from the application of about 100,000 acre-feet of water diverted annually from the Dolores River to some 35,000 acres situated in the McElmo Creek watershed.

Except for the presence of the waste and return flows, the runoff of McElmo Creek would be erratic, and vary from no flow at times to flood spurts during storms. An inspection of aerial photographs of the area indicates that not all of the return flow from the Montezuma Valley project appears at the Cortez station on McElmo Creek. Substantial irrigated area drainage flows into Yellow Jacket Creek, a tributary of McElmo Creek below the gage, and into Aztec Creek, a tributary of the Mancos River.

Streamflow was difficult to estimate for this station. Several methods were devised, the results of which were compared and utilized to arrive at the adopted values. The methods used were: one, correlation of total McElmo near Cortez recorded flows with precipitation at Rico; two, consideration of natural runoff per square mile above the gage to be one-half the measured runoff for the drainage above the Mancos River near Towaoc; and three, a correlation of natural runoff above the gage (obtained by substracting estimated return flows from irrigated areas) for years of record with precipitation at Rico to obtain natural runoff estimates to which return flow estimates were added.

San Juan River near Bluff, Colorado. (Appendix A, Table 28.) Records at this station, the lowest on the San Juan River, are complete from 1914 through 1945 with the exception of water years 1914 and 1918 through February of 1927. The missing months of record at this station were estimated by direct correlation with the revised Farmington record previously discussed. As a supplementary check on the accuracy of the San Juan River streamflow at Bluff, Utah, the water year annual totals of the Colorado River at Cisco, Utah, the Green River at Green River, Utah, and the San Juan River near Bluff, Utah, were deducted from the recorded annual totals of the Colorado River at Lees Ferry, Arizona. The values thus obtained show an average gain in the sum of the tributaries of 4.7 percent with a maximum annual variation of 7.7 percent and a minimum annual variation of 1.8 percent. Since the intervening drainage area between these stations is relatively unproductive, it was concluded that Bluff estimates cannot be in error to any appreciable extent.

Colorado River at Lees Ferry, Arizona. (Appendix A, Table 29.) Except for the flow of the Paria River, which enters the Colorado River a short distance upstream from the Compact Point at Lee Ferry, Arizona, all runoff leaving the Upper Basin States is measured at this station. Records have been published for the runoff at this station from June 1921 through September 1945. The Bureau of Reclamation presented an estimate for missing records on a calendar year basis in the Colorado River Report dated March 1946. This estimate was made in 1934. Estimated runoff for each year represented an adjusted average between the Colorado River at Yuma, Arizona, and the sum of the Colorado River at Cisco, Green River at Little Valley (now at Green River) and San Juan River at Farmington, with an allowance for depletions and tributary inflow. A slightly lower average estimate was published by the U. S. Geological Survey in Water Supply Paper 556, and later republished in Water Supply Paper 918. The Geological Survey estimate assumed the flow of the Colorado River at Lees Ferry to be made up of the measured flow at the key upstream stations, namely, the Green River at Green River or Little Valley, Utah, the Colorado River at Cisco or Moab, Utah (derived by comparison with Fruita), and any station on the San Juan River below the mouth of the Animas River. In addition, the flow of the San Rafael River at its mouth and the estimated runoff of the Fremont and Escalante Rivers were added to the Green River. Other inflow was assumed to be taken up in losses. The Geological Survey estimate was made when records at Lees Ferry were available only through September 1923.

It was the belief of the Engineering Advisory Committee that an independent estimate should be made, utilizing more recent records and data. Monthly correlation curves were plotted from concurrent records at Lees Ferry against the sum of the flows of the Green River at Green River, Utah; Colorado River near Cisco, Utah; and the San Juan River near Bluff, Utah. Since these streamflows represent practically all of the flow at Lees Ferry, their use as a correlation factor is reliable.

Paria River at Lees Ferry, Arizona. (Appendix A, Table 29.) Records at this station have been published from October 1923 through 1945. The runoff prior to 1923 was estimated annually through use of statistically weighted rainfall related to recorded runoff. Monthly distribution of water year estimates were based upon application of percentages derived from means of months of record.

Colorado River at Lees Ferry, Arizona. (Appendix A, Table 30.) For the purpose of showing the flow of the Colorado River at the Compact Point, Lee Ferry, Arizona, the recorded and estimated record of the Colorado and Paria Rivers at Lees Ferry were combined and tabulated.

Recent Records. (Appendix A, Table 32.) Records for water years 1946 and 1947 have been tabulated in Table 32. Most of these records are advance unpublished data which are subject to revision prior to publishing.

Drainage Areas

Need for Drainage Area Estimates. Calculation of state line flows makes necessary the estimation of contributions from ungaged areas. These estimates are dependent upon the size of the drainage area involved as well as upon other factors. Drainage areas above key gages were measured on the best available maps and compared with published drainage areas. Published drainage areas do not in all cases agree with the findings of the Committee. Where differences were found, drainage areas were rechecked on all available maps before changes were recommended. Changes for the most part are due to the availability of better prepared maps since published areas were measured. Changes from published drainage areas above key gaging stations selected for study are discussed in the following paragraphs.

In the study of runoff from ungaged areas it became evident that subdivision of gaging station drainage areas was desirable. The table on page 33 was prepared for this purpose, as well as to show the amount of drainage area within each of the Upper Basin States.

Drainage Areas on Green River. Drainage areas at key gages were measured above and including the Green River at Green River, Utah. Published values were adopted with the exception of the drainage areas above the Little Snake River near Dixon, Wyoming, and near Lily, Colorado, Duchesne River at Myton, Utah, and near Randlett, Utah, and the Green River, at Green River, Utah. The drainage areas above Brush Creek near Jensen, Utah, and above Price River near Heiner, Utah have never been published. They were determined by the Committee.

Little Snake River near Dixon, Wyoming. Drainage area above this station has been published as 988 square miles. A map prepared by the State of Colorado was used to determine this area to be 1,028 square miles. The use of other maps verified this area.

Little Snake River near Lily, Colorado. Drainage area above this station is published as 3,730 square miles. A map prepared by the State of Colorado showed 3,680 square miles, an area which was verified through use of other maps.

Brush Creek near Jensen, Utah. This drainage area has not been published. It was determined to be 255 square miles through use of aerial mosaics and of U. S. National Forest Service maps.

Duchesne River near Randlett, Utah. Published drainage area for this station is 3,920 square miles. This drainage area was found to be 3,820 square miles through the use of U. S. Geological Survey topographic maps and aerial mosaics and verified by other maps.

Green River at Green River, Utah. The drainage area above this station has been published as 40,600 square miles. From a study of Geological Survey topographic maps, aerial mosaics and verification from other maps, the Committee determined this area to be 40,920 square miles. The drainage area above the Green River at Little Valley, Utah, at which the Green River gaging station was located prior to June 20, 1924, was determined to be 41,280 square miles.

Drainage Areas on Colorado River. Drainage areas on the Colorado River at and above the gage near Cisco, Utah, were checked and accepted by the Committee as published by the U. S. Geological Survey.

Drainage Areas on San Juan River. Drainage areas above key gages were measured including the San Juan River gage near Bluff, Utah. Published values were adopted with the exception of the drainage areas above the San Juan River near Blanco, New Mexico, San Juan River at Farmington, New Mexico, and San Juan River at Shiprock, New Mexico. The unpublished drainage area above the Animas River near Cedar Hill, New Mexico, gage not heretofore published was also determined.

San Juan River near Blanco, New Mexico. The published drainage area above this station is 3,320 square miles. Using the most reliable maps available, namely, New Mexico State Highway Planning maps and U. S. Geological Survey Topographic maps, the Committee determined this drainage area to be 3,558 square miles. The adopted area was verified by other maps.

Animas River near Cedar Hill, New Mexico. This drainage area is not published. Published areas for the Animas River at Farmington, New Mexico, and the Animas River at Durango, Colorado, were verified, however, and the Cedar Hill station area was made up of the Durango station area as published with the intervening area measured from available maps.

San Juan River at Farmington, New Mexico. Published drainage area above this station is 6,580 square miles. Using New Mexico State Highway Planning maps and U. S. Geological Survey topographic maps the Committee obtained a drainage area of 7,245 square miles. Other maps were used to verify this value.

San Juan River at Shiprock, New Mexico. Drainage area published for this station is 12,800 square miles. Using New Mexico State Highway Planning maps and U. S. Geological Survey topographic maps the Committee obtained a drainage area of 12,876 square miles. This area was verified by use of other maps.

UPPER COLORADO RIVER BASIN COMPACT COMMISSION

ENGINEERING ADVISORY COMMITTEE

SUMMARY of DRAINAGE AREAS by STATES
in
SQUARE MILES

AREAS above STATIONS	ARIZONA	COLORADO	N. MEXICO	UTAH	WYOMING	TOTALS
Lee Ferry, Arizona. (Compact Point)	6,936	38,932	9,646	37,165	17,210	109,889
Paria River at Lees Ferry, Arizona	450	-	-	1,100	-	1,550
Balance - Lees Ferry to Lee Ferry	4	-	-	-	-	4
Colorado River at Lees Ferry, Arizona	6,482	38,932	9,646	36,065	17,210	108,335
AREA 1						
Lees Ferry, Arizona to Green River, Cisco, and Bluff, Utah	1,880	-	-	18,425	-	20,305
San Rafael River near Green R., Utah	-	-	-	1,690	-	1,690
Dirty Devil R. near Hanksville, Utah	-	-	-	3,500	-	3,500
Escalante R. near Escalante, Utah	-	-	-	315	-	315
Miscellaneous Balance	1,880	-	-	12,920	-	14,800
AREA 2						
Green River at Green River, Utah	-	10,683	-	13,027	17,210	40,920
Green River near Linwood, Utah	-	-	-	290	14,010	14,300
Henrys Fork at Linwood, Utah	-	-	-	280	250	530
Little Snake River near Lily, Colo.	-	1,680	-	-	2,000	3,680
Yampa River near Maybell, Colorado	-	3,410	-	-	-	3,410
White River near Watson, Utah	-	3,863	-	157	-	4,020
Combined	-	8,953	-	727	16,260	25,940
Balance (Area 2)	-	1,730	-	12,300	950	14,980
Brush Creek near Jensen, Utah	-	-	-	255	-	255
Ashley Creek near Vernal, Utah	-	-	-	101	-	101
Duchesne River near Randlett, Utah	-	-	-	3,820	-	3,820
Price River near Heiner, Utah	-	-	-	430	-	430
Miscellaneous Balance	-	1,730	-	7,694	950	10,374
AREA 3						
Colorado River near Cisco, Utah	-	22,360	-	1,740	-	24,100
Colorado River near Cameo, Colorado	-	8,055	-	-	-	8,055
Plateau Creek near Cameo, Colorado	-	604	-	-	-	604
Gunnison River near Grand Jct., Colo.	-	8,020	-	-	-	8,020
Dolores River at Gateway, Colorado	-	4,010	-	340	-	4,350
Combined	-	20,689	-	340	-	21,029
Balance (Area 3)	-	1,671	-	1,400	-	3,071
AREA 4						
San Juan River near Bluff, Utah	4,602	5,889	9,646	2,873	-	23,010
San Juan River at Rosa, New Mexico	-	1,674	316	-	-	1,990
Pine River at Ignacio, Colorado	-	448	-	-	-	448
Animas River near Cedar Hill, N.M.	-	1,092	-	-	-	1,092
La Plata River at Colo.-N.M. Stateline	-	331	-	-	-	331
Mancos River near Towaoc, Colorado	-	539	11	-	-	550
McElmo Creek near Cortez, Colorado	-	233	-	-	-	233
Combined	-	4,317	327	-	-	4,644
Balance (Area 4)	4,602	1,572	9,319	2,873	-	18,366
Rosa to Farmington New Mexico	-	250	3,465	-	-	3,715
Farmington to Shiprock New Mexico	19	107	5,174	-	-	5,300
Shiprock, New Mexico to Bluff, Utah	4,583	1,215	680	2,873	-	9,351

Paria River at Lees Ferry, Arizona. Since streamflow at this station is a part of the Lee Ferry streamflow, the compact division point, its drainage area was measured in conjunction with the measurement of the drainage area above the Colorado River at Lee Ferry. The published drainage area is 1,570 square miles. Measurements made by the Committee on U. S. Geological Survey topographic maps disclosed an area of 1,550 square miles. This area was verified by other maps.

Colorado River at Lees Ferry. Drainage area published for this station is 107,900 square miles. Measurement of drainage areas above this station by the Committee shows agreement with published areas above the gage near Bluff, Utah on the San Juan River and above the gage near Cisco, Utah, on the Colorado River. The Committee found 320 square miles more drainage area above Green River, Utah, on the Green River than was published. Between the three stations mentioned above the Lees Ferry measurements of area on aerial mosaics and U. S. Geological Survey topographic maps disclosed the published values were apparently 115 square miles too small and that the drainage area above Lees Ferry is 108,335 square miles. Other maps were used to verify the results obtained.

Colorado River at Lee Ferry, Arizona. The drainage area above this point is made up of the drainage areas of the Paria River and Colorado River at Lees Ferry, Arizona plus a small drainage area measured from U. S. Geological Survey topographic maps. The drainage area above Lee Ferry on the Colorado River was determined to be 109,889 square miles.

Water Using Areas

Types of Water Using Areas. In order that the Committee might estimate the effect of man in depleting the flow of the Colorado River above Lee Ferry it was necessary to determine the water using areas which man has influenced. The categories of water using areas investigated by the Committee were as follows: irrigated areas including natural overflow areas, water consuming noncropped areas, and river channel areas exposed to evaporation and transpiration losses. Areas which consume water in a state of nature were not investigated unless the activities of man have influenced them to some extent. Channel losses have been influenced by the use of water by man at upstream sites.

Irrigated Areas. Irrigated areas are those on which man applies water for the purpose of growing crops. Basically, the Committee has used the land classification maps of the Bureau of Reclamation to determine the areas of lands irrigated at the present time. The Committee has supplemented these data where deemed necessary. The table on page 35 lists the findings of the Committee on irrigated areas. Field investigations were made by members of the Committee to determine these data.

UPPER COLORADO RIVER BASIN COMPACT COMMISSION

ENGINEERING ADVISORY COMMITTEE

IRRIGATED AREAS (in acres) (Averages for 1914-1945)

IRRIGATED AREA LOCATION	ARIZ.	COLO.	N. MEX.	UTAH	WYO.	TOTALS
Green River above Linwood	-	-	-	-	201,275	201,275
Linwood to Green River, Utah						
Henrys Fork	-	-	-	9,270	13,910	23,180
Little Snake R. above Lily	-	7,895	-	-	13,515	21,410
Yampa R. above Maybell	-	65,720	-	-	-	65,720
White R. above Watson	-	30,660	-	50	-	30,710
Uinta Basin	-	-	-	170,320	-	170,320
Price R. above Woodside	-	-	-	15,970	-	15,970
Remainder Linwood to Green River, Utah	-	1,840	-	4,620	-	6,460
TOTAL above Green R., Utah	-	106,115	-	200,230	228,700	535,045
Colorado River above Cisco						
Colorado R. above Cameo	-	154,581	-	-	-	154,581
Plateau Cr. at Cameo	-	24,650	-	-	-	24,650
Gunnison R. at Grand Jct.	-	251,842	-	-	-	251,842
Dolores River at Gateway	-	35,906	-	-	-	35,906
Remainder above Cisco	-	77,347	-	1,960	-	79,307
TOTAL above Cisco, Utah	-	544,326	-	1,960	-	546,286
San Juan R. above Bluff	3,270	140,165	39,000	7,710	-	190,145
Lees Ferry to Bluff, Cisco and Green R., Utah						
San Rafael River	-	-	-	42,420	-	42,420
Dirty Devil River	-	-	-	22,660	-	22,660
Escalante River	-	-	-	4,390	-	4,390
Remainder Lees Ferry to Bluff, Cisco and Green River, Utah	500	-	-	6,110	-	6,610
TOTAL Lees Ferry to Tribs.	500	-	-	75,580	-	76,080
TOTAL above Lees Ferry, Arizona	3,770	790,606	39,000	285,480	228,700	1,347,556
Paria River	-	-	-	3,040	-	3,040
TOTAL above Lee Ferry, Arizona	3,770	790,606	39,000	288,520	228,700	1,350,596

UPPER COLORADO RIVER BASIN COMPACT COMMISSION

ENGINEERING ADVISORY COMMITTEE

NATURAL OVERFLOW AREAS (in acres) Averages 1914-1945

AREA LOCATION	ARIZ.	COLO.	N. MEX.	UTAH	WYO.	TOTALS
Green River above Linwood	-	-	-	-	36,170	36,170
Linwood to Green River, Utah						
Henrys Fork	-	-	-	-	1,100	1,100
Little Snake R. above Lily	-	772	-	-	3,000	3,772
Yampa R. above Maybell	-	9,005	-	-	-	9,005
White R. above Watson	-	2,746	-	-	-	2,746
Uinta Basin	-	-	-	-	-	-
Price R. above Woodside	-	-	-	-	-	-
Remainder Linwood to Green River, Utah	-	-	-	-	-	-
TOTAL above Green R., Utah	-	12,523	-	-	40,270	52,793
Colorado River above Cisco						
Colorado R. above Cameo	-	5,829	-	-	-	5,829
Plateau Cr. at Cameo	-	-	-	-	-	-
Gunnison R. at Grand Jct.	-	12,412	-	-	-	12,412
Dolores R. at Gateway	-	-	-	-	-	-
Remainder above Cisco	-	-	-	-	-	-
TOTAL above Cisco, Utah	-	18,241	-	-	-	18,241
San Juan R. above Bluff	-	-	-	-	-	-
Lees Ferry to Bluff, Cisco and Green R., Utah						
San Rafael River	-	-	-	-	-	-
Dirty Devil River	-	-	-	-	-	-
Escalante River	-	-	-	-	-	-
Remainder Lees Ferry to Bluff, Cisco and Green River, Utah	-	-	-	-	-	-
TOTAL Lees Ferry to Tribs.	-	-	-	-	-	-
TOTAL above Lees Ferry, Arizona	-	30,764	-	-	40,270	71,034
Paria River	-	-	-	-	-	-
TOTAL above Lee Ferry, Arizona	-	30,764	-	-	40,270	71,034

UPPER COLORADO RIVER BASIN COMPACT COMMISSION

ENGINEERING ADVISORY COMMITTEE

WATER CONSUMING NONCROPPED AREAS (in acres) Averages 1914-194

AREA LOCATION	ARIZ.	COLO.	N.MEX.	UTAH	WYO.	TOTALS
Green River above Linwood	-	-	-	-	23,600	23,600
Linwood to Green River, Utah						
Henrys Fork	-	-	-	1,500	500	2,000
Little Snake R. above Lily	-	2,500	-	-	5,000	7,500
Yampa R. above Maybell	-	10,300	-	-	-	10,300
White R. above Watson	-	6,544	-	-	-	6,544
Uinta Basin	-	-	-	31,760	-	31,760
Price R. above Woodside	-	-	-	2,210	-	2,210
Remainder Linwood to Green River, Utah	-	100	-	520	-	620
TOTAL above Green R., Utah	-	19,444	-	35,990	29,100	86,474
Colorado River above Cisco						
Colorado R. above Cameo	-	17,800	-	-	-	17,800
Plateau Cr. at Cameo	-	2,500	-	-	-	2,500
Gunnison R. at Grand Jct.	-	32,915	-	-	-	32,915
Dolores R. at Gateway	-	3,650	-	-	-	3,650
Remainder above Cisco	-	12,703	-	218	-	12,921
TOTAL above Cisco, Utah	-	69,568	-	218	-	69,786
San Juan River above Bluff	-	17,800	6,482	680	-	24,962
Lees Ferry to Bluff, Cisco and Green R., Utah						
San Rafael River	-	-	-	6,600	-	6,600
Dirty Devil River	-	-	-	3,655	-	3,655
Escalante River	-	-	-	430	-	430
Remainder Lees Ferry to Bluff, Cisco and Green River, Utah	-	-	-	702	-	702
TOTAL Lees Ferry to Tribs.	-	-	-	11,387	-	11,387
TOTAL above Lees Ferry, Arizona	-	106,812	6,482	48,275	29,100	190,669
Paria River	-	-	-	350	-	350
TOTAL above Lee Ferry, Arizona	-	106,812	6,482	48,625	29,100	191,019

Natural Overflow Areas. Natural overflow areas are riparian lands naturally irrigated by spring and early summer high water and from which native grasses are pastured or harvested for hay. These areas were flooded prior to man's developments and remain to a large extent naturally irrigated. Natural overflow areas have been determined by members of the Committee by field trips, discussion with early residents and from other sources of information. The acreages of these lands shown on page 36 are probably smaller than actually existed. In most cases flooding of these lands persists to some extent even though the flow of the streams has been regulated by man's activities.

Water Consuming Noncropped Areas. Water consuming noncropped areas are those areas which consume water incidental to the cropped lands and as a result of the practice of irrigation. The Committee has recognized that some areas are flooded or seeped through man's irrigation activities, and that such a condition results in the evaporation and transpiration of water justly chargeable to man as stream depletion. The acreage of such areas in the Upper Basin States is tabulated in the table on page 37.

Channel Areas. The major cause of channel loss in the Upper Colorado River Basin is evaporation from exposed water surfaces, and wetted channel areas, and evaporation and transpiration from vegetation in the flood plains of the streams. It was necessary therefore, to determine channel areas from Lee Ferry to headwater sections. Exposed river bottom areas were measured and estimated from the available aerial photographs, plan and profile maps of the Upper Colorado River drainage system, and other maps where necessary. Channel areas and channel losses are discussed in detail in the analyses which follow.

Transmountain Diversions and Other Water Uses. The Committee has assembled all data pertaining to the diversion of water outside the natural basin and such uses of water as municipal and industrial depletions and reservoir evaporation losses. These data have been supplemented by estimates where necessary to reflect normal stream depletions by these uses for the 1914 through 1945 period. The following tables list transmountain diversions and other uses by states of the Upper Colorado River Basin above Lee Ferry, Arizona.

TRANSMOUNTAIN DIVERSIONS

Average 1914-45

State	From	Acre-Feet
Colorado	Colorado R. above Glenwood Springs	28,316
Colorado	Roaring Fork River	14,281
Colorado	Gunnison River	531
Colorado	San Juan River	585
Colorado Total		43,713
Utah	Strawberry River (to Daniel Creek)	4,000
Utah	Strawberry River (to Spanish Fork)	66,000
Utah	Cottonwood Creek (to Oak Creek)	2,500
Utah	Cottonwood Creek (to Ephraim Creek)	2,500
Utah	Huntington Creek (to Sanpitch River)	4,000
Utah Total		79,000
Upper Basin Total		122,713

SUMMARY OF
TRANSMOUNTAIN DIVERSIONS AND OTHER WATER USES

Averages for 1914-45

Acre-feet

Type of Use	Arizona	Colorado	New Mexico	Utah	Wyoming
Transmountain Diversions	-	43,713	-	79,000	-
Res. Evap. Losses	200	10,000	-	13,500	2,200
Domestic Use	-	9,000	1,000	3,000	1,100
Totals at Sites of Use	200	62,713	1,000	95,500	3,300
Total for Basin				162,713	

ANALYSES

Present Stream Depletions

The Committee has recognized from the outset that the sum of individual stream depletions at the sites of use is greater than the total stream depletion measured at Lee Ferry. This condition prevails on streams where channel losses occur no matter what their magnitude. In the Upper Colorado River Basin channel losses are known to be substantial. Water withheld upstream from Lee Ferry is not subject to loss in conveyance from the sites of use to Lee Ferry. The resultant reduction in channel loss constitutes a salvage and therefor can be deducted from the depletion at sites of use, when calculating depletion at Lee Ferry.

The Committee has undertaken to determine stream depletion at Lee Ferry through a progression of steps as follows:

1. Determination of areas using water as a result of man-made irrigation.

2. Determination of unit rates of consumptive use of irrigation water.

3. Computation of stream depletions at sites of use by application of unit rates of consumptive use of irrigation to water using areas and summation of transmountain diversions, and other uses of water by man.

4. Estimation of channel losses between sites of use of water and Lee Ferry, Arizona, for historic and virgin flow during the period 1914-45.

5. Computations of stream depletions above certain key gages, at state boundaries, and at Lee Ferry.

<u>Unit Rates of Consumptive Use of Irrigation Water</u>. The Committee stated in its report of August 31, 1946, that unit rates of stream depletion now incorporated in the Bureau of Reclamation Report dated March 1946 would be used to estimate present depletions as they might be modified by subsequent studies.

Unit rates of depletion as used by the Bureau of Reclamation are dependent upon the determination of consumptive use rates for irrigated areas by the Lowry-Johnson method described in 1942 Transactions, American Society of Civil Engineers, volume 107. Determinations of consumptive use by this method at all sites of use under study by the Committee have not been made by the Bureau of Reclamation for the study period, as it requires the use of maximum daily temperatures to determine effective day degrees of heat and minimum daily temperatures to define the length of the growing season. Computation of unit rates of consumptive use by the Lowry-Johnson method would be a very lengthy process if applied to all areas under study. Further, basic data are not available for such application without considerable estimation. Efforts to improvise short cut applications of the method were not successful.

The Committee undertook to estimate unit rates of consumptive use of irrigation water through the use of pertinent climatological data. Recognizing the importance of this item it was decided to obtain the services of the best qualified experts in this field.

Consultation services of Mr. H. F. Blaney, eminent authority on consumptive use and Senior Irrigation Engineer with the Soil Conservation Service, U. S. Department of Agriculture, and his assistants have been utilized by the Committee in this regard. A field inspection trip was made by Mr. Blaney and Mr. W. D. Criddle of his division, throughout the Upper Colorado River Basin to obtain first hand knowledge of conditions effecting consumptive use of irrigation water rates. Mr. Blaney was accompanied on this trip by members of the Engineering Committee. Mr. Blaney prepared a report for the Engineering Committee on consumptive use of water rates obtained by methods found practical through research made by his division. Climatological and other data were furnished to Mr. Blaney by the Committee. The Committee believes the consumptive use of water rates determined by Mr. Blaney to be the most reliable values obtainable with the data so far collected in the Upper Colorado River Basin.

Mr. Blaney's report incorporated as Appendix B of this report, gives in detail the technical background of the determination of consumptive use of water rates in the Upper Colorado River Basin. Through an exhaustive review of basic data, the advise and aid of members of the Engineering Advisory Committee, state and local irrigation practitioners and authorities, and an extensive field inspection trip through the Upper Colorado River Basin, Mr. Blaney has completed his report to reflect actual conditions in regard to full or short irrigation supplies, types of crops, natural overflow hay and pasture, and incidental areas.

The Blaney report gives consumptive use of irrigation water rates during the irrigation period at sites of present water use for all types of crops grown, all general types of native vegetation growths, seeped lands, and water surfaces and natural overflow areas under applicable local conditions of full and short supplies. These consumptive use of water rates are given for total irrigation period consumptive use of water rates, and total irrigation period consumptive use of water rates minus precipitation. It was assumed that average winter consumptive use under present conditions has not changed from what it was under virgin conditions.

The Engineering Advisory Committee has adopted Mr. Blaney's estimates of normal unit "consumptive use of water rates minus precipitation." The Committee considers these rates to be synonymous with unit rates of stream depletion at sites of use.

Stream Depletions at Sites of Use. The unit rates of consumptive use of irrigation water, determined by Mr. Blaney and considered by the Committee to be unit rates of stream depletion at sites of use, were utilized to estimate stream depletions at sites of use.

The stream depletions chargeable to man, as computed by the Committee, are listed in the tables for the states in the Upper Colorado River Basin on pages 43 to 45. For convenience the following summary table is also given.

Man-made Depletions at Sites of Use
Averages for 1914-1945, incl.
Acre-feet

Type of Use	Arizona	Colorado	New Mex.	Utah	Wyoming
Cropped Lands	3,790	821,378	56,174	384,043	183,620
Incidental Areas	---	178,662	14,993	81,001	40,750
Transmountain Diversions	---	43,713	---	79,000	---
Res. Evap. Losses	200	10,000	---	13,500	2,200
Domestic Use	---	9,000	1,000	3,000	1,100
Less Water Supplied from Importations	---	---	---	4,000	---
Rounded totals adopted	4,000	1,062,800	72,200	556,500	227,700

Total for Basin 1,923,200

Channel Losses. Channel losses have been computed by the Committee on the major tributaries of the Colorado River and the main stem from the major sites of stream depletion to Lee Ferry. Channel losses are natural depletions of the river and as such are not caused by man. All natural depletions have not been computed, but channel losses have because irrigation by man has brought about a reduction in them. The Committee has estimated the amount of channel loss which has normally taken place during the period 1914-1945.

Exposed river bottom areas were measured and estimated from the available aerial photographs, and plan and profile maps of the Upper Colorado River drainage system, and other maps where necessary. Through careful analysis the average area of channel exposed to evaporation at uniform rates was estimated for various increments of distance along the streams, from Lee Ferry to the headwater areas.

F = Full water supply
S = Short water supply
a = Natural overflow areas
b = Domestic use
c = Reservoir evaporation losses
d = Transmountain diversions
e = Trees and brush

AVERAGE YEARLY STREAM DEPLETION AT SITES OF USE

PERIOD 1914-45

f = Seeped lands
g = Ponds
h = Swamp
i = Idle
j = Willows
k = Import

Location		Alfalfa			Grass, Hay & Pasture			Grains and Beans			Corn and Other Annuals			Orchard			Incidental Areas			Other	Total
		Acres	Rate Feet	Depletion Acre-feet	Acres	Rate Feet	Depletion Acre-feet	Acres	Rate Feet	Depletion Acre-feet	Acres	Rate Feet	Depletion Acre-feet	Acres	Rate Feet	Depletion Acre-feet	Acres	Rate Feet	Depletion Acre-feet	b, c, & d	Acre-feet
								ARIZONA													
1. Chinle Creek & Tributaries	F	180	2.10	380				620	1.08	670	970	1.38	1340							200	
	S										2000	0.70	1400								3990
Totals Arizona		180		380				620		670	2970		2740							200	3990
								COLORADO													
1. Cottonwood-Vermillion (Green River)	S	300	.70	210	1370	.57	781	170	.46	78							100	.69	69		1138
2. Upper Yampa and Elk	F	2570	.81	2082	21001	.64	13441	1000	.46	460							2800	.69	1932		
	S	225	.70	158	4153	.57	2367	88	.46	40							700	.69	483	850	22889
					a 5379	.20	1076														
3. Lower Yampa	S	3045	.92	2801	18671	.70	13070	5912	.84	4966				50	1.00	50	6800	1.25	8500	20	30132
					a 3626	.20	725														
4. Little Snake	S	1520	1.15	1748	4913	.91	4471	690	.89	614							2500	1.65	4125	40	11245
					a 772	.32	247														
5. White River	F	11367	1.10	12504	6106	.91	5556	2001	.77	1541							6544	1.16	7591	100	33719
	S	3525	.70	2468	4650	.53	2464	265	.77	204											
					a 2746	.47	1291														
6. Colorado River above Glenwood	F	3244	.98	3179	25372	.82	20805	1989	.68	1353							3700	1.00	3700	70	29383
	F				a 1968	.14	2769														
					a 2974	.00	0														
7. Muddy, Troublesome, and Blue River	S	732	.88	644	6946	.68	4723	448	.68	305							400	1.00	400		
	F	688	.98	674	7137	.82	5852	422	.68	287							1500	1.00	1500	410	14903
	S				a 484	.14	68														
	F				a 103	.39	40														
8. Eagle River and Gypsum Creek	F	9333	1.11	10360	855	.92	787	2049	.68	1393							1800	1.02	1836		
	S	2255	.78	1759	125	.61	76	712	.68	484							450	1.02	459		17274
	F				a 300	.40	120														
9. Roaring Fork above Basalt & Tributaries	F	6439	.96	6181	4089	.80	3271	2034	.71	1444							1800	1.11	1998		
	S	994	.89	885	23	.75	17	314	.71	223							150	1.11	166		14185
10. Roaring Fork below Basalt & Tributaries	F	6971	1.42	9899	799	1.19	951	2560	.87	2227							1000	1.72	1720	370	
	S	7358	1.08	7947	380	.84	319	2722	.87	2368							500	1.72	860		26661
11. Colorado River & Tribs. - Glenwood to Cameo	S	38698	.92	35602	918	.70	643	10286	1.03	10595	1700	1.31	2227	160	1.19	190	6500	2.03	13195	43440	105892
12. Plateau Valley	S	16551	.83	13737	3699	.71	2626	4350	1.12	4872				50	1.07	54	2500	2.03	5075		26364
13. Grand Valley	F	21609	2.36	50997	59	2.04	120	31540	1.10	34694	13140	1.47	19314	9350	1.60	14960	12603	2.06	25962	5230	151277
14. Upper Gunnison to Cimarron	F	1484	.97	1439	30037	.81	24330	2135	.63	1345							600	.93	558		30837
	F				a 6206	.51	3165														
15. Tomichi and Cochetopa	S	143	.83	119	15015	.62	9309	206	.63	130							2000	.93	1860	1138	13921
	S				a 6206	.22	1365														
16. N. Fork of Gunnison and Tributaries	S	36044	.94	33881	9249	.71	6567	14722	.95	13986	5400	1.23	6642	13340	1.18	15741	12000	2.11	25320	2300	104437
17. Upper Uncompahgre River	F	14685	1.40	20559	5550	1.19	6604	4895	1.04	5091							2500	1.57	3925		36179
18. Uncompahgre Project	F	38880	1.93	75038				35270	1.08	38092	11495	1.38	15863	880	1.35	1188	15815	2.28	36058		166239
19. Little Dolores	F	519	1.57	815	130	1.27	165	1000	1.05	1050							100	2.92	292		2322
20. Upper Dolores	F	1980	1.57	3109	550	1.27	698	960	.97	931							150	1.71	256	170	5164
21. Lower Dolores	S	3470	2.36	8189	683	2.04	1393	1633	1.10	1796				70	1.60	112	500	2.06	1030	200	12720
22. San Miguel including Lilylands, etc.	S	13223	.87	11504	6260	.67	4194	6222	.73	4542	855	.85	727				3000	1.28	3840	500	25307
23. Montezuma and McElmo above Cortez	F	17296	1.57	27155	2577	1.33	3427	9840	.97	9545				640	.97	621	4500	1.71	7695	100	48543

F = Full water supply
S = Short water supply
a = Natural overflow areas
b = Domestic use
c = Reservoir evaporation losses
d = Transmountain diversions
e = Trees and brush

f = Seeped lands
g = Ponds
h = Swamp
i = Idle
j = Willows
k = Import

AVERAGE YEARLY STREAM DEPLETION AT SITES OF USE

PERIOD 1914-45

Location		Alfalfa			Grass, Hay & Pasture			Grains and Beans			Corn and Other Annuals			Orchard			Incidental Areas			Other	Total
		Acres	Rate Feet	Depletion Acre-feet	Acres	Rate Feet	Depletion Acre-feet	Acres	Rate Feet	Depletion Acre-feet	Acres	Rate Feet	Depletion Acre-feet	Acres	Rate Feet	Depletion Acre-feet	Acres	Rate Feet	Depletion Acre-feet	b, c, & d	Acre-feet
24. Montezuma and McElmo below Cortez	F	4330	1.57	6798	640	1.33	851	2470	.97	2396				160	.97	155	1000	1.71	1710	2700	14610
25. Upper San Juan Piedra	F F	2000 2000	.92 1.29	1840 2580	7362 2186	.73 1.06	5374 2317										500 200	.83 1.33	415 266	735	13527
26. Los Pinos (Pine) River	F	13014	1.29	16788	9647	1.06	10226	8838	.77	6805	421	.77	324	453	.69	313	5000	1.33	6650	660	41766
27. Animas River	F	4461	1.24	5532	2984	1.01	3014	2711	.73	1979	122	.85	104				1000	1.32	1320	3420	15369
28. Florida River	S	5500	.82	4510	4400	.65	2860	4053	.73	2959	200	.85	170	347	.66	229	3000	1.32	3960		14688
29. LaPlata River	S	8279	.93	7699	2590	.73	1891	10240	.82	8397				50	.77	38	1600	1.36	2176	160	20361
30. Mancos River	S	4790	1.00	4790	2164	.81	1753	3300	.97	3201				100	.97	97	1000	1.76	1760	100	11701
Total Colorado		309522		396180	244054		175686	178047		170393	33333		45371	25650		33748	106812		178662	62713	1062753
NEW MEXICO																					
1. Navajo River	S	216	1.09	235	42	.86	36	32	.66	21							e 45 f 15	1.44 .95	65 14		371
2. Los Pinos (Pine River)	F	397	1.29	512	151	1.06	160	304	.78	237	100	.85	85	6	.66	4	e 150 f 5 g 2	1.33 1.14 2.07	200 6 4		1208
3. LaPlata River	S	2198	.98	2154	503	.78	392	1392	.88	1225	767	1.37	1051	83	1.36	113	e 290 f 355 g 35 h 65	1.74 1.52 1.63 2.19	505 540 57 142		6179
4. Animas and San Juan Rivers	F	8229	2.25	18515	2513	1.93	4850	5048	1.12	5654	8654	1.43	12375	2543	1.43	3636	e 3645 f 1095 g 40 h 740	2.42 2.14 2.28 2.98	8821 2343 91 2205	1000	59490
5. Chaco	S	1641	.98	1608	3680	.78	2870	501	.88	441											4919
Total New Mexico		12681		23024	6889		8308	7277		7578	9521		13511	2632		3753	6482		14993	1000	72167
UTAH																					
1. Henrys Fork	S	5650 i 320	1.16	6554	1550	.94	1457	1750	.94	1645							800 f 450 j 250	1.02 1.18 1.34	816 531 335		11338
2. Ashley Valley and Brush Creek	F	12250 i 720	1.56	19110	5620	1.34	7531	9260	1.09	10093							3490 f 1290 j 620	1.30 1.49 1.30	4537 1922 806	2000	45999
3. Ouray	S	3260 i 180	1.26	4108	350	1.02	357	3840	1.10	4224							560 j 300	1.64 1.64	918 492		10099
4. Unita Basin Bench Lands	S	15730	1.61	25325	51930	1.31	68028	7600	.97	7372	1665	1.18	1965				8900 f 1750 j 1540	1.68 1.48 1.28	14952 2590 1971	79000	201203
5. Unita Basin Valley Lands	S	22165	1.82	40340	25800	1.50	38700	7570	1.10	8327	2430	1.38	3353				8800 f 2500 g 1100 j 910	2.00 1.78 1.89 1.73	17600 4450 2079 1574	9800	126223
6. Price River	F	6550 i 450	1.81	11855	1560	1.54	2402	5760	1.06	6106	1590	1.32	2099	60	1.17	70	900 f 950 j 360	1.91 2.15 2.40	1719 2042 864	4300	31457
7. Green River	F	1260 i 200	2.40	3024	290	2.08	603	1794	1.22	2189	1070	1.61	1723	6	1.64	10	200 f 180 j 140	2.08 2.38 2.67	416 428 374		8767
8. Moab	S	620	2.07	1283	650	1.70	1105	540	1.09	589	300	1.48	444	30	1.69	51	160 f 80 j 20	2.17 2.49 2.17	347 199 43		4061
9. LaSal	S	1620 i 620	1.08	1750	940	.86	808	2750	.92	2530							580 f 80	1.22 1.43	708 114		5910

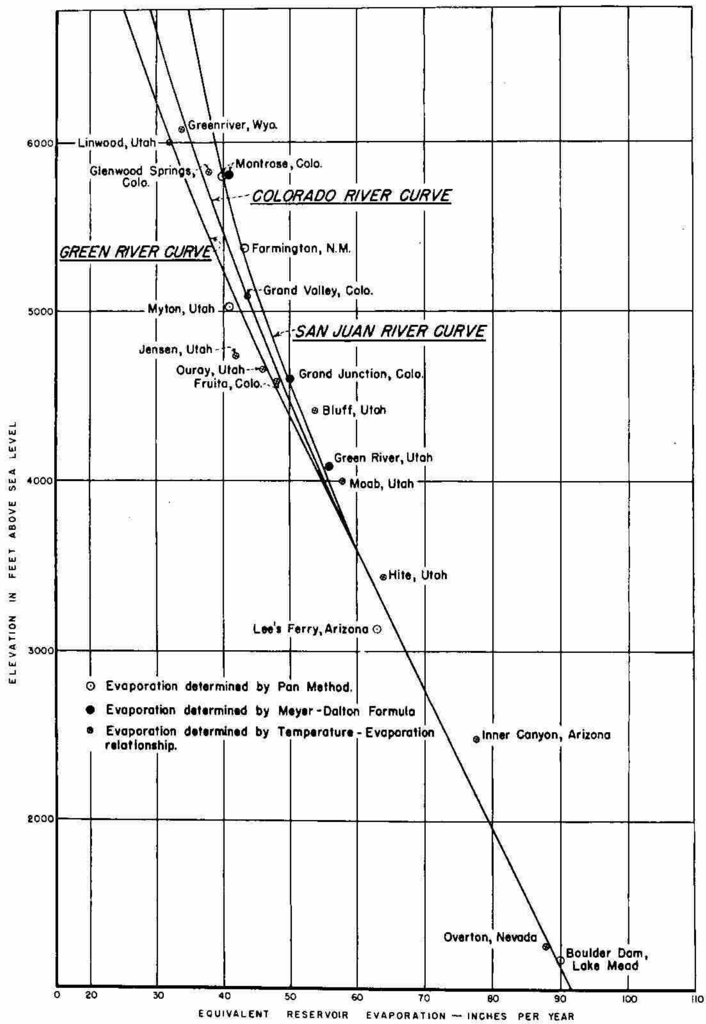
F = Full water supply
S = Short water supply
a = Natural overflow areas
b = Domestic use
c = Reservoir evaporation losses
d = Transmountain diversions
e = Trees and brush

f = Seeped lands
g = Ponds
h = Swamp
i = Idle
j = Willows
k = Import

AVERAGE YEARLY STREAM DEPLETION AT SITES OF USE

PERIOD 1914-45

Location		Alfalfa			Grass, Hay & Pasture			Grains and Beans			Corn and Other Annuals			Orchard			Incidental Areas			Other b, c, & d	Total Acre-feet
		Acres	Rate Feet	Depletion Acre-feet	Acres	Rate Feet	Depletion Acre-feet	Acres	Rate Feet	Depletion Acre-feet	Acres	Rate Feet	Depletion Acre-feet	Acres	Rate Feet	Depletion Acre-feet	Acres	Rate Feet	Depletion Acre-feet		
10. Monticello	S	1190 i 300	1.16	1380	870	.92	800	1200	.92	1104							240 g 100	1.66 1.97	398 197		3879
11. Huntington - Castle Dale - Ferron	S	17200 i 620	1.63	28036	8300	1.34	11122	15640	1.01	15796	520	1.26	655	140	1.08	151	2600 f 2600 j 1400	1.83 1.62 1.40	4758 4212 1960	400	67090
12. Emery - Hanksville	S	3950 i 560	1.59	6280	660	1.30	858	3100	.98	3038	180	1.22	220	10	1.18	12	410 f 275 j 375	1.53 1.78 2.02	627 490 758		12283
13. Loa	S	5920 i 400	1.25	7400	3090	1.07	3306	4790	.86	4119							1825 f 320 j 450	.93 1.08 1.23	1697 346 553		17421
14. Escalante	S	1680 i 350	1.36	2285	1200	1.11	1332	1000	.92	920	140	1.13	158	20	1.01	20	310 j 120	1.80 1.80	558 216		5469
15. Blanding	S	1600 i 355	1.28	2048	360	1.02	367	1570	1.02	1601	260	1.30	338	5	1.23	6	260 g 80	2.06 2.44	536 195		5091
16. Paria River	S	1500	1.37	2055	260	1.11	289	1070	.92	984	190	1.12	213	20	1.00	20	150 f 110 j 90	1.74 1.96 2.18	261 216 196	k -4000	234
Totals Utah		102145 i 5075		162833	103430		139065	69234		70637	8345		11168	291		340	48625		81001	91500	556544
								W Y O M I N G													
1. Henrys Fork	S	2100	1.15	2420	10710 1100	.91 .50	9750 a 550										500	1.67	840		13560
2. Blacks Fork	S	7000	1.08	7560	32800 3600	.83 .48	27200 a 1730	3500	.91	3180							2200	1.69	3720		43390
3. Hams Fork	F	570	1.30	740	3200 7070	1.12 .85	3580 a 6010										3700	1.68	6200		16530
4. LaBarge, Fontenelle, Piney, Muddy, Cottonwood, and Horse Creeks	S	1310	.99	1300	54845 13560	.78 .48	42780 a 6510										9600	1.13	10850	300	61740
5. Beaver, Willow, Pine, Pole, Boulder, New Fork, East Fork, and North Fork Creeks	F	400	.95	380	32670 5780	.80 .63	26300 a 3640										3400	1.28	4320	200	34840
6. Green River above Green River, Wyoming	F	470	.95	450	16780 6690	.80 .63	13420 a 4210										3600	1.28	4610		22690
7. Big and Little Sandy Creek	F	3770	1.21	4560	1840	1.03	1900	3770	.93	3510							800	1.82	1460	1400	12830
8. Green River below Green River, Wyoming	S				1180 470	.91 .50	1070 a 240										300	1.67	500	1100	2910
9. Little Snake River	S	1700	1.11	1890	6615 3000	.88 .32	5820 a 960	2200	.89	1960							5000	1.65	8250	300	19180
Totals Wyoming		17320		19300	201910		155670	9470		8650							29100		40750	3300	227670
GRAND TOTALS - Upper Colorado River Basin		446923		601717	556283		478729	264648		257928	54169		72790	28573		37841	191019		315406	158713	1923124



ELEVATION - EVAPORATION CURVE

FOR USE IN ESTIMATING ANNUAL EVAPORATION AT ANY GIVEN SITE ON THE PORTION OF THE RIVER SYSTEM SHOWN

Within the Upper Colorado River Basin there are very few evaporation records of any consequence. These records were augmented by estimates based on formulas involving meteorologic variables such as vapor pressure, air and water temperatures, and wind velocities. These data were converted to free water surface evaporation, and plotted against elevation to obtain relationship curves. Such curves were developed for the Colorado, San Juan, and Green Rivers to allow for the effect of latitude on evaporation rates. These curves are shown on page 47.

Application of unit evaporation rates obtained from the curves to channel areas, with allowance made for the effect of turbulence on evaporation rates, resulted in determination of channel losses due to evaporation. Effort was made to be conservative in the estimation of channel losses. It is believed that the results obtained are minimum values. The channel sections for which losses were computed are listed in the table which follows in terms of total acre-feet lost and loss per mile of channel. It is to be noted that the only channel section where the evaporation rate times area formula is deviated from is in the drainage area bounded by the inflow stations on the Colorado River at Cameo, Colorado, Gunnison River near Grand Junction, Colorado, Plateau Creek near Cameo, Colorado, Dolores River near Gateway, Colorado, to the outflow station on the Colorado River near Cisco, Utah. Here the streamflow records, which are believed reliable, indicate a channel loss which exceeds estimates made through use of evaporation loss factor only. For this reason that channel loss has been determined by subtracting the outflow measured near Cisco from the measured inflows with allowance for stream depletion and unmeasured inflow as estimated by the Committee. Channel losses on the Dolores River were computed in this section by application of an evaporation rate to the channel area exposed to evaporation.

SUMMARY OF AVERAGE ESTIMATED CHANNEL LOSSES IN THE UPPER COLORADO RIVER BASIN PERIOD 1914-1945

Units - 1000 A. F.		
Colorado River and Tributaries		Loss/Mile
Granby to Cameo	28.5	151
Cameo to Cisco	230.4*	2116
Cisco to mouth of Green River	35.2	361
Mouth of Green River to San Juan R.	57.7	417
San Juan River to Lees Ferry, Ariz.	37.2	477
Gunnison River - mouth to Tomichi Cr.	18.1	122
Dolores River - mouth to Gateway, Colo.	8.7	300
Dolores River - Gateway to Dolores	18.6	127

SUMMARY OF AVERAGE ESTIMATED CHANNEL LOSSES IN THE UPPER COLORADO RIVER BASIN PERIOD 1914-1945 (continued)

Units - 1000 A. F.

		Loss/Mile
Green River and Tributaries		
Green R. - Green R., Wyo. to Linwood	21.5	317
Green R. - Linwood to Green River, U.	135.1	422
Green R. - Green River, Utah to mouth	52.6	448
Little Snake River-Colo-Wyo. Line to Lily, Colorado	8.3	127
Yampa R. - Steamboat Spgs. to Maybell	13.7	124
Yampa R. - Maybell to mouth	20.0	227
White River - Meeker to Watson	12.8	111
White River - Watson to mouth	18.0	360
Price River - Heiner to mouth	5.0	60
San Juan and Tributaries		
San Juan - Rosa to Blanco	15.8	426
San Juan - Blanco to Farmington	19.6	654
San Juan - Farmington to Bluff	107.6	785
San Juan - Bluff to mouth	30.6	266
Pine River - Ignacio to mouth	10.0	371
Animas River - Cedar Hill to mouth	11.1	265
La Plata River - State Line to mouth	5.0	225
Mancos River - Towaoc to mouth	3.6	225
McElmo Cr. - Cortez gage to mouth	7.6	225

* Sum of measured inflows	5746.2	
Est. unmeasured flow	44.3	(a)
Sum of meas. and unmeas. flows	5790.5	
Irrigation depletions	153.5	
Sum of meas. and unmeas. flows minus irrig. depletions	5637.0	(A)
Dolores River at Gateway minus est. channel loss to mouth	779.4	(B)
Sum of (A) and (B)	6416.4	
Colorado R. near Cisco, Utah	6186.0	
Channel Loss	230.4	

(a) includes the area from Gateway to mouth on the Dolores R. Estimated average runoff 14.4 acre-feet per square mile, average precipitation 10.58 inches in Colorado and 9.32 inches in Utah.

It is evident in any section of stream channel that channel losses could be obtained by subtracting the measured outflow from the measured inflow provided that depletions other than channel losses, and side channel inflow were known and were accounted for algebraically. This approach to the estimation of channel losses was made in two sections of the Upper Colorado River Basin, namely from the gaging stations on the Green River at Green River, Utah, Colorado River near Cisco, Utah, and San Juan River near Bluff, Utah, to the Colorado River at Lees Ferry, Arizona, and on the San Juan River from Rosa, New Mexico, to the San Juan River near Bluff, Utah. Since this method of estimating channel losses involved a careful analysis of streamflow records it was called the hydrometric method. The results obtained in the two sections studied check fairly close with those computed by the evaporation rate, and channel area process.

Although the average losses computed by the hydrometric method for the period 1914 to 1945 were not used other than to verify the results of the evaporation rate times area process, the annual losses derived by that method were related to annual streamflows and were used as a pattern to estimate the effect of man made depletions at sites of use on downstream channel losses. In order that the hydrometric method can be better understood a brief description of its application in the Colorado River above Lees Ferry and in the San Juan Basin above Bluff is presented.

Colorado River above Lees Ferry. Daily records of inflow to the Colorado River section for the Green River at Green River, Utah, Colorado River near Cisco, Utah, and San Juan River near Bluff, Utah, for water years 1915 to 1917 and 1928 to 1945 inclusive are available. Concurrent daily records of outflow are available for the Colorado River at Lees Ferry from 1928 to 1945. In this river section there is relatively little additional inflow from the intervening drainage except area following heavy precipitation, and only minor depletions by irrigated lands.

Daily discharge hydrographs were plotted for the Colorado River at Lees Ferry. Lag curves were established through use of all available discharge data on the main stem, Green River and San Juan River and were applied to the daily records of the inflow of these stations. Many trials and adjustments were necessary before good matches between the inflow hydrographs and the outflow hydrographs at Lees Ferry were obtained. The final results were most gratifying however.

When the lagged inflow and recorded outflow to the area above Lees Ferry were plotted together, and daily precipitation, obtained through averaging records of eight precipitation stations within the area was also plotted, it became possible to see when and under what conditions losses occurred. Large losses occurred when the river was rising. These losses are most likely due to normal evaporation, transpiration by plants, deep percolation, and bank and channel storage. Less severe losses occurred when the discharge remained constant or diminished. In this river section some inflows to the river were evident as discharges diminished even though precipitation indicated there should be no tributary inflow other than base flow from side channel sources. It was assumed after considerable study that such inflows must be derived from the accumulated bank and channel storage made when the river was rising.

Using daily precipitation records to eliminate streamflow records influenced by intervening inflow, periods were selected for study during conditions of a rising river for dry and prewetted channels, uniform flow, and diminishing flow. The effect of base flow from tributaries between the inflow gages and Lee Ferry was eliminated by adding estimated base flow to the losses indicated by the records.

Available records for the San Rafael, Dirty Devil, and Escalante Rivers and data obtained on a boat trip made by the U. S. Geological Survey were utilized to the greatest possible extent in estimating average base flows for months of the year. An annual base inflow of 175 second-feet was estimated in these studies.

In this section channel losses were found to relate most nearly to the inflow discharge. Losses accumulated from low flow discharges to high flow discharges plotted against inflow discharge formed a good relationship for conditions of a rising river. This was also true for conditions of diminishing flow. Curves were established for the following conditions: losses,--rising river, dry channel; losses,--rising river, wetted channel, (considered wet if stage up to or higher within 30 days); losses minus bank and channel storage,--diminishing flow; bank and channel storage minus losses,--diminishing flow; losses--uniform discharge (fluctuation no greater than 300 second-feet).

The curves developed were used by entering them with daily inflow discharges at the three inflow gages to obtain losses under various conditions for the section above Lees Ferry. The mean channel loss computed by the hydrometric method for the section above Lees Ferry was 236,500 acre-feet as compared with 213,300 acre-feet computed by the evaporation rate applied to channel area method.

San Juan River above Bluff, Utah. Channel losses were estimated by the hydrometric method on the San Juan River between the inflow stations for the San Juan River at Rosa, New Mexico, the Pine River at Ignacio, Colorado, the Animas River at Cedar Hill, La Plata River near State Line, Mancos River near Towaoc, Colorado, and McElmo Creek near Cortez, Colorado, and the outflow station, San Juan River near Bluff, Utah. This section of river is not as ideally situated as the section above Lees Ferry because of the irrigated lands along the streams, the numerous tributaries etc., nevertheless it is believed good results were obtained in view of the circumstances.

Precipitation data, and inflow and outflow hydrographs were plotted and analyzed in a manner similar to the section above Lees Ferry after corrections were made for diversions around the Ignacio gage. Five precipitation stations were used to indicate runoff from unmeasured sources. It was determined also that base flow from unmeasured tributaries was negligible. In all, there were sufficient daily records to plot graphs for twenty-one years in the period 1914 to 1945. For water years of record prior to and including 1933, it was necessary to substitute records on the Animas at Farmington, New Mexico, for Cedar Hill and on La Plata at La Plata for State Line. In water years 1915 and 1916, the sum of the daily records for the San Juan and Piedra at Arboles was substituted for the San Juan at Rosa.

Since daily records are most nearly complete for the period 1934 to 1945, it was decided to limit selection of channel loss periods for study to those years. It was necessary to estimate daily records for McElmo Creek during part of this period. Since McElmo Creek inflow is small in comparison to other inflows, it was felt that inconsistencies introduced by the estimates would be small. Records on the Mancos and La Plata Rivers and diversion records from the Dolores River to the Montezuma Valley Irrigation District were used in estimating McElmo Creek flows. Daily records at Diversion points for canals diverting around the Ignacio gage on the Pine River are available from 1934 through 1945. Some lands are served from the measured water above the Ignacio gage, however. A location map of these canals was superimposed upon a land classification map in the vicinity of the Ignacio gage and deductions were made from the diversion records for supply of these intervening lands.

It was possible to find periods when losses occurred between inflow and outflow stations during 1934 to 1945 and when precipitation would indicate there was no unmeasured runoff. It should be remembered that such losses include irrigation depletions along the channels of the measured inflow streams but <u>not</u> along channels of unmeasured stream since such unmeasured inflows were excluded by selection from the study periods.

It was found that accumulated losses on a rising river related to discharge under conditions of dry and wet channel. Sufficient loss periods at various discharges were found to plot accumulated loss versus discharge for both dry and wet channel conditions.

Losses for diminishing and uniform conditions of flow were found to be more nearly related to temperatures than to discharge. This assumption seemed to be supported by the comparatively uniform occurrence of losses for diminishing and uniform flow conditions. Further study indicated that a good relationship existed between losses for ten-day periods, plotted against mean inflow discharges for the periods in various bands of mean maximum temperatures in ranges from above 90 degrees to 40 degrees.

Curves having been developed for various conditions of flow, it was possible to use daily records of total measured inflow to estimate losses during the period 1934 to 1945. Daily inflow records were also available from 1928 to 1933 and 1915 to 1917, inclusive for the major inflow tributaries, namely, the San Juan, Pine, Animas, and La Plata Rivers. The loss curves were used to compute losses which would have occurred on this major measured inflow. In years 1928 to 1933 and 1915 to 1917, relationship curves of loss to inflow were used to obtain the additional losses chargeable to the estimate minor inflow during these years.

Average annual losses for the period 1914 to 1945 were estimated to be 326,300 acre-feet including stream depletions. Stream depletions in this section average about 74,700 acre-feet which leaves 251,600 acre-feet by the hydrometric method. The average losses computed for the 1914 to 1945 period by the evaporation rate times area method, and used in the studies was 180,300 acre-feet. Considering the type of data and character of the section, the results obtained by the hydrometric study were believed to be good. The losses computed by evaporation were more conservative and were adopted for that reason.

Salvaged Channel Losses. Channel losses shown in the table on page 53 for historic conditions are average channel losses for the period 1914 to 1945 computed by application of evaporation rates to average exposed channel areas.

The channel losses computed by the hydrometric method for the river sections above Lees Ferry, and above Bluff, Utah illustrate that channel losses increase or decrease as the streamflow increases or decreases.

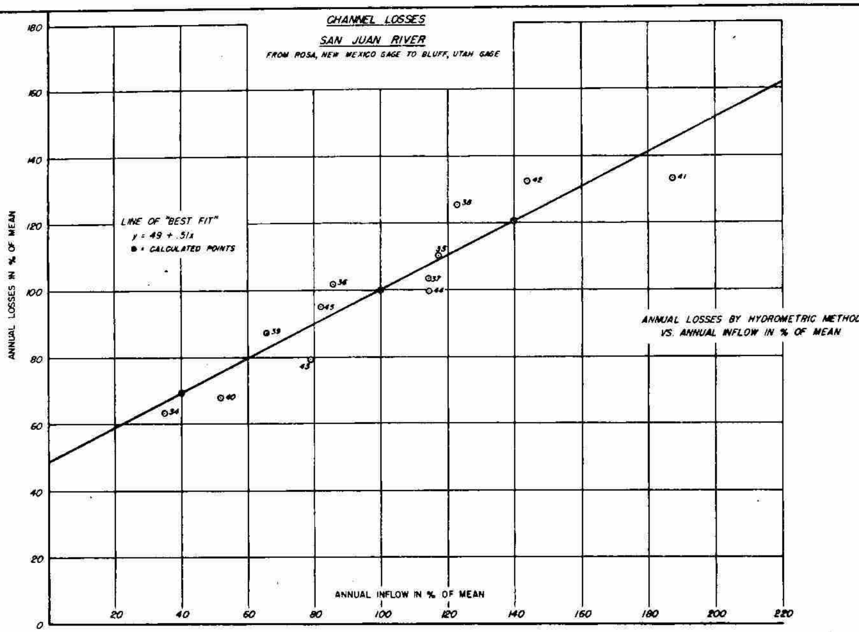
The annual channel losses for the two sections were plotted against the annual inflows to these sections in terms of percentage of the mean for the years computed as shown on page 54. The plotted points illustrate the relationship of channel loss to inflow into the sections. Lines of best fit were computed mathematically. These curves illustrate the way in which channel losses vary from the mean in the two sections of stream channel. The hydrometric method of annual analysis of channel losses was not readily adaptable to other river sections for which average channel losses have been computed. It was the opinion of the Committee that channel loss variation from the average in all sections of the Upper Colorado River Basin could be related to the variation in streamflow from the average. In computing such variation, the curves on page 54 were used for the river sections they represent. These curves were used also for other river sections. The selection of the curve used based upon whether the section's channel was more nearly akin to the section above Lees Ferry or above Bluff.

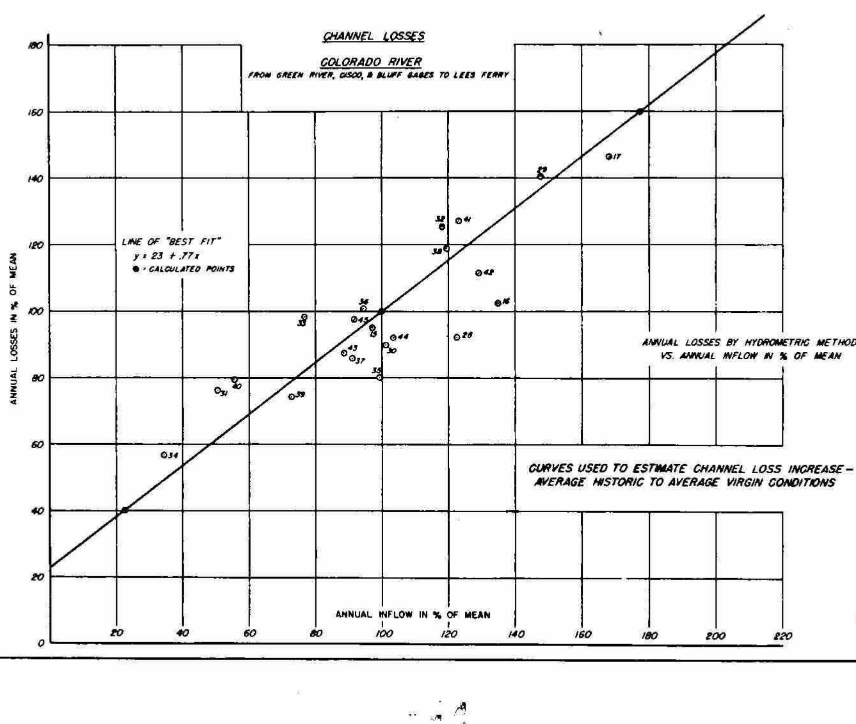
Table of Average Historic, Virgin and Salvaged Channel Losses
for
Selected River Sections
in the
Upper Colorado River Basin

Period 1914-45

UNITS - 1000 A.F.

RIVER SECTION	ARIZONA				COLORADO				NEW MEXICO				UTAH				WYOMING				TOTAL			
			Salvaged				Salvaged				Salvaged				Salvaged				Salvaged				Salvaged	
	Virgin	Historic	Out of State	Within State	Virgin	Historic	Out of State	Within State	Virgin	Historic	Out of State	Within State	Virgin	Historic	Out of State	Within State	Virgin	Historic	Out of State	Within State	Virgin	Historic	Out of State	Within State
Green River - Green River, Wyoming to Linwood, Utah													2.3	2.3	0	0	20.5	19.2	0	1.3	22.8	21.5	0	1.3
Green River - Linwood, Utah to the Yampa River													3.9	3.8	0	0.1	25.1	22.6	2.5	0	29.0	26.4	2.5	0.1
Little Snake River - Colorado-Wyoming State Line to Lily, Colorado					4.1	4.0	0	0.1									4.5	4.3	0.2	0	8.6	8.3	0.2	0.1
Yampa River - Craig, Colorado to the Green River					27.0	26.3	0	0.7									3.1	3.0	0.1	0	30.1	29.3	0.1	0.7
Green River - Yampa River to Brush Creek					5.2	5.1	0.1	0					1.1	1.1	0	0	6.3	5.7	0.6	0	12.6	11.9	0.7	0
Green River - Brush Creek to Ashley Creek					1.0	1.0	0	0					0.3	0.3	0	0	1.3	1.2	0.1	0	2.6	2.5	0.1	0
Green River - Ashley Creek to Duchesne River					15.2	14.7	0.5	0					5.2	4.7	0	0.5	18.0	16.2	1.8	0	38.4	35.6	2.3	0.5
Green River - Duchesne River to White River					0.3	0.3	0	0					0.2	0.2	0	0	0.3	0.3	0	0	0.8	0.8	0	0
White River - Watson, Utah to the Green River					18.4	17.8	0.6	0					0.2	0.2	0	0					18.6	18.0	0.6	0
Green River - White River to Price River					19.2	18.5	0.7	0					13.3	10.4	0	2.9	16.1	14.6	1.5	0	48.6	43.5	2.2	2.9
Price River - Heiner, Utah to the Green River													5.0	5.0	0	0					5.0	5.0	0	0
Green River - Price River to Green River, Utah					6.2	6.0	0.2	0					4.7	3.7	0	1.0	5.2	4.7	0.5	0	16.1	14.4	0.7	1.0
Sub-Total - Green River above Green River, Utah					96.6	93.7	2.1	0.8					36.2	31.7	0	4.5	100.4	91.8	7.3	1.3	233.2	217.2	9.4	6.6
Colorado River - Glenwood Springs, Colorado to Cameo, Colorado					15.6	15.0	0	0.6													15.6	15.0	0	0.6
Gunnison River - Delta, Colorado to Grand Junction, Colorado					8.3	7.2	0	1.1													8.3	7.2	0	1.1
Dolores River - Dolores, Colorado to the Colorado River					31.9	27.0	0.9	4.0					0.3	0.3	0	0					32.2	27.3	0.9	4.0
Colorado River - Cameo, Colorado to Cisco, Utah					253.4	230.1	8.2	15.1					0.3	0.3	0	0					253.7	230.4	8.2	15.1
Sub-Total - Colorado River above Cisco, Utah					309.2	279.3	9.1	20.8					0.6	0.6	0	0					309.8	279.9	9.1	20.8
Pine River - Ignacio, Colorado to the San Juan River					10.6	10.0	0.4	0.2													10.6	10.0	0.4	0.2
San Juan River - Rosa, New Mexico to Blanco, New Mexico					15.4	15.3	0.1	0	0.5	0.5	0	0									15.9	15.8	0.1	0
Animas River - Cedar Hill, New Mexico to Farmington, New Mexico					11.2	11.0	0.2	0	0.1	0.1	0	0									11.3	11.1	0.2	0
San Juan River - Blanco, New Mexico to Farmington, New Mexico					18.2	17.8	0.4	0	1.8	1.8	0	0									20.0	19.6	0.4	0
LaPlata River - Colorado - New Mexico State Line to the San Juan River					6.7	5.0	1.7	0													6.7	5.0	1.7	0
San Juan River - Farmington, New Mexico to Shiprock, New Mexico					24.9	24.3	0.6	0	2.0	1.6	0	0.4									26.9	25.9	0.6	0.4
San Juan River - Shiprock, New Mexico to the Mancos River					19.1	18.6	0.5	0	2.2	1.8	0	0.4									21.3	20.4	0.5	0.4
Mancos River - Towaoc, Colorado to the San Juan River					3.9	3.5	0.1	0.3	0.1	0.1	0	0									4.0	3.6	0.1	0.3
San Juan River - Mancos River to McElmo Creek					26.1	25.3	0.7	0.1	2.8	2.3	0.4	0.1									28.9	27.6	1.1	0.2
McElmo Creek - Cortez, Colorado to the San Juan River					4.5	7.6	- 0.9	- 2.2													4.5	7.6	- 0.9	- 2.2
San Juan River - McElmo Creek to Chinle Creek					18.1	17.8	0.3	0	1.9	1.6	0.3	0	0.2	0.2	0	0					20.2	19.6	0.6	0
San Juan River - Chinle Creek to Bluff, Utah	0.3	0.3	0	0	12.7	12.5	0.2	0	1.3	1.1	0.2	0	0.2	0.2	0	0					14.5	14.1	0.4	0
Sub-Total - San Juan River above Bluff, Utah	0.3	0.3	0	0	171.4	168.7	4.3	- 1.6	12.7	10.9	0.9	0.9	0.4	0.4	0	0					184.8	180.3	5.2	- 0.7
Colorado River - Cisco, Utah to the Green River					38.7	35.0	3.7	0					0.2	0.2	0	0					38.9	35.2	3.7	0
Green River - Green River, Utah to the Colorado River					22.7	21.9	0.8	0					17.7	13.3	0	4.4	19.2	17.4	1.8	0	59.6	52.6	2.6	4.4
Colorado River - Green River to San Juan River					43.8	40.2	3.6	0					11.9	9.9	0	2.0	8.4	7.6	0.8	0	64.1	57.7	4.4	2.0
San Juan River - Bluff, Utah to the Colorado River	0.6	0.6	0	0	28.0	27.2	0.8	0	3.1	2.4	0.7	0	0.5	0.4	0	0.1					32.2	30.6	1.5	0.1
Colorado River - San Juan River to Lee Ferry, Arizona (Compact Point)	0.2	0.2	0	0	29.2	26.9	2.3	0	0.7	0.5	0.2	0	6.7	5.5	0.5	0.7	4.6	4.1	0.5	0	41.4	37.2	3.5	0.7
Sub-Total - Colorado River above Lee Ferry, Arizona to Green River, Cisco, and Bluff	0.8	0.8	0	0	162.4	151.2	11.2	0	3.8	2.9	0.9	0	37.0	29.3	0.5	7.2	32.2	29.1	3.1	0	236.2	213.3	15.7	7.2
Total - Above Lee Ferry, Arizona (Compact Point)	1.1	1.1	0	0	739.6	692.9	26.7	20.0	16.5	13.8	1.8	0.9	74.2	62.0	0.5	11.7	132.6	120.9	10.4	1.3	964.0	890.7	39.4	33.9


CHANNEL LOSSES
SAN JUAN RIVER
FROM ROSA, NEW MEXICO GAGE TO BLUFF, UTAH GAGE
LINE OF "BEST FIT"
y = 49 + .51x
● = CALCULATED POINTS
ANNUAL LOSSES BY HYDROMETRIC METHOD
VS. ANNUAL INFLOW IN % OF MEAN
ANNUAL LOSSES IN % OF MEAN
ANNUAL INFLOW IN % OF MEAN


CHANNEL LOSSES
COLORADO RIVER
FROM GREEN RIVER, CISCO, & BLUFF GAGES TO LEES FERRY
LINE OF "BEST FIT"
y = 23 + .77x
● = CALCULATED POINTS
ANNUAL LOSSES BY HYDROMETRIC METHOD
VS. ANNUAL INFLOW IN % OF MEAN
CURVES USED TO ESTIMATE CHANNEL LOSS INCREASE –
AVERAGE HISTORIC TO AVERAGE VIRGIN CONDITIONS
ANNUAL LOSSES IN % OF MEAN
ANNUAL INFLOW IN % OF MEAN

S.F.K.
6-4-48

The curves were utilized by the Committee to determine what additional channel losses would be obtained under virgin flow conditions for the period 1914 to 1945, inclusive, when average historic streamflow would have been increased by the amount of man made depletions.

As an example, the table of page 53 shows the historical channel loss for the river section on the Green River from Green River, Wyoming, to Linwood, Utah, to be 21,500 acre-feet. This would be the expected channel loss for an average historic inflow to the section of 1,521,500 acre-feet. However, man made stream depletions of 194,800 acre-feet would increase the flow through this section to 1,716,300 acre-feet, or 113 percent of the average historic flow. This section of the channel is considered more nearly akin to the San Juan River section. If the San Juan curve is entered with 113 percent it is noted that channel losses would have been 106 percent of mean or 22,800 acre-feet. The channel losses under virgin conditions are estimated at 22,800 acre-feet or 1,300 acre-feet more than is estimated to have occurred historically. The 1,300 acre-feet is therefore considered to have been salvaged due to stream depletions at sites of use.

As further illustration, the average historic inflow to the section from Cisco, Utah to the mouth of the Green River on the Colorado River is estimated to be 6,186,000 acre-feet. The channel loss computed by evaporation rate times channel area for this section is estimated to be 35,200 acre-feet. When depletions above Cisco, Utah are added to the historic flow, the average virgin inflow to the section is estimated to be 7,039,200 acre-feet, or 114 percent of the mean historic flow. Using the Colorado River curve, the 114 percent flow would indicate channel losses of 110.5 percent of the mean of 35,200 acre-feet or 38,900 acre-feet channel loss under virgin condition. This would illustrate a salvage of 3,700 acre-feet due to stream depletions at sites of use.

The detailed table in Appendix C entitled "Analysis of Contributions by States Based Upon Mean Virgin Runoff for the period 1914-1945" illustrates in detail how virgin flow channel losses were computed incrementally, section by section from headwater areas to Lee Ferry.

<u>Stream Depletions at Key Gaging Stations, State Lines, and Lee Ferry</u>. In order to estimate the stream depletion caused by man at the compact point, Lee Ferry, key gaging stations, and at state lines the Committee has adjusted the estimated depletions at sites of use to downstream points by reducing them by the amount of salvaged channel losses they cause. Average stream depletions for the 1914-1945 period at specific points in the Upper Colorado River Basin are listed in the table on page 56. The estimation of salvaged channel loss has previously been explained in considerable detail. For further details on routing of stream depletions consult Appendix C wherein the detailed table entitled "Analysis of Contributions by States Based Upon Mean Virgin Runoff for the Period 1914-1945" illustrates the method used to route stream depletions from sites of use to downstream points.

Table of Stream Depletions at
State Lines by Principal Streams, selected gages and Lee Ferry, Arizona
Averages for 1914-1945 Units -1000 A.F.

	ARIZ	COLORADO	NEW MEX	UTAH	WYO.	TOTAL
DEPLETIONS AT STATE LINES BY PRINCIPAL STREAMS						
Green River at Utah - Wyoming State Line (above Lindwood)	0	0	0	0	193.5	193.5
Henrys Fork at Utah - Wyoming State Line (nr. Linwood)	0	0	0	11.3	13.6	24.9
Little Snake River at Colorado - Wyoming State Line	0	11.3	0	0	19.3	30.6
Yampa River at Junction with Green River	0	52.2	0	0	0	52.2
White River at Colorado - Utah State Line	0	33.7	0	0	0	33.7
Miscellaneous balance above Green River, Utah	0	1.1	0	415.2	0	416.3
Total depletions at State Lines above Green River, Utah	0	98.3	0	426.5	226.4	751.2
Colorado River at Colorado - Utah State Line	0	723.1	0	0	0	723.1
Dolores River at Colorado - Utah State Line	0	39.2	0	0	0	39.2
Total Depletions at State Lines above Cisco, Utah	0	762.3	0	0	0	762.3
San Juan River at Colorado - New Mexico State Line (Colorado)	0	13.6	0	0	0	13.6
Pine River at Colorado - New Mexico State Line	0	41.5	0	0	0	41.5
Animas River at Colorado - New Mexico State Line	0	30.0	0	0	0	30.0
La Plata River at Colorado - New Mexico State Line	0	20.4	0	0	0	20.4
Mancos River at Colorado - New Mexico State Line	0	11.4	0	0	0	11.4
McElmo Creek at Colorado - Utah State Line	0	65.4	0	0	0	65.4
Miscellaneous balance above Bluff, Utah	4.0	- 0.1*	71.3	9.0	0	84.2
Total depletions at State Lines above Bluff, Utah	4.0	182.2	71.3	9.0	0	266.5
Balance above Lee Ferry, Arizona (Arizona - Utah State Line)	0	0	0	109.3#	0	109.3
Total depletions at State Lines above Lee Ferry, Arizona	4.0	1042.8	71.3	544.8	226.4	1889.3
DEPLETIONS AT KEY GAGES AND LEE FERRY, ARIZONA						
Green River at Green River, Utah	0	96.2	0	426.5	219.1	741.8
Colorado River near Cisco, Utah	0	753.2	0	0	0	753.2
San Juan River near Bluff, Utah	4.0	177.9	70.4	9.0	0	261.3
Colorado River at Lee Ferry, Arizona (Compact Point)	4.0	1016.1	69.5	544.3	216.0	1849.9

*Salvaged channel loss San Juan River in Colorado
#Includes 4.0 importation

Water Contribution by States

The committee determined water contributions by states and at Lee Ferry for the period of study, 1914 through 1945, under historic and under virgin conditions. Estimating and tabulating necessary to determine historic streamflow at key gaging stations was completed. Because these gages are not all located at state lines, historic contributions by states are made up of measured flows at gages corrected for runoff from unmeasured areas and intervening channel losses. No difficulty was encountered in the estimation of runoff from unmeasured areas as they are in the main areas of low altitude with relatively minor runoff. However, runoff from unmeasured areas and channel losses, play a vital role in the determination of water contributions by states at state lines and at Lee Ferry. An outstanding example is the condition existing within the boundaries of the State of Utah. Although a great portion of the waters entering and leaving Utah is gaged near the boundaries, channel losses are in part chargeable to water originating in Wyoming, Colorado, New Mexico, and Arizona; a situation which makes calculation of Utah contributions impossible either at the state boundaries or Lee Ferry without channel loss analysis. This situation is existent in some form in every state above Lee Ferry.

Contributions from drainage areas between state lines and key gaging stations were determined in most instances by proportioning the total flow derived between the two gages on a drainage area basis. The two exceptions were the drainage area between Cameo and Cisco on the Colorado River, and the Paria River in Arizona. In the Cameo-Cisco section the unmeasured inflow was estimated through consideration of the average precipitation which falls thereon. This procedure was necessary to arrive at channel losses. The unmeasured contributions from Utah and Colorado were estimated through consideration of the average precipitation computed for each state in this section. Arizona's contribution in the Paria River Basin was estimated by Arizona as 16-acre-feet per square mile This estimate was adopted by the Committee. The determination of unmeasured contributions for the Upper Basin States is illustrated in the table on page 58.

Streamflows at key gages and unmeasured flows from areas between key gages and state lines were routed to state lines and downstream points including Lee Ferry. Channel losses for river sections between key gages, downstream points, and Lee Ferry were distributed among the states of the Upper Colorado River Basin proportionately to the amount of their contribution to the sections.

Historic contributions. Historic contributions of streamflow by the states of the Upper Colorado River Basin at key gaging stations, state lines, and Lee Ferry, have been computed as averages for the period 1914 to 1945 inclusive. Records and estimates of streamflow listed in Appendix A were utilized, together with estimates of contributions from unmeasured areas shown in the table on page 58 and average historic channel losses

DETERMINATION OF STREAMFLOW CONTRIBUTIONS
FROM
DRAINAGE AREAS BETWEEN STATE LINES AND KEY GAGES
PERIOD 1914-45

	ea	State	Measured Inflow	Measured Outflow Plus losses	Unmeasure Contri-bution	Area square miles	Acre F per sq mile
1.	Green River above	Utah			1.	3	25.4
	Linwood, Utah	Wyo.			99.0a	6,321	15.7
	Total		1 422.	1 2 .1	100.6	6 84	1 .8
2.	Green river betwee	Colo.			27.4	1,730	15.8
	Linwood and Green	Utah			121.8	7,694	15.8
	River Utah	Wyo.			15.1	950	15.8
	Total		4 66 .2	4 8 1.	164.	10 4	15.8
3.	White River,	Colo.			114.5	3,101	36.9
	Meeker, Colo. to	Utah			5.8	157	36.9
	Watson, Utah						
	Total		461.	82.0	120.	2 8	6.
4.	Colorado River be-tween Cameo, Colo.,	Colo.			26.6b	1,671	15.9
	and Cisco, Utah	Utah			17.7b	1,400	12.6
	Total		46.2	0. c	44.	1	14.4
5.	San Juan River	Colo.			27.6	492	56.2
	above Rosa, New Mexico	NMex.			17.1	304	56.2
	Total		11.	6.6	44.	6	6.2
6.	San Juan River,	Colo.			7.0	207	33.9
	Rosa to Blanco	NMex.			31.0	913	33.9
	Total		1 248.0d	1 286.0	38.0	1 120	.
7.	Animas River at	Colo.			1.3	43	29.0
	Cedar Hill and S Juan River at Blanco to Farming-ton	N.Mex			73.9	2,552	29.0
	Total		2 066.	2 142.1	75.2	2	29.0
8.	San Juan River,	Ariz.			46.8	4,602	10.2
	Farmington to	Colo.			13.5	1,322	10.2
	Bluff	NMex.			59.6	5,854	10.2
		Utah			29.2	2,873	10.2
	Total		2 2 0. e	2 .4	14 .1	14 651	10.2
9.	Mancos River -	Colo.			51.0	539	94.5
	Towaoc to San Juan River	NMex.			1.0	11	94.5
	Total		2.0	0	2.0	0	.
10.	Bluff, Cisco and	Ariz.			79.3	1,880	42.2
	Green River to Lee Ferry	Utah			777.3	18,425	42.2
	Total		1 14 .	14 001.9	8 6.6	20 0	42.2
11.	Paria River, Arizona, com-puted by Ari-zona	Ariz.			7.2	450	16.0
	Total		--	--	7.2	4 0	16.0

a Although not strictly proportional, this adjustment was made to compensate the proportional channel loss distribution which was made between Utah & Wy

b Divided on basis of average precipitation 9.32 inches in Utah, 10.58 inche Colorado.

c Cisco flow less Dolores R, at Mouth + Depletions + Channel Losses.

d Uncludes 35,000 acre-feet around Ignacio Gage.

[illegible]

for the period 1914 to 1945, to route historic contributions downstream to Lee Ferry. The detailed analysis of historic contributions by states is given in the table entitled "Analysis of Contributions by States Based on Mean Historic Runoff for the Period 1914-1945," in Appendix C. The following table summarizes the computation of historic contributions at state lines.

AVERAGE ANNUAL HISTORIC FLOWS
AT STATE LINES (1914-1945, incl.)

	(1000 A.F.)
Arizona	
Ungaged area tributary to San Juan River	86.5
Ungaged area tributary to Colorado River	46.8
Arizona share of main stem channel losses within State	-0.1
Net flow at State Line	133.2
Colorado	
Little Snake River (at mouth)	226.9
Yampa River (exclusive of Little Snake River)	1,172.5
White River	576.2
Ungaged area tributary to Green River	27.4
Colorado River including Gunnison River	5,469.9
Dolores River	762.3
San Juan River above Rosa	929.9
Pine River	294.7
Animas River	807.2
La Plata River	30.9
Mancos River	48.2
McElmo Creek	51.1

Colorado (continued)	(1000 A.F.)
Ungaged area tributary to San Juan River	13.5
Colorado share of main stem channel losses within State	-2.3
Net Flow at State Line	10,408.4
New Mexico	
Ungaged area tributary to San Juan River	192.1
New Mexico share of main stem channel losses within State	-6.0
Net Flow at State Line	186.1
Utah	
Tributaries of Green River above Linwood	158.8
Henry's Fork	66.8
Brush Creek near Jensen	36.0
Ashley Creek near Vernal	78.0
Duchesne River near Randlett	653.3
Price River at Mouth	87.6
Ungaged area tributary to Green River	127.4
Dolores River	23.2
Ungaged area tributary to Colorado River above Cisco	17.7
Paria River	18.1
Ungaged area tributary to Colorado River below Green River, Bluff and Cisco	777.3
Ungaged area tributary to San Juan River at Bluff	29.3
Utah share of main stem channel losses within State	-50.6
Net Flow at State Line	2,022.8

Wyoming (1000 A. F.)

Green River above Linwood	1,364.4
Little Snake River (at State Line)	249.8
Ungaged area tributary to Green River below Linwood	15.1
Wyoming share of main stem channel losses within State	-18.7
Net Flow at State Line	1,610.6
Sum of Flows at State Lines	14,361.1

The channel losses on water conveyed out of the states to Lee Ferry were proportioned to the state on the basis of the proportionate part of the total quantities of water carried through the channels. The aggregate amounts of such out-of-state channel losses and the estimated contributions by states of the historic flow (average 1914-45, inclusive) at Lee Ferry are as follows:

State	Historic Flow at State Lines acre-feet	Out of state losses acre-feet	Historic Contribution to Flow at Lee Ferry	
			Acre-feet	% of total
Arizona	133,200	1,000	132.200	0.96
Colorado	10,408,400	455,600	9,952,800	72.18
New Mexico	186,100	7,700	178,400	1.29
Utah	2,022,800	6,000	2,016,800	14.63
Wyoming	1,610,600	102,200	1,508,400	10.94
Total	14,361,100	572,500	13,788,600	100.00

Virgin Contributions. Virgin streamflow contributions at state lines and at Lee Ferry by the states of the Upper Colorado River Basin have been computed as average for the period 1914 to 1945 inclusive by adding to the historic contributions the man made stream depletions at sites of use and routing the estimated virgin streamflows downstream. The manner in which virgin flow channel losses were estimated has previously been discussed in detail under channel losses.

Detailed analysis of virgin flow contributions is presented in Appendix C, table entitled "Analysis of Contributions by States Based upon Mean Virgin Runoff for the Period 1914 to 1945."

The following table shows the virgin contributions at state lines and Lee Ferry and also the out of state channel losses which were estimated for average virgin flow conditions.

Virgin Flows at State Lines and Lee Ferry

State	Virgin flow at state lines acre-feet	Out of state losses acre-feet	Contribution to virgin flow at Lee Ferry	
			acre-feet	% of total
Arizona	137,200	1,000	136,200	0.87
Colorado	11,451,200	482,300	10,968,900	70.14
New Mexico	257,400	9,500	247,900	1.58
Utah	2,567,600	6,500	2,561,100	16.38
Wyoming	1,837,000	112,600	1,724,400	11.03
Total	16,250,400	611,900	15,638,500	100.00

Main Stem Reservoir Operations. Because the flow of the Colorado River is not uniform, it is necessary to consider the effect of reservoir storage in determining the ultimate use the Upper Basin States can make of their allocation under the terms of the Colorado River Compact. During the period 1914 to 1945, the historic flow at Lee Ferry has ranged between a minimum of about 4,400,000 acre-feet in 1934 and a maximum of about 21,900,000 acre-feet in 1917. The average for this period was 13,788,600 acre-feet. In the 10-year period of lowest historic flow, 1931 to 1940, inclusive, the average annual flow was 10,151,000 acre-feet.

It was recognized that upstream development of irrigation projects and storage reservoirs therefor, will to some extent equate the flow of the stream. However, reservoirs built for irrigation projects alone apparently will not provide enough long-time holdover storage to enable the Upper Basin States to fully utilize their allocated water and make adequate deliveries to Lee Ferry. The extent to which upstream development can aid in equating streamflow cannot be evaluated reliably at this time.

To permit full use of the Upper Basin allocation of 7,500,000 acre-feet during drought cycles, holdover reservoirs must be constructed in the Upper Colorado River Basin to impound water in years of high runoff and to release such stored water in critical periods of low runoff, such as 1931-40 to help meet the Upper Division obligation at Lee Ferry.

Operation studies were made, assuming for simplification that all holdover storage needed by the Upper Basin would be provided at the Glen Canyon site on the Colorado River. For further simplification in operation it was assumed that during the period of drawdown and refilling of the reservoir the flow at Lee Ferry would be maintained at an annual rate of 7,500,000 acre-feet. It was recognized that the Mexican Treaty imposes a contingent obligation on the Upper Colorado River Basin. However, as such obligation could not be precisely determined, no attempt was made to evaluate the effects thereof, if any on Upper Basin uses.

Studies were made of various reservoir capacities but it was assumed in all such studies that 5,000,000 acre-feet of storage capacity would be reserved as dead storage for power head and sediment. The reservoir site selected for study is above the damsite known as the "Fifteen Mile, Glen Canyon Damsite." Area and capacity curves were extrapolated from data published by the U. S. Geological Survey in Water-Supply Paper No. 556.

Average evaporation from a free water surface was estimated from the elevation-evaporation curve at five feet per annum. A net reservoir loss curve was developed for use in the studies by deducting from the reservoir surface evaporation loss, the river channel losses for the inundated channel, plus 80 percent of the precipitation over the remaining inundated area, at various elevations. This net loss curve shown on page 66 was utilized to estimate net reservoir losses in all operation studies made.

Reservoir operations studies were started in the year 1940, the end of the most critical period of flow in the 32-year period 1914 to 1945, with the reservoir assumed to be at the top of dead storage capacity of 5,000,000 acre-feet. The reservoir was operated from 1940 back through the critical period which started in 1930, to obtain the capacity needed to maintain various sustained demands at Lee Ferry. Operations were then made from 1941 to 1945 and 1914 through 1929 in sequence to determine if the reservoir would fill. A closed cycle operation was thus obtained for the 32-year period with various assumptions of sustained demands. Historic records of runoff for the Colorado River at Lees Ferry were used in the study as inflow to the reservoir. The streamflow at Lees Ferry was assumed to represent the inflow to Glen Canyon reservoir as there is very little uncontrolled inflow between Glen Canyon and Lees Ferry, such uncontrolled inflow could be used to help meet the Lee Ferry demand.

Reservoir operations were made for the sustained demands shown in the following table:

OPERATION STUDIES--GLEN CANYON RESERVOIR
Period 1914-1945 1,000 acre-feet units

Operation No.	Sustained Demand on Lee Ferry Flow	Total Storage Capacity	Average Depletion Due To Reservoir Evaporation Loss	Total Spills
1	12,500.0	32,462.7	469.5	26,211.1
2	12,675.0	34,639.7	481.0	20,214.1
3	12,760.0	35,689.7	481.3	17,512.1
4	13,000.0	38,571.7	490.8	9,529.1
5	13,060.0	39,304.7	492.9	7,540.1
6	13,070.0	39,419.7	492.9	7,222.1
7	13,100.0	39,775.7	492.0	6,290.1
8	13,200.0	40,981.7	487.5	3,234.1
9	13,300.0	42,175.7	481.1	240.1

(1) Includes increased upstream depletion and assumed uniform annual deliveries to Lower Basin of 7,500,000 acre-feet. Evaporation loss not charged to sustained demand.

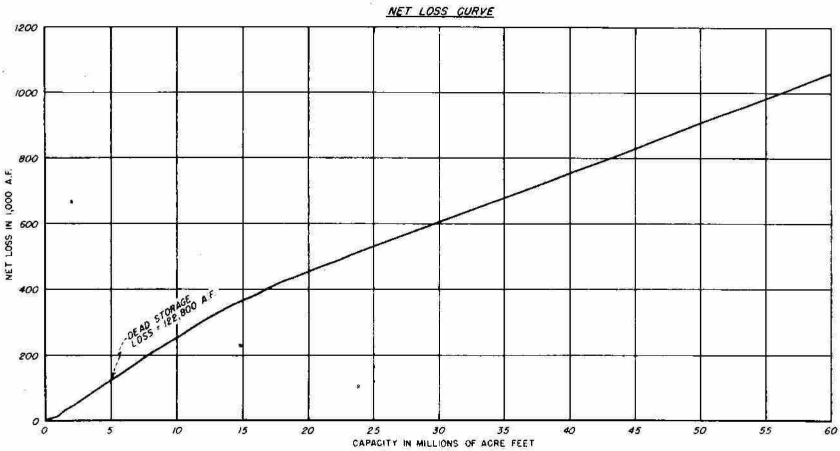
The results of the operation studies were plotted, and curves were drawn for reservoir capacities, losses, and spills versus sustained demand on Lee Ferry flow. (See page 66.)

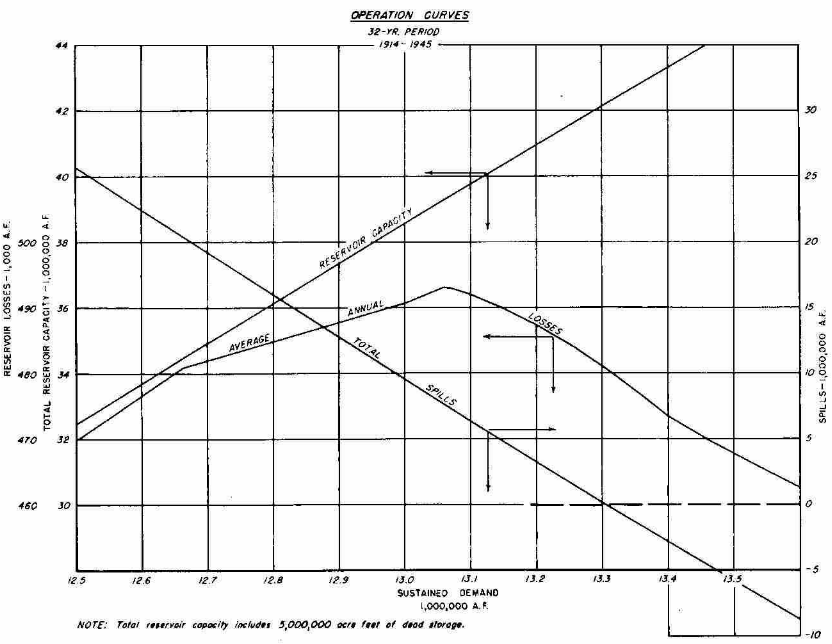
A basic premise of the study is that the Upper Colorado River Basin is entitled to deplete the virgin flow at Lee Ferry by an average of 7,500,000 acre-feet annually. To determine the total storage capacity needed to regulate the streamflow to permit the Upper Basin to make full use of its allocated water, a value of "Sustained Demand on Lee Ferry Flow" was selected, such that the sum of the "Demand on Lee Ferry Flow," "Depletion due to reservoir evaporation loss," and present upstream depletion above Lee Ferry (1,849,900 acre-feet) equalled 15,000,000 acre-feet.

This condition occurs with a sustained demand on Lee Ferry flows of 12,669,100 acre-feet. Entering the curve with this value gives a total storage capacity of 34,500,000 acre-feet and a depletion due to reservoir evaporation loss of 481,000 acre-feet.

In view of these studies, the Committee concluded that (1) the live storage capacity needed to equate the streamflow would not exceed 30,000,000 acre-feet and (2) stream depletions due to losses from main stem holdover reservoirs would be approximately 500,000 acre-feet annually.

GLEN CANYON RESERVOIR
15-MILE DAM SITE





NOTE: Total reservoir capacity includes 5,000,000 acre feet of dead storage.

S.F.K.
5-27-48

A P P E N D I X   A

T A B L E S

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C L I M A T O L O G I C A L

D A T A

and

S T R E A M F L O W

UPPER COLORADO RIVER COMPACT COMMISSION

ENGINEERING ADVISORY COMMITTEE

Average Precipitation in Inches 1914 - 1945

No.	Station	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
							ARIZONA							
1.	Chinle	0.57	0.58	0.67	0.60	0.40	0.38	1.55	1.60	1.11	0.86	0.45	0.73	9.50
2.	Ganado	0.73	1.08	0.88	0.95	0.56	0.48	1.55	1.99	1.60	1.05	0.77	0.97	12.61
3.	Jeddito	1.04	1.09	1.04	0.87	0.56	0.24	1.27	2.00	1.50	0.96	0.56	1.28	12.41
4.	Kayenta	0.44	0.58	0.70	0.47	0.39	0.32	1.27	1.60	0.83	0.77	0.52	0.46	8.35
							COLORADO							
5.	Aspen	1.96	1.99	1.91	1.89	1.64	0.96	1.44	1.61	1.63	1.40	1.27	1.41	19.11
6.	Cedaredge	0.83	0.94	0.95	1.35	1.24	0.79	0.97	1.27	1.35	1.29	0.63	0.79	12.40
7.	Collbran	1.20	1.18	1.54	*1.78	*1.47	*0.78	1.15	1.59	1.58	1.51	1.05	1.07	15.90
8.	Cortez	0.93	1.23	1.28	1.11	0.67	0.40	1.41	1.47	1.77	1.36	0.70	1.01	13.34
9.	Craig	0.81	0.84	1.40	1.51	1.69	1.38	1.22	1.09	1.28	1.64	0.90	0.93	14.69
10.	Crested Butte	2.09	2.11	1.85	1.57	1.46	1.36	2.21	2.42	2.23	*1.12	1.20	1.72	21.34
11.	Delta	*0.59	*0.49	0.56	*0.71	*0.94	*0.44	*0.63	*1.12	*1.03	*0.89	*0.55	*0.50	8.45
12.	Dillon	*1.23	*1.45	*2.02	*2.19	*1.64	*0.99	*1.80	*1.88	*1.38	*1.39	*1.03	*1.26	18.26
13.	Durango	*1.61	*1.60	*1.79	*1.59	*1.14	*0.87	*2.08	*2.19	*2.02	*1.86	*1.24	*1.71	19.70
14.	Ft. Lewis	*1.37	*1.82	*1.71	*1.39	*1.13	*0.80	*2.19	*2.18	*2.17	*1.69	*0.95	*1.44	18.84
15.	Fraser	1.55	1.75	1.87	2.17	1.91	1.24	*2.11	*1.75	*1.29	*1.35	*1.12	1.29	19.40
16.	Fruita	0.88	0.64	0.89	*0.82	*0.73	*0.49	0.74	*1.00	*1.17	*0.99	0.68	0.72	9.75
17.	Glenwood Springs	1.64	1.77	1.69	1.72	1.58	1.04	1.48	1.88	1.64	1.43	1.18	1.32	18.37
18.	Grand Junction	*0.62	*0.60	*0.82	*0.80	*0.72	*0.43	*0.75	*1.19	*1.03	*0.86	*0.57	*0.68	9.07
19.	Gunnison	0.84	0.80	0.69	0.70	0.89	0.72	1.60	1.43	0.97	0.70	0.50	0.68	10.52
20.	Hayden	1.24	1.20	1.34	1.42	1.60	1.03	1.25	1.34	1.63	1.47	0.89	1.21	15.62
21.	Ignacio	1.21	1.27	1.44	1.27	0.95	0.90	1.92	1.99	1.72	1.43	1.01	1.25	16.36
22.	Lay	1.29	1.12	1.56	1.66	1.51	0.75	1.09	1.21	1.47	1.48	0.95	1.47	15.56
23.	Meeker	1.14	1.02	1.35	1.79	1.56	0.92	1.65	1.77	1.57	1.48	1.13	1.14	16.52
24.	Mesa Verde	1.67	2.20	2.20	1.57	1.10	0.69	1.94	2.25	2.26	1.55	1.11	1.76	20.30
25.	Montrose	*0.55	*0.47	*0.76	*1.00	*1.05	*0.47	*0.79	*1.31	*1.11	*0.96	*0.60	*0.69	9.76
26.	Northdale	1.17	1.38	1.55	1.40	0.81	0.54	1.36	1.56	2.38	1.68	1.05	1.39	16.27
27.	Norwood	1.10	1.45	1.67	1.82	1.26	0.83	2.02	2.18	1.84	1.50	0.98	1.29	17.94
28.	Pagosa Springs	2.85	2.51	2.71	1.78	0.94	1.10	2.13	2.39	1.66	2.70	1.16	2.29	24.22
29.	Palisade	0.63	0.62	0.87	1.15	0.91	0.53	0.77	1.08	1.28	1.16	0.72	0.67	10.39
30.	Paonia	*1.39	*1.38	*1.46	*1.73	*1.41	0.73	*1.01	*1.38	1.36	1.57	1.22	1.40	16.04
31.	Rifle	0.91	0.67	0.91	1.05	1.03	0.49	1.08	1.06	1.13	1.14	0.74	0.79	11.00
32.	Sapinero	2.08	2.15	2.51	2.28	1.75	*0.96	1.62	*2.17	*1.75	*1.50	*1.46	1.95	22.18
33.	Steamboat Spgs.	2.31	*2.43	2.39	2.27	2.23	1.38	1.58	1.76	*1.78	*1.99	*1.69	*2.26	24.07
34.	Sunbeam	0.47	0.52	0.79	1.12	1.10	0.78	0.92	1.21	1.16	1.39	0.75	0.50	10.71
35.	Willow Creek	1.83	2.26	2.40	2.35	1.89	1.30	1.78	1.77	1.68	1.70	1.83	1.70	22.49
							NEW MEXICO							
36.	Aztec	*0.67	0.69	0.88	0.69	0.65	*0.51	1.07	1.13	1.24	*0.89	*0.63	*0.82	9.87
37.	Bloomfield	*0.55	*0.72	*0.62	0.62	0.66	0.50	1.11	1.23	1.14	0.76	0.55	0.64	9.11
38.	Chaco	0.43	0.78	0.70	0.40	0.67	0.28	1.20	1.46	1.36	0.78	0.51	0.86	9.43
39.	Chama	*1.90	*2.05	*1.90	*1.50	*1.42	*0.99	*2.53	*2.63	*2.12	*1.53	*0.99	*2.12	21.68
40.	Crownpoint	*0.59	*0.63	*0.58	*0.60	*0.65	*0.61	*2.07	*1.93	*1.40	0.82	0.50	0.62	11.00
41.	Dulce	1.40	1.58	1.63	1.39	1.24	0.91	2.49	2.09	1.95	1.36	1.21	1.58	18.83
42.	Farmington	0.55	0.73	0.67	0.63	0.61	0.35	1.03	0.99	1.10	0.85	0.56	0.64	8.71
43.	Fruitland	0.52	0.62	0.53	0.54	0.39	0.21	0.87	0.78	0.82	0.74	0.45	0.56	7.03
44.	Gameroo	0.60	0.79	0.91	0.75	0.73	0.41	1.71	2.14	1.48	0.92	0.70	0.82	11.96
45.	Governador	0.83	1.32	0.98	0.98	0.84	0.62	1.05	1.26	1.88	1.02	0.55	0.99	12.32
46.	Haynes	0.72	0.71	0.80	0.81	0.61	0.79	2.38	1.75	1.18	1.31	0.42	0.83	12.31
47.	Shiprock	0.34	0.55	0.73	0.67	0.59	0.29	0.74	1.02	1.49	0.52	0.46	0.56	7.96
48.	Tohatchi	0.71	0.62	0.67	0.63	0.65	0.46	1.83	1.56	1.23	0.83	0.52	0.65	10.36
							UTAH							
49.	Alton	1.61	1.81	1.70	1.26	0.78	0.53	1.57	1.72	1.71	1.37	0.82	1.62	16.50
50.	Blanding	*1.29	*1.40	*1.09	*0.98	*0.75	*0.46	*1.15	*1.23	*1.35	*1.39	*0.97	*1.40	13.46
51.	Bluff	0.71	0.80	0.72	0.58	0.43	0.27	0.64	0.72	0.92	0.77	0.44	0.80	7.80
52.	Castledale	0.71	0.66	0.57	0.55	0.53	0.52	0.95	1.23	0.95	0.84	0.50	0.62	8.63
53.	Duchesne	*0.58	*0.63	*0.81	*0.76	*0.81	*0.70	*1.05	*1.30	*1.07	*0.95	*0.48	*0.52	9.66
54.	Emery	*0.53	*0.49	*0.50	*0.49	*0.62	*0.46	0.95	1.16	0.96	0.76	*0.24	*0.45	7.61
55.	Escalante	1.13	1.01	0.97	0.66	0.56	0.49	1.57	2.06	1.38	1.12	0.60	1.01	12.56
56.	Ft. Duchesne	*0.44	*0.37	0.50	0.72	0.70	0.51	0.53	0.65	1.01	0.83	0.38	0.37	7.01
57.	Fruitland	1.03	1.06	1.10	0.77	0.66	0.93	1.16	1.37	1.55	1.51	0.63	0.81	12.58
58.	Green River	*0.45	*0.39	*0.45	*0.54	0.39	0.55	0.60	0.78	0.75	*0.76	*0.35	*0.44	6.45
59.	Hanksville	0.41	*0.31	0.28	0.32	0.38	0.33	0.69	0.73	0.56	0.53	0.24	0.38	5.16
60.	Hiawatha	0.77	1.14	1.10	0.96	1.08	0.95	1.32	2.01	1.45	1.16	0.62	0.69	13.25
61.	La Sal	0.90	0.91	0.82	1.14	0.89	0.69	1.52	1.51	1.36	1.30	0.74	1.04	12.82
62.	Loa	0.51	0.54	0.61	0.50	0.47	0.38	1.12	1.39	0.88	0.60	0.37	0.48	7.85
63.	Manila	0.36	0.61	0.85	1.46	1.23	0.69	0.98	0.96	0.86	1.28	0.65	0.42	10.35
64.	Moab	*0.80	*0.71	*0.85	*0.88	*0.74	*0.49	*1.03	*0.87	*0.97	*1.02	*0.66	*0.92	9.94
65.	Monticello	1.25	1.44	1.58	1.07	0.83	0.60	1.63	1.76	1.70	1.82	1.12	1.20	16.00
66.	Mt. Emmons	0.30	0.48	0.49	0.75	0.84	0.46	0.80	1.19	0.97	0.69	0.48	0.49	7.94
67.	Myton	0.32	0.32	0.45	0.66	0.58	0.43	0.80	0.93	0.91	0.79	0.37	0.34	6.90
68.	Price	0.83	0.78	0.73	0.79	0.74	0.71	0.95	1.33	1.27	0.96	0.53	0.77	10.39
69.	Soldier Summit	1.59	1.76	1.74	1.10	1.21	0.67	1.30	1.42	1.24	1.08	1.16	1.61	15.88
70.	Thompsons	0.61	0.63	0.77	0.65	0.51	0.48	0.80	0.89	1.02	1.04	0.54	0.72	8.66
71.	Tropic	1.20	1.08	1.14	0.81	0.58	0.40	1.47	1.75	1.50	1.03	0.63	1.10	12.69
72.	Vernal	0.63	0.60	0.55	0.95	0.86	0.43	0.63	0.76	1.15	0.97	0.66	0.58	8.77
73.	Watson	0.54	0.58	0.97	1.06	0.94	0.75	1.54	1.54	1.29	1.07	0.91	0.71	11.90
							WYOMING							
74.	Big Piney	0.36	0.35	0.42	0.84	1.13	0.97	0.70	0.77	1.17	1.06	0.34	0.29	8.40
75.	Dixon	0.79	0.71	1.01	1.17	1.24	0.81	1.10	1.28	0.98	1.17	0.81	0.93	12.00
76.	Eden	0.42	0.53	0.45	0.76	0.81	0.71	0.76	0.83	0.73	0.67	0.34	0.33	7.34
77.	Evanston	*0.92	*1.15	*1.10	*1.23	*1.16	*0.96	*0.99	*1.15	*1.05	*1.17	*0.81	*0.79	12.48
78.	Green River	*0.35	*0.51	*0.54	1.06	1.06	*0.65	*0.59	*0.70	*0.82	*0.88	*0.42	*0.32	7.90
79.	Kemmerer	0.56	0.61	0.67	0.66	0.76	0.72	0.77	0.77	0.56	0.67	0.59	0.60	7.94
80.	Kendall	1.57	1.62	1.50	1.21	1.69	1.68	1.13	1.13	1.34	1.19	1.22	1.74	17.02
81.	Lyman	0.45	0.82	0.79	1.81	1.40	0.57	1.35	0.79	0.80	1.26	0.80	0.65	11.49
82.	Pinedale	0.88	0.87	0.71	0.94	1.21	1.13	1.04	0.95	1.08	1.04	0.71	0.86	11.42
83.	Rock Springs	0.40	0.69	0.69	1.09	0.93	0.62	0.76	0.67	0.57	0.80	0.47	0.33	8.02

NOTES

* Recorded for the Period 1914 - 1945

Other Values are Estimated for the Period

UPPER COLORADO RIVER COMPACT COMMISSION

ENGINEERING ADVISORY COMMITTEE

Temperature in Degrees F.

No.	Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	April-Sept Mean	Mean Annual	U.S. Annual
								ARIZONA									
1.	Chinle	N/	28.2	34.2	41.6	49.2	58.6	68.6	74.2	72.2	63.9	52.0	39.4	29.9	64.4	51.0	1945
		E/	28.4	34.4	41.9	49.5	58.9	69.0	74.6	72.6	64.3	52.3	39.6	30.1	64.8	51.3	
2.	Ganado	N/	26.8	33.6	36.4	47.8	55.7	64.9	70.8	69.7	62.1	51.4	39.1	30.6	61.8	49.1	1945
		E/	26.6	33.4	36.2	47.5	55.4	64.6	70.4	69.3	61.8	51.1	38.9	30.4	61.5	48.8	
3.	Jeddito	N/	30.4	34.6	41.8	49.0	56.4	65.9	72.0	70.2	63.3	52.5	41.8	32.0	62.8	50.8	1945
		E/	30.9	35.1	42.4	49.7	57.3	66.9	73.1	71.3	64.6	53.3	42.4	32.5	63.8	51.6	
4.	Kayenta	N/	27.8	37.5	44.0	51.8	61.3	70.7	76.1	73.3	65.8	54.0	40.6	30.1	66.5	52.8	1938
		E/	27.9	37.6	44.1	51.9	61.5	70.9	76.3	73.5	66.0	54.2	40.7	30.2	66.7	52.9	
								COLORADO									
5.	Aspen	N/	18.8	22.4	29.1	39.6	47.8	55.9	62.0	60.7	53.9	43.5	30.4	23.1	53.3	40.6	1945
		E/	18.4	22.0	28.5	38.8	46.9	54.8	60.8	59.5	52.8	42.6	29.8	22.6	52.3	39.8	
6.	Cedaredge	N/	26.2	31.2	38.8	47.5	55.9	64.7	71.0	69.2	61.3	50.3	38.1	28.0	61.6	48.5	1945
		E/	26.4	31.4	39.0	47.8	56.2	65.1	71.4	69.6	61.7	50.6	38.3	28.2	62.0	48.8	
7.	Collbran	N/	21.9	27.7	36.2	45.8	53.9	62.6	68.6	66.7	58.7	47.4	35.3	24.2	59.4	45.7	1945
		E/	21.8	27.6	36.1	45.6	53.7	62.4	68.4	66.5	58.5	47.2	35.2	24.1	59.2	45.6	
8.	Cortez	N/	26.1	31.0	37.9	45.4	54.1	63.0	69.0	67.3	59.7	49.1	37.0	28.2	59.8	47.3	1945
		E/	26.5	31.5	38.5	46.1	55.0	64.0	70.1	68.4	60.7	49.9	37.6	28.7	60.7	48.2	
9.	Craig	N/	18.5	21.2	31.1	42.1	51.4	58.8	65.7	64.9	55.3	45.1	31.4	21.5	56.4	42.3	1946
		E/	18.2	20.8	30.5	41.4	50.5	57.8	64.5	63.7	54.3	44.3	30.8	21.1	55.4	41.5	
10.	Crested Butte	N/	13.0	16.4	22.6	32.6	43.3	51.6	56.7	55.3	47.6	37.3	24.9	15.2	47.8	34.7	1946
		E/	13.1	16.5	22.7	32.8	43.5	51.9	57.0	55.6	47.9	37.5	25.0	15.3	48.1	34.9	
11.	Delta	N/	24.5	32.4	41.6	50.7	59.6	68.0	74.1	71.9	63.2	51.2	37.7	26.6	64.6	50.2	1946
		E/	24.6	32.6	41.8	51.0	59.9	68.4	74.5	72.3	63.5	51.5	37.9	26.7	64.5	50.4	
12.	Dillon	N/	13.3	16.0	21.1	31.8	41.8	49.2	55.0	53.6	46.9	36.4	24.1	15.2	46.4	33.7	1946
		E/	13.3	16.0	21.0	31.7	41.7	49.1	54.8	53.4	46.8	36.3	24.0	15.2	46.3	33.6	
13.	Durango	N/	24.6	29.8	37.2	45.0	52.5	60.8	66.9	65.8	58.5	48.0	36.6	26.6	58.2	46.0	1946
		E/	24.3	29.5	36.8	44.5	51.9	60.1	66.1	65.0	57.8	47.5	36.2	26.3	57.6	45.5	
14.	Ft. Lewis	N/	21.7	25.9	32.5	41.7	50.2	58.8	64.9	61.4	55.7	45.3	33.7	27.0	55.5	43.2	1946
		E/	21.7	25.9	32.5	41.7	50.2	58.8	64.9	61.4	55.7	45.3	33.7	27.0	55.5	43.2	
15.	Fraser	N/	11.6	15.1	21.1	31.7	40.5	48.7	53.6	52.1	45.5	35.3	22.8	13.4	45.4	32.6	1944
		E/	11.7	15.2	21.3	32.0	40.9	49.1	54.1	52.6	45.9	35.6	23.0	13.5	45.8	32.9	
16.	Fruita	N/	23.2	32.1	42.1	51.0	60.0	68.9	75.7	73.4	64.1	51.3	37.9	26.5	65.5	50.5	1946
		E/	23.4	32.3	42.4	51.4	60.5	69.4	76.3	74.0	64.6	51.7	38.2	26.7	66.0	50.9	
17.	Glenwood Springs	N/	23.7	28.9	37.7	46.6	55.7	62.5	68.8	67.4	59.7	49.1	36.0	26.0	60.1	46.8	1946
		E/	23.9	29.2	38.1	47.1	56.2	63.1	69.5	68.1	60.3	49.6	36.4	26.3	60.7	47.3	
18.	Grand Junction	N/	25.5	32.9	43.5	52.4	61.1	71.4	77.6	75.4	66.2	52.8	38.9	27.5	67.3	52.1	1946
		R/	25.3	33.9	42.9	52.3	62.2	72.1	78.5	75.6	66.8	54.3	40.0	29.1	67.9	52.8	
19.	Gunnison	N/	7.9	13.8	25.9	39.5	47.8	55.8	61.5	60.0	52.4	41.5	27.8	13.0	52.8	37.2	1946
		E/	7.9	13.9	26.0	39.7	48.0	56.0	61.8	60.3	52.6	41.7	27.9	13.0	53.1	37.4	
20.	Hayden	N/	16.9	21.3	29.6	41.9	51.1	59.7	66.4	64.7	55.8	45.7	31.6	20.4	56.6	42.1	1946
		E/	16.9	21.4	29.7	42.0	51.2	59.9	66.6	64.9	55.9	45.8	31.7	20.5	56.8	42.2	
21.	Ignacio	N/	22.2	28.5	36.7	45.0	52.9	60.7	68.0	66.2	58.8	47.8	35.6	26.4	58.6	45.7	1944
		R/	22.2	28.6	36.6	44.7	53.0	61.5	67.6	66.3	58.8	47.8	35.8	26.3	58.6	45.7	
22.	Lay	N/	17.5	21.2	31.7	41.6	50.1	59.2	66.8	64.2	55.5	44.1	32.0	19.6	56.2	42.0	1933
		E/	17.8	21.5	32.2	42.2	50.9	60.1	67.8	65.2	56.3	44.8	32.5	19.9	57.1	42.6	
23.	Meeker	N/	20.1	24.6	33.6	43.2	51.5	59.2	65.2	63.8	55.5	44.7	33.5	21.4	56.4	43.0	1946
		E/	20.2	24.7	33.7	43.4	51.7	59.4	65.5	64.0	55.7	44.9	33.6	21.5	56.6	43.2	
24.	Mesa Verde	N/	29.2	33.4	38.7	47.4	56.8	67.8	72.5	70.7	62.4	51.8	39.6	31.2	62.9	50.1	1946
		E/	29.3	33.5	38.8	47.6	57.0	68.0	72.8	70.9	62.6	52.0	39.7	31.3	63.1	50.3	
25.	Montrose	N/	24.4	31.5	39.5	48.1	56.9	66.0	71.7	69.3	61.6	49.8	37.3	26.6	62.3	48.5	1946
		E/	24.6	31.7	39.8	48.4	57.3	66.5	72.2	69.8	62.0	50.0	37.6	26.8	62.7	48.9	
26.	Northdale	N/	21.4	26.4	34.6	43.3	51.6	60.0	67.7	66.0	57.5	46.4	33.1	25.6	57.7	44.5	1946
		E/	21.3	26.3	34.4	43.0	51.3	59.6	67.3	65.6	57.2	46.1	32.9	25.4	57.3	44.2	
27.	Norwood	N/	22.4	27.6	35.2	43.6	52.4	61.5	67.2	65.1	58.0	47.7	34.8	25.5	58.0	45.1	1945
		E/	22.5	27.7	35.3	43.7	52.5	61.7	67.4	65.3	58.1	47.8	34.9	25.6	58.1	45.2	
28.	Pagosa Springs	N/	17.8	22.5	31.1	41.5	48.5	56.8	63.3	61.8	54.4	43.6	31.4	21.6	54.4	41.2	1944
		E/	17.8	22.5	31.0	41.4	48.4	56.7	63.2	61.7	54.3	43.5	31.3	21.6	54.3	41.1	

Notes

N/ Weather Bureau Normals   E/ Estimated for the period 1914 - 1945   R/ Recorded for the period 1914 - 1945

UPPER COLORADO RIVER COMPACT COMMISSION

ENGINEERING ADVISORY COMMITTEE

Temperature in Degrees F.

No.	Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	April -Sept Mean	Mean Annual	W.B. Annual
						COLORADO (cont.)											
29.	Palisade	N/	26.5	34.8	43.2	53.2	62.4	71.8	78.0	75.5	67.0	54.5	41.4	30.6	68.0	53.2	1946
		E/	26.5	34.8	43.2	53.2	62.4	71.8	78.0	75.5	67.0	54.5	41.4	30.6	68.0	53.2	
30.	Paonia	N/	25.2	31.9	38.8	47.7	56.3	65.2	71.4	69.4	61.3	50.9	38.8	27.5	61.9	48.7	1946
		E/	25.0	31.7	38.6	47.4	56.0	64.8	71.0	69.0	60.9	50.6	38.6	27.3	61.5	48.4	
31.	Rifle	N/	22.3	29.9	38.6	48.2	56.7	65.0	71.6	67.2	60.5	48.7	36.9	26.1	61.5	47.6	1946
		E/	22.4	30.1	38.8	48.5	57.0	65.4	72.0	67.6	60.8	49.0	37.1	26.2	61.9	47.9	
32.	Sapinero	N/	16.8	20.6	27.8	36.7	45.5	54.0	59.3	58.0	51.2	41.0	29.5	19.2	50.8	38.3	1946
		E/	17.0	20.8	28.1	37.1	46.0	54.6	59.9	58.6	51.7	41.4	29.8	19.4	51.3	38.7	
33.	Steamboat Springs	N/	14.1	18.2	26.4	38.6	48.3	55.4	61.4	59.5	52.5	42.0	28.7	16.6	52.6	38.5	1946
		R/	13.9	18.6	26.2	38.2	48.2	55.2	61.6	59.4	52.1	41.7	28.7	16.9	52.5	38.4	
34.	Sunbeam	N/	17.7	23.0	32.9	43.1	51.8	60.0	67.8	65.4	56.1	45.1	31.5	21.2	57.4	43.0	1945
		E/	17.6	22.9	32.7	42.8	51.5	59.6	67.4	65.0	55.8	44.8	31.3	21.1	57.0	42.7	
35.	Willow Creek	N/	18.8	23.1	28.9	39.8	48.6	55.8	63.1	61.9	53.9	43.9	30.4	23.2	53.8	40.9	1945
		E/	18.3	22.5	28.1	38.7	47.2	54.2	61.3	60.2	52.4	42.7	29.5	22.5	52.3	39.8	
						NEW MEXICO											
36.	Aztec	N/	27.3	33.6	41.0	49.2	58.3	67.5	73.7	71.8	63.8	52.2	39.1	29.3	64.1	50.6	1945
		E/	26.8	34.8	41.4	49.3	57.6	66.1	73.1	71.0	63.3	52.3	39.6	30.0	63.4	50.5	
37.	Bloomfield	N/	27.0	33.7	41.6	49.7	58.8	68.2	74.8	72.6	[illegible]	51.8	38.9	28.3	64.7	50.8	1945
		E/	26.0	34.1	41.1	49.6	58.9	68.2	74.9	72.6	64.6	52.2	38.9	29.0	64.8	50.9	
38.	Chaco	N/	27.8	33.1	40.3	48.8	57.8	67.1	73.1	70.9	62.8	51.7	38.9	34.7	63.4	50.6	1943
		E/	27.5	32.7	39.8	48.2	57.1	66.3	72.3	70.1	62.1	51.1	38.5	34.3	62.7	50.0	
39.	Chama	N/	21.6	25.0	31.2	40.3	48.6	57.7	63.6	62.3	55.9	46.0	34.7	24.5	54.7	42.6	1945
		E/	21.2	24.5	30.6	39.5	47.7	56.6	62.4	61.1	54.8	45.1	34.1	24.0	53.7	41.8	
40.	Crownpoint	N/	29.1	35.2	40.9	48.4	57.2	67.7	71.5	69.6	63.4	52.5	40.8	32.0	63.0	50.7	1945
		E/	29.2	35.3	41.1	48.6	57.4	68.0	71.8	69.9	63.6	52.7	41.0	32.1	63.2	50.9	
41.	Dulce	N/	17.7	25.5	34.3	43.4	51.4	60.3	66.1	64.1	56.8	45.3	33.2	21.3	57.0	43.3	1938
		E/	17.8	25.7	34.5	43.7	51.8	60.7	66.6	64.6	57.2	45.6	33.4	21.5	57.4	43.6	
42.	Farmington	M/	28.0	34.4	42.3	50.4	59.4	68.7	74.7	72.8	64.6	52.3	39.4	29.6	65.1	51.4	No Normals
		E/	27.9	34.3	42.1	50.2	59.2	68.4	74.4	72.5	64.2	52.1	39.2	29.5	64.8	51.2	
43.	Fruitland	N/	29.0	35.0	43.1	51.0	60.0	69.1	74.7	72.9	64.8	52.8	39.9	30.9	65.4	51.9	1945
		E/	29.2	35.2	43.3	51.3	60.3	69.5	75.1	73.3	65.2	53.1	40.1	31.1	65.8	52.2	
44.	Gamerco	N/	27.3	32.7	38.8	46.9	55.4	64.6	70.5	68.1	61.0	49.7	37.4	29.3	61.1	48.5	1944
		E/	27.1	32.5	38.6	46.6	55.1	64.2	70.1	67.7	60.6	49.4	37.2	29.1	60.7	48.2	
45.	Governador	N/	25.8	30.1	37.6	45.7	55.2	64.7	71.4	70.6	62.2	50.2	36.9	28.8	61.6	48.3	1945
		E/	25.7	30.0	37.5	45.6	55.1	64.6	71.2	70.5	62.1	50.0	36.8	28.7	61.5	48.2	
46.	Haynes	N/	22.7	29.5	36.0	43.0	53.6	63.3	68.8	66.5	58.8	47.6	36.6	24.6	59.0	45.9	1925
		E/	22.5	29.2	35.6	42.5	53.0	62.6	68.1	65.8	58.2	47.1	36.2	24.3	58.4	45.4	
47.	Shiprock	N/	28.8	35.6	45.0	53.4	62.0	70.0	76.7	74.8	67.4	55.3	41.4	30.4	67.4	53.4	1945
		E/	28.6	35.4	44.7	53.1	61.7	69.6	76.3	74.4	67.0	55.0	41.2	30.2	67.0	53.1	
48.	Tohatchi	N/	30.5	34.4	42.2	49.7	59.0	68.7	73.3	71.1	64.7	54.1	41.8	32.8	64.4	51.9	1941
		E/	30.5	34.5	42.3	49.8	59.1	68.8	73.4	71.2	64.8	54.2	41.9	32.9	64.5	52.0	
						UTAH											
49.	Alton	N/	26.0	30.1	34.2	41.8	49.8	59.1	64.6	62.4	55.8	46.4	36.5	28.1	55.6	44.6	1945
		E/	26.1	30.2	34.4	42.0	50.0	59.4	64.9	62.7	56.1	46.6	36.7	28.2	55.8	44.8	
50.	Blanding	N/	26.6	32.5	39.7	47.8	55.9	65.8	71.9	70.3	62.1	51.4	39.1	29.1	62.3	49.4	1946
		E/	26.6	32.5	39.7	47.8	55.9	65.8	71.9	70.3	62.1	51.4	39.1	29.1	62.3	49.4	
51.	Bluff	N/	29.4	38.5	39.5	55.2	64.9	74.1	80.3	77.9	69.1	56.6	42.3	31.4	70.2	54.9	1946
		E/	29.9	39.1	40.1	56.1	66.0	75.3	81.6	79.2	70.2	57.5	43.0	31.9	71.4	55.8	
52.	Castledale	N/	18.5	26.3	37.0	45.4	54.4	63.4	69.4	67.2	58.4	46.9	35.0	22.0	59.7	45.3	1946
		E/	18.5	26.2	36.9	45.3	54.3	63.3	69.2	67.1	58.3	46.8	34.9	22.0	59.6	45.2	
53.	Duchesne	N/	16.0	23.2	35.4	45.3	53.7	61.5	68.7	66.8	57.8	46.4	32.6	20.0	59.0	44.0	1946
		R/	15.6	23.4	35.3	45.2	54.0	61.7	68.9	66.8	57.8	46.5	32.5	20.6	59.1	44.0	
54.	Emery	N/	24.0	29.0	36.7	44.5	53.1	61.2	67.3	65.6	57.7	47.5	36.5	26.8	58.1	45.8	1946
		E/	24.0	29.0	36.7	44.5	53.1	61.2	67.3	65.6	57.7	47.5	36.5	26.8	58.1	45.8	
55.	Escalante	N/	25.8	31.6	39.2	46.7	55.0	64.2	69.8	67.9	59.8	49.6	37.9	28.2	60.6	48.0	1946
		E/	25.5	31.3	38.8	46.2	54.4	63.5	69.1	67.2	59.2	49.1	37.5	27.9	60.0	47.5	

Notes

N/ Weather Bureau Normals
E/ Estimated for the period 1914-1945
M/ Mean of Fruitland and Bloomfield
R/ Recorded for the period 1914-1945

UPPER COLORADO RIVER COMPACT COMMISSION

ENGINEERING ADVISORY COMMITTEE

Temperature in Degrees F.

No.	Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	April -Sept Mean	Mean Annual	W.B. Annual
							UTAH (cont.)										
56.	Ft. Duchesne	N/ E/	13.3 13.2	20.6 20.5	35.5 35.3	46.9 46.6	55.5 55.1	64.1 63.7	70.8 70.3	68.7 68.2	59.8 59.4	47.0 46.7	33.0 32.8	19.5 19.4	61.0 60.6	44.6 44.3	1946
57.	Fruitland	N/ E/	21.0 21.3	24.4 24.7	31.1 31.5	40.4 40.9	49.5 50.1	58.4 59.1	64.3 65.1	63.6 64.4	53.9 54.5	44.4 44.9	33.1 33.5	21.0 21.3	55.0 55.7	42.1 42.6	1929
58.	Green River	N/ E/	22.7 21.8	33.2 32.6	44.0 43.2	53.4 53.2	63.0 62.9	72.3 72.0	79.7 79.8	77.0 76.9	66.8 67.0	53.1 53.1	38.4 38.1	26.3 27.4	68.7 68.6	52.5 52.3	1946
59.	Hanksville	N/ E/	23.8 23.9	33.8 34.0	43.9 44.1	52.9 53.2	61.9 62.3	71.5 71.9	77.7 78.1	74.3 74.7	65.1 65.5	52.8 53.1	39.2 39.4	28.3 28.5	67.2 67.6	52.1 52.4	1946
60.	Hiawatha	N/ E/	22.6 22.6	26.3 26.4	33.3 33.4	42.9 43.0	52.3 52.4	61.8 61.9	68.8 69.0	66.6 66.7	58.4 58.5	47.3 47.4	34.0 34.1	25.1 25.2	58.5 58.6	45.0 45.1	1946
61.	La Sal	N/ E/	24.2 24.7	28.7 29.3	35.0 35.7	44.3 45.2	52.8 53.9	61.9 63.1	68.0 69.4	66.5 67.8	58.3 59.5	47.4 48.3	36.1 36.8	24.8 25.3	58.6 59.8	45.7 46.6	1945
62.	Loa	N/ E/	21.4 21.8	25.6 26.1	33.0 33.6	41.1 41.9	50.2 51.2	58.7 59.8	65.3 66.5	62.8 64.0	54.0 55.0	43.0 43.8	32.1 32.7	22.4 22.8	55.3 56.4	42.5 43.3	1946
63.	Manila	N/ E/	21.0 21.3	25.4 25.8	33.1 33.6	40.9 41.6	50.3 51.1	58.7 59.7	66.3 67.4	63.8 64.8	55.9 56.8	45.7 46.4	33.0 33.5	19.0 19.3	56.0 56.9	42.8 43.5	1938
64.	Moab	N/ E/	28.9 29.0	36.7 36.9	46.4 46.7	55.3 55.6	64.2 64.6	72.4 72.8	78.6 79.0	75.9 76.3	67.1 67.5	53.7 54.0	41.4 41.6	31.1 31.3	68.9 69.3	54.3 54.6	1946
65.	Monticello	N/ E/	24.2 24.2	28.8 28.9	35.7 35.8	44.8 44.9	52.5 52.6	61.8 61.9	67.8 67.9	66.2 66.3	58.6 58.7	48.9 49.0	36.8 36.9	27.0 27.1	58.6 58.7	46.1 46.2	1946
66.	Mt. Emmons	N/ E/	14.8 15.1	25.4 25.9	33.5 34.1	44.5 45.3	53.7 54.7	60.6 61.[illegible]	68.0 69.3	65.0 66.2	56.6 57.6	46.0 46.8	32.0 32.6	18.2 18.5	58.1 59.2	43.2 44.0	1936
67.	Myton	N/ E/	15.4 15.4	24.4 24.4	37.0 37.0	47.6 47.6	57.2 57.2	65.5 65.5	72.2 72.2	70.4 70.4	61.5 61.5	49.4 49.4	33.6 33.6	20.9 20.9	62.4 62.4	46.2 46.2	1946
68.	Price	N/ E/	23.7 23.8	29.9 30.0	38.9 39.1	47.5 47.7	57.2 57.4	66.5 66.8	72.7 73.0	70.9 71.2	61.9 62.1	51.0 51.2	37.1 37.2	26.3 26.4	62.8 63.0	48.6 48.8	1946
69.	Soldier Summit	N/ E/	17.5 17.5	21.4 21.5	27.9 28.0	38.4 38.5	47.0 47.1	54.0 54.1	61.0 61.2	60.3 60.5	51.1 51.2	40.0 40.1	28.3 28.4	18.9 18.9	52.0 52.1	38.8 38.9	1941
70.	Thompsons	N/ E/	24.7 24.7	33.3 33.4	42.5 42.6	51.6 51.7	62.2 62.3	71.3 71.4	78.7 78.9	76.2 76.4	66.3 66.4	54.4 54.5	40.4 40.5	28.9 29.0	67.7 67.8	52.5 52.6	1946
71.	Tropic	N/ E/	27.8 28.2	30.8 31.2	38.3 38.8	45.3 45.9	53.0 53.7	61.8 62.6	67.8 68.7	65.6 66.5	58.5 59.3	48.6 49.2	38.2 38.7	29.6 30.0	58.7 59.4	47.1 47.7	1946
72.	Vernal	N/ E/	16.8 16.6	23.3 23.0	35.4 34.9	47.0 46.4	55.2 54.5	64.7 63.8	70.3 69.4	68.0 67.1	58.5 57.7	46.2 45.6	34.4 33.9	18.4 18.2	60.6 59.8	44.9 44.3	1945
73.	Watson	N/ E/	19.8 20.2	27.1 27.6	35.1 35.8	44.9 45.8	54.5 55.6	65.3 66.6	71.5 72.9	69.0 70.4	60.1 61.3	47.3 48.2	34.0 34.7	21.1 21.5	60.9 62.1	45.8 46.7	1946
							WYOMING										
74.	Big Piney	A/ E/	8.9 8.8	11.0 10.9	22.8 22.7	36.8 36.6	44.8 44.5	52.0 51.7	60.2 59.9	56.2 55.9	47.7 47.4	38.1 37.9	23.1 23.0	15.1 15.0	49.6 49.3	34.7 34.5	No Normals
75.	Dixon	N/ E/	16.5 16.5	21.6 21.6	29.4 29.4	40.9 40.9	50.2 50.2	58.2 58.2	65.4 65.4	63.3 63.3	54.4 54.4	44.0 44.0	30.4 30.4	19.7 19.7	55.4 55.4	41.2 41.2	1946
76.	Eden	N/ E/	9.7 9.8	15.5 15.6	26.5 26.7	38.1 38.4	47.7 48.1	56.4 56.9	63.5 64.0	61.2 61.7	51.7 52.1	41.1 41.4	26.8 27.0	12.7 12.8	53.1 53.5	37.6 37.9	1941
77.	Evanston	N/ E/	18.9 18.9	21.2 21.3	28.0 28.1	38.6 38.7	46.8 46.9	53.9 54.0	62.2 62.4	60.7 60.9	52.4 52.5	42.0 42.1	30.6 30.7	20.8 20.9	52.4 52.5	39.7 39.8	1946
78.	Green River	N/ E/	18.5 18.3	23.3 23.8	32.7 32.2	42.9 42.8	52.5 52.9	61.5 61.7	69.2 69.9	67.0 67.2	56.7 57.1	44.8 45.3	32.1 32.2	20.4 20.9	58.3 58.6	43.5 43.7	1946
79.	Kemmerer	N/ E/	17.6 17.2	18.8 18.4	27.7 27.1	39.9 39.1	49.1 48.1	56.2 55.1	63.7 62.4	61.8 60.6	52.9 51.8	43.4 42.5	29.1 28.5	22.5 22.1	53.9 52.8	40.2 39.4	1946
80.	Kendall	N/ E/	11.7 11.8	14.0 14.1	20.0 20.1	29.2 29.4	41.3 41.5	50.4 50.7	56.9 57.2	55.7 56.0	47.3 47.6	37.0 37.2	24.2 24.3	16.5 16.6	46.8 47.1	33.7 33.9	1944
81.	Lyman	A/ E/	16.9 17.0	21.5 21.7	28.7 28.9	37.8 38.1	49.3 49.7	58.3 58.7	64.8 65.3	61.7 62.2	52.0 52.4	42.8 43.1	29.2 29.4	22.0 22.2	54.0 54.4	40.4 40.7	No Normals
82.	Pinedale	N/ E/	11.6 11.7	15.2 15.3	22.8 23.0	34.7 35.0	44.5 44.9	52.8 53.2	60.3 60.8	57.4 57.9	48.9 49.3	38.7 39.0	23.1 23.3	14.4 14.5	49.8 50.2	35.4 35.7	1946
83.	Rock Springs (Airport)	N/ E/	18.5 18.2	22.5 22.1	31.0 30.5	41.4 40.7	51.0 50.2	59.8 58.8	68.2 67.1	66.2 65.1	56.2 55.3	44.8 44.1	30.8 30.3	23.2 22.8	57.1 56.2	42.8 42.1	1946

Notes

N - Weather Bureau Normals
E - Estimated for the period 1914-1945

A - Average

UPPER COLORADO RIVER COMPACT COMMISSION

ENGINEERING ADVISORY COMMITTEE

Evaporation in INCHES

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	
				FARMINGTON (near) NEW MEXICO							Elev. 5374			
1914											a 3.51	3.89		
1915	2.79	2.20	1.18			3.08	4.28	5.84	5.40	6.37	5.27	4.30		
1916	3.46	2.13		a 3.06	1.17	3.39	5.44	6.85	7.21	6.47	5.78	4.64		
1917	3.20	a 1.85	a 0.68		a 0.48	2.80	5.55	6.50	7.35	6.66	5.82	4.85		
1918	4.34	2.86	1.69	0.46	1.15	3.05	5.84	7.63	6.84	6.42	6.70	4.59	51.57	
1919	3.56	1.56	0.80			4.20	7.24	6.50	9.10	5.91	5.97	4.99		
1920	3.64	2.63	0.78	1.09	1.79	3.86	4.55	6.06	6.78	8.91	5.43	5.02	50.54	
1921	3.56	1.67	0.78	1.03	1.52	3.08	5.31	6.77	6.73	8.59	5.36	5.60	50.00	
1922	3.50	1.83	0.82	0.71	1.25	3.43	4.67	7.02	8.47	8.94	7.13	4.18	51.95	
1923	5.45	3.40	4.68	3.38	2.82	5.95	4.94	9.34	8.93	7.25	5.36	3.64	65.14	1/
1924	3.65	2.39	1.28	2.52	3.06	5.73	6.85	9.51	10.22	3.18	6.76	5.71	60.86	
1925	3.70	2.01	0.75	b 0.22	2.37	3.23	6.37	7.67	7.75	11.99	7.13	5.49	58.73	
1926	2.82	1.69	1.04	1.21	2.53	4.28	3.80	5.94				5.37		
1927	3.40		1.22	0.70	1.43	3.25	5.70	8.62	6.39	6.92	b 0.48	4.67		
1928	5.09	2.75	1.00		c 2.28	4.05	6.34	6.49	9.45	10.20	5.51	5.68		
1929	3.71	1.74	0.96	d 0.72	0.90	4.11	6.23	e 7.60	e 8.17	7.68	5.23	4.26	51.31	
1930	3.94	1.89	d 0.59			4.00	5.97	7.05	7.91	6.77	6.00	4.66		
1931	3.41	1.73	d 0.25		1.46		5.36		6.70	6.58	6.56	5.01		
1932	3.46	1.16												
1933														
1934				1.58	2.40	6.18	7.41	7.96	9.04	8.05	7.53	5.79		2/
1935	5.15	2.19	0.92	0.88	1.84	5.75	6.21	7.08	10.03	8.86	6.85	5.15	58.91	
1936	4.44	2.23	1.18	1.46	1.58	4.79	6.46	7.98	8.32	6.68	4.74	4.56	54.42	
1937	2.95	1.76	0.97			3.37	7.37	6.61	7.42	5.04	5.21	4.08		
1938	3.26	2.60	1.38	1.03	0.93	2.94	5.75	6.75	6.03	5.43	5.28	3.45	44.83	
1939	3.30	1.84	0.95	1.02	0.47	3.14	6.62	7.30	7.52	6.68	5.23	3.64	47.71	
1940	3.62	1.84	1.34		0.81	4.25	5.90	6.22	6.24	5.85	5.45	3.72		
1941	3.05	1.64	0.38	0.75	1.42	3.53	3.44	6.55	6.86	7.16	5.62	4.14	44.54	3/
1942	2.40	1.87			1.28	3.10	5.37	7.99	7.35	6.28	5.30	5.69		
1943	3.29	1.95	0.74	0.77	1.54	3.33	7.16	7.59	6.89	6.77	6.02	5.51	51.56	
1944	3.52	1.90	0.54		1.51	3.92	5.62	6.80	7.19	6.58	6.28	4.46		
1945	3.16	1.45	0.69	0.24	1.89	3.10	5.55	8.02	8.11	7.22	6.26	5.76	51.47	
		Floating Pan: 3 feet square and 1.5 feet deep.						Approx. Lat. 36 44' Long. 108 12'						
					LEES FERRY ARIZONA						Elev. 3142			
1922	5.85	3.02	1.76	1.74	3.04	5.39	7.56	11.21	12.73	14.68	10.16	9.67	86.81	
1923	7.61	3.04	2.15			6.02	7.66	12.31	13.17	12.38	9.55	7.50		
1924	6.31	2.58	1.83		3.32	5.64	7.89	11.13	14.36	12.30	12.76	9.99		
1925	5.72	3.24				6.21	8.48	12.57	12.69	14.56	10.20	7.78		
1926					4.22	6.10	6.21	11.27	15.54	14.57	13.95	9.32		
1927	5.95	3.62			2.18	5.01	8.98	14.10	13.77	14.46	11.19	8.83		
1928	5.56	2.67		1.67	2.79	5.52	8.73	10.27	13.30	13.47	11.47	9.71		
1929	6.07	2.43				6.01	7.66	11.23	13.83	11.56	9.96	8.15		
1930	5.72	2.92	2.11	1.34	2.91	6.06	8.53	10.26	14.53	12.25	10.50	9.31	86.44	3/
1931	6.21	3.00	1.80	1.35	2.36	6.54	9.21	12.26	13.87	15.01	11.00	9.45	92.06	
1932	6.50	3.89		1.92	2.16	6.89	9.58	11.85	13.08	14.11	12.66	9.60		
1933	5.89	3.69	1.74		2.43	6.46	8.43	11.24	15.09	14.32	12.55	10.78		
1934	5.43	3.67	1.65	2.47	3.36	7.40	10.04	13.09	13.63	15.74	13.76	9.83	100.07	
1935	7.07	3.72	1.56	1.17	2.91	5.40	8.59	10.01	14.26	14.20	11.97	8.66	89.52	
1936	6.41	2.95	1.32	1.89	2.93	6.47	9.14	11.95	13.73	13.56	11.37	9.03	90.75	
1937	5.42	2.86	1.85	0.74	1.80	4.91	8.62	11.47	12.22	12.43				
1938					2.64	5.07	8.98							
		Class "A" Station. Located on north bank of the Colorado River, between Glen and Marble Canyons, Above mouth of Paria River, about 10 miles south of Utah State Line.												

NOTES

a - Partial record
b - Probably incomplete record
c - Includes part of previous month
d - Water frozen part of month
e - Partially estimated

1/ - Surface Water Supply Papers of New Mexico

2/ - New Mexico State Engineer's Report

3/ - U.S. Weather Bureau Climatological Annual Summaries

UPPER COLORADO RIVER COMPACT COMMISSION

ENGINEERING ADVISORY COMMITTEE

Evaporation in INCHES

MONTROSE COLORADO Elev. 5811

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	
1939								8.80	10.75	11.45	9.01	5.37		
1940	4.04					4.53	5.43	8.70	11.09	10.35	8.84	4.97		
1941	3.73	1.64		1.20	1.19	3.14	4.00	5.94	9.61	9.44	7.53	5.25		
1942	2.38	1.58	1.10	1.10	1.05	3.32	4.58	7.88	9.73	10.40	8.81	6.96	58.89	3/
1943	3.97	2.18			1.99	3.29	6.91	6.88	8.62	10.31	6.13	5.78		
1944	4.03	1.84	0.87	1.07	1.42	2.64	3.74	6.84	8.92	9.43	8.66	7.39	56.85	
1945	3.93	1.71	1.50	1.04	1.33	3.17	3.57	7.32	8.37	9.62	7.23	6.37	55.16	

Pan: 48" in diameter, 10" deep. Lat. 38 30' Long. 107 50' Near the edge of town limits of Montrose

FT. DUCHESNE UTAH Elev. 4941

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	
1943							6.61	8.05	7.73	8.51	6.66	6.15		
1944	3.46						3.79	7.62	7.31	8.54	7.75	5.57		3/
1945	2.49						5.43	7.67	7.53	8.22	7.20	5.80		

MOON LAKE UTAH Elev. 8150

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	
1941										a 5.14	6.33	a 3.91		
1942										8.59	8.36	6.03		
1943										8.30	6.41			3/
1944									6.53	8.45	8.80	6.51		
1945									7.42	7.42	5.99	6.13		

MYTON UTAH Elev. 5030

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	
1918								a 4.48	11.68	9.39	9.48	6.19		
1919	2.69							10.28	10.94	11.22	9.54	5.94		
1920	3.41	a 0.41					a 4.37	a 5.99	a 5.48	9.92	7.51	5.67		
1921	3.84						5.70	8.51	8.30	8.82	7.39	7.89		
1922	4.36	a 0.30						7.99	a 9.05	a 8.83	7.64	6.46		
1923	4.10	a 0.26					a 4.60	8.07	10.39	10.50	7.94	6.23		
1924	1.40							9.67	12.42	a10.14	9.84	6.23		
1925	4.01	a 0.33					i 7.66	9.40	7.45	8.74	7.39	5.67		
1926	i 3.30								10.06	8.71	8.43	7.64		
1927									i 8.56	i 9.16	7.86	i 5.86		
1928									i10.16	i10.11		i 6.94		
1929								8.10	10.54	8.66	7.95	4.93		3/
1930								5.84	11.14	9.29	6.74	4.93		
1931								i 8.81	9.05	10.02		i 6.29		
1932								a 5.18	8.17	8.58	7.23	5.94		
1933								a 3.40	10.56	8.86	7.74	6.33		
1934	a 3.41							7.83	7.58	9.31	7.23	6.10		
1935	a 1.83							i 6.20	9.41	8.79	6.60	5.34		
1936								8.15	7.99	7.31	6.84	i 5.44		
1937								a 3.52	7.11	6.36	i 5.88	4.77		
1938	i 3.26							i 7.71	i 8.95	9.72	8.75	5.37		
1939	a 1.83							8.45	10.87	11.59	9.38	5.45		
1940	3.90						6.82	8.95	11.17	10.28	8.93	4.04		
1941	i 3.49					i 3.72	4.42	9.01	8.41	8.71	7.64	5.69		
1942	2.70									7.04	6.43	5.69		
1943	3.71													

Weather Bureau Standard Equipment. Land Pan

NOTES

a - Partial Record

i - For full month, partly calculated

3/ - U.S. Weather Bureau Climatological Annual Summaries

UPPER COLORADO RIVER COMPACT COMMISSION
ENGINEERING ADVISORY COMMITTEE

Lat. 41 32' Long. 109 29'
Sec. 22, T. 18 N., R. 107 W.
100 feet downstream from R.R. Bridge

STATION LOCATION

GREEN RIVER at GREEN RIVER, WyOMING
NAME OF STATION

7,670 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914	E 65.6	E 61.8	E 21.7	E 25.5	E 29.0	E 87.0	E 175.0	E 342.0	E 615.0	E 316.0	E 106.0	E 49.8	1894.4	150.3	
1915	33.8	29.8	24.6	20.0	18.1	49.2	84.3	99.4	168.1	162.7	68.5	75.6	834.1	66.2	
1916	72.2	48.6	38.4	25.6	32.7	121.3	157.3	238.5	495.8	335.7	132.4	53.4	1751.9	139.0	
1917	53.7	30.8	24.9	23.0	20.2	32.5	134.8	292.6	599.3	637.5	147.4	79.6	2076.3	164.7	
1918	57.2	47.0	33.8	23.1	22.2	54.7	107.2	187.6	799.3	263.1	96.7	53.6	1745.5	138.5	
1919	55.3	44.6	27.6	22.0	19.2	40.3	95.1	158.4	127.2	33.3	32.2	29.7	684.9	54.3	
1920	44.5	34.2	23.1	21.5	21.6	57.5	101.6	270.1	519.3	249.1	87.8	52.4	1482.7	117.6	
1921	50.8	45.6	30.7	27.7	27.8	94.0	137.3	255.1	773.2	181.2	85.0	55.9	1764.3	140.0	
1922	45.7	43.8	36.9	30.7	27.8	111.0	108.4	332.6	652.0	219.7	114.5	67.2	1790.3	142.0	
1923	45.2	40.0	30.7	24.6	22.2	38.1	120.0	343.5	455.7	368.9	124.0	64.5	1677.4	133.1	
1924	74.9	56.0	33.3	30.7	31.6	57.8	167.9	242.9	187.3	106.6	46.3	38.0	1073.8	85.2	
1925	42.2	38.6	29.2	21.5	25.0	73.0	113.9	208.7	344.4	322.9	117.7	73.3	1410.4	111.9	
1926	77.5	54.2	43.0	40.0	36.1	82.3	138.9	219.1	170.4	126.8	73.6	44.0	1105.9	87.7	1/
1927	41.6	38.0	30.7	27.7	27.8	48.7	72.1	218.4	528.7	318.2	112.4	111.4	1575.7	125.0	
1928	92.6	79.1	43.0	30.7	23.0	66.6	82.5	385.9	339.3	227.5	119.5	53.9	1523.6	120.9	
1929	49.4	43.5	29.5	26.4	22.2	64.0	149.1	173.5	271.8	146.8	78.9	73.5	1128.6	89.5	
1930	58.1	37.9	35.9	19.6	23.4	55.5	162.0	160.7	322.9	186.2	211.7	72.2	1346.1	106.8	
1931	89.0	39.6	28.7	18.7	20.3	42.2	61.5	65.0	118.8	38.8	39.2	21.3	583.1	46.3	
1932	25.0	22.5	17.8	15.4	17.3	42.8	82.7	191.6	349.4	258.2	83.5	40.3	1146.5	91.0	
1933	37.6	32.6	21.9	15.4	16.7	27.1	59.5	77.5	377.9	133.7	43.5	28.8	872.2	69.2	
1934	27.1	28.1	26.4	19.1	23.9	35.4	22.4	78.2	50.4	26.4	29.3	15.3	382.0	30.3	
1935	19.3	17.9	18.0	18.0	18.1	32.7	59.3	75.2	357.5	128.4	50.9	24.3	819.6	65.0	
1936	21.7	25.6	16.6	15.8	21.2	35.6	156.2	394.9	480.3	172.5	120.5	49.7	1510.6	119.8	
1937	42.2	36.2	27.5	22.1	19.7	38.2	174.0	234.8	256.5	214.7	70.6	35.5	1172.0	93.0	
1938	34.2	28.3	23.1	20.9	22.2	33.9	156.6	187.2	407.5	207.4	68.8	74.8	1264.9	100.3	
1939	83.4	51.8	37.7	31.4	27.5	92.7	78.4	201.6	170.6	99.2	50.8	34.6	959.7	76.1	2/
1940	E 31.0	E 24.5	E 25.7	E 21.4	E 21.9	E 40.8	E 28.0	E 66.3	E 113.1	E 28.0	E 27.6	E 20.9	449.2	35.6	
1941	E 35.5	E 27.5	E 26.2	E 21.8	E 19.1	E 45.3	E 95.2	E 173.9	E 341.9	E 137.1	E 81.0	E 47.7	1052.2	83.5	
1942	E 67.0	E 53.5	E 26.3	E 23.7	E 23.5	E 43.3	E 199.5	E 150.5	E 336.7	E 205.0	E 58.5	E 32.4	1219.9	96.8	
1943	E 29.1	E 26.4	E 25.9	E 27.5	E 28.8	E 58.7	E 200.4	E 237.4	E 476.2	E 359.5	E 120.9	E 50.0	1640.8	130.2	
1944	E 48.4	E 43.4	E 29.6	E 24.9	E 25.2	E 31.4	E 266.7	E 155.2	E 351.3	E 230.0	E 60.1	E 30.6	1296.8	102.9	
1945	E 37.9	E 31.3	E 20.8	E 23.9	E 26.8	E 40.6	E 77.6	E 111.2	E 245.4	E 284.4	E 124.9	E 76.1	1100.9	87.3	
Mean 14-45	49.6	39.5	28.4	23.8	23.8	55.4	119.6	204.0	368.2	210.2	87.0	51.0	1260.5		

E - Estimated

NOTES

1/ - U.S.G.S. Water Supply Paper 918
2/ - U.S.G.S. Water Supply Paper 879

Lat. 41 03' Long. 110 34'
Sec. 35 T. 13 N., R. 117 W.
4½ miles north of Utah-Wyoming State Line

STATION LOCATION

BLACKS FORK near MILLBURNE, WYOMING
NAME OF STATION

156 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914													E 141.0	124.5	
1915													E 128.5	113.5	
1916													E 113.4	100.2	
1917													E 158.0	139.6	
1918													E 101.1	89.3	
1919													E 76.5	67.6	
1920													E 112.3	99.2	
1921													E 164.0	144.9	
1922													E 168.0	148.4	
1923													E 150.3	132.8	
1924													E 83.9	74.1	
1925													E 97.0	85.7	
1926													E 101.5	89.7	
1927													E 126.1	111.4	
1928													E 117.5	103.8	
1929													E 139.9	123.6	
1930													E 122.0	107.8	
1931													E 71.0	62.7	
1932													E 116.5	102.9	
1933													E 85.5	75.5	
1934													E 53.0	46.8	
1935													E 94.0	83.0	
1936													E 91.0	80.4	
1937													E 117.5	103.8	
1938													E 120.8	106.7	
1939										e 15.7	3.5	3.4	E 100.0	88.3	↑
1940	2.8	1.7	1.3	1.2	1.3	1.7	4.4	34.0	16.1	4.1	2.1	4.0	74.7	66.0	
1941	5.2	2.4	2.1	1.8	1.2	1.7	3.3	40.3	46.5	19.4	7.9	4.1	135.9	120.0	
1942	3.9	3.0	E 2.8	E 2.1	E 1.7	E 2.1	E 3.0	28.1	45.8	16.0	4.0	2.7	115.3	101.8	1/
1943	2.4	E 2.1	E 1.8	E 1.5	E 1.4	E 2.0	E13.8	30.6	32.4	15.8	6.2	2.6	112.6	99.5	
1944	2.5	e 2.1	E 1.8	E 1.5	E 1.7	E 2.5	E 3.5	e 29.6	45.4	21.5	4.9	2.4	119.4	105.5	
1945	2.9	e 1.7	E 1.2	E 1.2	E 1.4	E 1.5	E 2.2	22.6	37.8	26.6	11.3	4.3	114.7	101.3	↓
Mean 40-45													112.1		
Mean 14-45													113.2		

E - Estimated (months by U.S.G.S. unpublished)
e - Partly Estimated by U.S.G.S. unpublished

NOTES

1/ - U.S.G.S. Water Supply Papers

UPPER COLORADO RIVER COMPACT COMMISSION
ENGINEERING ADVISORY COMMITTEE

Lat. 41 03' Long 110 24'
W. line of S. 4, T. 12 N., R. 115 W.
1 mile upstream from Gilbert Creek

STATION LOCATION

EAST FORK of SMITH FORK near ROBERTSON, WYOMING
NAME OF STATION

53 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914	E 0.9	E 0.7	E 0.5	E 0.3	E 0.4	E 0.6	E 1.1	E 14.7	E 14.1	E 5.4	E 6.0	E 1.1	45.8	140.9	
1915	E 1.0	E 0.8	E 0.5	E 0.4	E 0.4	E 0.5	E 2.2	E 9.8	E 14.3	E 5.4	E 1.9	E 1.2	38.4	118.2	
1916	E 1.1	E 0.7	E 0.5	E 0.4	E 0.4	E 0.6	E 2.4	E 9.1	E 11.5	E 4.4	E 2.1	E 0.9	34.1	104.9	
1917	E 1.1	E 0.8	E 0.5	E 0.4	E 0.3	E 0.5	E 0.8	E 9.8	E 18.0	E10.9	E 3.5	E 1.3	47.9	147.4	
1918	E 1.1	E 0.6	E 0.4	E 0.3	E 0.4	E 0.4	E 0.7	E 5.5	E 11.0	E 5.9	E 1.3	E 0.8	28.4	87.4	
1919	E 0.9	E 0.6	E 0.4	E 0.3	E 0.3	E 0.5	E 1.2	E 6.7	E 1.6	E 1.4	E 1.1	E 0.8	15.8	48.6	
1920	E 0.7	E 0.7	E 0.5	E 0.2	E 0.3	E 0.7	E 0.7	E 9.3	E 13.9	E 3.6	E 0.8	E 0.5	31.9	98.2	
1921	E 0.3	E 0.4	E 0.2	E 0.1	E 0.2	E 0.2	E 0.3	E 12.4	E 19.4	E 7.4	E 3.8	E 1.5	46.2	142.2	
1922	E 0.9	E 0.8	E 0.5	E 0.4	E 0.4	E 0.6	E 0.9	E 12.4	E 19.0	E 8.0	E 4.9	E 1.3	50.1	154.2	
1923	E 1.0	E 0.8	E 0.6	E 0.4	E 0.4	E 0.6	E 0.9	E 11.5	E 16.6	E 8.2	E 2.6	E 1.0	44.6	137.2	
1924	E 1.0	E 0.7	E 0.5	E 0.4	E 0.4	E 0.5	E 1.0	E 7.5	E 5.0	E 1.7	E 0.7	E 0.7	20.1	61.9	
1925	E 0.5	E 0.5	E 0.4	E 0.3	E 0.3	E 0.5	E 0.8	E 7.8	E 9.5	E 3.3	E 1.9	E 1.2	27.0	83.1	
1926	E 1.4	E 0.9	E 0.6	E 0.4	E 0.4	E 0;5	E 2.1	E 8.3	E 7.0	E 3.5	E 1.8	E 0.8	27.7	85.2	
1927	E 0.6	E 0.5	E 0.4	E 0.3	E 0.3	E 0.4	E 0.8	E 10.2	E 11.9	E 5.5	E 2.6	E 3.4	36.9	113.5	
1928	E 1.5	E 1.1	E 0.6	E 0.4	E 0.4	E 0.5	E 1.4	E 12.8	E 9.6	E 3.8	E 1.1	E 0.8	34.0	104.6	
1929	E 0.7	E 0.6	E 0.4	E 0.4	E 0.4	E 0.5	E 0.8	E 10.5	E 16.0	E 6.4	E 2.9	E 1.4	41.0	126.2	
1930	E 1.2	E 0.9	E 0.6	E 0.4	E 0.4	E 0.5	E 2.2	E 9.4	E 11.8	E 4.3	E 5.3	E 1.3	38.3	117.9	
1931	E 1.1	E 0.7	E 0.5	E 0.3	E 0.3	E 0.5	E 0.8	E 4.4	E 5.0	E 1.1	E 0.8	E 0.7	16.2	49.9	
1932	E 0.6	E 0.6	E 0.4	E 0.3	E 0.3	E 0.4	E 0.9	E 11.3	E 12.3	E 5.0	E 2.4	E 0.9	35.4	108.9	
1933	E 0.6	E 0.5	E 0.3	E 0.3	E 0.3	E 0.3	E 0.4	E 4.2	E 11.6	E 3.8	E 0.8	E 0.6	23.7	72.9	
1934	E 0.4	E 0.5	E 0.3	E 0.2	E 0.2	E 0.3	E 1.3	E 3.7	E 2.0	E 0.4	E 0.8	E 0.6	10.7	32.9	
1935	E 0.5	E 0.5	E 0.4	E 0.3	E 0.3	E 0.5	E 0.7	E 3.5	E 13.9	E 2.8	E 0.8	E 0.7	24.9	76.6	
1936	E 0.5	E 0.5	E 0.4	E 0.3	E 0.3	E 0.4	E 0.8	E 6.3	E 6.7	E 3.2	E 3.3	E 1.4	24.1	74.2	
1937	E 0.8	E 0.7	E 0.4	E 0.3	E 0.3	E 0.4	E 1.0	E 13.2	E 10.6	E 4.6	E 2.4	E 1.1	35.8	110.2	
1938	E 0.7	E 0.5	E 0.4	E 0.3	E 0.3	E 0.4	E 2.6	E 8.7	E 14.3	E 4.6	E 1.9	E 1.4	36.1	111.1	
1939	E 1.7	E 1.0	E 0.6	E 0.4	E 0.4	E 0.5	E 2.0	E 7.8	E 6.2	E 1.7	E 0.9	E 1.2	24.4	75.1	
1940	1.0	0.4	0;2	0.2	0.3	0.3	1.2	10.1	3.5	1.0	0.4	1.0	19.6	60.3	
1941	1.5	0.9	0.6	0.4	0.3	0.4	0.7	12.1	14.5	5.3	2.7	1.5	40.9	125.9	
1942	1.7	1.0	E 0.6	E 0.4	E 0.3	E 0.3	0.7	7.2	13.6	4.9	1.6	0.8	33.1	101.9	1/
1943	0.7	E 0.6	E 0.5	E 0.4	E 0.3	E 0.5	E 3.6	7.7	8.6	4.1	2.3	0.8	30.1	92.6	
1944	0.7	0.6	e 0.4	E 0.3	E 0.3	E 0.6	E 1.5	e 8.0	15.6	8.8	2.0	0.7	39.5	121.6	
1945	0.9	e 0.6	E 0.4	E 0.4	E 0.4	E 0.5	E 1.2	7.4	11.7	8.8	3.8	1.1	37.2	114.5	
Mean 14-45													32.5		

E - Estimated (months 1942-1945 by U.S.G.S. unpub.)
e - Partly estimated by U.S.G.S. unpublished

NOTes

1/ - U.S.G.S. Water Supply Papers

Lat. 41 01 Long. 110 29'
S. 15, T. 12 N., R. 116 W.
3/4 miles downstream from Archie Creek

STATION LOCATION

WEST FORK of SMITH FORK near ROBERTSON, WYOMING
NAME OF STATION

37 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.9	E 10.4	E 7.5	E 0.6	E 1.0	E 0.2	21.2	129.9	
1915	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 1.9	E 8.6	E 7.8	E 0.6	E 0.4	E 0.3	20.2	123.8	
1916	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 2.0	E 8.4	E 4.8	E 0.5	E 0.4	E 0.2	16.9	103.6	
1917	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.6	E 8.6	E 14.5	E 1.1	E 0.6	E 0.3	26.3	161.1	
1918	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.5	E 6.4	E 4.2	E 0.6	E 0.2	E 0.2	12.7	77.8	
1919	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 1.0	E 7.2	E 0.2	E 0.1	E 0.2	E 0.2	9.5	58.2	
1920	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.2	E 0.6	E 8.4	E 7.2	E 0.4	E 0.1	E 0.2	17.6	107.8	
1921	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.2	E 9.6	E 15.6	E 0.8	E 0.7	E 0.4	27.9	170.9	
1922	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.7	E 9.6	E 15.0	E 0.8	E 0.9	E 0.3	27.9	170.9	
1923	E 0.1	E 0.1	E-0.1	E 0.1	E 0.1	E 0.1	E 0.7	E 9.4	E 11.8	E 0.7	E 0.5	E 0.2	24.1	147.7	
1924	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.8	E 7.6	E 0.5	E 0.2	E 0.1	E 0.1	9.9	60.7	
1925	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.6	E 7.8	E 2.8	E 0.4	E 0.3	E 0.3	12.8	78.4	
1926	E 0.1	E 0.1	E 0.2	E 0.1	E 0.1	E 0.1	E 1.7	E 8.0	E 0.9	E 0.4	E 0.3	E 0.1	12.1	74.1	
1927	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.7	E 8.9	E 4.9	E 0.6	E 0.4	E 0.5	16.6	101.7	
1928	E 0.2	E 0.2	E 0.2	E 0.1	E 0.1	E 0.1	E 1.1	E 9.8	E 3.0	E 0.4	E 0.2	E 0.1	15.5	95.0	
1929	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.7	E 9.0	E 10.9	E 0.7	E 0.5	E 0.4	22.8	139.7	
1930	E 0.1	E 0.1	E 0.2	E 0.1	E 0.1	E 0.1	E 1.9	E 8.5	E 4.7	E 0.5	E 1.0	E 0.3	17.6	107.8	
1931	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.6	E 5.8	E 0.9	E 0.2	E 0.1	E 0.1	8.3	50.9	
1932	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.7	E 9.3	E 5.3	E 0.6	E 0.4	E 0.1	17.0	104.1	
1933	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.3	E 5.5	E 4.7	E 0.5	E 0.1	E 0.1	11.8	72.3	
1934	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 1.1	E 4.9	E 0.2	E 0.1	E 0.1	E 0.1	7.1	43.5	
1935	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.6	E 4.8	E 6.9	E 0.3	E 0.1	E 0.4	13.7	83.9	
1936	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.7	E 7.0	E 1.6	E 0.4	E 0.4	E 0.2	10.9	66.8	
1937	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.8	E 10.0	E 3.7	E 0.5	E 0.2	E 0.3	16.1	98.6	
1938	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 1.3	E 8.0	E 7.6	E 0.5	E 0.6	E 0.4	19.0	116.4	
1939	E 0.2	E 0.2	E 0.2	E 0.1	E 0.1	E 0.1	E 1.8	E 7.8	E 1.6	e 0.2	0.1	0.1	12.5	76.6	
1940	0.1	0.1	E 0.1	E 0.1	E 0.0	E 0.1	0.8	6.5	0.8	0.1	0.0	0.1	8.8	53.9	
1941	0.2	0.2	0.2	0.1	0.0	0.1	0.2	9.4	6.3	0.8	0.4	0.2	18.1	110.9	
1942	0.4	0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.6	e 7.5	4.2	0.5	0.2	0.1	14.0	85.8	1/
1943	0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 0.1	E 4.0	7.2	4.0	0.7	0.3	0.1	16.9	103.6	
1944	0.2	e 0.2	E 0.1	E 0.1	E 0.1	E 0.1	E 1.4	e 8.2	5.3	0.9	0.1	0.1	16.8	102.9	
1945	0.2	0.2	E 0.2	E 0.1	E 0.1	E 0.2	E 0.9	8.5	6.3	1.8	0.9	0.3	19.7	120.7	
Mean 14-45													16.3		

E - Estimated (months 1939-1945 by U.S.G.S. unpub.) -- NOTES -- except Oct.-June of 1939
e - Partly Estimated by U.S.G.S. unpublished

1/ - U.S.G.S. Water Supply Papers

UPPER COLORADO RIVER COMPACT COMMISSION
ENGINEERING ADVISORY COMMITTEE

Lat. 40 58' Long. 109 35'
In SW¼ S. 29, T. 3 N., R. 21 E.
¾ mile upstream from Henrys Fork

STATION LOCATION

GREEN RIVER near LINWOOD, UTAH
NAME OF STATION

14,300 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914	E 74.7	E 70.5	E 23.1	E 26.4	E 32.5	E 138.6	E 221.3	E 454.1	E 689.3	E 338.2	E 132.5	E 59.3	2260.5	150.5	
1915	E 36.1	E 32.5	E 26.6	E 21.3	E 20.2	E 73.6	E 112.5	E 133.4	E 193.3	E 176.8	E 79.3	E 95.1	1000.7	66.6	
1916	E 82.8	E 54.8	E 43.3	E 26.5	E 36.7	E 197.5	E 200.1	E 317.3	E 557.0	E 359.0	E 170.0	E 64.3	2109.3	140.5	
1917	E 60.3	E 33.7	E 27.0	E 24.1	E 22.6	E 44.9	E 173.1	E 388.8	E 671.9	E 676.8	E 191.3	E 100.6	2415.1	160.8	
1918	E 64.5	E 52.9	E 37.8	E 24.2	E 24.8	E 83.0	E 139.9	E 250.0	E 893.9	E 282.5	E 119.3	E 64.5	2037.3	135.7	
1919	E 62.2	E 50.1	E 30.3	E 23.2	E 21.5	E 58.3	E 125.4	E 211.4	E 147.9	E 40.6	E 27.8	E 31.4	830.1	55.3	
1920	E 49.1	E 37.7	E 24.8	E 22.7	E 24.2	E 87.8	E 133.2	E 359.1	E 583.1	E 267.8	E 106.7	E 62.9	1759.1	117.2	
1921	E 56.8	E 51.3	E 34.0	E 28.4	E 31.2	E 150.6	E 176.1	E 339.2	E 864.9	E 196.3	E 102.7	E 67.7	2099.2	139.8	
1922	E 50.6	E 49.1	E 41.5	E 31.2	E 31.2	E 179.8	E 141.4	E 441.7	E 730.4	E 236.8	E 144.6	E 83.4	2161.7	144.0	
1923	E 50.0	E 44.6	E 34.0	E 25.6	E 24.8	E 54.5	E 155.3	E 456.1	E 512.5	E 394.0	E 158.0	E 79.7	1989.1	132.5	
1924	E 86.0	E 63.6	E 37.8	E 31.2	E 35.4	E 88.4	E 212.8	E 323.1	E 214.6	E 117.7	E 47.8	E 42.9	1301.3	86.7	
1925	E 46.3	E 43.0	E 32.2	E 22.7	E 28.0	E 114.5	E 148.0	E 277.9	E 389.0	E 345.5	E 149.1	E 91.9	1688.1	112.4	
1926	E 89.2	E 61.5	E 48.9	E 39.8	E 40.5	E 130.5	E 179.0	E 291.6	E 195.8	E 139.0	E 86.5	E 51.2	1352.5	90.1	
1927	E 45.6	E 42.2	E 34.0	E 28.4	E 31.2	E 72.8	E 97.8	E 290.7	E 593.6	E 340.6	E 141.6	E 144.7	1863.2	124.1	
1928	E 107.5	E 91.1	E 48.9	E 31.2	E 25.7	E 103.5	E 110.3	E 512.2	E 361.1	E 245.1	E 151.7	E 65.0	1853.3	123.4	
1929	50.0	44.3	30.7	27.7	25.0	125.5	218.8	290.1	351.0	173.4	90.8	96.3	1523.6	101.5	
1930	72.9	51.8	47.9	26.1	34.9	70.4	208.1	213.0	388.1	204.7	288.3	81.3	1692.5	112.7	
1931	100.9	47.0	31.9	19.3	21.2	54.0	74.9	71.5	130.3	45.1	44.4	21.7	662.2	44.1	
1932	28.4	23.4	18.5	16.0	20.1	69.7	125.3	269.5	390.1	266.2	95.5	48.2	1370.9	91.3	
1933	38.8	· 38.2	26.0	18.9	19.2	36.5	80.2	111.9	447.6	162.2	44.4	29.8	1053.7	70.2	
1934	27.2	27.4	28.4	19.3	24.5	42.0	29.3	72.0	52.9	26.3	30.4	15.9	395.6	26.3	1/
1935	19.0	18.6	18.6	18.7	18.6	33.8	63.9	96.8	405.8	141.6	57.0	24.2	916.6	61.0	
1936	21.1	24.3	16.8	15.6	24.0	48.8	166.5	502.5	492.9	180.7	150.4	56.4	1700.0	113.2	
1937	45.4	42.4	28.5	22.6	20.2	58.8	207.6	320.0	295.9	221.4	71.3	33.9	1368.0	91.1	
1938	34.3	28.8	23.5	21.3	24.5	59.7	203.0	261.6	461.7	236.3	76.2	102.2	1533.1	102.1	
1939	99.3	54.7	37.4	31.3	28.2	139.8	140.0	240.0	168.9	100.0	57.0	35.1	1131.7	75.4	
1940	32.7	26.2	27.9	22.6	24.5	59.1	44.9	89.6	132.2	35.0	21.3	19.2	535.2	35.6	
1941	38.2	29.8	28.6	23.0	21.4	66.8	125.6	231.9	386.2	149.9	97.1	56.4	1254.9	83.6	
1942	76.5	60.6	28.7	24.7	26.3	63.4	250.7	201.0	380.4	221.4	65.1	35.1	1433.9	95.5	2/
1943	30.4	28.5	28.2	28.3	32.3	90.0	251.8	315.9	535.3	384.1	153.7	59.6	1938.1	129.1	
1944	53.8	48.7	32.7	25.9	· 28.2	43.0	331.4	207.2	396.6	247.7	67.4	32.6	1515.2	100.9	
1945	41.1	34.3	22.0	24.9	30.0	58.8	104.4	149.0	279.1	305.0	159.3	95.8	1303.7	86.8	
Mean 14-45	55.4	44.0	31.3	24.8	26.7	84.3	154.7	271.7	415.4	226.9	105.6	60.9	1501.6		

NOTES

E - Estimated

1/ - U.S.G.S. Water Supply Paper No. 918
2/ - U.S.G.S. Annual Water Supply Papers

Lat. 40 57' Long. 110 04'
SW¼ S. 31, T. 3 N., R. 17 E.
¼ Mile west of Ashley National Forest Boundary

STATION LOCATION

BURNT FORK near BURNT FORK, WYOMING
NAME OF STATION

53 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914	E 1.5	E 0.6	E 0.4	E 0.4	E 0.3	E 0.4	E 0.9	E 10.1	E 8.8	E 4.3	E 4.5	E 1.8	34.0	135.5	
1915	E 1.7	E 0.8	E 0.5	E 0.4	E 0.3	E 0.3	E 1.4	E 6.3	E 9.0	E 4.3	E 2.3	E 2.0	29.3	116.7	
1916	E 1.8	E 0.6	E 0.5	E 0.4	E 0.3	E 0.5	E 1.5	E 5.8	E 5.8	E 3.5	E 2.5	E 1.4	24.6	98.0	
1917	E 1.8	E 0.7	E 0.5	E 0.4	E 0.3	E 0.3	E 0.7	E 6.3	E 17.5	E 8.5	E 3.4	E 2.2	42.6	169.7	
1918	E 1.9	E 0.5	E 0.4	E 0.3	E 0.3	E 0.3	E 0.7	E 2.9	E 5.3	E 4.7	E 1.9	E 1.3	20.4	81.3	
1919	E 1.5	E 0.5	E 0.4	E 0.3	E 0.3	E 0.3	E 1.0	E 3.9	E 0.6	E 1.3	E 1.7	E 1.3	13.1	52.2	
1920	E 1.2	E 0.6	E 0.4	E 0.3	E 0.3	E 0.5	E 0.7	E 5.9	E 8.5	E 2.9	E 1.4	E 0.5	23.2	92.4	
1921	E 0.5	E 0.2	E 0.2	E 0.2	E 0.2	E 0.2	E 0.3	E 8.4	E 22.0	E 5.8	E 3.5	E 2.7	44.2	176.1	
1922	E 1.5	E 0.7	E 0.5	E 0.5	E 0.4	E 0.4	E 0.8	E 8.4	E 20.5	E 6.3	E 4.0	E 2.2	46.2	184.1	
1923	E 1.6	E 0.7	E 0.6	E 0.5	E 0.4	E 0.4	E 0.8	E 7.7	E 13.7	E 6.5	E 2.8	E 1.6	37.3	148.6	
1924	E 1.6	E 0.6	E 0.5	E 0.4	E 0.4	E 0.4	E 0.8	E 4.5	E 1.8	E 1.5	E 1.2	E 0.9	14.6	58.2	
1925	E 0.9	E 0.4	E 0.4	E 0.4	E 0.3	E 0.3	E 0.7	E 4.8	E 3.9	E 2.7	E 2.3	E 2.0	19.0	75.7	
1926	E 2.3	E 0.9	E 0.6	E 0.4	E 0.3	E 0.4	E 1.4	E 5.1	E 2.5	E 2.8	E 2.2	E 1.2	20.1	80.1	
1927	E 0.9	E 0.4	E 0.4	E 0.3	E 0.3	E 0.3	E 0.8	E 6.6	E 6.0	E 4.4	E 2.9	E 6.0	29.3	116.8	
1928	E 2.4	E 1.0	E 0.6	E 0.5	E 0.4	E 0.4	E 1.1	E 8.6	E 4.0	E 3.1	E 1.6	E 1.2	24.9	99.2	
1929	E 1.1	E 0.5	E 0.4	E 0.4	E 0.3	E 0.3	E 0.8	E 6.8	E 16.3	E 5.1	E 3.0	E 2.4	37.4	149.0	
1930	E 2.0	E 0.9	E 0.6	E 0.5	E 0.4	E 0.4	E 1.4	E 6.0	E 5.8	E 3.4	E 4.2	E 2.1	27.7	110.4	
1931	E 1.8	E 0.6	E 0.5	E 0.4	E 0.3	E 0.4	E 0.7	E 2.0	E 1.7	E 1.1	E 1.3	E 0.9	11.7	46.6	
1932	E 0.9	E 0.4	E 0.4	E 0.4	E 0.3	E 0.3	E 0.8	E 7.4	E 6.4	E 3.9	E 2.7	E 1.3	25.2	100.4	
1933	E 0.9	E 0.4	E 0.3	E 0.3	E 0.3	E 0.3	E 0.5	E 1.9	E 5.6	E 3.1	E 1.3	E 0.8	15.7	62.6	
1934	E 0.7	E 0.4	E 0.3	E 0.3	E 0.2	E 0.2	E 1.0	E 1.6	E 0.8	E 0.5	E 1.4	E 0.9	8.3	33.1	
1935	E 0.8	E 0.4	E 0.4	E 0.3	E 0.3	E 0.4	E 0.7	E 1.5	E 8.4	E 2.3	E 1.3	E 1.0	17.8	70.9	
1936	E 0.8	E 0.4	E 0.4	E 0.3	E 0.3	E 0.3	E 0.7	E 3.6	E 2.4	E 2.6	E 3.3	E 2.5	17.6	70.1	
1937	E 1.3	E 0.6	E 0.4	E 0.3	E 0.3	E 0.3	E 0.9	E 9.0	E 4.7	E 3.7	E 2.7	E 1.7	25.9	103.2	
1938	E 1.2	E 0.4	E 0.4	E 0.3	E 0.3	E 0.3	E 1.2	E 5.4	E 8.9	E 3.7	E 2.4	E 1.3	26.8	106.8	
1939	E 2.9	E 1.0	E 0.6	E 0.5	E 0.3	E 0.4	E 1.4	E 4.8	E 2.1	E 1.5	E 1.3	E 2.9	19.7	78.5	
1940	E 2.0	E 0.6	E 0.5	E 0.4	E 0.3	E 0.3	E 1.2	E 3.1	E 1.4	E 1.0	E 0.9	E 1.8	13.5	53.8	
1941	E 2.7	E 0.8	E 0.5	E 0.4	E 0.3	E 0.4	E 0.8	E 8.3	E 8.9	E 4.3	E 2.5	E 1.8	31.7	126.3	
1942	E 2.5	E 1.0	E 0.7	E 0.5	E 0.4	E 0.4	E 1.2	E 4.7	E 8.4	E 4.2	E 2.5	E 1.2	27.7	110.4	
1943	E 1.0	E 0.4	E 0.4	E 0.3	E 0.3	E 0.4	e 1.9	2.9	3.4	2.8	2.5	1.1	17.4	69.3	
1944	0.8	e 0.4	E 0.4	E 0.4	E 0.3	E 0.3	E 0.6	e 7.3	13.2	6.3	2.9	1.5	34.4	137.1	1/
1945	0.9	0.5	E 0.4	E 0.4	E 0.3	E 0.4	E 0.7	3.6	5.9	4.7	2.9	1.1	21.8	86.9	
Mean 14-45	1.5	0.6	0.4	0.4	0.3	0.4	0.9	5.5	7.3	3.7	2.4	1.7	25.1		

NOTES

E - Estimated
e - Partly Estimated

1/ - U.S.G.S. Water Supply Papers except estimates

UPPER COLORADO RIVER COMPACT COMMISSION
ENGINEERING ADVISORY COMMITTEE

Lat. 41 00' Long. 110 17'
SE¼ S. 20, T. 12 N., R. 114 W.
½ mile downstream from West Fork

STATION LOCATION

HENRYS FORK near LONETREE, WYOMING
NAME OF STATION

55 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914	E 0.9	E 1.0	E 0.4	E 0.4	E 0.5	E 0.5	E 0.8	E 15.9	E 13.2	E 6.0	E 2.8	E 1.2	43.6	134.6	
1915	E 1.0	E 1.2	E 0.5	E 0.5	E 0.5	E 0.4	E 1.3	E 10.8	E 13.6	E 6.0	E 1.6	E 1.5	38.9	120.1	
1916	E 1.0	E 1.0	E 0.5	E 0.5	E 0.5	E 0.6	E 1.4	E 10.3	E 9.0	E 4.9	E 1.6	E 0.9	32.2	99.4	
1917	E 1.1	E 1.1	E 0.5	E 0.4	E 0.5	E 0.5	E 0.7	E 10.8	E 26.0	E 11.5	E 2.2	E 1.4	56.7	175.0	
1918	E 1.1	E 0.8	E 0.4	E 0.4	E 0.4	E 0.4	E 0.6	E 4.2	E 8.1	E 6.5	E 1.2	E 0.8	24.9	76.8	
1919	E 0.9	E 0.8	E 0.4	E 0.4	E 0.5	E 0.5	E 0.9	E 7.2	E 1.1	E 2.0	E 1.1	E 0.8	16.6	51.2	
1920	E 0.7	E 0.9	E 0.4	E 0.3	E 0.4	E 0.7	E 0.6	E 10.5	E 12.9	E 4.2	E 0.9	E 0.4	32.9	101.5	
1921	E 0.3	E 0.3	E 0.2	E 0.2	E 0.2	E 0.2	E 0.3	E 12.8	E 32.0	E 8.0	E 2.2	E 1.7	58.4	180.2	
1922	E 0.9	E 1.6	E 0.5	E 0.5	E 0.6	E 0.5	E 0.7	E 12.8	E 29.1	E 8.6	E 2.6	E 1.4	59.8	184.6	
1923	E 0.9	E 1.1	E 0.5	E 0.6	E 0.6	E 0.5	E 0.8	E 13.8	E 20.9	E 9.0	E 1.8	E 1.1	51.6	159.2	
1924	E 0.9	E 0.9	E 0.5	E 0.5	E 0.5	E 0.5	E 0.8	E 8.4	E 2.8	E 2.0	E 0.8	E 0.6	19.2	59.3	
1925	E 0.5	E 0.6	E 0.5	E 0.4	E 0.4	E 0.5	E 0.7	E 8.9	E 3.8	E 3.8	E 1.6	E 1.3	23.0	71.0	
1926	E 1.3	E 1.3	E 0.4	E 0.5	E 0.5	E 0.5	E 1.3	E 9.4	E 3.9	E 4.0	E 1.5	E 0.8	25.4	78.4	
1927	E 0.5	E 0.6	E 0.4	E 0.4	E 0.4	E 0.4	E 0.7	E 12.2	E 9.2	E 6.0	E 1.9	E 2.5	35.2	108.6	
1928	E 1.4	E 1.5	E 0.6	E 0.6	E 0.6	E 0.5	E 1.0	E 15.0	E 6.1	E 4.2	E 1.1	E 0.8	33.4	103.1	
1929	E 0.7	E 0.8	E 0.4	E 0.5	E 0.5	E 0.5	E 0.7	E 12.6	E 18.8	E 7.0	E 1.9	E 1.6	46.0	142.0	
1930	E 1.2	E 1.2	E 0.5	E 0.6	E 0.5	E 0.5	E 1.4	E 11.2	E 9.0	E 4.6	E 2.7	E 1.2	34.6	106.8	
1931	E 1.0	E 0.9	E 0.5	E 0.4	E 0.4	E 0.4	E 0.7	E 3.6	E 2.5	E 1.5	E 0.8	E 0.5	13.2	40.7	
1932	E 0.5	E 0.7	E 0.4	E 0.4	E 0.4	E 0.4	E 0.7	E 13.6	E 10.0	E 5.5	E 1.7	E 0.9	35.2	108.6	
1933	E 0.5	E 0.6	E 0.3	E 0.4	E 0.3	E 0.3	E 0.4	E 3.3	E 8.5	E 4.1	E 0.8	E 0.5	20.0	61.7	
1934	E 0.4	E 0.6	E 0.3	E 0.3	E 0.3	E 0.3	E 1.0	E 2.7	E 1.0	E 1.0	E 0.9	E 0.5	9.3	28.7	
1935	E 0.4	E 0.6	E 0.4	E 0.4	E 0.4	E 0.5	E 0.7	E 2.7	E 12.5	E 3.2	E 0.8	E 0.6	23.2	71.6	
1936	E 0.4	E 0.6	E 0.4	E 0.4	E 0.4	E 0.4	E 0.7	E 6.8	E 3.8	E 3.7	E 2.1	E 1.6	21.3	65.7	
1937	E 0.8	E 0.9	E 0.4	E 0.4	E 0.4	E 0.4	E 0.9	E 13.8	E 7.0	E 5.0	E 1.8	E 1.1	32.9	101.5	
1938	E 0.8	E 0.6	E 0.3	E 0.4	E 0.4	E 0.5	E 1.1	E 9.9	E 14.0	E 5.0	E 1.6	E 1.5	36.1	111.4	
1939	E 1.6	E 1.2	E 0.5	E 0.5	E 0.5	E 0.5	E 1.3	E 9.0	E 3.1	E 2.0	E 0.9	E 1.9	23.0	71.0	
1940	E 1.1	E 0.9	E 0.4	E 0.4	E 0.4	E 0.4	E 1.1	E 5.7	E 2.0	E 1.5	E 0.6	E 1.2	15.7	48.5	
1941	E 1.6	E 1.3	E 0.5	E 0.4	E 0.4	E 0.5	E 0.8	E 13.2	E 13.5	E 6.0	E 1.6	E 1.2	41.0	126.5	
1942	E 1.4	E 1.4	E 0.6	E 0.5	E 0.5	E 0.5	E 1.1	E 8.6	E 12.8	E 5.2	E 1.6	E 0.8	35.0	108.0	
1943	E 0.8	E 0.7	E 0.4	E 0.4	E 0.4	E 0.4	E 0.5	6.8	6.6	3.1	1.5	0.7	22.3	68.8	
1944	0.7	e 0.8	E 0.4	E 0.4	E 0.4	E 0.4	E 0.7	e 9.9	16.7	8.7	1.7	0.6	41.4	127.8	1/
1945	0.8	0.5	E 0.4	E 0.4	E 0.4	E 0.4	E 0.7	8.1	11.0	7.7	3.4	1.1	34.9	107.7	
Mean 14-45													32.4		

NOTES

E - Estimated e - Partly estimated 1/ - Annual U.S.G.S. Water Supply Papers (except E and e)

Lat. 41 00' Long. 109 39'
S. 23, T. 12 N., R. 109 W.
200 feet North of Utah State Line

STATION LOCATION

HENRYS FORK at LINWOOD, UTAH
NAME OF STATION

530 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914													E 96.7	144.9	
1915													E 47.6	71.3	
1916													E 94.5	141.6	
1917													E 89.9	134.7	
1918													E 78.4	117.4	
1919													E 42.3	63.4	
1920													E 74.6	111.8	
1921													E 89.0	133.3	
1922													E 98.0	146.8	
1923													E 83.3	124.8	
1924													E 62.6	93.8	
1925													E 74.9	112.2	
1926													E 67.3	100.8	
1927													E 77.3	115.8	
1928													E 87.7	131.4	
1929	2.3	3.0	2.6	2.2	2.8	10.1	6.8	14.0	30.4	10.4	9.0	11.4	105.0	157.3	
1930	7.2	5.7	3.1	1.8	2.2	3.2	7.5	9.4	10.2	2.5	15.2	4.8	72.8	109.1	
1931	5.1	3.1	1.8	1.8	2.2	2.8	3.3	3.7	2.7	0.4	0.6	0	27.5	41.2	
1932	0.2	1.6	1.4	1.2	1.7	5.4	5.1	15.3	16.2	3.9	1.5	1.4	54.9	82.2	
1933	2.1	3.5	1.3	1.0	0.8	4.4	4.6	5.4	20.9	1.7	0.1	0	45.8	68.6	1/
1934	0.1	1.0	1.5	1.8	2.2	2.8	2.0	0.3	0	0	0.1	0	11.8	17.7	
1935	0	0.8	2.1	1.5	1.8	2.1	0.2	1.1	19.5	0.5	0.1	0.1	29.8	44.6	
1936	0.2	1.7	1.9	1.2	1.6	2.6	3.1	3.6	1.8	6.5	18.3	4.4	46.9	70.2	
1937	4.2	3.9	3.4	1.7	2.3	4.4	6.4	15.5	12.2	9.2	1.4	3.7	68.3	102.3	
1938	3.9	3.7	3.6	2.9	2.5	3.9	6.5	15.2	22.1	5.5	1.0	7.9	78.7	117.9	
1939	7.1	4.6	3.6	2.6	2.1	6.4	5.9	12.8	3.0	0.6	0.2	0.5	49.4	74.0	
1940	2.3	2.4	2.6	2.0	2.0	3.1	3.1	7.4	0.5	0	0	0.2	25.6	38.3	
1941	1.0	2.2	1.8	1.9	2.2	3.7	2.7	15.3	22.4	9.0	6.2	5.0	73.4	110.0	2/
1942	9.8	5.8	4.3	2.9	2.5	3.5	7.2	17.3	23.1	6.0	1.2	1.1	84.7	126.9	
1943	2.1	4.4	3.6	2.8	3.1	4.6	4.8	7.3	4.9	1.4	2.6	0.9	42.5	63.7	
1944	1.6	3.5	2.5	2.4	2.2	3.3	11.7	18.1	27.9	11.4	1.3	0.7	86.6	129.7	
1945	3.2	2.7	2.6	2.7	2.5	4.6	6.3	12.7	12.4	9.8	6.1	2.7	68.3	102.3	3/
Mean 14-45													66.8		

NOTES

E - Estimated

1/ - U.S.G.S. Water Supply Paper 918
2/ - Annual U.S.G.S. Water Supply Papers
3/ - U.S.G.S. Unpublished

UPPER COLORADO RIVER COMPACT COMMISSION
ENGINEERING ADVISORY COMMITTEE

Lat. 41° 32' Long. 107° 32'
S. 6, T. 12 N., R. 90 W
600' upstream from Willow Creek

STATION LOCATION

LITTLE SNAKE RIVER NEAR DIXON, WYOMING

NAME OF STATION

1,028 square miles

DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914	5.4	6.1	E 4.1	E 5.0	E 7.4	e 9.3	93.4	256.0	143.0	12.9	2.6	2.5	547.7	129.3	
1915	8.9	6.3	E 6.5	E 6.0	E 8.0	E 24.5	E 65.8	97.2	101.0	5.9	0.6	2.5	333.2	78.7	
1916	4.8	5.7	E 6.5	E 5.7	E 7.8	e 32.0	78.6	152.0	98.8	11.6	12.2	5.8	421.5	99.5	
1917	12.3	10.6	E 8.5	E 6.5	E 7.2	E 9.9	71.4	184.0	240.0	71.3	7.2	4.0	639.5	150.8	
1918	[illegible]	8.1	E 6.0	E 6.5	E 7.0	e 19.4	38.9	172.0	125.0	10.6	0.6	2.1	402.1	94.9	1/
1919	6.5	e 7.5	E 7.6	E 6.9	E 8.9	e 67.9	101.0	179.0	60.7	2.0	0.7	1.0	449.6	106.2	
1920	8.2	e 8.5	E 6.5	E 6.0	E 6.5	E 9.1	30.5	350.0	216.0	20.3	4.6	5.6	671.8	158.6	
1921	10.6	E 14.6	E 10.0	E 8.2	E 9.0	E 25.8	34.3	280.0	210.0	16.9	4.7	2.8	626.9	148.0	
1922	4.5	3.4	E 5.5	E 7.0	E 8.5	e 15.0	29.1	199.0	106.0	4.2	2.0	1.5	385.7	91.1	
1923	2.1	2.4	E 6.3	E 5.0	E 6.5	E 9.0	21.6	163.0	107.0	12.2	3.0	2.6	340.6	80.4	
1924													E 352.1	83.1	
1925													E 371.1	87.6	
1926													E 499.2	117.9	
1927													E 495.0	116.9	
1928													E 541.7	127.9	
1929													E 798.5	188.5	
1930													E 264.1	62.4	
1931													E 395.1	93.3	
1932													E 688.7	162.6	
1933													E 487.0	115.0	
1934													E 66.6	15.7	
1935													E 215.2	50.8	
1936													E 320.1	75.6	
1937													E 439.9	103.9	
1938	E 2.7	E 5.1	E 5.0	E 5.5	E 8.5	e 12.0	68.2	181.5	112.3	7.3	0.8	1.8	410.7	97.0	
1939	3.1	4.8	4.9	5.3	5.5	16.1	52.5	127.1	32.7	0.8	0.3	0.8	253.9	60.0	
1940	2.1	3.5	3.6	3.6	4.6	8.8	44.3	140.5	39.2	0.7	0.2	0.6	251.7	59.4	
1941	2.8	4.0	3.9	4.0	4.7	13.6	30.9	175.9	67.5	2.7	2.8	3.2	316.0	74.6	2/
1942	11.6	9.0	7.4	6.4	5.5	9.5	96.9	149.1	116.3	5.8	0.5	0.5	418.5	98.8	
1943	1.6	4.2	4.9	4.5	5.5	14.6	77.5	95.4	116.5	6.4	0.8	0.4	332.3	78.5	
1944	2.1	4.4	3.6	3.5	• 4.2	6.4	22.1	141.1	136.0	8.9	0.4	0.3	333.0	78.6	
1945	2.7	4.2	4.4	4.2	4.9	9.6	34.8	195.6	172.1	39.0	9.5	3.8	484.8	114.5	
MEAN 14-23 38-45	5.7	6.2	5.8	5.6	6.7	17.4	55.1	179.9	122.2	13.3	3.0	2.3	423.2	99.9	
14-45	5.7	6.2	5.8	5.6	6.7	17.4	55.1	180.1	122.3	13.3	3.0	2.3	423.5	100.0	

1/ WSP 618 and 18th Biennial Report Colo. State Engnrs.
2/ U.S.G.S. Annual Water Supply Papers

NOTES

E - Estimated
e - partial record estimated

Lat. 40° 32' Long. 108° 25'
S. 20, T. 7 N., R 98 W
10 miles upstream from mouth

STATION LOCATION

LITTLE SNAKE RIVER NEAR LILY, COLORADO

NAME OF STATION

3,680 square miles

DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914													E 604.2	127.9	
1915													E 370.3	78.4	
1916													E 466.6	98.8	
1917													E 703.3	148.8	
1918													E 445.5	94.3	
1919													E 497.3	105.2	
1920													E 739.6	156.5	
1921													E 690.6	146.2	
1922	7.0	5.0	6.0	4.0	3.0	16.0	50.0	226.5	130.8	6.6	2.7	1.2	458.8	97.1	
1923	2.8	2.9	4.0	6.0	3.0	17.0	70.0	191.8	135.5	16.2	3.4	8.1	460.8	97.5	
1924	12.3	7.1	4.3	4.3	5.2	9.2	95.3	175.2	71.9	5.7	0.0	0.5	391.0	82.8	
1925	3.7	9.0	7.0	5.0	4.0	22.0	106.5	127.4	72.4	25.5	16.6	12.6	411.7	87.1	
1926	23.7	13.0	10.0	9.0	8.0	23.2	125.2	219.2	102.0	10.7	1.6	5.8	551.4	116.7	
1927	8.7	5.0	5.0	5.0	4.0	14.0	109.2	239.7	111.6	36.7	3.3	4.6	546.8	115.7	
1928	11.6	21.6	15.0	11.0	11.0	48.3	87.3	260.1	123.0	7.0	0.8	1.0	597.7	126.5	
1929	18.6	9.9	7.4	9.2	8.3	58.4	119.0	340.6	244.9	35.7	10.3	15.5	877.8	185.8	
1930	15.7	8.7	5.2	4.3	6.6	15.7	76.4	90.5	57.9	3.3	5.8	4.9	295.0	62.4	1/
1931	6.2	1.5	1.5	4.1	8.1	38.1	123.4	139.5	81.3	28.0	5.2	0.9	437.8	92.7	
1932	10.8	15.5	8.6	12.6	12.1	69.8	139.5	277.0	173.7	32.5	3.4	2.5	758.0	160.4	
1933	8.4	10.8	5.5	1.0	1.0	24.0	66.4	187.9	216.7	15.6	0.6	0.2	538.1	113.9	
1934	0.1	2.0	4.0	1.0	1.0	12.3	27.7	29.3	2.2	0.0	0.0	0.0	79.6	16.8	
1935	0.0	0.0	2.0	4.0	2.0	11.0	23.6	88.0	99.1	7.0	1.7	3.3	241.7	51.2	
1936	0.1	3.5	8.0	6.0	6.0	9.6	73.3	173.7	57.0	4.0	14.6	0.2	356.0	75.3	
1937	3.6	6.3	3.0	3.0	1.0	13.0	69.9	208.7	122.1	45.0	5.0	6.1	486.7	103.0	
1938	4.4	6.8	6.8	7.9	8.6	19.7	71.2	208.5	122.5	11.3	2.6	10.2	480.5	101.7	
1939	5.7	10.9	10.7	6.7	7.6	33.5	53.7	135.0	38.4	0.4	0.0	0.3	302.9	64.1	
1940	2.6	2.8	2.2	1.4	2.7	13.8	50.0	136.6	45.7	0.5	0.2	1.7	260.2	55.1	
1941	12.4	4.2	2.2	2.5	3.1	20.8	46.4	181.2	75.2	5.4	32.8	8.6	394.8	83.6	
1942	19.9	14.4	11.0	7.2	6.2	27.5	107.2	139.2	118.2	10.8	0.2	0.0	460.9	97.5	2/
1943	3.0	4.2	2.9	4.1	5.1	14.1	73.6	86.0	135.3	8.8	2.6	0.4	340.1	72.0	
1944	1.1	3.9	4.5	4.0	4.2	7.8	37.0	150.4	162.9	14.9	0.4	0.0	391.1	82.8	
1945	4.9	3.5	4.8	4.0	5.0	9.8	38.1	165.3	175.9	50.6	13.1	4.4	479.4	101.5	
MEAN 22-45	7.8	7.2	5.9	5.3	5.3	22.9	76.6	174.0	111.5	15.9	5.3	3.9	441.6	93.5	
14-45	8.4	7.7	6.3	5.7	5.7	24.5	81.9	186.1	119.2	17.0	5.7	4.2	472.4	100.0	

1/ Water Supply Paper 918
2/ Annual Water Supply Papers

NOTES

E - Estimated

UPPER COLORADO RIVER COMPACT COMMISSION
ENGINEERING ADVISORY COMMITTEE

Lat. 40° 29' Long. 106° 50'
S. 17, T. 6 N., R. 84 W.
½ mile upstream from Soda Creek
STATION LOCATION

YAMPA RIVER AT STEAMBOAT SPRINGS, COLORADO
NAME OF STATION

604 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914	5.3	4.5	4.3	4.0	4.2	11.9	46.6	149.0	140.0	19.0	11.4	9.4	409.6	118.7	1/
1915	13.4	8.7	6.1	5.5	4.7	10.8	56.2	78.7	76.8	10.1	4.3	4.8	280.1	81.2	1/
1916	6.5	4.8	3.5	2.7	2.9	21.1	52.3	91.6	120.0	19.0	15.7	9.1	349.2	101.2	1/
1917	13.1	8.1	5.9	5.5	4.7	12.3	34.0	109.0	224.0	67.6	12.8	9.4	506.4	146.8	1/
1918	6.9	7.4	6.6	7.4	6.9	15.4	35.9	104.0	149.0	34.6	9.2	9.5	392.8	113.8	1/
1919	14.1	11.3	9.2	8.0	7.2	12.3	39.6	129.0	46.0	6.4	3.9	3.2	290.2	84.1	1/
1920	4.1	6.5	4.3	4.6	5.7	7.1	20.9	172.0	186.0	30.4	12.6	8.0	462.2	134.0	1/
1921	9.0	10.2	8.4	8.3	9.1	15.7	44.8	161.0	209.0	30.6	14.1	9.3	529.5	153.4	1/
1922	6.7	7.3	7.1	6.8	7.3	10.7	26.5	92.2	88.1	11.6	7.7	5.1	277.1	80.3	1/
1923	5.1	5.7	6.2	7.4	8.3	10.5	37.4	134.0	153.0	29.0	14.6	8.3	419.5	121.6	1/
1924	10.6	8.3	5.8	6.3	5.6	7.0	37.5	108.0	112.0	13.0	3.8	4.5	322.4	93.4	1/
1925	11.3	9.5	8.1	8.0	6.8	13.5	54.1	113.0	63.7	14.4	9.6	9.9	321.9	93.3	1/
1926	12.1	9.5	8.9	8.0	6.9	14.2	58.0	146.0	86.9	17.7	10.5	6.3	385.0	111.6	1/
1927	8.8	7.7	7.7	7.4	6.7	11.1	49.4	148.0	133.0	44.4	12.7	9.8	446.7	129.4	2/
1928	10.2	11.5	9.5	8.3	8.1	19.1	55.0	191.0	122.0	18.5	8.1	5.0	466.3	135.1	2/
1929	7.3	8.6					45.0	138.0	181.0	34.2	13.8	11.7	E 469.0	135.9	2/
1930	10.8	7.6	8.0	7.4	8.0	10.6	70.2	91.0	92.2	12.3	13.3	9.2	340.6	98.7	2/
1931	9.6	9.8	7.9	7.2			22.5	95.3	64.9	5.9	2.5	4.6	E 243.0	70.4	2/
1932	5.9	6.0					36.5	123.0	128.0	28.1	12.4	6.5	E 378.0	109.5	2/
1933	7.8	7.9					31.5	78.1	161.0	12.5	5.6	5.0	E 342.0	99.1	2/
1934	5.4	5.6	5.3	4.9	5.4	13.1	29.3	43.8	8.4	1.0	3.2	1.4	126.8	36.7	3/
1935	3.1	4.4					19.8	55.0	122.0	14.1	6.4	4.4	E 251.7	72.9	3/
1936	5.1	6.4					68.5	163.1	84.6	15.2	8.8	5.3	E 383.7	111.2	3/
1937	6.3	5.3	4.8	4.3	6.1	8.3	21.8	89.5	58.1	16.7	6.0	4.0	231.2	67.0	3/
1938	6.2	8.1	9.9	9.9	8.9	14.2	50.2	112.8	121.2	15.4	7.4	10.0	374.2	108.4	3/
1939	6.4	7.2	7.9	7.1	6.7	15.5	51.6	123.6	57.2	6.2	5.8	4.4	299.6	86.8	3/
1940	6.1	5.9	4.4	4.6	4.5	9.8	34.0	115.1	61.0	7.7	3.2	3.9	260.2	75.4	3/
1941	7.6	5.2	4.5	5.1	4.6	9.8	27.1	140.6	69.7	13.8	9.5	5.3	302.8	87.7	3/
1942	10.7	9.1	6.8	6.8	5.5	8.3	56.1	91.0	101.2	12.2	5.5	3.4	316.6	91.7	3/
1943	5.0	6.3	5.5	4.8	5.9	9.3	56.2	85.6	89.5	14.2	8.3	3.8	294.4	85.3	3/
1944	4.6	6.3	5.5	5.0	4.6	6.8	16.1	81.4	97.2	14.7	4.5	1.2	247.9	71.8	3/
1945	4.9	5.1	6.5	6.0	5.2	8.3	23.5	98.0	112.5	30.3	14.7	7.5	322.5	93.5	3/
MEAN 14-45													345.1		

NOTES

1/ U.S.G.S. Annual Water Supply Papers
2/ Colorado State Engineer's Reports
3/ U.S.G.S. Annual Water Supply Papers
E - Estimated (U.S.G.S. Water Supply Paper 879)

Lat. 40° 30' Long. 108° 02'
S. 2, T. 6 N., R. 95 W.
3 miles east of Maybell
STATION LOCATION

YAMPA RIVER NEAR MAYBELL, COLORADO
NAME OF STATION

3410 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914													E 1638.0	137.7	
1915													E 970.0	81.5	
1916								389.5	342.6	79.3	42.4	24.6	E 1340.0	112.7	1/
1917	46.2	33.9	29.5	23.7	22.2	41.8	213.1	616.0	762.0	275.9	45.8	24.5	2134.6	179.5	1/
1918	20.7	21.7	20.1	19.2	19.6	57.4	138.7	361.5	439.9	139.6	26.1	24.4	1288.9	108.4	1/
1919	34.6	29.5	23.4	19.7	21.1	41.8	188.7	403.9	146.3	24.5	13.3	11.4	958.2	80.6	1/
1920	14.3	19.3	15.3	15.0	17.7	24.2	62.3	676.7	543.1	127.4	36.0	22.9	1574.2	132.3	1/
1921	23.8	25.6	27.1	23.7	27.8	97.1	148.7	561.1	684.9	122.1	41.9	18.7	1802.5	151.5	1/
1922	17.9	17.7	20.3	18.4	21.4	46.7	97.6	427.3	348.4	76.7	22.1	11.1	1125.6	94.6	1/
1923	11.5	16.1	22.1	19.7	21.1	26.4	181.7	516.5	408.9	123.2	38.8	21.8	1407.8	118.4	1/
1924	25.9	20.0	15.4	15.1	15.5	19.7	149.5	317.7	289.0	54.9	15.8	13.2	951.7	80.0	1/
1925	25.4	24.2	22.1	18.4	17.8	41.8	190.1	323.8	208.5	67.2	25.6	31.9	996.8	83.8	1/
1926	33.2	23.3	24.6	23.7	20.6	54.1	226.6	392.8	247.3	57.6	22.7	13.5	1140.0	95.8	1/
1927	18.8	18.2	20.3	19.7	17.2	36.3	189.8	508.0	364.1	96.2	31.2	21.2	1341.0	112.7	1/
1928	30.7	40.0	33.2	25.8	29.9	88.5	171.3	612.6	341.1	86.2	28.9	21.3	1509.5	126.9	1/
1929	25.2	28.4	23.4	24.6	22.2	116.8	294.0	693.0	532.7	157.8	48.7	57.8	2024.6	170.2	1/
1930	42.8	33.9	29.5	20.9	21.1	48.2	258.8	270.3	239.3	35.0	38.3	26.0	1064.1	89.5	1/
1931	41.9	41.1	31.0	20.0	20.0	45.5	163.6	237.6	177.0	28.8	11.9	9.0	827.4	69.6	1/
1932	18.5	17.8	15.2	10.9	11.2	56.3	200.0	509.2	367.0	127.5	38.8	15.4	1387.8	116.7	1/
1933	21.0	23.3	15.1	10.4	16.7	28.9	112.5	305.9	450.6	50.6	16.5	9.7	1061.2	89.2	1/
1934	11.2	11.4	12.0	7.1	18.9	32.9	93.3	150.6	32.6	1.2	1.6	1.7	374.5	31.5	1/
1935	7.5	11.6	11.1	16.1	20.4	28.0	69.8	238.9	377.0	72.2	17.4	8.2	878.2	73.8	1/
1936	10.4	13.9	13.2	14.8	15.5	27.0	255.0	469.4	250.2	44.9	21.6	8.1	1144.0	96.2	1/
1937	12.9	12.0	11.1	10.8	14.4	36.9	99.6	395.7	243.8	74.3	17.7	10.6	939.8	79.0	1/
1938	19.4	21.0	23.2	21.9	24.1	50.3	169.8	423.6	363.0	68.9	19.1	23.9	1228.2	103.3	1/
1939	15.2	18.7	21.8	15.5	14.1	74.8	176.4	377.3	174.1	20.8	8.8	12.9	930.4	78.2	2/
1940	18.7	14.9	10.0	9.5	14.3	34.6	143.5	373.6	194.2	24.0	4.6	5.4	847.3	71.2	2/
1941	21.2	18.6	15.3	13.6	16.4	39.3	92.0	451.2	240.2	49.9	20.9	11.4	990.0	83.2	2/
1942	40.2	28.2	24.0	21.1	19.2	50.1	238.6	361.2	328.7	58.6	13.9	5.0	1188.8	99.9	2/
1943	10.5	14.7	12.8	11.6	13.5	46.3	189.8	236.7	270.1	70.3	19.9	8.6	904.8	76.1	2/
1944	10.2	14.2	12.2	10.3	10.3	18.0	43.7	311.4	346.7	63.9	8.0	2.0	850.9	71.5	2/
1945	8.7	15.9	12.8	12.1	9.8	23.4	89.1	439.2	393.4	162.8	56.2	19.8	1243.2	104.5	2/
MEAN 17-45	22.0	21.7	19.5	17.0	18.4	46.0	160.3	412.5	336.7	81.5	24.5	16.3	1176.4		
14-45													1189.5		

NOTES

1/ U.S.G.S. Water Supply Paper 918
2/ U.S.G.S. Annual Water Supply Papers
E - Estimated

UPPER COLORADO RIVER COMPACT COMMISSION
ENGINEERING ADVISORY COMMITTEE

Lat 40 24' Long. 109 21'
SW¼ Sec. 4, T 5 S., R.23 E.
At mouth, 2 3/4 miles N. of Jensen
STATION LOCATION

BRUSH CREEK near JENSEN, UTAH
NAME OF STATION

255 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914													E 50.1	139.2	
1915													E 43.1	119.8	
1916													E 37.7	104.8	
1917													E 58.2	161.8	
1918													E 28.3	78.7	
1919													E 21.7	60.3	
1920													E 43.2	120.1	
1921													E 63.3	175.9	
1922													E 62.1	172.6	
1923													E 48.2	134.0	
1924													E 25.1	69.8	
1925													E 24.2	67.3	
1926													E 29.8	82.8	
1927													E 42.3	117.6	
1928													E 36.3	100.9	
1929													E 47.6	132.3	
1930													E 36.0	100.0	
1931													E 16.2	45.0	
1932													E 36.6	101.7	
1933													E 21.9	60.9	
1934													E 14.3	39.7	
1935													E 31.8	88;4	
1936													E 18.0	50.0	
1937													E 37.8	105.0	
1938													E 38.8	107.8	
1939													E 27.9	77.5	
1940													16.7	46.4	1/ (1940–1945)
1941													34.0	94.5	
1942													50.0	139.0	
1943													29.0	80.6	
1944													50.1	139.2	
1945													31.1	86.4	
Mean 14 – 45													36.0		

NOTES

1/ - Sum of the recorded flow at this station (U.S.G.S. Water Supply Papers) plus the water stored in Oaks Park Reservoir with appropriate corrections for irrigation diversions.

Lat. 40 34' 50" Long. 109 37' 20"
SE¼ S.1, T. 3 S., R. 20 E.
3/4 mile upstream from head of Utah Power and Light Co's canal
STATION LOCATION

ASHLEY CREEK near VERNAL, UTAH
NAME OF STATION

101 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914	e 4.2	e 3.2	e 2.4	e 1.9	e 1.9	e 2.3	e 3.3	e 39.3	e 23.5	e 8.4	e 9.8	e 4.8	105.0	134.6	1/ (1914–1929)
1915	4.9	3.9	2.7	2.3	1.8	1.8	6.5	24.7	24.0	8.4	5.1	5.2	91.3	117.1	
1916	5.1	3.4	2.8	2.4	2.0	2.7	6.8	23.1	16.7	7.0	5.3	3.6	80.9	103.7	
1917	5.3	3.6	2.7	2.2	1.7	1.8	2.2	E 25.0	E 47.5	E 14.5	7.4	5.7	119.6	153.3	
1918	e 5.3	e 4.5	e 3.4	e 2.7	e 2.2	e 2.3	e 2.8	e 15.1	e 11.4	e 5.4	e 5.0	e 3.7	63.8	81.8	
1919	4.6	3.3	2.5	2.2	1.7	1.8	4.5	13.8	6.8	3.9	3.0	2.9	51.0	65.4	
1920	3.9	2.6	1.9	2.0	1.7	1.7	1.8	30.3	29.9	6.9	4.7	3.9	91.3	117.1	
1921	3.5	3.3	2.8	2.3	1.8	2.1	2.7	32.8	54.0	10.6	6.6	6.4	128.9	165.3	
1922	4.9	3.5	2.9	2.6	2.1	2.2	2:6	33.3	50.3	9.8	7.0	5.6	126.8	162.6	
1923	4.6	3.7	3.2	2.7	2.2	2.2	2.8	30.5	29.2	11.2	5.4	3.2	100.9	129.4	
1924	3.8	2.9	2.6	2.3	2.1	2.1	2.9	18.9	9.5	4.7	2.9	2.4	57.1	73.2	
1925	2.4	2.1	2.0	1.9	1.7	1.8	3.4	14.2	11.8	6.8	5.1	5.4	58.6	75.1	
1926	6.7	4.7	3.2	2.4	1.8	1.9	8.5	20.9	9.0	6.0	4.8	3.0	72.9	93.5	
1927	2.7	2.1	2.0	1.7	1.5	1.6	2.5	26.1	16.9	9.1	6.4	13.7	86.3	110.6	
1928	7.0	5.5	3.4	2.8	2.3	2.2	4.2	33.8	12.8	6.4	4.6	2.8	87.8	112.6	
1929	e 3.1	e 2.8	E 2.1	E 2.3	E 1.8	e 1.8	e 2.5	e 27.3	31.4	e 9.3	e 6.5	e 6.3	97.2	124.6	
1930	5.6	4.1	3.1	2.8	2.1	2.2	6.5	23.9	15.2	6.3	7.0	5.6	84.4	108.2	2/ (1930–1945)
1931	5.4	3.4	2.8	2.5	1.9	2.0	2.7	9.3	5.5	2.8	2.3	1.9	42.5	54.5	
1932	2.0	1.9	1.8	1.8	1.7	1.7	2.0	24.5	18.3	8.4	5.6	4.4	74.1	95.0	
1933	3.7	2.4	1.7	1.5	1.3	1.3	1.4	9.4	15.4	4.6	3.6	2.2	48.5	62.2	
1934	1.8	1.5	1.3	1.3	1.1	1.2	3.8	7.8	3.5	2.4	3.0	2.5	31.2	40.0	
1935	2.1	2.0	1.8	1.6	1.4	1.6	1.7	11.7	27.1	6.6	4.0	2.3	63.9	81.9	
1936	1.9	1.7	1.4	1.2	1.1	1.1	2.2	11.4	6.7	4.3	4.8	4.0	41.8	53.6	
1937	3.3	2.5	1.7	1.4	1.0	1.1	2.3	31.5	15.6	8.7	5.7	3.9	78.7	100.9	
1938	3.0	2.1	1.6	1.4	1.2	1.3	2.4	20.3	24.5	8.9	5.5	4.8	77.0	98.7	
1939	6.7	4.8	3.3	2.5	1.9	2.1	7.6	17.7	7.2	4.3	2.9	5.3	66.3	85.0	
1940	5.6	3.5	2.2	1.6	1.4	1.5	4.6	17.5	6.9	4.1	2.2	3.0	54.1	69.4	
1941	4.8	3.3	2.3	1.9	1.6	1.7	1.6	30.2	22.3	9.3	6.5	6.8	92.3	118.3	
1942	9.5	6.2	4.0	2.6	1.8	1.8	6.0	22.5	25.3	9.5	7.0	5.0	101.2	129.7	
1943	3.2	1.9	1.6	1.3	1.0	1.1	8.8	16.6	10.5	8.3	5.8	3.3	63.4	81.3	
1944	2.2	1.7	1.5	1.3	1.1	1.1	1.2	23.1	36.1	12.1	8.3	4.2	93.9	120.4	
1945	2.6	2.0	1.6	1.4	1.1	1.2	1.3	15.4	15.5	8.5	6.7	5.3	62.6	80.3	
Mean 14-45	4.2	3.1	2.4	2.0	1.7	1.8	3.6	21.9	20.0	7.4	5.4	4.5	78.0		

NOTES

E - Estimated
e - Partly Estimated

1/ - U.S.G.S. Water Supply Papers except E and e
2/ - U.S.G.S. Water Supply Papers

UPPER COLORADO RIVER COMPACT COMMISSION
ENGINEERING ADVISORY COMMITTEE

Lat. 40 12' Long. 110 03'
NW¼ S. 25, T. 3 S., R. 2 W.
3 miles downstream from Lake Fork
40 miles upstream from mouth
STATION LOCATION

DUCHESNE RIVER at MYTON, UTAH
NAME OF STATION

2705 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914	32.3	26.5	19.7	24.3	21.1	30.2	56.4	205.7	224.8	63.2	24.4	17.4	746.0	169.7	
1915	29.5	22.5	19.5	19.1	17.8	21.9	33.0	67.2	149.3	31.2	8.2	22.6	441.8	100.5	
1916	28.9	22.2	23.1	22.8	23.0	54.1	62.0	132.3	171.0	38.6	28.2	16.0	622.2	141.6	
1917	40.5	24.4	17.1	15.1	31.4	52.4	47.6	105.0	343.2	145.8	32.5	31.2	886.2	201.6	
1918	29.2	29.6	28.7	20.4	21.7	24.5	20.3	51.0	162.7	41.8	7.9	16.7	454.5	103.4	
1919	33.0	27.1	25.5	16.0	19.4	38.9	38.7	126.4	45.8	6.7	8.5	17.4	403.4	91.8	
1920	22.9	22.6	18.7	17.8	21.6	32.1	27.1	136.0	195.7	40.2	33.5	19.1	587.3	133.6	
1921	26.2	29.6	21.5	20.0	27.0	42.3	33.2	118.4	366.2	92.5	42.7	32.8	852.4	193.9	
1922	22.2	20.9	31.9	24.6	23.6	40.6	41.2	242.3	378.2	61.9	38.1	28.6	954.1	217.1	
1923	25.1	32.3	31.3	26.1	22.2	28.8	44.9	176.3	219.0	91.6	32.4	22.6	752.6	171.2	
1924	35.6	30.0	27.2	24.6	27.6	26.6	31.4	83.1	24.2	3.5	1.7	4.4	319.9	72.8	
1925	10.9	16.0	17.0	16.1	15.6	17.1	14.9	71.2	62.5	23.8	14.3	20.6	300.0	68.3	
1926	26.5	20.6	21.1	18.3	23.4	20.6	29.6	91.6	50.8	8.8	10.4	2.6	324.3	73.8	1/
1927	7.3	10.3	14.2	15.4	15.1	23.1	22.6	97.9	127.9	45.9	13.4	95.1	488.2	111.1	
1928	46.8	31.1	23.6	20.0	19.2	28.0	23.2	154.1	79.6	11.5	8.9	5.7	451.7	102.8	
1929	19.5	19.3	19.0	20.0	18.1	24.6	24.0	79.1	127.3	35.7	23.0	28.5	438.1	99.7	
1930	17.4	18.0	17.8	18.5	18.1	17.9	29.4	58.9	112.2	9.9	24.5	14.0	356.6	81.1	
1931	23.3	18.3	17.8	17.2	15.6	18.3	14.7	27.8	14.6	2.0	0.7	0.4	170.7	38.8	
1932	2.3	10.6	18.5	20.3	20.1	22.9	21.7	95.5	126.4	35.2	11.5	7.9	392.9	89.4	
1933	10.9	12.9	13.6	15.4	13.9	18.2	13.8	25.2	93.4	9.8	4.2	0.9	232.2	52.8	
1934	2.4	10.4	15.6	16.9	15.2	10.9	8.3	10.0	1.1	0.5	0.7	0.1	92.1	21.0	
1935	0.3	3.5	12.7	11.7	9.5	12.5	11.8	27.1	114.5	9.1	5.4	1.5	219.6	50.0	
1936	2.4	10.5	12.0	12.9	12.1	11.7	29.2	133.2	78.1	33.5	26.0	17.7	379.3	86.3	
1937	10.3	14.9	18.5	20.0	19.4	24.6	34.4	146.3	75.6	34.5	11.0	16.5	426.0	96.9	
1938	13.3	15.2	19.5	15.8	17.4	18.6	32.9	86.1	101.5	19.3	5.1	22.4	367.1	83.5	
1939	21.9	23.9	22.6	19.7	16.7	29.8	30.5	55.0	15.4	1.4	1.1	10.3	248.3	56.5	
1940	13.3	10.6	13.3	14.8	14.4	16.4	8.4	50.3	13.4	0.5	0.3	12.2	167.9	38.2	
1941	21.9	18.9	20.0	16.3	16.2	14.3	18.1	123.2	152.1	26.8	13.7	10.7	452.2	102.9	
1942	30.6	30.3	27.6	26.1	22.8	26.0	50.0	64.5	104.9	13.4	3.4	3.1	402.7	91.6	2/
1943	9.7	15.0	19.8	19.1	19.8	21.5	40.6	93.2	96.6	25.6	14.4	3.0	378.3	86.1	
1944	11.3	16.0	18.3	16.7	17.3	27.5	29.3	94.7	155.6	53.2	4.4	4.0	448.3	102.0	
1945	13.3	15.8	21.2	21.6	19.5	20.3	15.5	56.0	72.4	25.2	21.0	5.7	307.5	70.0	
Mean 14-45	20.0	19.7	20.2	18.9	19.2	25.5	29.3	96.4	126.8	32.6	14.9	16.0	439.5		

NOTES

1/ - U.S.G.S. Water Supply Paper No. 918
2/ - Annual U.S.G.S. Water Supply Papers

Lat. 40 13' Long. 109 47'
SE¼ SE¼ S. 17, T. 3 S., R. 2 E.
½ mile downstream from Uinta River
STATION LOCATION

DUCHESNE RIVER near RANDLETT, UTAH
NAME OF STATION

3820 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914	E 71.0	E 41.0	E 27.0	E 34.0	E 30.5	E 46.0	E 71.0	E 267.0	E 385.0	E 96.0	E 36.5	E 38.0	1143.0	175.0	
1915	E 64.0	E 35.0	E 26.5	E 26.5	E 25.0	E 33.0	E 45.0	E 77.0	E 232.0	E 40.0	E 13.0	E 49.0	666.0	101.9	
1916	E 63.0	E 34.5	E 31.5	E 32.0	E 33.5	E 85.0	E 77.0	E 167.0	E 277.0	E 52.0	E 42.0	E 35.0	929.5	142.3	
1917	E 89.0	E 37.5	E 23.5	E 21.0	E 45.0	E 83.0	E 61.0	E 130.0	E 632.0	E 240.0	E 48.0	E 67.0	1477.0	226.1	
1918	E 63.0	E 45.5	E 39.0	E 28.5	E 31.5	E 36.0	E 31.0	E 55.0	E 257.0	E 58.0	E 12.5	E 36.5	693.5	106.2	
1919	E 72.0	E 42.0	E 35.0	E 22.0	E 28.5	E 61.0	E 51.0	E 158.0	E 46.0	E 7.0	E 13.5	E 38.0	574.0	87.9	
1920	E 49.0	E 35.0	E 25.5	E 25.0	E 31.5	E 50.0	E 39.0	E 172.0	E 327.0	E 56.0	E 49.5	E 41.5	901.0	137.9	
1921	E 57.0	E 45.5	E 29.5	E 28.0	E 39.0	E 66.0	E 45.0	E 148.0	E 680.0	E 147.0	E 62.5	E 71.0	1418.5	217.1	
1922	E 48.0	E 32.0	E 43.0	E 34.5	E 34.5	E 63.0	E 54.0	E 317.0	E 700.0	E 92.0	E 56.0	E 62.5	1536.5	235.2	
1923	E 54.0	E 50.0	E 42.0	E 36.5	E 32.5	E 44.0	E 58.0	E 227.0	E 375.0	E 145.0	E 48.0	E 49.5	1161.5	177.8	
1924	E 77.0	E 46.0	E 37.5	E 34.5	E 40.0	E 41.0	E 43.0	E 98.0	E 24.0	E 4.0	E 3.3	E 10.0	458.3	70.2	
1925	E 22.0	E 24.5	E 23.5	E 22.5	E 23.0	E 26.0	E 25.0	E 83.0	E 68.0	E 27.0	E 22.0	E 45.0	411.5	63.0	
1926	E 58.0	E 31.5	E 27.5	E 25.5	E 34.0	E 31.0	E 41.0	E 110.0	E 53.0	E 9.0	E 16.0	E 6.0	442.5	67.7	
1927	E 14.0	E 17.5	E 19.5	E 21.5	E 22.0	E 35.0	E 34.0	E 119.0	E 185.0	E 65.0	E 20.5	E207.0	760.0	116.3	
1928	E103.0	E 48.0	E 32.0	E 28.0	E 28.0	E 43.0	E 34.0	E 197.0	E 92.0	E 12.0	E 14.0	E 12.5	643.5	98.5	
1929	E 42.0	E 29.5	E 26.0	E 28.0	E 26.0	E 38.0	E 35.0	E 94.0	E 185.0	E 48.0	E 34.5	E 62.0	648.0	99.2	
1930	E 37.0	E 27.5	E 24.5	E 25.5	E 26.5	E 27.0	E 36.0	E 65.0	E 152.0	E 10.0	E 36.5	E 30.5	498.0	76.2	
1931	E 50.0	E 28.0	E 24.5	E 24.0	E 23.0	E 28.0	E 25.0	E 28.0	E 14.8	E 2.5	E 1.5	E 1.0	250.3	38.3	
1932	E 3.0	E 16.5	E 25.5	E 28.5	E 29.5	E 35.0	E 33.0	E 117.0	E 182.0	E 48.0	E 17.5	E 17.5	553.0	84.6	
1933	E 22.0	E 19.5	E 18.5	E 21.5	E 20.5	E 27.0	E 24.0	E 26.0	E 115.0	E 10.0	E 7.5	E 2.5	314.0	48.1	
1934	E 4.0	E 16.0	E 21.5	E 23.5	E 22.5	E 15.0	E 18.0	E 11.0	E 1.2	E 1.0	E 1.5	E 0.5	135.7	20.8	
1935	E 0.4	E 5.5	E 17.5	E 16.5	E 14.0	E 19.0	E 22.0	E 28.0	E 158.0	E 10.0	E 9.0	E 3.5	303.4	46.4	
1936	E 3.0	E 16.0	E 16.5	E 18.0	E 18.0	E 17.0	E 41.0	E 168.0	E 90.0	E 43.0	E 39.0	E 38.5	508.0	77.8	
1937	E 21.0	E 23.0	E 25.5	E 28.0	E 28.0	E 38.0	E 47.0	E 185.0	E 85.0	E 45.0	E 17.0	E 36.0	578.5	88.6	
1938	E 27.0	E 23.5	E 26.5	E 22.0	E 25.5	E 28.0	E 44.0	E 102.0	E 130.0	E 23.0	E 8.5	E 49.0	509.0	77.9	
1939	E 47.0	E 37.0	E 31.0	E 27.5	E 24.5	E 46.0	E 42.0	E 61.0	E 15.5	E 2.0	E 2.0	E 22.5	358.0	54.8	
1940	E 27.0	E 16.5	E 18.5	E 20.1	E 18.0	E 25.0	E 18.0	E 55.0	E 13.5	E 1.0	E 1.0	E 26.5	240.1	36.8	
1941	E 47.0	E 29.0	E 27.5	E 23.0	E 23.5	E 21.0	E 29.0	E 153.0	E 237.0	E 32.0	E 21.0	E 23.5	666.5	102.0	
1942	E 66.0	E 47.0	E 37.5	E 36.5	E 33.0	E 40.0	E 64.0	E 74.0	E 138.0	E 15.0	E 6.0	E 7.0	564.0	86.3	
1943	17.9	21.8	27.6	26.4	28.6	29.3	42.8	99.9	102.8	28.4	23.2	8.1	456.8	69.9	
1944	22.2	23.7	24.9	23.2	25.9	43.4	48.2	128.1	255.0	81.9	7.5	6.9	690.9	105.8	1/
1945	23.7	26.1	28.3	30.3	27.0	32.1	23.7	59.2	90.6	30.5	30.9	11.6	414.0	63.4	
Mean 14-45	42.6	30.4	27.6	26.3	27.9	39.1	40.7	118.1	196.8	46.3	22.6	34.9	653.3		

NOTES

E - Estimated

1/ - U.S.G.S. Water Supply Papers

UPPER COLORADO RIVER COMPACT COMMISSION
ENGINEERING ADVISORY COMMITTEE

Lat. 40° 02' Long. 107° 52'
S. 30, T. 1 N., R. 93 W
1 mile upstream from Curtis Creek

STATION LOCATION

WHITE RIVER NEAR MEEKER, COLORADO
NAME OF STATION

762 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914	21.0	17.9	17.8	17.8	16.7	22.1	34.5	112.0	135.0	44.8	23.7	17.5	480.8	104.1	
1915	23.7	19.6	19.7	18.4	16.7	19.7	34.0	54.6	71.6	27.0	18.1	19.6	342.7	74.2	
1916	20.9	19.6	23.3	20.0	18.7	25.1	36.8	89.2	124.0	49.6	31.8	25.4	484.4	104.9	
1917	31.3	20.2	18.4	18.4	16.7	22.5	26.5	74.4	184.0	111.0	36.0	28.4	587.8	127.3	
1918	27.4	21.2	23.1	21.6	20.1	24.0	27.1	91.0	137.0	42.2	23.5	19.9	478.1	103.5	
1919	22.3	21.2	19.7	19.7	18.3	20.3	47.0	92.8	46.2	21.6	17.2	20.4	366.7	79.4	
1920	21.8	20.1	17.6	20.0	19.2	20.2	21.2	121.0	186.0	69.5	30.3	24.6	571.5	123.8	
1921	24.6	29.0	25.2	21.8	19.2	20.8	25.4	130.0	243.0	93.5	41.1	33.1	706.7	153.1	1/
1922	29.0	24.4	23.6	21.5	20.5	24.6	29.9	94.7	129.0	39.7	23.3	24.6	484.8	105.0	
1923	24.3	22.8	22.1	19.7	16.7	24.6	34.9	109.0	114.0	45.1	25.4	20.2	478.8	103.7	
1924	25.5	24.6	22.1	20.9	17.8	20.9	26.5	91.0	104.0	27.5	19.4	20.2	420.4	91.1	
1925	22.8	23.3	E 22.1	E 21.5	E 20.0	E 22.8	e 40.5	98.4	91.6	41.4	26.2	30.3	460.9	99.8	
1926	26.3	22.0	E 22.1	E 21.5	E 20.0	E 22.8	48.1	107.0	115.0	45.3	27.9	22.6	500.6	108.4	
1927	24.2	23.7	21.5	20.3	18.9	22.1	32.4	108.0	115.0	48.3	30.1	27.8	492.3	106.6	
1928	29.2	29.8	27.1	24.6	20.7	25.2	28.0	154.0	126.0	56.7	41.3	40.8	603.4	130.7	
1929	31.9	38.6	E 21.5	E 24.6	E 22.2	E 33.8	E 56.5	138.0	192.0	74.4	37.2	42.6	713.3	154.5	
1930	35.0	29.1	E 24.6	E 21.5	E 23.3	29.4	42.7	65.2	115.0	38.4	33.1	28.4	485.7	105.2	2/
1931	28.3	27.0	E 15.0	E 16.1	E 14.0	E 16.2	33.2	67.0	60.7	19.6	20.3	21.5	338.9	73.4	
1932	22.3	20.5	E 23.3	E 22.2	E 19.4	e 25.1	38.7	119.0	130.0	62.1	33.4	26.3	542.3	117.5	
1933	25.9	'24.2	e 22.0	E 21.0	E 19.0	E 23.0	33.0	76.2	149.0	42.9	25.2	23.3	484.7	105.0	
1934	22.2	21.8	20.8	15.4	14.7	22.9	32.6	43.7	15.7	9.2	11.9	14.5	245.4	53.1	
1935	16.7	16.3	16.6	15.4	12.9	16.1	21.2	53.4	127.3	35.3	17.0	17.4	365.6	79.2	
1936	16.3	18.2	15.9	18.6	16.7	17.4	38.6	117.2	88.8	30.2	22.9	18.1	418.9	90.7	
1937	19.0	17.1	16.8	16.1	14.7	16.9	19.6	86.4	58.8	31.5	15.2	17.5	329.6	71.4	
1938	18.2	17.0	17.0	15.0	14.1	20.9	39.4	108.7	150.9	44.8	23.1	26.4	495.5	107.3	
1939	22.7	19.4	19.7	18.8	14.2	20.2	34.9	93.7	66.9	21.3	18.8	21.8	372.4	80.7	
1940	21.4	18.7	17.3	17.4	16.3	18.7	29.6	106.8	61.8	19.6	15.1	17.6	360.3	78.0	3/
1941	22.6	19.1	18.0	16.8	15.0	19.1	24.6	132.3	103.7	34.8	22.1	21.4	449.5	97.4	
1942	28.4	22.6	19.7	19.1	16.7	19.6	43.4	107.6	129.1	31.0	21.5	17.9	476.6	103.2	
1943	20.0	20.6	18.7	15.7	14.8	17.3	37.6	61.7	91.7	31.7	29.1	18.3	377.2	81.7	
1944	18.1	18.7	17.7	18.0	. 15.1	17.5	18.6	85.9	113.9	39.1	19.8	15.6	398.0	86.2	
1945	19.7	18.5	16.7	16.6	16.2	19.0	20.7	101.7	114.9	64.1	32.1	20.9	461.1	99.9	
MEAN 14-45	23.8	22.1	20.2	19.2	17.5	21.6	33.1	96.6	115.4	43.5	25.4	23.3	461.7		

NOTES

1/ U.S.G.S. Water supply Paper 618 (except E and e)
2/ Colorado State Engineer's Reports (except E and e)
3/ U.S.G.S. Annual Water Supply Papers (except E and e)

E - Estimated (by Colorado State Engineer Unpublished)
e - Partly Estimated (by Colorado State Enginer Unpublished)

Lat. 39° 58' Long. 109° 10'
S. 2, T. 10 S., R. 24 E.
Just downstream from Evacuation Creek

STATION LOCATION

WHITE RIVER NEAR WATSON, UTAH
NAME OF STATION

4,020 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914													E 725.0	124.6	
1915													E 450.0	77.3	
1916													E 635.0	109.1	
1917													E 885.0	152.1	
1918								75.6	134.2	52.7	60.3	35.8	E 585.0	100.5	
1919	48.3	27.1											E 440.0	75.6	
1920													E 740.0	127.2	
1921													E 910.0	156.4	
1922													E 675.0	116.0	
1923							49.7	119.2	110.8	52.6	47.9	29.4	E 685.0	117.7	
1924	35.1	30.2	29.4	27.0	24.2	28.3	31.5	88.2	110.7	26.9	21.4	21.4	474.3	81.5	
1925	24.3	22.7	22.4	21.5	22.5	36.3	56.9	100.5	91.2	59.4	38.9	43.1	539.7	92.7	1/
1926	47.4	37.2	36.9	35.7	32.2	40.6	62.8	121.4	134.9	59.8	38.7	21.1	668.7	114.9	
1927	35.7	24.2	24.9	24.6	30.5	52.8	31.0	97.4	105.9	53.2	34.7	36.8	551.7	94.8	
1928	33.7	32.7	27.7	25.8	24.2	46.1	47.1	185.0	118.6	67.9	49.3	38.1	696.2	119.6	
1929	54.9	39.2	24.6	27.7	25.0	70.7	146.7	217.5	239.1	179.7	117.8	114.1	1257.0	216.0	
1930	63.2	42.4	30.7	23.4	31.1	36.9	74.3	73.8	107.9	36.0	55.0	29.9	604.6	103.9	
1931	29.9	23.2	14.1	17.8	20.8	32.3	40.3	64.3	61.3	17.5	21.6	22.5	365.6	62.8	
1932	25.7	23.4	26.1	25.8	26.5	43.7	47.3	129.4	113.0	60.2	45.8	27.7	594.6	102.3	
1933	27.7	25.4	26.1	24.9	26.9	42.1	50.0	71.0	159.4	34.0	27.9	22.0	537.4	92.3	
1934	23.8	26.2	25.3	24.6	30.0	25.7	34.1	42.3	13.5	6.7	12.1	16.5	280.8	48.3	
1935	17.3	17.0	20.0	20.8	20.6	23.8	23.3	63.4	123.8	32.3	18.3	21.8	402.4	69.1	
1936	20.0	22.3	20.3	22.4	21.1	23.8	39.9	121.5	91.6	37.0	29.4	22.3	471.6	81.0	
1937	23.1	19.6	17.6	9.8	16.1	31.7	22.0	82.7	59.4	54.6	23.2	32.2	392.0	67.4	
1938	28.3	19.3	16.9	17.5	20.7	41.8	43.3	124.4	155.1	49.4	31.4	51.3	599.4	103.0	
1939	29.0	20.1	18.1	20.1	20.0	72.6	40.4	93.0	70.0	19.1	18.9	27.1	448.4	77.0	
1940	26.5	22.3	20.4	20.9	21.2	25.0	37.0	100.5	57.5	17.4	14.5	24.4	387.6	66.6	2/
1941	30.4	22.0	18.2	18.2	22.2	31.4	33.6	156.1	117.7	40.3	32.8	28.7	551.6	94.8	
1942	44.0	28.7	23.8	22.7	22.1	43.4	107.0	158.5	143.7	44.5	26.6	22.9	687.9	118.2	
1943	29.0	27.4	22.6	21.2	24.1	33.1	40.2	56.0	87.2	31.0	44.2	19.9	435.9	74.9	
1944	21.3	23.0	21.4	18.8	21.4	32.2	28.5	94.2	111.6	39.8	18.4	15.1	445.7	76.6	
1945	19.3	20.1	20.0	25.5	25.6	28.1	29.6	108.1	105.2	56.9	37.5	23.5	499.4	85.8	
MEAN 24-45	31.3	25.8	23.1	22.6	24.0	38.3	48.5	106.8	108.1	46.5	34.5	31.0	540.5		
14-45													582.0		

NOTES

1/ U.S.G.S. Water Supply Paper 918 (Except E)
2/ Annual U.S.G.S. Water Supply Papers

E - Estimated

UPPER COLORADO RIVER COMPACT COMMISSION
ENGINEERING ADVISORY COMMITTEE

Near Heiner - lat. 39 43 05, Long. 110 51 55, in SW¼ sec. 1, T. 13 S., R. 9 E, 2/3 miles north of Heiner.
Near Helper - in SE¼ sec. 36, T. 13 S., R. 9 E., 2 miles South of Helper.
STATION LOCATION

PRICE RIVER NEAR HEINER, UTAH or NEAR HELPER, UTAH
NAME OF STATION

(near Heiner) 430 square miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914	2.9	2.9	1.8	2.0	2.2	7.8	28.0	71.3	27.7	12.8	7.2	3.0	169.6	183.2	
1915	4.4	2.4	2.2	1.8	2.2	4.5	12.3	20.0	12.4	7.9	3.5	3.0	76.6	82.7	
1916	1.9	2.3	1.9	2.1	2.0	10.8	29.4	52.3	22.1	12.0	8.7	3.9	149.4	161.4	
1917	5.2	2.3	2.1	2.1	3.0	4.4	21.6	56.7	63.7	10.9	3.4	3.2	178.6	192.9	
1918	2.8	2.2	2.5	2.5	2.3	5.3	6.8	17.6	7.4	5.8	1.7	3.4	60.3	65.1	
1919	3.6	2.7	3.1	2.1	1.9	5.9	18.6	34.3	6.1	2.2	2.8	8.2	91.5	98.8	
1920	2.3	1.6	1.8	1.7	1.7	2.3	6.2	67.0	27.3	4.7	8.1	3.8	128.5	138.8	
1921	2.9	2.7	1.5	1.5	1.8	11.1	15.5	78.7	46.5	6.4	8.6	6.4	183.6	198.3	
1922	3.5	2.9	2.9	2.5	2.1	4.2	13.4	101.0	48.4	8.3	5.9	3.2	198.3	214.2	
1923	2.3	2.6	2.7	2.5	2.5	3.0	24.6	78.7	30.9	8.9	4.5	3.5	166.7	180.1	
1924	3.7	2.7	1.6	1.8	2.8	2.7	14.0	10.4	2.8	1.1	2.4	2.4	48.4	52.3	
1925	1.3	1.5	1.4	1.6	2.1	4.5	7.6	12.0	6.0	2.7	7.9	4.0	52.6	56.8	
1926	3.5	1.4	1.2	1.0	1.7	6.4	14.3	20.7	5.6	5.3	2.2	0.7	64.0	69.1	
1927	0.9	0.7	0.6	0.7	1.0	2.4	6.3	13.2	7.8	1.5	1.5	1.3	37.9	40.9	
1928	1.7	1.6	1.1	1.2	1.3	6.9	12.7	41.7	21.8	13.8	12.8	8.8	125.4	135.5	
1929	3.5	1.3	1.1	1.1	4.8	6.4	5.6	17.6	18.2	14.4	3.1	2.6	79.7	86.1	
1930	3.4	1.3	1.4	1.2	1.3	1.6	6.0	9.1	10.8	6.9	6.6	3.5	53.1	57.4	1/
1931	3.0	0.5	0.5	0.5	0.8	1.7	3.9	7.0	5.5	4.5	2.1	0.7	30.7	33.2	
1932	0.5	0.8	0.5	0.6	1.0	1.6	5.4	12.7	11.0	10.4	9.0	4.2	57.7	62.3	
1933	3.3	1.6	0.8	0.9	1.0	2.3	3.1	11.7	13.3	8.8	11.3	6.6	64.7	69.9	
1934	4.4	1.3	1.5	1.2	0.9	0.9	3.5	6.0	3.1	2.8	0.9	0.2	26.7	28.8	
1935	0.2	0.2	0.2	0.2	0.6	1.8	3.0	8.8	12.2	11.3	4.9	4.7	48.1	52.0	
1936	1.7	0.9	0.4	0.5	0.5	1.6	24.9	22.2	12.1	8.3	7.4	5.4	85.9	92.8	
1937	3.5	0.7	0.4	0.4	0.4	2.2	24.2	36.7	16.9	10.5	11.7	5.4	113.0	122.1	
1938	8.8	5.4	1.2	0.7	0.9	2.7	9.2	26.7	14.2	10.5	9.3	3.6	93.2	100.7	
1939	2.8	1.5	0.6	0.6	0.4	7.6	7.1	14.9	11.3	7.8	4.2	2.2	61.0	65.9	
1940	0.7	0.6	0.6	0.4	0.5	2.2	5.4	13.6	10.9	8.8	5.3	4.2	53.2	57.5	
1941	0.9	0.7	0.5	0.4	1.3	3.9	7.0	42.1	21.2	12.5	9.4	7.2	107.1	115.7	
1942	2.9	1.9	1.1	1.1	0.9	4.3	25.5	33.2	21.6	13.6	9.9	6.8	121.8	131.6	
1943	4.6	0.8	0.7	0.7	1.6	3.3	7.8	13.7	9.7	13.2	8.4	5.4	69.9	75.5	
1944	1.0	0.5	0.4	0.3	0.4	2.3	6.4	35.0	18.5	14.9	10.4	7.5	97.6	105.4	
1945	2.1	0.9	0.6	0.6	0.7	2.9	2.8	17.3	10.2	13.8	8.9	6.7	67.5	72.9	
Total	90.2	53.4	40.9	38.5	48.6	131.5	382.1	1003.9	557.2	277.3	204.0	134.7	2962.3		
Mean 14-45	2.8	1.7	1.3	1.2	1.5	4.1	11.9	31.4	17.4	8.7	6.4	4.2	92.6		

NOTES

1/ U.S.G.S. Annual Water Supply Papers   Price R. near Helper Oct. 1913 through May 1934 near Heiner June 1934 through Sept. 1945

Lat. 39° 00' Long. 110° 09'
NW¼ SW¼ S. 15, T. 21 S, R. 16 E

GREEN RIVER AT GREEN RIVER, UTAH
NAME OF STATION

40,920 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

STATION LOCATION
Location at Little Valley from Jan. 1, 1912 - June 20, 1924.

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914	219.2	193.6	103.2	119.9	146.6	395.5	749.1	1754.0	2123.0	838.2	283.9	156.2	7082.4	152.0	
1915	243.4	162.0	94.2	92.2	98.1	186.6	442.7	675.6	928.7	378.7	127.6	185.6	3615.4	77.6	
1916	242.1	168.6	115.5	105.5	128.7	558.0	626.2	1289.0	1368.0	635.9	353.4	153.0	5743.9	123.3	
1917	307.1	152.6	126.3	79.5	116.0	206.0	709.9	1612.0	2755.0	1721.0	409.2	238.7	8433.3	181.0	
1918	200.2	184.2	167.4	144.6	136.1	251.0	385.3	846.9	1728.0	705.9	201.4	153.0	5104.0	109.6	
1919	226.6	179.3	130.1	87.3	97.2	276.4	474.5	913.4	552.6	107.9	74.0	106.4	3225.7	69.2	
1920	122.6	125.1	90.6	107.6	139.9	243.8	388.8	1643.0	2027.0	628.4	278.8	151.0	5946.6	127.7	
1921	160.3	197.1	116.6	121.2	169.0	471.6	443.3	1547.0	2776.0	661.2	338.3	204.4	7206.0	154.7	
1922	144.3	146.6	134.0	107.8	137.4	394.8	359.7	1646.0	2227.0	528.5	250.3	171.7	6248.1	134.1	
1923	126.8	153.9	131.1	135.2	117.7	225.8	682.4	1588.0	1836.0	795.8	355.6	196.5	6344.8	136.2	
1924	239.0	201.3	127.1	88.8	165.0	203.3	673.1	976.4	749.2	223.0	90.6	89.2	3826.0	82.1	
1925	105.0	122.1	72.5	89.3	129.5	275.2	469.3	841.7	839.0	569.9	268.8	269.5	4051.8	87.0	1/
1926	298.0	191.7	145.9	116.6	126.3	344.4	611.0	1121.0	780.7	354.6	198.5	93.7	4382.4	94.1	
1927	118.3	102.9	103.6	101.8	110.9	218.0	384.8	1276.0	1313.0	758.3	230.9	506.7	5225.2	112.2	
1928	303.5	257.1	143.6	172.3	156.7	395.5	394.9	1879.0	1259.0	445.2	227.1	124.7	5758.6	123.6	
1929	219.3	169.5	97.5	123.4	109.5	483.2	728.1	1541.0	1682.0	639.5	293.3	377.6	6463.9	138.8	
1930	255.6	166.2	131.4	77.0	231.2	244.8	610.2	727.3	1040.0	339.0	505.9	225.8	4554.4	97.8	
1931	241.4	147.6	114.6	94.2	107.9	215.6	296.5	478.6	443.1	104.1	91.5	56.1	2391.2	51.3	
1932	91.3	89.2	53.5	79.2	91.4	253.8	491.2	1385.0	1245.0	670.6	237.6	134.1	4821.9	103.5	
1933	116.7	135.4	77.8	89.5	93.2	190.3	268.0	662.4	1371.0	333.7	107.1	80.0	3525.1	75.7	
1934	75.8	88.4	85.6	100.0	119.4	132.5	174.2	284.8	126.6	39.7	43.8	35.9	1306.7	28.0	
1935	44.1	55.6	57.0	68.4	83.8	116.4	172.1	456.9	1264.0	331.6	124.2	75.7	2849.8	61.2	
1936	59.0	82.9	60.7	66.6	90.6	140.7	447.5	1314.0	1051.0	380.0	317.3	136.3	4146.6	89.0	
1937	118.2	130.6	81.0	61.5	94.4	281.3	451.2	1157.0	898.7	553.1	159.5	147.3	4133.8	88.7	
1938	122.2	124.3	120.1	101.0	125.2	263.0	467.8	1122.0	1345.0	486.4	173.4	296.4	4746.8	101.9	
1939	234.2	171.1	153.6	128.1	103.5	390.0	446.2	882.2	523.9	162.2	99.0	126.1	3420.1	73.4	
1940	126.2	98.2	88.7	81.6	96.6	198.7	253.5	703.2	492.2	106.8	49.5	81.0	2376.2	51.0	
1941	151.5	113.2	95.7	100.2	126.0	216.1	313.5	1172.0	1146.0	358.5	267.5	181.9	4242.1	91.1	2/
1942	317.9	239.7	168.2	112.1	122.5	264.3	857.6	979.6	1271.0	414.6	152.1	90.7	4990.3	107.1	
1943	117.6	123.6	116.5	111.7	129.7	235.8	569.4	763.0	1074.0	612.1	300.1	116.1	4269.6	91.7	
1944	123.9	145.9	112.1	79.8	111.3	252.4	528.7	924.3	1391.0	591.3	142.8	72.9	4476.4	96.1	
1945	114.8	119.1	88.4	108.9	127.9	185.3	290.9	909.0	1016.0	700.7	335.4	162.7	4159.1	89.3	
MEAN 14-45	174.6	148.1	109.5	101.6	123.1	272.2	473.8	1096.0	1270.1	505.5	221.5	162.4	4658.4		

NOTES

1/ WSP 918. Record at Little Valley Oct. 1913 to June 20, 1924

2/ U.S.G.S. Annual Water Supply Papers

UPPER COLORADO RIVER COMPACT COMMISSION
ENGINEERING ADVISORY COMMITTEE

Lat. 40°05', Long. 106°05'
S. 1, T. 1 N., R. 78 W.
3 miles upstream from Beaver Creek

STATION LOCATION

COLORADO RIVER AT HOT SULPHUR SPRINGS, COLORADO

NAME OF STATION

782 Square Miles

DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914	19.1	13.7	7.4	7.4	6.9	10.8	36.3	197.8	284.4	87.7	31.1	17.2	719.8	151.0	
1915	16.5	8.9	4.9	4.9	4.7	7.7	33.3	60.5	159.7	84.1	23.3	15.4	423.9	88.9	
1916	14.5	8.3	6.5	7.1	6.8	14.3	31.6	112.4	161.0	57.2	29.7	19.4	468.8	98.3	
1917	18.3	11.4	7.7	7.7	6.9	7.7	34.4	84.9	281.4	165.7	33.7	15.3	675.1	141.6	
1918	11.0	9.2	8.3	7.1	6.4	7.0	19.8	140.9	306.0	84.8	22.8	16.1	639.4	134.1	
1919	20.2	12.0	7.5	6.5	5.6	7.7	30.1	114.3	90.1	33.6	20.1	12.9	360.6	75.6	
1920	10.9	7.5	5.7	6.0	6.0	21.0	38.8	180.7	260.1	96.2	38.4	20.7	692.0	145.2	
1921	14.5	9.6	9.4	8.2	6.2	7.3	24.1	147.3	334.2	79.6	37.8	19.6	697.8	146.4	
1922	14.2	7.4	7.8	7.8	6.2	8.0	18.4	97.5	135.3	40.0	21.8	10.9	375.3	78.7	
1923	6.7	6.0	6.1	5.8	5.3	6.1	19.6	111.9	218.7	97.2	35.6	19.4	538.4	112.9	
1924	17.4	7.1	6.8	6.6	5.8	8.4	23.2	126.0	224.9	62.8	11.2	6.3	506.5	106.3	
1925													E400.0	85.0	
1926	22.8	11.3	8.3	7.7	6.7	9.8	47.3	160.0	230.4	106.9	31.9	13.0	656.1	137.6	1/
1927	11.5	9.8	8.5	6.2	5.3	7.8	29.6	164.5	162.6	64.6	33.8	17.0	521.2	109.3	
1928	18.0	14.6	13.5	9.2	7.5	9.8	24.5	177.4	180.3	104.6	25.5	11.6	596.5	125.1	
1929	12.4	9.7	6.5	5.8	5.1	7.1	24.4	135.3	189.2	90.0	42.0	33.5	561.0	117.7	
1930	20.8	9.5	9.2	6.8	6.4	7.7	58.2	89.4	136.6	46.4	49.6	20.0	460.6	96.6	
1931	16.8	9.5	4.2	3.8	3.9	4.6	17.6	64.7	142.0	34.6	19.8	12.8	334.3	70.1	
1932	12.0	9.2	3.4	5.6	5.4	5.5	30.7	128.7	153.9	75.5	21.6	10.9	462.4	97.0	
1933	9.8	8.8	5.6	4.2	4.4	6.6	15.7	71.0	238.7	67.4	18.9	14.7	465.8	97.7	
1934	11.7	8.4	6.4	5.2	5.6	8.4	26.8	102.4	47.3	13.2	10.6	8.5	254.5	53.4	
1935	7.0	6.9	5.4	5.2	4.7	6.0	15.1	47.1	182.9	81.1	22.9	13.0	397.3	83.3	
1936	10.2	8.4	6.4	6.3	5.5	7.3	65.7	186.3	150.2	55.0	34.1	14.1	549.5	115.3	
1937	14.3	9.4	6.8	5.3	5.0	6.1	23.0	93.4	84.5	42.4	17.8	12.7	320.7	67.3	
1938	14.8	12.4	10.2	7.4	5.7	9.5	43.4	141.6	210.4	65.3	19.0	23.2	562.9	118.1	
1939	11.7	8.5	6.7	6.9	6.1	9.9	29.9	131.2	101.2	21.8	11.7	7.4	353.0	74.1	
1940	8.9	6.6	5.6	5.0	5.5	9.7	21.1	86.1	89.3	29.7	12.6	12.9	293.0	61.5	
1941	15.0	7.0	5.2	4.9	4.7	9.3	19.3	122.4	112.7	31.7	15.1	11.0	358.3	75.2	
1942	11.5	9.7	7.5	6.1	5.6	6.3	33.6	91.4	185.9	55.0	14.3	7.2	434.1	91.1	2/
1943	7.4	7.4	6.5	6.3	5.8	6.8	36.3	85.1	139.3	48.2	18.6	8.8	376.5	79.0	
1944	7.8	6.0	5.4	4.5	4.9	6.5	14.2	75.5	151.7	42.8	9.8	4.9	334.0	70.1	
1945	6.5	6.1	5.1	4.4	4.8	6.2	14.7	87.1	128.6	76.0	37.5	11.5	388.5	81.5	
MEAN															
14-24	13.4	9.0	6.9	6.2	5.8	8.3	29.1	116.6	176.6	65.9	24.9	14.2	476.7		
26-45	13.4	9.0	6.9	6.2	5.6	8.3	29.1	116.6	176.6	65.9	24.9	14.2	476.7		
14-45	13.4	9.0	6.9	6.2	5.7	8.3	29.1	116.6	176.6	65.9	24.9	14.2	476.7		

NOTES

1/ U.S.G.S. Water Supply Paper 918
2/ Annual U.S.G.S. Water Supply Papers

E - Estimated by Committee

Lat. 39° 33', Long. 107° 19'
S. 9, T. 6 S., R. 89 W.
½ mile upstream from Roaring Fork

STATION LOCATION

COLORADO RIVER AT GLENWOOD SPRINGS, COLORADO

NAME OF STATION

4560 Square Miles

DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914	86.7	63.2	42.0	45.1	41.9	62.2	154.6	767.4	1114.0	358.2	166.4	100.9	3002.6	144.3	
1915	100.6	58.3	38.0	38.5	37.1	45.8	136.2	284.0	566.9	273.0	95.2	60.9	1734.5	83.4	
1916	69.1	48.0	42.7	44.4	39.4	76.6	142.5	454.7	704.2	299.3	181.8	105.6	2208.3	106.1	
1917	96.6	62.4	48.2	42.7	40.9	48.2	172.4	422.4	1185.0	583.6	155.1	90.2	2947.7	141.7	
1918	72.8	68.9	59.3	50.8	49.0	79.0	126.4	566.5	1166.0	327.8	112.0	99.9	2778.4	133.5	
1919	89.2	68.0	52.0	47.0	40.1	63.5	156.7	455.9	319.6	144.2	91.5	68.5	1596.2	76.7	
1920	63.6	60.4	51.7	44.6	39.7	47.0	74.9	725.4	989.0	360.0	154.9	96.6	2707.8	130.2	
1921	81.7	67.7	50.7	49.6	38.9	76.9	103.0	627.1	1154.0	341.0	183.3	113.6	2887.5	138.8	
1922	70.3	63.0	65.2	50.1	46.9	75.5	102.6	458.5	663.5	189.9	110.5	74.6	1970.6	94.7	
1923	56.1	51.4	48.9	46.8	41.1	47.0	92.9	506.1	899.7	416.7	186.1	101.4	2494.2	119.9	
1924	110.8	76.2	52.6	52.3	48.6	51.7	149.1	490.2	783.3	222.9	77.7	61.2	2176.6	104.6	
1925	84.0	67.7	45.1	45.2	40.8	78.0	164.0	396.7	439.5	204.5	104.7	101.3	1771.5	85.2	
1926	90.9	64.7	48.6	45.4	39.0	54.7	197.0	593.2	856.8	384.8	138.0	58.5	2571.6	123.6	1/
1927	63.0	56.9	45.8	43.4	38.8	52.9	135.6	700.0	688.5	296.6	169.0	96.7	2387.2	114.7	
1928	93.2	79.3	62.0	58.6	46.9	72.9	129.5	843.3	789.9	417.9	135.5	86.2	2815.2	135.3	
1929	77.6	66.8	42.5	47.2	41.3	58.5	135.9	588.2	912.6	390.2	212.9	160.8	2734.5	131.4	
1930	110.2	76.2	54.8	51.5	47.1	55.0	263.4	380.5	573.7	198.1	202.7	96.7	2109.9	101.4	
1931	78.3	50.8	40.4	36.2	35.2	44.4	94.9	261.6	363.0	113.3	67.1	58.3	1243.5	59.8	
1932	50.6	38.5	30.1	28.9	30.5	44.0	144.4	538.1	642.8	286.6	115.8	58.6	2008.9	96.6	
1933	56.9	49.7	40.7	41.1	33.5	47.0	73.0	281.8	907.0	234.2	88.8	66.6	1920.3	92.3	
1934	58.3	46.9	41.5	36.9	33.9	44.8	103.0	344.5	164.0	57.2	56.7	42.5	1030.2	49.6	
1935	35.7	35.3	32.7	32.9	29.8	41.3	76.3	207.4	690.7	266.7	103.7	68.1	1620.6	77.9	
1936	56.2	52.8	34.1	35.6	34.4	44.1	214.8	751.9	576.6	236.4	167.2	78.8	2282.9	109.7	
1937	65.2	53.6	40.0	34.8	36.3	48.1	97.4	429.3	342.7	173.9	75.9	65.5	1462.7	70.3	
1938	67.0	58.7	42.4	39.7	39.2	68.0	168.0	538.8	895.3	296.7	106.0	113.1	2432.9	116.9	
1939	68.3	53.9	53.0	50.4	40.8	67.6	146.8	583.2	420.8	124.9	66.6	51.5	1727.8	83.1	
1940	54.7	44.3	35.6	35.9	36.5	48.6	90.4	355.3	362.5	125.8	58.1	61.0	1308.7	62.9	
1941	71.0	49.4	42.5	36.4	37.4	50.5	84.6	534.5	469.6	163.4	83.7	67.4	1690.4	81.3	
1942	78.1	59.3	48.0	42.6	40.6	46.4	166.6	389.1	721.5	229.6	78.5	46.1	1946.4	93.6	2/
1943	52.7	49.2	40.1	37.1	35.9	48.5	161.9	342.0	581.6	253.5	108.5	66.1	1777.1	85.4	
1944	60.4	67.3	64.4	37.4	44.2	50.3	84.7	301.6	497.6	184.6	72.3	45.4	1510.2	72.6	
1945	60.3	56.6	58.6	41.4	36.7	61.6	72.0	347.0	461.4	267.7	180.5	73.3	1717.1	82.5	
MEAN															
14-45	72.8	58.3	46.7	42.8	39.4	56.3	131.7	483.3	684.5	263.2	122.1	79.3	2080.4		

NOTES

1/ U.S.G.S. Water Supply Paper 918
2/ Annual U.S.G.S. Water Supply Papers

UPPER COLORADO RIVER COMPACT COMMISSION
ENGINEERING ADVISORY COMMITTEE

Lat. 39° 33' Long. 107° 20'
S. 9, T. 6 S., R. 89 W.
1500 feet upstream from mouth

STATION LOCATION

ROARING FORK AT GLENWOOD SPRINGS, COLORADO
NAME OF STATION

1460 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914	43.2	36.6	29.0	24.6	25.0	30.7	59.5	432.9	652.5	383.1	80.5	47.1	1844.7	179.4	
1915	44.7	30.1	26.5	22.8	20.5	22.8	38.9	85.7	256.6	126.8	41.8	31.3	748.5	72.8	
1916	30.7	27.9	26.1	24.8	21.2	37.5	69.2	189.4	401.5	229.4	114.8	58.7	1231.2	119.8	
1917	66.3	38.0	33.2	32.0	26.1	32.2	58.3	169.6	498.9	341.0	102.7	64.7	1463.0	142.3	
1918	46.9	37.2	31.9	29.5	24.5	36.8	58.2	226.8	578.6	166.9	61.1	63.1	1361.5	132.4	
1919	51.5	41.5	33.7	31.4	24.0	31.2	71.2	231.1	200.2	97.0	54.7	46.4	913.9	88.9	
1920	42.2	34.5	31.5	30.0	24.0	27.7	36.1	305.5	455.4	230.3	88.9	49.9	1356.0	131.9	
1921	43.0	35.1	29.5	25.6	20.8	31.0	40.0	196.5	511.0	198.5	91.9	61.8	1284.7	125.0	
1922	39.7	30.4	27.0	25.6	22.3	32.2	51.8	257.4	336.2	129.1	71.1	49.6	1072.4	104.3	
1923	38.9	34.0	33.5	28.8	20.1	25.8	47.1	218.0	400.5	233.7	99.7	56.1	1236.2	120.3	
1924	47.2	34.7	32.4	32.3	24.0	24.2	48.4	198.5	360.7	117.7	36.9	33.4	990.4	96.3	1/
1925	38.2	31.2	25.8	23.3	21.2	29.7	66.1	196.3	241.9	146.6	78.5	79.7	978.5	95.2	
1926	59.4	41.2	28.0	23.4	20.0	25.3	57.8	174.5	307.7	163.2	54.6	32.5	987.6	96.1	
1927	41.9	33.1	29.9	26.9	22.2	25.4	47.9	257.5	359.9	165.3	89.6	70.6	1170.2	113.8	
1928	55.7	41.2	33.9	27.8	24.9	29.4	46.4	269.2	296.5	171.2	60.6	43.4	1100.2	107.0	
1929	38.1	32.6	29.2	26.8	22.6	26.0	44.5	224.3	386.9	169.7	93.9	111.7	1206.3	117.3	
1930	76.6	50.7	32.2	27.3	22.3	23.8	72.1	134.7	265.7	109.7	85.0	44.0	944.1	91.8	
1931	38.3	28.8	25.9	22.6	17.1	18.8	28.1	86.5	166.8	56.6	26.2	32.2	547.9	53.3	
1932	38.2	26.9	22.2	21.1	19.5	22.6	61.0	248.7	348.0	214.6	79.9	38.5	1141.2	111.0	
1933	40.2	34.3	31.1	35.9	24.7	24.5	33.6	130.5	409.4	103.5	42.0	38.9	948.6	92.3	
1934	33.2	25.2	20.9	20.5	17.0	20.9	52.7	169.1	72.5	26.3	18.0	22.8	499.1	48.5	
1935	25.1	21.6	20.6	17.8	14.7	17.1	32.9	102.4	382.0	165.4	56.3	43.3	899.2	87.5	
1936	37.9	28.8	25.8	24.3	20.2	22.0	94.7	341.1	264.1	90.2	60.0	38.9	1048.0	101.9	
1937	35.6	28.0	23.5	21.2	19.1	21.9	39.9	241.9	191.8	94.7	35.8	35.7	789.1	76.8	
1938	35.9	29.4	26.3	22.9	17.5	24.2	64.4	218.6	447.2	186.1	63.2	58.3	1194.0	116.2	
1939	40.4	33.4	29.2	25.3	19.5	25.6	55.5	218.2	191.5	62.0	27.9	38.6	767.1	74.6	
1940	32.9	25.5	20.2	19.3	16.9	21.2	39.6	154.7	153.1	46.5	21.3	38.7	589.9	57.4	
1941	39.8	27.1	22.9	20.3	17.0	20.4	30.6	234.5	242.7	120.0	43.7	42.6	861.6	83.8	
1942	56.2	37.2	29.4	23.8	19.0	20.0	70.2	184.5	352.0	139.4	45.3	31.0	1008.0	98.1	2/
1943	29.8	27.3	24.2	21.4	19.0	22.6	72.9	159.9	305.2	130.5	77.8	42.9	933.5	90.8	
1944	34.4	29.8	25.1	23.7	19.8	21.0	28.0	179.6	294.1	163.4	42.2	23.3	884.4	86.0	
1945	30.6	28.8	24.7	22.8	17.9	20.6	30.3	159.7	254.3	182.2	85.1	38.7	895.7	87.1	
MEAN 14-45	42.3	32.5	27.6	25.2	20.8	25.5	51.5	206.2	330.8	155.0	63.5	47.1	1028.0		

NOTES

1/ U.S.G.S. Water Supply Paper 918
2/ Annual U.S.G.S. Water Supply Papers

Lat. 39° 13' Long. 108° 15'
S. 6, T. 10 S., R. 97 W.
3.4 miles upstream from Plateau Creek

STATION LOCATION

COLORADO RIVER NEAR CAMEO, COLORADO
NAME OF STATION

8055 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914													E 5475.0	156.2	
1915													E 2800.0	79.9	
1916													E 3875.0	110.6	
1917													E 4975.0	141.9	
1918													E 4675.0	133.4	
1919													E 2850.0	81.3	
1920													E 4575.0	130.5	
1921													E 4700.0	134.1	
1922													E 3450.0	98.4	
1923													E 4200.0	119.8	
1924													E 3575.0	102.0	
1925													E 3100.0	88.4	
1926													E 4025.0	114.8	
1927													E 4000.0	114.1	
1928													E 4425.0	126.2	
1929													E 4450.0	127.0	
1930													E 3450.0	98.4	
1931													E 2000.0	57.1	
1932													E 3550.0	101.3	
1933													E 3225.0	92.0	
1934	98.3	85.4	87.0	87.4	76.0	91.3	193.9	630.0	256.4	93.2	86.4	74.0	1859.3	53.0	
1935	66.6	61.7	61.7	61.6	52.3	62.8	115.5	357.3	1272.0	475.8	156.9	116.7	2860.9	81.6	
1936	108.4	93.3	73.3	73.7	68.3	75.7	329.4	1168.0	942.5	347.5	234.8	122.2	3637.1	103.8	1/
1937	109.1	90.0	76.4	70.4	70.4	90.0	153.1	744.1	588.8	302.2	126.6	116.2	2537.3	72.4	
1938	122.3	103.9	91.9	79.0	71.7	117.9	275.4	866.2	1462.0	514.0	170.3	187.0	4061.6	115.9	
1939	121.1	103.8	103.9	90.8	75.0	111.8	207.1	842.9	657.7	188.3	100.4	102.0	2704.8	77.2	
1940	95.5	77.9	62.5	62.9	62.6	78.4	137.3	541.8	533.3	161.8	81.9	102.6	1998.5	57.0	
1941	122.8	85.1	73.9	64.9	66.6	82.2	133.2	948.2	803.2	324.7	143.6	121.9	2960.3	84.5	
1942	166.1	123.7	103.5	89.6	86.1	102.9	333.7	757.4	1215.0	406.5	138.6	86.3	3609.4	103.0	
1943	93.7	94.2	83.8	76.6	73.8	88.7	237.1	509.1	931.2	387.3	192.2	117.0	2884.7	82.3	2/
1944	111.3	115.2	106.6	74.4	76.4	81.5	117.5	564.4	889.8	377.6	123.0	77.6	2715.3	77.5	
1945	98.7	100.4	98.9	78.2	71.7	94.6	115.5	601.1	794.6	498.6	287.1	117.7	2957.1	84.4	
MEAN 34-45	109.5	94.5	85.3	75.8	70.9	89.8	195.7	710.9	862.2	339.0	153.5	111.8	2898.9		
14-45													3505.0		

NOTES

1/ U.S.G.S. Water Supply Paper 918
2/ Annual U.S.G.S. Water Supply Papers

E - Estimated

UPPER COLORADO RIVER COMPACT COMMISSION
ENGINEERING ADVISORY COMMITTEE

Lat. 39° 11' Long. 108° 16'
SW¼ S. 18, T. 10 S., R. 97 W.
1.1 miles upstream from mouth

STATION LOCATION

PLATEAU CREEK NEAR CAMEO, COLORADO
NAME OF STATION

604 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914													E 280.0	150.3	
1915													E 150.0	80.5	
1916													E 250.0	134.2	
1917													E 285.0	153.0	
1918													E 170.0	91.3	
1919													E 130.0	69.8	
1920													E 315.0	169.1	
1921													E 270.0	145.0	
1922													E 250.0	134.2	
1923													E 212.0	113.8	
1924													E 158.0	84.8	
1925													E 130.0	69.8	
1926													E 188.0	101.0	
1927													E 215.0	115.4	
1928													E 220.0	118.1	
1929													E 308.0	165.4	
1930													E 180.0	96.7	
1931													E 85.0	45.6	
1932													E 228.0	122.4	
1933													E 128.0	68.7	
1934													E 52.0	27.9	
1935													E 113.0	60.7	
1936								41.4	8.8	1.9	2.2	2.0	E 122.0	65.5	
1937	3.1	3.8	3.7	3.2	2.8	4.5	10.5	53.5	14.9	7.2	2.4	2.7	112.3	60.3	
1938	5.2	4.6	4.8	4.4	4.1	6.9	30.1	73.7	66.5	8.8	3.7	8.3	221.1	118.7	1/
1939	6.8	6.6	5.9	6.0	4.1	7.8	16.6	36.9	6.7	1.9	1.8	3.4	104.5	56.1	
1940	3.5	3.6	3.3	3.4	4.1	5.6	15.7	41.9	3.0	1.3	1.5	3.0	89.9	48.3	
1941	6.3	5.1	5.6	5.4	5.1	6.5	12.3	103.6	43.6	5.5	4.5	7.8	211.3	113.5	
1942	20.5	11.1	9.1	6.4	6.3	7.3	45.2	112.2	67.4	7.5	4.4	4.9	302.3	162.3	2/
1943	6.3	7.1	6.4	5.4	5.0	6.8	18.5	30.6	19.3	2.6	8.4	4.3	120.7	64.8	
1944	5.3	5.6	4.7	3.6	4.3	5.4	8.9	72.8	61.3	11.9	4.2	3.6	191.6	102.9	
1945	5.0	5.9	4.0	4.6	5.1	6.6	10.7	62.6	43.5	8.2	7.2	4.0	167.4	89.9	
MEAN 37-45	6.9	5.9	5.3	4.8	4.5	6.4	18.7	65.3	36.2	6.1	4.2	4.7	169.0		
14-45													186.3		

NOTES

1/ U.S.G.S. Water Supply Paper 918
2/ Annual U.S.G.S. Water Supply Papers

E - Estimated

Lat. 39° 02' Long. 108° 34'
NW¼ S. 35, T. 1 S., R. 1 W.
2 miles upstream from mouth

STATION LOCATION

GUNNISON RIVER NEAR GRAND JUNCTION, COLORADO
NAME OF STATION

8020 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914													E 2797.0	136.1	
1915													E 1850.0	90.0	
1916													E 2610.0	127.0	
1917	61.5	56.5	55.3	52.3	50.0	79.9	207.1	632.5	1090.0	406.4	108.6	49.9	2850.0	138.7	
1918	55.9	61.9	55.5	55.3	58.0	83.8	162.3	555.4	662.3	149.1	46.7	77.8	2024.0	98.5	
1919	62.9	74.6	68.4	49.9	48.9	81.3	256.5	505.4	292.2	126.0	68.3	42.6	1677.0	81.6	
1920	55.6	70.5	60.0	56.5	75.2	66.5	110.9	1161.0	953.0	284.1	88.3	44.3	3025.9	147.3	
1921	79.9	83.0	57.1	64.6	59.6	89.8	127.8	633.6	1031.0	286.6	154.6	90.8	2758.4	134.2	
1922	65.7	76.5	75.0	61.1	51.2	74.3	177.4	916.9	609.0	114.6	57.1	29.3	2308.1	112.3	
1923	45.6	61.8	61.3	54.8	44.9	50.9	128.6	712.3	674.6	286.9	180.8	105.2	2407.7	117.2	
1924	114.3	89.4	65.4	60.1	57.1	55.7	207.2	632.6	580.1	95.1	17.5	22.3	1996.9	97.2	
1925	75.4	80.3	60.4	58.1	57.2	93.5	248.6	376.7	310.1	148.4	95.5	120.2	1724.4	83.9	
1926	129.1	80.3	61.5	49.2	56.3	69.7	262.1	543.7	512.3	156.5	49.8	23.9	1994.4	97.1	
1927	82.8	74.2	64.9	59.0	58.0	76.2	222.2	729.5	547.2	235.5	111.6	172.3	2433.4	118.4	1/
1928	130.6	98.6	81.3	82.0	67.8	104.0	182.4	871.3	557.2	191.7	62.7	43.0	2472.6	120.3	
1929	77.7	84.3	58.2	45.3	46.5	109.8	202.9	889.3	768.4	273.3	217.9	295.1	3068.7	149.3	
1930	151.5	114.7	73.6	49.9	77.4	72.1	389.1	405.1	444.8	107.6	162.0	52.1	2099.9	102.2	
1931	83.6	70.9	67.5	66.4	57.5	52.0	61.0	129.7	126.9	32.2	15.9	23.2	786.8	38.3	
1932	85.6	77.0	66.2	47.0	68.6	76.2	342.0	703.7	483.7	192.9	74.4	42.1	2259.4	110.0	
1933	56.5	67.1	52.7	38.1	40.6	64.8	75.2	359.5	553.8	82.1	32.7	44.0	1467.1	71.4	
1934	55.4	61.2	57.4	46.1	44.4	43.4	74.1	155.0	34.4	10.1	9.4	15.9	606.8	29.5	
1935	16.5	30.7	48.8	44.2	38.2	45.0	59.1	265.5	583.0	147.7	55.6	52.4	1386.7	67.5	
1936	63.6	60.9	49.9	50.1	44.9	55.2	291.5	629.3	301.9	72.7	79.4	53.5	1752.9	85.3	
1937	51.4	61.0	52.8	44.3	44.0	64.9	163.2	624.0	246.9	82.4	27.8	33.2	1495.9	72.8	
1938	57.9	62.3	61.9	54.3	45.4	78.1	355.2	644.4	749.1	182.0	51.6	111.5	2453.7	119.4	
1939	76.5	75.9	67.1	64.2	55.4	106.4	214.0	376.7	232.4	35.2	38.1	61.2	1403.1	68.3	
1940	51.6	59.7	49.9	48.4	45.0	61.4	128.3	335.7	162.5	29.9	31.5	48.9	1052.8	51.2	
1941	87.6	62.1	55.2	50.7	50.5	63.4	123.2	871.0	563.2	191.9	95.2	81.0	2295.0	111.7	
1942	197.7	121.3	83.7	70.7	62.3	75.9	546.5	759.5	687.9	167.2	67.6	55.5	2895.8	140.9	2/
1943	56.9	65.3	58.4	56.6	47.9	56.1	279.5	388.7	397.3	113.2	153.6	87.2	1760.7	85.7	
1944	68.7	74.5	61.0	51.4	48.0	53.4	102.0	757.4	693.6	230.4	51.4	44.8	2236.6	108.9	
1945	58.3	71.0	63.6	54.9	46.7	52.1	90.7	627.7	407.0	163.6	122.3	46.2	1804.1	87.8	
MEAN 17-45	77.8	73.4	61.8	54.7	53.4	70.9	199.7	592.9	526.0	158.4	80.3	67.9	2017.2		
14-45													2054.9		

NOTES:

1/ U.S.G.S. Water Supply Paper 918
2/ Annual U.S.G.S. Water Supply Papers

E - Estimated

UPPER COLORADO RIVER COMPACT COMMISSION
ENGINEERING ADVISORY COMMITTEE

Lat. 38° 41' Long. 108° 58'
SW¼ S 15, T 51 N, R 19 W
0.3 mile downstream from West Creek
STATION LOCATION

DOLORES RIVER AT GATEWAY, COLORADO
NAME OF STATION

4,350 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914													E 640.0	81.2	
1915													E 730.0	92.6	
1916													E 1090.0	138.3	
1917													E 1150.0	145.9	
1918													E 350.0	44.4	
1919													E 575.0	73.0	
1920													E 1265.0	160.5	
1921													E 1400.0	177.7	
1922													E 1057.0	134.1	
1923													E 897.0	113.8	
1924													E 650.0	82.5	
1925													E 543.0	68.9	
1926													E 957.0	121.4	
1927													E 1060.0	134.5	
1928													E 687.0	87.2	
1929													E 980.0	124.4	
1930													E 630.0	79.9	
1931													E 285.0	36.2	
1932													E 980.0	124.4	
1933													E 370.0	47.0	
1934													E 230.0	29.2	
1935													E 580.0	73.6	
1936													E 535.0	67.9	
1937						22.7	262.8	277.0	72.1	34.0	18.9	12.1	E 705.0	89.5	1/
1938	10.6	8.1	10.3	10.2	11.2	39.8	292.4	215.8	192.9	48.3	14.8	34.3	888.7	112.8	
1939	15.6	11.0	11.4	9.7	9.3	54.8	110.5	87.6	35.4	8.4	7.6	17.9	379.2	48.1	
1940	7.8	6.9	6.3	7.9	12.4	17.4	121.3	171.7	66.7	11.7	7.2	17.0	454.3	57.7	
1941	34.3	12.1	13.1	13.6	20.0	41.1	174.3	614.8	248.1	98.3	31.1	32.2	1333.0	169.2	
1942	197.1	61.1	33.8	25.8	22.1	49.8	516.4	387.1	213.2	45.9	16.7	8.3	1577.3	200.2	2/
1943	9.3	9.9	11.6	11.5	13.9	20.5	212.2	133.3	97.5	23.9	34.1	18.8	596.5	75.7	
1944	10.7	9.2	10.0	9.4	12.2	16.8	96.9	463.2	266.7	72.9	14.5	4.8	987.3	125.3	
1945	7.5	11.9	11.5	11.7	15.7	14.1	134.1	296.3	88.0	32.1	29.0	5.8	657.7	83.5	
MEAN 38-45	36.6	16.3	13.5	12.5	14.6	31.8	207.2	296.2	151.0	42.7	19.4	17.4	859.2	109.0	
14-45													788.1	100.0	

1/ Water Supply Paper 918
2/ U.S.G.S. Annual Water Supply Papers

NOTES

E - Estimated

Lat. 38° 49' Long. 109° 18'
NW¼ Sec. 17 T 23 S R 24 E
1 mile downstream from Dolores River
STATION LOCATION
October 1913 - November 1914 - Colorado River at Moab, Utah

COLORADO RIVER NEAR CISCO, UTAH
NAME OF STATION

24,100 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914	249.3	214.8	141.8	180.2	151.4	224.1	584.0	2080.0	2808.0	1129.0	499.0	265.3	8526.9	137.8	
1915	373.6	209.8	144.5	130.4	140.8	176.6	577.8	1117.0	1548.0	615.8	184.2	129.2	5347.7	86.4	1/
1916	171.5	164.8	155.4	181.6	186.2	422.6	754.7	1679.0	2012.0	853.8	636.1	286.1	7503.8	121.3	
1917	423.6	205.9	166.4	123.0	138.8	193.3	530.1	1519.0	3304.0	1513.0	422.4	231.3	8768.8	141.8	
1918	186.8	184.8	170.8	155.4	159.3	263.5	403.0	1413.5	2352.4	667.1	202.8	236.6	E 6396.0	103.4	
1919	228.6	220.8	204.2	151.6	136.0	249.0	579.5	1439.8	929.5	372.4	213.0	149.6	E 4874.0	78.8	
1920	157.5	185.1	172.7	178.0	190.5	202.0	278.6	2845.3	3090.1	1015.5	379.1	205.6	E 8900.0	143.9	
1921	245.5	241.1	186.8	188.6	174.4	277.6	328.2	1911.7	3489.0	1004.4	524.9	323.8	E 8896.0	143.8	
1922	211.9	229.1	227.7	178.9	150.0	258.0	439.6	2220.9	2051.6	485.0	259.4	167.9	E 6880.0	111.2	
1923	138.5	188.2	188.6	183.7	154.2	171.6	431.6	1750.0	2206.0	1039.0	524.1	297.7	7273.2	117.6	
1924	292.8	243.1	183.7	150.3	188.9	170.1	620.9	1570.0	1799.0	470.2	112.4	123.7	5932.1	95.9	
1925	196.7	189.9	149.4	135.3	144.4	219.1	564.4	1094.0	1101.0	548.8	307.5	374.4	5024.9	81.2	
1926	318.0	223.5	171.8	142.2	143.7	212.3	765.8	1685.0	1891.0	736.9	210.5	100.7	6601.4	106.7	
1927	211.1	185.9	166.3	163.4	160.3	208.8	622.0	2071.0	1878.0	877.4	474.2	528.8	7547.2	122.0	
1928	358.3	275.1	231.5	209.1	191.6	281.7	519.8	2323.0	1867.0	808.8	255.2	170.5	7491.6	121.1	
1929	252.2	225.2	145.2	140.2	128.5	267.4	676.3	2110.0	2387.0	882.3	622.3	674.2	8510.8	137.6	
1930	403.2	274.1	204.4	145.1	206.5	202.4	919.3	1032.0	1549.0	435.0	524.7	201.3	6097.0	98.6	
1931	233.4	172.7	142.9	135.5	152.7	147.1	211.0	547.7	686.5	200.8	92.3	142.8	2865.4	46.3	2/
1932	208.6	166.7	130.2	117.0	177.4	194.2	731.0	2062.0	1687.0	767.7	293.1	152.5	6687.4	108.1	
1933	167.2	179.2	132.7	132.2	126.3	176.6	179.9	809.9	2004.0	420.0	147.5	155.6	4631.1	74.9	
1934	160.5	152.0	153.7	140.2	125.4	136.2	227.0	672.2	261.2	65.0	62.5	64.2	2220.1	35.9	
1935	83.2	103.0	127.4	126.6	111.9	128.8	265.4	734.6	1967.0	642.5	215.7	174.8	4681.0	75.7	
1936	187.9	182.1	143.0	142.3	153.7	166.7	784.0	1879.0	1257.0	403.2	299.3	167.7	5765.9	93.2	
1937	156.5	172.5	148.5	115.8	133.3	196.3	579.4	1597.0	873.3	413.6	434.3	142.2	4663.8	75.4	
1938	184.1	180.8	169.3	149.4	140.3	255.1	918.0	1729.0	2404.0	735.5	202.5	354.2	7422.2	120.0	
1939	219.7	196.4	176.8	160.4	138.7	278.9	514.8	1208.0	867.1	187.6	109.8	194.1	4252.3	68.7	
1940	148.0	150.7	125.7	131.0	137.4	170.3	375.7	1048.0	739.9	179.3	86.4	171.8	3463.2	56.0	
1941	294.9	179.5	154.6	139.3	152.9	206.5	44.9	2355.0	1582.0	579.4	250.6	236.5	6576.1	106.3	
1942	579.0	311.3	229.3	180.7	165.6	228.5	1344.0	1809.0	1961.0	578.7	184.6	134.2	7705.9	124.6	3/
1943	161.7	186.0	164.2	153.1	146.2	174.2	708.7	995.6	1365.0	502.1	367.7	212.1	5136.6	83.0	
1944	184.4	215.4	189.5	139.9	152.1	166.5	303.6	1794.0	1843.0	677.2	148.7	99.0	5903.3	95.4	
1945	159.1	195.7	171.1	149.0	150.5	177.8	328.5	1495.0	1311.0	676.4	446.4	146.0	5406.5	87.4	
MEAN 14-45	236.1	200.2	167.8	151.6	153.4	212.6	547.2	1580.8	1783.5	640.1	293.5	219.2	6186.0		

1/ Water Supply Paper 918
2/ Record transcribed from Water Supply Paper 918

NOTES

3/ U.S.G.S. Annual Water Supply Papers
E - Estimated

UPPER COLORADO RIVER COMPACT COMMISSION
ENGINEERING ADVISORY COMMITTEE

SUM of the RIO BLANCO, RITO BLANCO and SAN JUAN RIVERS at PAGOSA SPRINGS, COLORADO
NAME OF STATION

(Rio Blanco) Long. 106 47' 40" Lat. 37 12' 45"
(Rito Blanco) Long. 106 54' 20" Lat. 37 11' 40"
(San Juan) Long. 107 00' 40" Lat. 37 15' 55"
STATION LOCATION

379 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914													E 438.0	109.6	
1915													E 524.0	131.2	
1916													E 555.0	138.9	
1917													E 572.0	143.2	
1918													E 286.0	71.6	
1919													E 376.0	94.1	
1920													E 620.0	155.2	
1921													E 454.0	113.6	
1922													E 416.0	104.1	
1923													E 390.0	97.6	
1924													E 421.0	105.4	
1925													E 294.0	73.6	
1926													E 328.0	82.1	
1927													E 506.0	126.7	
1928													E 298.0	74.6	
1929													E 450.0	112.6	
1930													E 290.0	72.6	
1931													E 212.0	53.1	
1932													E 551.0	137.9	
1933													E 248.0	62.1	
1934													E 152.0	38.0	
1935									229.8	98.5	27.5	13.5	E 469.0	117.4	
1936	7.7	4.9	3.7	3.4	3.3	13.3	68.2	110.7	44.4	12.4	25.7	19.7	317.4	79.4	
1937	10.5	11.8	6.2	5.3	4.2	9.3	86.5	177.6	106.1	27.2	8.8	5.4	458.9	114.9	
1938	6.4	4.3	3.4	3.9	3.6	12.5	67.7	112.7	159.3	37.9	11.4	21.6	444.7	111.3	
1939	13.9	6.5	4.7	4.2	3.3	16.3	42.6	81.7	39.1	6.3	4.7	12.8	236.1	59.1	
1940	5.5	4.4	2.9	2.9	3.3	12.7	33.7	81.7	33.5	7.5	6.3	9.5	203.9	51.0	
1941	14.2	7.0	6.5	5.3	5.7	10.8	33.8	208.1	211.4	117.5	24.6	22.4	667.3	167.0	1/
1942	79.2	22.7	11.7	7.7	5.7	7.6	78.5	123.1	133.0	28.2	8.6	5.6	511.6	128.1	
1943	4.5	4.7	4.4	4.2	4.3	9.7	66.1	81.2	63.8	19.3	11.1	5.7	279.0	69.8	
1944	5.2	4.6	3.8	3.5	3.9	5.5	31.4	150.3	166.4	46.0	8.4	4.4	433.4	108.5	
1945	8.9	6.1	4.9	4.5	4.3	6.7	39.7	144.4	117.9	31.5	9.9	3.5	382.3	95.7	
Mean 36-45	15.6	7.7	5.2	4.5	4.2	10.4	54.8	127.1	107.5	33.4	12.0	11.1	393.5		
14-45													399.5		

NOTES

E = Estimated

1/ U.S.G.S. Water Supply Papers

NAVAJO RIVER at EDITH, COLORADO
NAME OF STATION

Lat. 37 00' 10" Long. 106 54' 20"
NW ¼ S. 24, T. 32 N., R. 1 W.
340 feet downstream from highway bridge at Colorado-New Mexico State Line and 1 mile upstream from Coyote Creek.
STATION LOCATION

165 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914	3.3	2.7	2.6	2.3	1.9	9.9	20.7	32.8	E 32.7	E 12.5	E 9.8	E 7.6	139.4	105.7	
1915	8.7	3.7	2.5	2.2	2.7	6.8	25.2	34.7	38.4	20.7	6.2	3.1	154.9	117.5	
1916	2.6	2.4	2.4	2.5	3.8	21.2	32.2	36.3	33.4	20.2	12.8	4.6	174.4	132.3	
1917	12.1	3.3	3.2	3.8	2.8	3.2	20.5	32.2	54.5	E 30.7	E 5.0	3.4	174.7	132.5	
1918	2.8	2.0	2.3	1.9	2.2	5.3	9.3	18.7	21.8	8.4	4.4	3.2	82.3	62.4	
1919	2.2	1.9	2.0	2.2	2.9	8.7	22.5	45.3	24.1	17.0	6.9	4.6	140.3	106.4	
1920	4.8	4.8	4.8	2.9	4.0	21.8	42.1	78.3	46.5	17.8	9.3	3.4	240.5	182.4	2/
1921	2.7	2.7	2.6	2.2	1.9	4.2	9.7	32.2	46.5	15.2	14.4	5.3	139.6	105.9	
1922	3.6	2.6	2.6	2.4	3.1	7.2	26.6	56.5	35.7	9.4	3.5	2.1	155.3	117.8	
1923	1.9	2.0	2.0	3.3	4.5	6.3	14.2	33.2	29.2	11.2	7.9	6.3	122.0	92.5	
1924	5.8	3.3	2.9	3.5	3.8	4.3	26.3	33.4	20.1	13.0	4.2	2.3	122.9	93.2	
1925	1.9	1.8	1.7	1.1	2.6	7.9	19.5	23.1	17.7	8.6	5.3	4.7	95.9	72.7	
1926	7.0	3.2	2.8	E 2.2	E 2.7	E 5.7	22.3	34.2	30.6	14.8	5.0	2.5	133.0	100.9	
1927	2.8	2.1	2.2	2.3	2.8	6.3	27.0	40.5	24.4	15.7	6.5	16.8	149.4	113.3	
1928	6.5	5.7	3.9	3.4	3.8	6.8	9.4	27.4	13.5	5.4	3.8	1.6	91.2	69.2	
1929	1.5	2.1	1.8										E 148.0	112.3	
1930													E 93.0	70.5	
1931													E 71.0	53.9	
1932													E 183.0	138.8	
1933													E 78.0	59.2	
1934													E 57.0	43.2	
1935									51.0	21.4	8.7	5.8	E 155.0	117.6	
1936	4.5	2.6	2.0	2.1	2.3	9.5	32.6	31.5	10.8	4.4	7.1	5.9	115.3	87.4	
1937	4.9	4.9	3.0	3.2	3.3	7.2	46.4	53.8	27.0	10.0	3.7	2.4	169.8	128.8	
1938	3.4	2.2	1.9	2.1	2.1	6.8	29.1	35.4	39.2	10.4	3.8	6.1	142.5	108.1	
1939	4.5	2.5	2.4	2.2	1.9	8.4	18.7	25.1	11.5	2.7	2.2	4.1	86.2	65.[illegible]	
1940	2.1	1.8	1.4	1.6	1.9	6.1	12.5	22.9	11.2	3.1	3.0	2.8	70.4	53.4	3/
1941	4.0	2.6	2.7	2.3	2.4	5.1	21.1	73.5	55.1	32.7	9.3	7.7	218.5	165.7	
1942	19.1	8.4	6.4	3.7	2.7	5.7	51.5	41.1	35.9	9.6	4.3	3.0	191.4	145.2	
1943	2.9	2.9	2.2	1.1	1.0	4.5	22.7	20.7	18.5	6.9	3.6	1.8	88.8	67.3	
1944	2.5	2.0	1.6	1.5	1.6	2.8	12.0	33.6	39.2	12.9	3.9	2.4	116.0	88.0	
1945	3.0	2.4	2.5	2.2	2.3	3.0	15.8	43.7	28.5	9.3	4.6	2.0	119.3	90.5	
Mean 14-28															
36-45	4.8	3.1	2.7	2.4	2.7	7.4	23.6	37.6	29.8	12.9	6.0	4.4	137.4		
Mean 14-45													131.8		

NOTES

E = Estimated (Months by Colorado State Engineer, unpublished)

2/ Colorado and New Mexico State Engineers Reports
3/ U.S.G.S. Water Supply Papers

UPPER COLORADO RIVER COMPACT COMMISSION
ENGINEERING ADVISORY COMMITTEE

Sec. 16, T.32N., R. 5 W., ½ mile above mouth

STATION LOCATION

PIEDRA RIVER AT ARBOLES, COLORADO

NAME OF STATION

650 Square Miles

DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914	10.8	7.1	6.0	4.3	4.7	32.0	61.3	96.5	90.4	46.9	16.4	15.6	392.0	103.0	
1915	40.7	15.6	10.0	4.9	7.9	26.7	112.0	111.0	111.0	47.0	13.9	14.4	515.1	135.4	
1916	10.3	6.6	5.4	4.6	10.1	89.6	102.0	118.0	91.4	40.3	49.2	15.9	543.4	142.8	
1917	67.1	15.5	6.0	8.2	7.1	11.1	88.4	129.0	152.0	73.8	13.4	8.0	579.6	152.3	
1918	5.7	4.4	2.0	1.3	3.1	19.8	27.4	54.5	50.0	16.4	9.3	12.5	206.4	54.2	
1919	6.1	5.7	4.6	3.4	4.1	18.2	86.8	95.6	65.9	48.7	31.9	11.8	382.8	100.6	
1920	8.3	8.1	13.5	12.6	19.2	32.9	87.3	208.0	158.0	80.7	26.9	7.6	663.1	174.2	1/
1921	8.1	10.9	10.6	13.1	7.4	34.0	38.9	92.6	130.0	52.5	50.7	15.3	464.1	122.0	
1922	7.0	5.1	4.6	4.3	5.0	15.1	73.2	138.0	109.0	23.4	14.7	4.2	403.6	106.1	
1923	2.6	4.0	7.0	9.1	6.8	11.2	49.6	105.0	78.6	22.0	23.2	23.0	342.1	89.9	
1924	17.0	12.0	4.9	7.8	9.7	14.3	109.0	117.0	78.0	20.5	6.7	3.9	400.8	105.3	
1925	3.7	3.3	3.8	2.3	3.0	10.1	46.0	64.0	34.0	19.2	13.3	34.2	236.9	62.2	
1926	32.2	12.6	6.8	6.7								4.1	E308.0	80.9	
1927	7.0	6.0	5.0	4.6	4.3	15.7	73.8	112.0	86.3				E492.5	129.4	
1928													E261.5	68.7	
1929													E432.5	113.7	
1930													E255.0	67.0	
1931													E180.5	47.4	
1932													E560.5	147.3	
1933													E211.0	55.4	
1934													E128.5	33.8	
1935													E457.0	120.1	
1936													E296.5	77.9	
1937													E459.5	120.7	
1938													E438.5	115.2	
1939													E231.0	60.7	
1940													E170.0	44.7	
1941													E711.0	186.8	
1942													E534.0	140.3	
1943													E248.5	65.3	
1944													E369.5	97.1	
1945													E303.0	79.6	
MEAN															
14-25	15.6	8.2	6.5	6.3	7.3	26.2	73.5	110.8	95.7	41.0	22.5	13.9	427.5		
14-45													380.6		

E - Estimated

NOTES 1/ WSP 389 and Colo. State Engnr's Reports except 1916 and Dec. WY 1921 which are unpublished.

Sec. 20, T 32 N, R 5 W, 1/4 mile downstream from Piedra River
Lat. 37° 00' 20"
Long. 107° 24' 10"

STATION LOCATION

Record prior to Oct. 1920 is sum of Piedra & San Juan above mouth Piedra.

SAN JUAN RIVER AT ROSA

NAME OF STATION

1,990 square miles

DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914	29.8	19.2	15.0	12.9	15.3	76.6	145.2	261.5	258.4	108.4	52.1	54.8	1049.2	109.7	
1915	93.4	#32.4	#20.6	14.9	17.8	54.6	229.0	277.0	307.0	153.0	40.2	47.0	1286.9	134.5	
1916	23.2	15.3	13.5	15.5	e42.2	215.6	220.0	e270.0	265.4	126.1	141.1	47.8	1395.7	145.9	
1917	147.3	38.6	21.4	26.8	25.1	56.5	198.4	264.0	399.0	206.8	39.4	21.5	1444.8	151.0	
1918	13.9	10.3	6.2	5.5	8.5	61.4	72.8	149.9	173.0	53.0*	30.6	32.9	618.0	64.6	1/
1919	14.3	14.5	8.8	7.8	8.7	43.9	175.9	231.6	178.9	127.3	59.8	26.3	897.8	93.9	
1920	19.0	20.3	32.1	32.3	63.2	90.9	191.3	510.0	435.0	199.7	57.5	21.0	1672.3	174.8	
1921	21.3	26.7	18.1	29.7	18.7	67.4	66.3	210.0	311.0	127.0	133.0	51.9	1081.1	113.0	
1922	21.5	12.4	11.1	11.2	13.1	50.2	169.0	328.0	292.0	63.8	27.9	10.2	1010.4	105.6	
1923	7.7	10.5	15.7	14.7	28.3	50.9	114.0	215.0	241.0	70.3	53.3	84.0	905.4	94.7	
1924	55.1	35.6	26.0	33.0	45.2	38.9	185.0*	273.4	206.8	53.0	20.1	10.1	982.2	102.7	
1925	14.9	17.3	17.1	10.1	14.2	46.1	109.4	143.3	121.5	68.1	29.2	54.2	645.4	67.5	2/
1926	57.1	34.3	20.8	20.8	16.3	40.6	125.4	208.4	174.1	35.5	21.2	15.9	770.4	80.5	
1927	20.3	a15.5	a15.7	a15.4	17.2	64.9	218.1	302.9	264.6	122.1	42.3	132.1	1231.1	128.7	
1928	45.6	33.3	19.6	18.4	16.9	a61.1	83.9	191.0	121.0	27.2	22.1	14.1	654.2	68.4	
1929	15.1	19.1	10.8	7.7	9.1	37.2	189.0	282.0	209.0	73.2	127.0	102.0	1081.2	113.0	
1930	37.5	19.8	8.3	7.8	19.9	29.2	141.0	127.0	120.0	57.7	55.7	13.8	637.7	66.7	3/
1931	15.1	10.0	8.1	7.1	11.2	19.0	65.6	129.0	102.0	29.4	22.1	32.8	451.4	47.2	
1932	41.6	19.8	15.4	15.4	48.4	116.0	292.0	352.0	284.0	135.0	57.6	23.6	1400.8	146.4	
1933	17.1	10.8	9.0	9.6	8.7	24.0	41.0	109.0	192.0	46.5	22.9	37.5	528.1	55.2	
1934	23.4	12.8	12.3	11.6	13.1	31.8	77.0	78.6	19.4	9.8	10.7	20.2	320.7	33.5	
1935	8.7	7.6	7.5	8.8	14.0	39.9	165.8	232.1	391.7	175.6	57.1	34.0	1142.8	119.5	
1936	19.8	12.7	9.0	9.4	9.3	66.8	189.7	225.0	80.6	23.6	55.7	39.4	741.0	77.5	
1937	22.0	25.6	12.9	11.1	15.0	76.9	318.3	365.1	200.7	62.3	24.4	14.3	1148.6	120.1	4/
1938	17.7	11.7	10.2	12.1	13.4	78.7	226.8	269.9	291.3	76.3	26.2	62.0	1096.3	114.6	
1939	40.8	16.5	11.0	9.9	8.1	66.6	117.7	171.1	74.6	13.1	11.5	37.1	578.0	60.4	
1940	15.1	12.7	8.7	8.7	11.6	37.5	76.3	146.6	58.7	14.6	14.1	20.4	425.0	44.4	
1941	38.0	17.4	14.9	13.4	28.3	79.1	223.8	582.5	440.5	224.3	60.0	54.9	1777.1	185.8	
1942	178.1	65.4	32.7	25.5	21.4	44.9	347.9	273.5	251.9	56.5	21.5	15.2	1334.5	139.5	
1943	13.3	12.2	10.8	10.7	15.8	44.5	166.9	152.3	114.6	37.2	29.1	14.4	621.8	65.0	
1944	14.5	13.4	11.3	9.7	10.7	25.4	118.7	303.1	290.0	98.1	19.4	9.1	923.4	96.5	
1945	19.0	14.4	9.5	10.0	13.4	28.8	132.8	264.3	181.1	50.6	24.7	9.3	757.9	79.2	
MEAN															
14-45	35.0	19.9	14.5	14.3	19.4	58.3	162.3	246.9	220.3	85.2	44.1	36.4	956.6		

a-Revised in accordance with Tipton-Barrows report, 2-8-1934
e-Partial record estimated #-Piedra-USGS WSP; San Juan-Colo. State Engnrs. Report
*-Indicates recorded value has been revised

1/ Colo. except CY 1916 from N.M.
2/ N.M. Engnrs' Reports
3/ Colorado State Engnrs' Report
4/ Annual Water Supply Papers

UPPER COLORADO RIVER COMPACT COMMISSION
ENGINEERING ADVISORY COMMITTEE

LOS PINOS RIVER AT IGNACIO
NAME OF STATION

Sec. 5, T 33N, R 7 W,
2 mi. upstream from Rock Creek
Lat. 37° 07' 45" Long. 107° 37' 50"
3/4 mi. upstream from Ignacio
STATION LOCATION

448 square miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914	11.4	7.4	7.0	5.0	6.5	23.8	43.9	93.5	94.0*	41.0*	[illegible].2	1.3	343.0	133.8	
1915	26.4	10.8	5.4	3.4	5.0	15.9	55.4	80.3	116.0	45.4	4.5	7.0	375.5	146.5	
1916	5.5	4.0	4.5	5.8	7.8	41.7	60.6	86.0	93.1	43.5	50.0*	17.8	420.3	163.9	
1917	74.6	18.8	6.2	7.3	7.8	7.5	37.9	68.4	129.0	66.9	6.1	3.5	434.0	169.3	
1918	3.8	1.6	3.6	4.1	3.2	11.9	15.3	43.3	40.9	10.5	1.9	13.5	153.6	59.9	
1919	1.7	2.2	3.9	5.4	4.1	9.2	43.3	100.0	65.2	50.6	20.9	5.2	311.7	121.6	
1920	4.4	7.4	10.9	11.1	15.1	23.1	48.6	152.0*	129.0	64.8	10.5	1.6	478.5	186.6	1/
1921	5.8	9.7	6.1	8.0	5.7	17.0	25.8	81.0	128.0	50.2	33.3	9.7	380.3	148.3	
1922	3.4	4.5	5.4	5.2	6.9	12.3	34.9	92.9	105.0	15.2	4.3	1.0	291.0	113.5	
1923	0.7	2.9	5.2	6.6	5.9	7.8	24.2	78.3	80.1	21.4	13.1	11.9	258.1	100.7	
1924	13.6	10.6	7.5	a 7.9	a 7.8	8.1	39.3	83.5	43.0*	5.6	0.7	1.9	229.5	89.5	
1925	3.1	3.2	2.5	3.2	3.3	7.8	22.7	41.1	41.0	14.7	9.1	30.6	182.3	71.1	
1926	28.6	14.1	8.4	5.8	3.5	8.6	28.1	71.7	58.8	10.4	1.4	0.7	240.1	93.6	
1927	6.4	4.2	5.4	5.4	5.0	12.3	45.2	109.3	75.7	33.3	5.2	53.3	360.7	140.7	
1928	17.1	11.1	10.2	8.6	7.5	13.6	19.2	51.1	26.7	1.8	2.3	2.4	171.6	66.9	
1929	3.8	7.6	6.0	3.4	3.9	14.9	36.5	84.8	69.6	19.0	60.0	33.5	343.0	133.8	2/
1930	22.2	8.8	3.0	2.6	5.2	7.6	33.5	36.1	31.1	10.8	16.2	1.0	178.1	69.5	
1931	3.7	4.4	6.1	4.1	3.6	4.7	13.2	34.5	27.4	8.1	1.7	5.4	116.9	45.6	
1932	13.6	6.7	6.4	6.2	9.4	22.6	56.4	104.0	81.4	23.7	23.7	8.1	362.2	141.3	
1933	3.5	2.0	4.0	4.9	4.0	5.9	8.9	20.5	50.6	6.6	0.6	6.9	118.4	46.2	
1934	7.7	4.1	5.2	5.3	3.8	5.3	14.4	8.9	0.5	0.2	0.6	2.8	58.8	22.9	
1935	0.6	0.7	3.0	3.6	4.4	9.2	34.2	52.5	123.5	25.0	8.5	6.4	271.6	105.9	
1936	4.2	4.7	4.8	4.2	4.1	13.6	49.5	61.8	10.7	0.9	8.0	6.4	172.9	67.4	
1937	1.8	5.7	5.1	4.2	4.1	12.4	66.2	101.7	27.7	4.1	1.2	1.1	235.3	91.8	3/
1938	3.0	3.2	3.2	3.4	4.1	13.3	47.2	68.7	96.8	17.7	0.8	19.3	280.7	109.5	
1939	16.0	9.0	5.5	5.2	4.0	12.3	25.0	38.7	9.7	0.3	0.4	9.5	135.6	52.9	
1940	2.0	4.8	3.2	3.6	4.0	9.0	16.6	29.6	2.2	0.3	0.4	8.0	83.7	32.6	
1941	17.7	7.5	7.1	6.4	6.1	19.1	34.3	125.6	107.7	81.0	10.4	7.9	430.8	168.0	
1942	52.4	18.6	18.1	17.7	14.4	9.2	47.0	46.3	48.9	10.6	7.6	4.4	295.2	115.1	
1943	2.2	5.8	3.7	3.8	4.0	10.5	35.6	31.4	11.9	6.4	6.5	4.9	126.7	49.4	
1944	11.1	5.1	6.6	5.1	•4.9	8.3	13.9	66.9	83.1	28.5	13.2	26.8	273.5	106.7	
1945	11.2	2.0	3.2	2.7	4.0	6.5	13.6	13.8	20.6	7.5	2.9	2.9	90.9	35.5	
MEAN 14-45	12.0	6.7	5.8	5.6	5.7	12.6	34.1	67.4	63.4	22.7	10.4	10.0	256.4		

1/ New Mexico Surface Water Supply Papers
2/ Colorado State Engineers Reports
3/ Water Supply Papers

NOTES:
* - Indicates recorded value has been revised.
a - Values published by Colo. State Engineer accepted as correct (See Tipton-Barrows report)

SAN JUAN RIVER NEAR (AT) BLANCO, NEW MEXICO
NAME OF STATION

Lat. 36° 43' 50" Long. 107° 48' 50"
NE ¼ S. 18, T 29N., R 9 W
½ mile upstream from Hwy. Bridge
1 mile upstream from Canyon Largo
STATION LOCATION

3558 square miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914													E 1440.0	114.3	
1915													E 1705.0	135.3	
1916													E 1890.0	150.0	
1917													E 1990.0	157.9	
1918													E 785.0	62.3	
1919													E 1240.0	98.4	
1920													E 2275.0	180.5	
1921													E 1525.0	121.0	
1922													E 1380.0	109.5	
1923													E 1205.0	95.6	
1924													E 1200.0	95.2	
1925													E 855.0	67.8	
1926													E 1045.0	82.9	
1927													E 1710.0	135.7	
1928				40.6	36.6	89.4	111.7	243.9	144.8	29.2	19.8	12.3	E 855.0	67.8	
1929	15.2	24.2	17.2	14.8	16.7	72.8	198.8	353.7	297.0	84.8	231.7	183.4	1510.3	119.8	1/
1930	75.0	28.2	16.9	14.1	28.6	43.7	182.0	169.0	167.0	68.2	78.9	14.4	886.0	70.3	
1931	16.9	13.3	15.8	12.8	17.7	27.5	72.7	159.0	119.0	36.4	19.8	38.9	549.8	43.6	
1932	62.0	26.7	18.2	18.4	59.5	149.0	379.0	478.0	369.0	164.0	99.5	33.1	1856.4	147.3	
1933	20.5	12.9	13.9	16.9	17.5	38.7	48.3	141.0	258.0	57.5	18.8	52.2	696.2	55.2	
1934	35.1	16.9	16.3	17.2	17.6	37.6	89.9	83.9	15.2	9.3	7.8	17.9	364.7	28.9	
1935	7.7	8.3	11.2	12.9	20.6	49.1	198.5	306.1	557.7	196.1	74.8	60.6	1503.6	119.3	
1936	31.4	18.3	13.4	13.2	13.3	91.3	243.5	274.4	96.6	20.6	65.9	52.2	934.1	74.1	
1937	28.2	33.1	19.0	16.3	22.2	103.1	383.9	460.6	232.0	73.8	23.0	12.3	1407.5	111.7	2/
1938	23.1	15.4	12.7	15.0	16.9	99.9	276.3	345.1	413.6	106.6	23.0	87.9	1435.5	113.9	
1939	59.9	26.3	18.1	16.0	13.6	94.7	143.8	212.6	85.8	7.1	5.5	45.2	728.6	57.8	
1940	16.4	16.6	11.9	13.4	18.7	50.1	93.3	174.1	61.1	10.1	16.0	27.2	508.9	40.4	
1941	57.3	23.1	22.6	21.1	48.5	120.0	264.7	784.1	565.3	305.4	70.2	69.2	2351.5	186.6	
1942	257.1	82.6	48.4	41.9	35.3	62.4	410.8	302.8	289.5	68.2	31.2	21.9	1652.1	131.1	
1943	17.0	16.1	14.6	15.5	24.0	55.1	186.0	178.9	123.2	48.6	36.4	21.6	737.0	58.5	
1944	29.3	20.0	19.1	13.2	14.5	38.8	133.1	383.0	380.3	129.4	34.0	40.3	1235.0	98.0	
1945	37.0	17.0	13.9	14.0	24.5	40.9	141.5	277.2	197.2	61.4	31.6	12.4	868.6	68.9	
MEAN 29-45	46.4	23.5	17.8	16.9	24.1	69.1	202.7	299.0	248.6	85.2	51.1	46.5	1130.9		
14-45													1260.2		

1/ New Mexico Surface Water Supply Papers
2/ U.S.G.S. Annual WSP; 1931 & 32 in 734

NOTES: E = Estimated

UPPER COLORADO RIVER COMPACT COMMISSION
ENGINEERING ADVISORY COMMITTEE

Sec. 20, T 35 N, R 9 W
1/2 mile upstream from Lightner Creek
Lat. 37° 17' Long. 107° 52'

STATION LOCATION

ANIMAS RIVER AT DURANGO
NAME OF STATION

692 square miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914	29.6	17.3	13.8	12.9	10.3	29.9	59.5	195.0	270.0	132.0	40.3	22.4	833.0	127.2	
1915	40.0	20.1	12.4	12.3	9.4	17.8	71.4	138.0	204.0	105.0	33.7	22.2	686.3	104.8	1/
1916	20.2	16.0	13.1	12.4	13.6	51.9	83.4	181.0	255.0	114.0	85.8	37.0*	883.4	134.9	
1917	103.0	32.6	20.0	19.5	16.3	20.0	55.2	122.0	348.0	179.0	46.9	25.7	988.2	150.9	
1918	22.9	13.4	8.8	12.1	7.2	18.4	32.5	116.0	167.0	55.0	36.2	45.6	535.1	81.7	
1919	21.7	16.5	16.6	11.7	10.6	16.6	75.9	212.0	149.0	98.7	47.1	31.0	707.4	108.0	
1920	20.3	16.8	17.3	18.5	20.2	26.8	49.9	326.0	322.0	133.0	47.1	24.4	1022.3	156.1	
1921	24.4	21.9	16.9	13.5	12.6	29.0	49.8	155.0	334.0	135.0	85.4	38.7	916.2	140.0	
1922	18.6	14.5	14.9	13.2	12.8	19.9	66.6	228.0	284.0	82.4	35.3	18.0	808.2	123.5	
1923	13.3	13.6	12.7	9.6	10.4	18.3	41.4	164.0	201.0	89.8	58.8	36.6	669.5	102.3	
1924	34.4	22.0	14.1	12.0	13.1	13.8	61.3	154.0	143.0	44.1	18.3	13.2	543.3	83.0	2/
1925	11.6	10.0	8.6	7.5	8.2	17.4	36.5	127.0	124.0	69.5	35.7	79.1	535.1	81.7	
1926	42.7	24.2	16.2	13.6	12.6	15.9	e 56.0	156.0	e 184.0	e 67.6	e 33.2	21.2	643.2	98.2	
1927	22.3	14.7	14.9	12.7	12.6	25.3	75.0*	170.0	205.0	104.0*	37.2	138.0*	831.7	127.1	
1928	44.0	27.0	17.8	16.9	15.6	21.6	39.2	141.0	130.0	60.3	26.7	20.0	560.1	85.6	
1929	18.4	18.6	14.7	13.5	10.9	15.7	51.1	164.0	199.0	94.1	92.2	78.6	770.8	117.7	
1930	38.6	18.8	13.2	11.3	13.1	16.5	65.5	100.0	146.0	50.7	48.8	19.1	541.6	82.7	
1931	17.0	12.1	10.5	9.7	7.5	8.6	15.1	57.0	81.5	30.1	21.8	20.1	291.0	44.5	
1932	24.7	11.9	11.7	11.1	11.1	22.7	72.0	196.0	198.0	98.4	59.9	25.2	742.7	113.4	
1933	16.6	13.4	10.0	6.3	6.1	12.8	21.1	79.3	167.0	52.6	20.5	25.4	431.1	65.9	
1934	18.3	11.3	10.7	9.2	8.6	11.4	42.8	75.0	23.4	13.0	12.7	13.3	249.7	38.1	
1935	10.7	9.4	9.0	9.1	8.5	14.4	39.3	82.9	227.5	87.1	42.7	26.6	567.2	86.6	
1936	20.0	13.5	10.9	10.8	9.6	19.1	79.2	160.0	92.7	39.2	41.6	25.8	522.4	79.8	
1937	17.3	16.0	11.9	10.8	10.6	17.2	70.6	193.7	108.6	45.5	21.2	17.1	540.5	82.6	
1938	16.6	12.8	10.3	10.2	9.7	19.0	84.5	145.7	241.4	93.8	28.6	37.0	709.6	108.4	
1939	33.1	19.1	13.7	12.3	9.8	20.9	46.0	114.6	78.5	26.9	17.0	34.3	426.2	65.1	3/
1940	16.0	12.8	10.5	9.8	9.1	15.0	40.8	119.4	67.8	20.8	13.4	25.2	360.6	55.1	
1941	31.9	15.8	11.7	11.2	13.1	19.2	34.4	268.4	278.6	163.4	49.2	52.1	949.0	145.0	
1942	114.8	48.4	25.3	18.0	14.5	17.4	78.5	150.8	222.0	88.5	33.7	19.7	831.6	127.0	
1943	14.6	12.5	10.8	10.5	10.3	16.6	84.8	121.7	126.1	53.5	49.0	27.8	538.2	82.2	
1944	18.0	16.7	14.1	12.7	10.8	14.7	37.6	210.0	268.9	118.0	31.1	15.4	768.0	117.3	
1945	19.3	14.8	11.9	11.1	11.0	14.0	32.8	150.6	158.4	71.2	36.7	15.8	547.6	83.6	
MEAN 14-45	28.6	17.4	13.4	12.1	11.2	19.3	54.7	155.4	187.7	81.8	40.2	32.9	654.7		

1/ New Mexico Surface Water Supply Papers
2/ Colo. State Engnrs. Reports except Dec. 1920
3/ U.S.G.S. Water Supply Papers

NOTES: e - Partial record estimated
* - Indicates recorded value has been revised.

Lat. 37° 02' 15" Long. 107° 52' 25"
Sec. 7, T. 32 N., R 9 W
3/4 mi. downstream from Florida R.
2½ miles upstream from Colo.-N.M. State line.

STATION LOCATION

ANIMAS RIVER NEAR CEDAR HILL, NEW MEXICO
NAME OF STATION

1092 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914													E 1040.0	128.9	
1915													E 870.0	107.9	
1916													E 1080.0	133.9	
1917													E 1275.0	158.1	
1918													E 610.0	75.6	
1919													E 880.0	109.1	
1920													E 1310.0	162.4	
1921													E 1155.0	143.2	
1922													E 1020.0	126.4	
1923													E 820.0	101.7	
1924													E 685.0	84.9	
1925													E 670.0	83.1	
1926													E 805.0	99.8	
1927													E 1055.0	130.8	
1928													E 655.0	81.2	
1929													E 975.0	120.9	
1930													E 635.0	78.7	
1931													E 360.0	44.6	
1932													E 925.0	114.7	
1933													E 515.0	63.8	
1934			14.2	13.1	11.0	16.1	49.8	84.4	27.3	13.7	14.3	18.8	E 300.0	37.2	
1935	13.8	10.3	11.1	11.7	11.7	25.9	65.7	117.7	304.9	101.0	51.7	32.6	758.1	94.0	
1936	25.5	16.7	12.3	11.6	12.1	34.9	100.5	196.6	104.2	36.2	53.4	31.8	635.8	78.8	
1937	19.4	18.8	13.3	12.4	12.2	35.3	118.6	242.9	120.0	54.7	23.2	18.6	689.4	85.5	
1938	19.8	14.6	13.5	12.8	12.4	33.6	113.7	172.6	291.9	110.4	32.4	51.1	878.8	109.0	
1939	40.4	22.4	15.5	13.9	11.1	28.1	57.5	127.7	86.8	27.9	16.5	40.4	488.2	60.5	1/
1940	18.2	15.3	12.0	13.6	12.4	20.6	51.7	131.8	73.3	23.2	15.7	29.6	417.4	51.7	
1941	40.7	18.7	17.0	16.1	19.2	36.3	68.0	349.6	342.2	205.9	58.1	68.2	1240.0	153.7	
1942	152.4	63.6	33.3	23.6	19.1	28.3	111.6	172.8	238.7	90.6	34.6	23.1	991.7	122.9	
1943	18.1	16.0	14.3	14.8	14.0	26.4	108.6	139.5	130.0	55.3	53.9	32.1	623.0	77.2	
1944	23.0	21.0	16.3	13.1	12.7	19.6	47.2	237.7	296.0	125.4	32.5	16.2	860.7	106.7	
1945	20.7	18.0	14.0	12.8	12.3	17.5	42.3	170.4	163.2	67.6	33.5	17.6	589.9	73.1	
MEAN 35-45	35.6	21.4	15.7	14.2	13.6	27.9	80.5	187.2	195.6	81.7	36.8	32.8	743.0		
14-45													806.7		

E - Estimated

NOTES:

1/ U.S.G.S. Annual W.S.P.s

UPPER COLORADO RIVER COMPACT COMMISSION
ENGINEERING ADVISORY COMMITTEE

SE ¼ Sec. 16, T 29 N, R 13 W
1.1 miles upstream from mouth
Lat 36° 43' 20"
Long 108° 12' 00"
STATION LOCATION

ANIMAS RIVER AT FARMINGTON
NAME OF STATION

1,360 square miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914	40.2	22.1	18.6	19.9	20.4	53.8	83.9	222.0	297.0	154.0	37.3	21.4	990.6	131.4	1/
1915	60.4	27.9	19.0	18.5	15.7	34.8	110.0	170.0	244.0	109.0	25.3	23.2	857.8	113.8	1/
1916	25.5	14.6	15.5	16.9	19.5	88.3	118.0	216.0*	213.0	119.0	106.0	43.0	995.3	132.0	1/
1917	133.0	45.7	32.2	27.4	26.4	34.8	71.0*	194.0	418.0	196.0	40.7	21.5	1240.7	164.6	1/
1918	19.2	11.2	13.5	11.6	14.1	20.8	29.4	115.0	169.0	46.9	30.0*	37.1	517.8	68.7	1/
1919	16.2	14.2	15.1	12.4	16.2	28.2	106.0	268.0	171.0	115.0	49.2	29.8	841.3	111.6	1/
1920	25.2	19.4	24.9	34.0	38.8	42.5	68.8	377.0	412.0	146.0	45.5	23.6	1257.7	166.8	1/
1921	27.6	29.7	23.3	23.2	21.1	41.9	62.6	180.0	366.0	158.0	121.0	44.5	1098.9	145.8	1/
1922	21.2	20.7	21.5	16.4	23.8	43.5	80.5	294.0	352.0	81.0	25.0	12.2	991.8	131.6	1/
1923	12.7	17.9	20.0	20.0	20.7	23.9	56.2	188.0	212.0	91.2	67.3	45.9	775.8	102.9	1/
1924	37.8	39.9	20.5	18.2	28.3	21.4	83.8	176.8	165.3	42.7	13.4	11.6	659.7	87.5	1/
1925	15.1	12.9	14.8	13.6	12.1	20.4	56.2	147.9	124.0*	83.4	39.2	106.0*	645.6	85.6	1/
1926	72.9	42.3	24.2	23.8	22.2	23.9	71.5	201.0	201.0*	E 65.0	25.0*	16.2	789.0	104.7	1/
1927	35.6	28.8	35.6	21.1	15.9	37.1	c 95.0	224.4	202.5	106.7	33.3	181.2	1017.2	134.9	1/
1928	44.5	43.0	17.0	15.4	19.8	33.8	41.9	157.3	130.3	44.6	17.6	14.3	579.5	76.9	1/
1929	15.6	20.5	14.8	23.2	18.3	34.0	68.7	220.1	217.8	81.2	142.0	96.5	952.7	126.4	1/
1930	49.9	24.1	15.2	12.2	16.5	20.2	58.4	91.6	154.0	47.7	57.6	14.7	562.1	74.5	1/
1931	17.3	17.5	13.5	16.1	13.6	12.7	15.7	62.1	76.2	25.5	11.6	15.2	297.0	39.4	1/
1932	34.4	17.4	12.1	12.3	24.6	45.9	104.0	215.0	233.0	98.0	61.7	27.3	885.7	117.5	2/
1933	17.1	12.9	11.4	12.4	11.1	18.3	21.9	69.5	179.0	51.3	11.6	28.2	444.7	59.0	2/
1934	27.4	14.6	14.8	13.7	11.4	16.0	32.7	55.3	14.0	2.8	3.9	11.9	218.5	29.0	2/
1935	10.5	9.0	12.4	13.2	12.4	26.0	60.5	108.1	284.7	77.6	41.1	27.9	683.4	90.7	2/
1936	25.0	16.5	14.1	13.7	13.1	32.6	86.7	180.5	88.0	24.7	44.3	31.4	570.6	75.7	2/
1937	17.4	19.6	15.7	12.6	15.2	41.1	109.6	208.7	101.5	44.3	9.1	8.8	603.6	80.1	2/
1938	19.2	14.8	13.9	15.0	14.2	34.8	109.6	166.4	282.3	100.6	19.7	46.1	836.6	111.0	2/
1939	37.3	21.3	17.0	15.6	12.6	29.6	50.6	113.5	71.8	11.0	3.2	38.5	422.0	56.0	2/
1940	16.9	14.7	13.3	15.6	14.5	20.8	42.5	122.5	58.5	8.9	7.3	23.0	358.5	47.6	2/
1941	40.7	18.6	18.9	18.0	21.8	39.4	65.6	352.8	345.5	197.3	48.3	62.8	1229.7	163.1	2/
1942	167.6	67.8	34.8	25.4	20.0	29.0	106.8	156.3	223.9	74.8	20.8	14.7	941.9	125.0	2/
1943	13.1	13.2	13.5	14.0	14.0	26.8	92.2	121.8	114.1	43.0	40.7	26.3	532.7	70.7	2/
1944	19.4	20.5	17.4	15.0	14.8	20.6	44.4	222.6	284.4	112.9	21.0	8.4	801.4	106.3	2/
1945	18.8	17.2	14.8	14.1	13.7	19.2	39.3	150.0	148.4	53.4	25.0	7.7	521.6	69.2	2/
MEAN 14-45	35.5	22.8	18.2	17.3	18.0	31.8	70.1	179.7	204.8	81.7	38.9	35.0	753.8		

1/ New Mexico Surface Water Supply Papers
2/ U.S.G.S. Water Supply Papers

NOTES:
* - Indicates recorded value has been revised
c - Gage Height record in error.

SE ¼ Sec. 17, T 29 N, R 13 W
4000' downstream from Animas River
Lat. 36° 43'
Long. 108° 13'
STATION LOCATION

SAN JUAN RIVER AT FARMINGTON
NAME OF STATION

7,245 square miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914	91.0	55.5	42.[illegible]	36.7	51.0*	213.0	267.0	595.0*	662.0*	319.0*	124.0	95.8	2552.1	120.9	1/
1915	189.0	79.7	49.[illegible]	34.4	48.0*	128.0*	404.0	539.0*	682.0*	346.0	96.1	66.3	2661.8	126.1	1/
1916	56.2	34.8	29.7	40.0	90.0*	426.0*	443.0*	592.0	572.0	285.0	324.0*	127.0*	3019.7	143.0	1/
1917	400.0*	115.0	63.0*	63.7	62.4	116.0	336.0*	539.0*	1040.0	504.0*	e 100.0	e 68.1	3407.2	161.4	1/
1918	e 38.0	e 24.9	22.5	26.2	34.4	109.0	123.0	297.0	405.0	113.0*	E 72.0	E 92.0	1357.0	64.3	1/
1919	E 33.0	E 32.0	E 30.0	E 27.0	E 35.0	E 95.0	E 357.0	E 618.0	E 420.0	E 308.0	E 151.0	E 69.0	2175.0	103.0	1/
1920	E 51.0	E 49.0	E 73.0	E 82.0	E 166.0	E 197.0	E 339.0	E1122.0	E1014.0	E 439.0	E 131.0	E 50.0	3713.0	175.8	1/
1921	E 58.0	E 72.0	E 50.0	E 65.0	E 58.0	E 156.0	E 162.0	E 480.0	E 831.0	E 355.0	E 341.0	E 124.0	2752.0	130.3	1/
1922	E 48.0	36.5	40.6	38.7	56.4	129.0	348.0	769.0	804.0	184.0	53.4	15.5	2523.1	119.5	1/
1923	12.6	33.0*	43.7	41.0	56.0	97.0*	215.0	518.0	500.0	216.0	176.0	167.0	2075.3	98.3	1/
1924	109.6	98.4	69.4	48.9	97.9	65.6	342.0	549.0	385.0	82.1	33.1	23.9	1904.9	90.2	1/
1925	31.0	29.2	30.7*	29.5	36.4	88.2	198.0	318.0	300.0	175.0	122.0	217.0	1575.0	74.9	1/
1926	181.0	96.0*	57.0*	55.0*	52.0*	75.0	244.2	509.0	440.0*	114.0*	E 51.0	46.6	1920.8	91.0	1/
1927	80.5	52.0*	61.0*	43.6	55.2	141.0*	395.0*	688.8	591.1	275.0*	97.6	445.0*	2925.8	138.6	1/
1928	116.9	88.2	50.0*	45.9	59.8	132.0*	148.3	411.3	275.9	78.2	61.9	37.4	1505.8	71.3	1/
1929	75.0*	50.0*	38.5	36.9	40.3	101.0*	285.1	552.7	509.7	172.7	447.0	299.1	2608.0	123.5	1/
1930	128.0	50.7	37.3	30.1	40.2	47.3	254.0	264.0	315.0	139.0	174.0	27.2	1506.8	71.4	1/
1931	31.8	30.3	28.3	25.8	33.0	43.2	94.0	236.0	206.0	67.9	52.6	59.3	908.2	43.0	2/
1932	108.0	45.3	33.0	35.1	111.0	229.0	543.0	772.0	631.0	276.0	166.0	60.6	3010.0	142.5	2/
1933	39.2	31.8	29.4	31.2	29.6	60.1	65.2	209.0	484.0	116.0	32.2	72.1	1199.8	56.8	2/
1934	58.8	33.1	35.5	35.3	31.8	51.1	131.4	160.4	30.8	11.8	13.3	36.6	629.9	29.8	2/
1935	21.9	19.7	25.7	26.2	34.0	84.1	272.4	432.4	829.0	317.0	128.4	105.4	2296.2	108.7	2/
1936	68.6	39.1	27.6	27.4	28.4	142.7	295.9	446.5	175.8	45.4	126.3	89.3	1513.0	71.7	2/
1937	53.5	55.0	39.2	28.6	50.6	162.5	533.6	671.4	333.0	121.8	30.8	30.3	2110.3	99.9	2/
1938	40.7	29.3	23.6	27.3	46.8	140.3	426.2	535.4	726.0	223.2	43.1	155.9	2417.8	114.5	2/
1939	110.3	47.8	36.9	33.1	27.0	147.1	203.0	343.7	168.3	17.4	10.2	112.0	1256.8	59.5	2/
1940	34.4	34.1	26.1	30.8	37.5	72.8	132.8	294.4	125.7	19.9	24.6	49.7	884.8	41.9	2/
1941	96.1	44.6	46.2	44.6	86.5	158.2	332.3	1158.0	892.2	523.1	129.6	147.8	3659.2	173.3	2/
1942	447.1	162.4	86.3	69.0	59.1	101.9	540.8	476.6	527.3	148.2	51.7	36.9	2707.3	128.2	2/
1943	31.7	31.8	30.8	34.3	41.4	76.6	284.7	314.3	237.8	92.0	79.2	49.1	1303.7	61.7	2/
1944	50.3	43.7	38.1	32.3	36.4	60.7	171.6	611.9	665.5	252.2	53.7	52.7	2069.1	98.0	2/
1945	60.7	37.7	31.9	30.8	43.1	62.7	184.8	419.1	353.7	111.1	60.4	19.6	1415.6	67.0	2/
MEAN 14-45	92.2	52.6	41.4	39.3	54.2	122.2	283.5	513.9	504.1	201.5	111.2	95.3	2111.4		

1/ New Mexico Surface Water Supply Papers
2/ U.S.G.S. Water Supply Papers

NOTES:
e - Partial record estimated
E - Estimated
* - Indicates recorded value has been revised.

UPPER COLORADO RIVER COMPACT COMMISSION
ENGINEERING ADVISORY COMMITTEE

LA PLATA RIVER AT COLORADO-NEW MEXICO STATE LINE
NAME OF STATION

Lat. 37° 00' Long. 108° 11'
S. 10, T. 32 N., R. 13 W.
300' South of State Line
STATION LOCATION

331 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914													E 40.0	129.6	
1915													E 38.6	125.0	
1916													E 42.1	136.4	
1917													E 45.6	147.7	
1918													E 18.6	60.3	
1919													E 36.4	117.9	
1920													E 49.0	158.7	
1921	0.9	1.1	1.1	0.6	1.1	3.6	5.6	7.0	8.0	1.1	1.7	0.5	32.3	104.6	
1922	0.4	0.4	0.8	0.8	0.8	5.0	8.2	15.2	2.2	0	0	0	33.8	109.5	
1923	0.1	0.4	0.5	0.9	1.5	1.2	3.3	6.7	1.0	0.1	1.5	1.2	18.4	59.6	
1924	1.0	1.4	1.4	0.9	3.1	2.5	17.0	11.1	0.1	0	0.3	0.3	39.1	126.7	
1925	0.5	0.5	1.1	1.0	0.9	1.1	1.2	1.9	0.7	0.4	0.4	2.0	11.7	37.9	
1926	2.2	1.2	1.8	1.3	1.0	1.9	11.0	16.0	5.7	2.1	0.3	0.4	44.9	145.4	
1927	1.0	1.1	1.4	1.3	2.0	3.6	9.6	6.5	5.5	3.0	3.5	7.5	46.0	149.0	1/
1928	2.1	1.7	1.3	0.9	1.7	4.7	4.3	3.1	2.3	0.6	0.3	0.2	23.2	75.1	
1929	0.4	0.9	1.2	1.2	1.1	5.9	6.4	4.6	2.6	3.1	3.0	2.7	33.1	107.2	
1930	1.7	1.3	1.0	0.5	1.1	1.5	2.8	3.3	1.5	0.6	2.0	0.5	17.8	57.7	
1931	0.7	0.9	0.8	0.9	0.9	1.1	0.5	3.0	1.1	0.7	0.4	0.1	11.1	36.0	
1932	0.5	0.5	0.6	0.9	1.2	3.6	8.7	6.7	2.9	1.7	1.6	0.8	29.7	96.2	
1933	0.7	0.7	0.8	0.7	0.7	1.6	1.0	3.4	2.5	1.6	0	0.4	14.1	45.7	
1934	0.9	0.8	1.1	1.1	0.5	0.3	0.7	1.5	0.2	0.3	0.8	0.2	8.4	27.2	
1935	0	0.1	0.4	0.4	0.6	1.3	4.5	4.2	7.2	2.3	0.5	0.4	21.9	70.9	
1936	0.6	0.7	0.5	0.5	0.8	4.7	8.7	3.9	1.2	0.1	2.1	0.9	24.7	80.0	
1937	0.8	1.1	0.8	0.8	0.9	3.2	20.8	10.8	2.7	2.3	0.3	0.3	44.8	145.1	
1938	0.4	0.3	0.6	1.1	1.0	2.5	12.3	4.7	2.8	1.3	0.2	0.7	27.9	90.4	
1939	0.3	0.5	0.6	0.6	0.6	2.2	2.5	2.6	1.0	0.1	0	0.3	11.3	36.6	2/
1940	0	0.1	0.3	0.5	0.6	1.0	2.0	2.8	1.7	0.1	0.7	0.4	10.2	33.0	
1941	0.5	0.3	0.4	0.6	0.9	2.1	9.3	31.1	16.4	2.8	0.8	4.4	69.6	225.4	
1942	16.0	5.9	2.1	2.4	1.5	3.5	19.2	9.5	3.8	1.6	0.4	0.2	66.1	214.1	
1943	0.1	0.3	0.9	0.9	1.1	1.8	10.2	4.8	2.8	0.4	0.3	0.2	23.8	77.1	
1944	0.3	0.5	0.7	0.7	0.7	1.4	5.3	12.5	4.2	2.0	0.2	0.3	28.8	93.3	
1945	0.4	0.6	0.8	0.8	1.0	1.3	5.8	9.5	3.0	1.2	0.4	0.1	24.9	80.7	
MEAN 21-45	1.3	0.9	0.9	0.9	1.1	2.5	7.3	7.5	3.3	1.2	0.8	1.0	28.7		
14-45													30.9		

NOTES

1/ Colorado State Engineers Reports
2/ U.S.G.S. Water Supply Papers

E - Estimate

SAN JUAN RIVER AT SHIPROCK, NEW MEXICO
NAME OF STATION

Lat. 36° 47'35" Long. 108° 43'55"
SW¼ S. 22, T 30 N., R. 18 W.
6 miles downstream from Chaco River
STATION LOCATION

12,876 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914															
1915															
1916			32.6	39.4	136.0	518.0	431.0	718.0	834.0	444.0	478.0	160.0			
1917	544.0	84.2	46.3	47.2	61.3	118.0	399.0	569.0	1030.0	492.0	92.8	48.5	3532.3		
1918	39.7	28.7	25.4	28.2	43.6	115.0	182.0	364.0	470.0	173.0	94.6	117.0	1681.2		
1919	29.6	48.1	33.8	33.6	48.3	172.0	342.0	576.0	448.0	481.0	144.0	99.2	2455.6		
1920	66.6	55.9	63.0	132.0	212.0	262.0	429.0	1000.0	879.0	337.0	151.0	62.4	3649.9		
1921	64.8	50.1	34.7	38.0	61.6	109.0	161.0	399.0			377.0	179.0			
1922	34.2	51.5	59.0			237.0	298.0	837.0	780.0	149.0	46.4	22.7			
1923	20.7	23.3	34.3	55.4	54.6	67.8	131.0	484.0	474.0	204.0	152.0	235.0	1936.1		
1924	180.0	111.0	98.4	78.3	87.1	254.0	504.0	666.0	383.0	59.0	38.9	28.4	2488.1		1/
1925	42.7	56.8	46.4	34.7	32.2	49.5	191.5	368.1	282.7	158.2	125.3	261.7	1649.8		
1926	143.9	65.0	58.0		E 66.1	E 135.4	E 273.5	E 585.0	E 780.4	E 217.6					
1927				e 55.7	189.3	e 482.7	e 763.6	e 668.0	e 255.4	e 99.6	592.6				
1928	208.1	134.3	e 68.3	e 53.5	e 50.9	e 129.3	e 181.7	475.6	e 328.7	e 109.0	e 41.4	e 22.5	1803.3		
1929	e 30.9	e 48.1	e 41.6	e 46.1	e 52.7	e 184.6	e 270.5	543.7	492.8	e 208.4	e 485.9	e 348.2	2753.5		
1930	e 137.4	e 52.1	e 40.3	e 30.8	e 44.4	55.6	247.0	242.0	305.0	155.0	146.0	23.3	1478.9		
1931	e 38.2	e 35.8	e 34.3	e 30.7	e 39.9	e 51.8	e 105.0	e 245.0	e 229.0	e 91.4	e 66.0	e 66.2	1033.3		
1932	e 128.0	e 64.0	e 39.3	e 39.4	e 118.0	e 238.0	e 568.0	e 817.0	e 653.0	e 296.0	e 208.0	e 81.1	3249.8		
1933	46.8	34.8	34.6	35.9	35.0	69.5	72.5	250.0	531.0	157.0	48.2	99.9	1415.2		
1934	68.0	39.2	36.4	41.3	39.0	61.5	155.2	185.2	36.2	16.0	17.4	47.0	742.4		
1935	22.3	21.7	27.6	31.3	49.3	83.9	302.1	395.0	854.1	304.6	145.2	181.2	2418.3		
1936	73.1	53.5	33.2	38.1	44.9	156.1	369.1	474.5	201.6	47.2	143.8	121.6	1756.7		
1937	58.6	61.0	46.5	29.5	65.4	188.9	551.9	689.2	339.0	135.9	37.6	47.2	2250.7		
1938	52.7	37.6	34.4	32.3	46.4	158.2	420.6	523.1	715.6	217.8	50.1	198.1	2486.9		
1939	104.5	54.5	42.0	37.1	29.6	137.2	191.2	320.6	152.9	16.2	7.8	105.5	1199.1		2/
1940	38.2	35.7	30.0	33.7	38.4	68.5	136.1	294.1	122.6	24.9	28.0	59.7	909.9		
1941	103.5	48.2	62.8	52.4	101.1	169.1	339.8	1217.0	924.9	514.2	138.4	183.4	3854.8		
1942	514.6	167.3	88.9	65.6	60.8	104.2	547.1	471.6	539.1	145.8	49.6	36.4	2791.0		
1943	33.4	36.3	36.7	36.6	43.3	84.3	282.6	306.6	236.4	94.3	78.6	50.5	1319.6		
1944	54.0	49.8	41.9	35.2	38.6	61.6	183.4	611.9	666.6	255.7	51.4	60.5	2110.6		
1945	65.8	41.9	36.1	33.1	48.5	67.9	189.9	414.9	362.1	119.6	61.0	21.3	1462.1		

NOTES

1/ U.S.G.S. Water Supply Papers (1932 unpublished)
2/ New Mexico Surface Water Supply Papers

E - Estimated by Publishing Agency
e - Partly estimated by Publishing Agency.

UPPER COLORADO RIVER COMPACT COMMISSION
ENGINEERING ADVISORY COMMITTEE

MANCOS RIVER NEAR TOWAOC, COLORADO
NAME OF STATION

Lat. 37° 02' Long. 108° 45'
NE¼ Sec. 12, T. 32 N., R. 17 W.
12 miles South of Towaoc
STATION LOCATION

550 square miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914													E 73.8	141.9	
1915													E 61.2	117.6	
1916													E 79.0	151.9	
1917													E 89.2	171.5	
1918													E 34.5	66.3	
1919													E 61.8	118.8	
1920													E 94.5	181.7	
1921	E 0.7	E 1.0	E 0.8	E 0.7	2.0	3.2	8.0	27.5	22.0	11.4	22.4	6.9	106.6	204.9	
1922	1.0	1.0	E 0.7	E 0.7	E 1.0	8.1	10.0	39.5	5.9	0.3	0	0	68.2	131.1	
1923	0	0.6	0.8	0.8	1.1	2.5	4.5	15.6	5.3	2.6	4.4	1.5	39.7	76.3	
1924	1.2	2.4	2.2	1.1	1.7	1.4	10.7	14.8	0.6	0.1	0.2	0	36.4	70.8	
1925	0	0.3	0.3	0.4	0.7	0.8	4.4	4.2	0.7	2.6	0.7	4.9	20.0	38.4	
1926	3.3	2.3	1.3	1.1	1.2	3.6	6.8	37.2	16.2	2.7	1.2	0.9	77.8	149.6	
1927	0.3	0.2	E 0.4	E 0.5	E 1.4	5.5	18.9	17.0	8.0	5.2	0.6	6.5	64.5	124.0	
1928	3.4	3.0	1.2	0.8	1.2	6.0	7.4	16.1	2.2	0	0.9	0.2	42.4	81.5	
1929	0.4	0.8	0.4	0.5	0.8	7.6	6.9	11.7	2.4	1.7	6.5	5.0	44.7	85.9	1/
1930	2.2	0.9	0.6	0.5	1.2	1.5	14.0	5.6	1.8	1.2	2.6	0.3	32.4	62.3	
1931	0.2	0.3	0.7	0.7	0.8	1.0	1.1	1.4	0	1.8	0	0.5	8.5	16.3	
1932	0.9	0.5	0.4	0.8	5.2	6.0	14.0	18.8	4.4	2.6	2.9	1.4	57.9	111.3	
1933	1.0	0.7	0.6	0.6	0.8	1.2	1.6	6.4	5.0	2.8	0	0.6	21.3	40.9	
1934	1.0	0.7	0.5	0.6	0.8	0.8	1.5	0.3	0	0.8	1.4	0.6	9.0	17.3	
1935	0	0.1	0.1	0.1	0.6	1.5	7.4	11.9	10.2	1.0	1.0	1.5	35.4	68.0	
1936	0.8	0.5	0.3	0.4	0.6	3.7	16.7	7.9	9.4	0	2.7	3.3	37.3	71.7	
1937	1.8	1.8	0.4	0.5	0.8	4.9	18.5	19.0	3.7	4.8	0.3	0.7	57.2	110.0	
1938	0.6	0.5	0.3	0.5	0.7	6.9	18.8	13.0	6.8	2.3	0.3	2.7	53.4	102.6	
1939	1.1	0.3	0.7	0.5	0.7	4.5	4.5	1.5	0	0	0	1.0	14.8	28.4	
1940	0.1	0.2	0.2	0.3	0.5	1.8	4.5	6.2	0.9	0.4	0.6	2.8	18.5	35.6	
1941	1.1	0.5	0.4	0.7	2.6	6.6	10.0	35.6	15.9	6.5	1.2	6.1	87.2	167.6	
1942	28.2	4.8	2.8	2.8	2.6	5.3	19.3	16.9	8.7	0.5	0.1	0.2	92.2	177.2	
1943	0.6	0.7	0.7	0.7	2.1	3.8	16.1	11.9	3.7	0.5	1.3	0.6	42.7	82.1	
1944													E 60.8	116.9	
1945													E 41.8	80.4	
MEAN 21-43	2.2	1.0	0.8	0.7	1.4	3.8	9.8	14.8	5.4	2.2	2.2	2.1	46.4		
14-45													52.0		

NOTES
1/ State Engineers Reports and U.S.G.S. Water Supply Papers
E - Estimated (months by Colo. State Engr. unpublished)

McELMO CREEK near CORTEZ, COLORADO
NAME OF STATION

Lat. 37 20' Long. 106 40'
NE¼ S. 1, T.35N., R. 17 W.
½ mile downstream from Alkali Can.
STATION LOCATION

233 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914													E 42.0	102.4	
1915													E 32.0	78.0	
1916													E 39.6	96.5	
1917													E 36.0	87.7	
1918													E 38.4	93.6	
1919													E 41.2	100.4	
1920													E 51.0	124.3	
1921													E 45.3	110.4	
1922													E 44.4	108.2	
1923													E 42.7	104.1	
1924													E 29.4	71.6	
1925													E 40.6	98.9	
1926								2.1	1.2	3.2	1.0	1.7	E 49.2	119.9	
1927	1.9	1.9	0.3	1.9	7.6	3.0	2.7	4.2	11.1	7.0	3.3	12.2	57.0	138.9	
1928	4.7	3.7	1.6	2.0	3.1	3.1	2.2	5.5	4.9	2.0	0.7	0.2	33.7	82.1	1/
1929	1.2	1.8	1.0	1.6	3.8	6.3	1.2	5.9	6.1	3.4	10.6	7.8	55.7	135.7	
1930													E 37.4	91.1	
1931													E 24.7	60.2	
1932													E 45.4	110.6	
1933													E 32.2	78.5	
1934													E 30.0	73.1	
1935													E 41.2	100.4	
1936													E 37.7	91.9	
1937													E 41.8	101.9	
1938													E 46.0	112.1	
1939													E 32.8	79.9	
1940							3.8	4.6	2.9	0.9	1.6	3.4	E 38.2	93.1	2/
1941	3.5	2.3	2.2	1.7	4.0	4.3	5.5	6.0	7.2	6.7	5.6	10.2	59.2	144.3	
1942	8.3	4.7	2.7	3.2	2.5	3.5	3.8	4.5	5.2	6.2	4.4	2.2	51.2	124.8	3/
1943	1.7	1.8	1.9	2.4	3.2	4.0	3.6	10.2	5.5	4.0	4.3	2.7	45.3	110.4	
1944	e 2.5	e 2.0	1.7	1.7	1.4	3.6	2.6	4.8	5.3	6.1	3.4	1.4	36.5	89.0	2/
1945	2.2	2.5	1.2	1.5	1.4	2.1	3.3	4.6	4.2	5.3	5.0	2.0	35.3	86.0	
Mean 14-45													41.0		

E - Estimated
e - Partly estimated

NOTES
1/ - Colorado State Engineer's Reports
2/ - U.S.B.R. (unpublished)
3/ - U.S.G.S. Water Supply Papers

UPPER COLORADO RIVER COMPACT COMMISSION
ENGINEERING ADVISORY COMMITTEE

Lat. 37 09 Long. 109 52
SW¼ S. 7, T. 42 S., R. 19 E.
1600 feet downstream from Gypsum Cr.
1800 feet upstream from bridge
STATION LOCATION

SAN JUAN RIVER near BLUFF, UTAH
NAME OF STATION

23,010 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914	E 116.2	E 66.5	E 52.9	E 42.8	E 76.1	E 232.6	E 268.5	E 595.0	E 645.4	E 339.7	E 157.9	E 127.4	2721.0	119.6	
1915	221.4	93.9	62.6	62.4	129.3	137.1	478.3	569.9	600.6	398.8	102.3	62.5	2919.1	128.3	
1916	57.9	39.7	39.1	80.4	80.6	381.7	450.2	574.2	625.1	317.3	438.0	154.0	3238.2	142.3	
1917	482.5	81.9	41.1	42.7	69.6	84.3	351.9	560.0	831.7	521.1	177.0	111.2	3355.0	147.4	
1918	E 44.6	E 34.3	E 27.6	E 30.6	E 51.3	E 119.0	E 123.7	E 297.0	E 394.9	E 120.3	E 87.3	E 122.0	1452.6	63.8	
1919	E 37.8	E 41.8	E 37.3	E 31.5	E 52.2	E 103.7	E 359.0	E 618.0	E 409.5	E 328.0	E 194.6	E 89.0	2302.4	101.2	
1920	E 62.1	E 59.7	E 92.7	E 95.7	E 247.7	E 215.1	E 340.9	E 1122.0	E 988.6	E 467.5	E 167.4	E 62.0	3921.4	172.3	
1921	E 68.0	E 83.9	E 63.0	E 75.8	E 86.6	E 170.3	E 162.9	E 480.0	E 810.2	E 378.1	E 452.6	E 171.0	3002.4	131.9	
1922	E 58.1	E 46.5	E 50.9	E 45.1	E 84.2	E 140.8	E 350.0	E 769.0	E 783.9	E 196.0	E 62.0	E 12.0	2598.5	114.2	
1923	E 10.2	E 42.8	E 54.9	E 47.8	E 83.6	E 105.9	E 216.2	E 518.0	E 487.5	E 230.0	E 228.5	E 232.8	2258.2	99.2	
1924	E 141.3	E 111.7	E 88.0	E 57.0	E 146.1	E 71.6	E 343.9	E 549.0	E 375.4	E 87.4	E 34.4	E 20.9	2026.7	89.1	
1925	E 35.1	E 38.8	E 45.5	E 34.4	E 54.3	E 96.3	E 199.1	E 318.0	E 292.5	E 186.4	E 155.2	E 306.9	1762.5	77.4	
1926	E 237.8	E 109.2	E 72.0	E 64.2	E 77:6	E 81.9	E 245.6	E 509.0	E 429.0	E 121.4	E 58.8	E 54.5	2061.0	90.6	1/
1927	E 102.0	E 62.9	E 77.2	E 50.9	E 82.4	126.0	362.5	677.4	599.3	403.2	122.4	706.2	3372.4	148.2	
1928	195.5	124.5	59.7	59.8	84.7	132.7	155.3	419.9	308.3	88.3	55.1	42.4	1726.2	75.9	
1929	60.2	82.4	46.4	37.7	48.6	151.2	336.3	585.1	510.5	239.3	574.0	439.1	3110.8	136.7	
1930	135.3	63.5	41.3	29.3	70.1	76.7	264.1	270.5	340.2	159.7	247.3	25.9	1723.9	75.8	
1931	34.2	32.9	25.2	20.6	50.3	37.9	78.9	208.3	198.4	71.5	52.5	76.8	887.5	39.0	
1932	156.6	67.6	45.5	35.2	207.3	206.2	470.7	640.2	551.5	255.6	214.6	96.9	2947.9	129.5	
1933	49.3	37.8	26.6	28.9	48.1	73.2	65.0	169.6	439.0	132.7	39.8	131.8	1241.8	54.6	
1934	99.2	36.9	40.9	34.8	32.0	42.7	108.9	151.0	34.3	16.3	28.3	36:6	661.9	29.1	
1935	21.8	20.5	26.9	40.1	49.9	76.3	253.7	373.4	760.3	298.3	127.2	134.8	2183.2	95.9	
1936	68.6	41.2	32.0	36.3	50.1	137.5	315.7	424.6	191.1	40.8	155.6	137.4	1630.9	71.7	
1937	66.4	71.9	48.1	24.8	140.5	193.0	536.6	674.1	331.6	163.6	38.4	47.4	2336.4	102.7	
1938	89.4	36.5	36.7	36.4	47.2	187.4	381.7	485.7	683.0	231.9	49.4	201.0	2466.3	108.4	
1939	107.3	57.6	47.3	43.0	34.2	142.2	190.9	313.5	160.3	16.5	4.9	121.4	1239.1	54.4	
1940	38.8	36.6	29.3	39.2	49.9	74.2	125.3	288.8	126.2	32.4	41.0	114.6	996.3	43.8	
1941	145.8	66.6	81.4	77.8	126.7	211.3	392.4	1323.0	915.2	526.0	173.8	202.2	4242.2	186.4	
1942	654.7	191.0	104.5	81.1	67.7	126.1	602.0	479.0	533.2	150.3	50.7	38.0	3078.3	135.3	2/
1943	37.3	38.8	43.2	43.3	49.1	95.0	293.4	331.6	253.8	106.1	91.1	62.3	1445.0	63.5	
1944	58.3	58.5	51.1	37.4	48.9	75.8	203.8	640.3	704.5	283.1	61.0	66.3	2289.0	100.6	
1945	75.3	51.6	42.8	40.9	62.8	71.8	196.4	456.2	376.9	127.7	95.8	21.5	1619.7	71.2	
Mean 14-45	117.8	63.4	51.1	47.1	80.9	130.6	288.2	512.2	490.4	219.9	141.8	132.2	2275.6		

NOTES

E - Estimated

1/ - U.S.G.S. Water Supply Paper 918 (except E)
2/ - Annual U.S.G.S. Water Supply Papers

UPPER COLORADO RIVER COMPACT COMMISSION
ENGINEERING ADVISORY COMMITTEE

Lat. 36 51' 45" Long. 111 36' 15"
NE¼ SE¼ S. 13, T. 40 N., R. 7 E.
Just upstream from Paria River
STATION LOCATION

COLORADO RIVER at LEES FERRY, ARIZONA
NAME OF STATION

108,335 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914	E 645.7	E 535.3	E 327.8	E 363.5	E 399.1	E 873.5	E 1537.5	E 4448.3	E 5887.0	E 2623.3	E 1050.7	E 612.0	19303.7	140.3	
1915	E 946.2	E 523.8	E 331.3	E 302.1	E 393.3	E 520.3	E 1438.8	E 2295.8	E 3248.7	E 1602.1	E 462.5	E 420.7	12485.6	90.7	
1916	E 511.6	E 407.7	E 340.9	E 389.6	E 420.0	E 1385.6	E 1757.9	E 3524.6	E 4228.2	E 2064.5	E 1594.3	E 661.3	17286.2	125.6	
1917	E 1390.1	E 492.0	E 366.7	E 259.9	E 350.5	E 503.5	E 1528.2	E 3677.5	E 7274.5	E 4241.9	E 1126.4	E 648.0	21859.2	158.8	
1918	E 464.4	E 445.5	E 401.4	E 350.4	E 372.3	E 654.0	E 875.5	E 2498.8	E 4724.6	E 1713.9	E 548.9	E 570.4	13620.1	99.0	
1919	E 537.1	E 494.0	E 407.7	E 286.6	E 312.4	E 649.6	E 1356.5	E 2929.8	E 1997.0	E 948.3	E 537.9	E 384.6	10841.5	78.8	
1920	E 358.5	E 403.7	E 390.8	E 404.2	E 598.5	E 681.5	E 968.0	E 5678.7	E 6445.8	E 2400.8	E 921.7	E 466.7	19718.9	143.3	
1921	E 514.4	E 594.5	E 402.1	E 408.7	E 453.5	E 941.1	E 897.0	E 3937.5	7952.0	2210.0	1634.0	746.5	20691.3	150.3	
1922	427.4	415.1	448.1	349.0	437.1	905.2	1158.0	4448.0	5125.0	1438.0	704.0	420.5	16275.4	118.3	
1923	288.9	398.8	396.5	372.6	338.5	446.8	1275.0	3609.0	4560.0	2324.0	1348.0	878.5	16236.6	118.0	
1924	726.5	645.5	421.2	309.2	504.3	505.4	1635.0	3055.0	3126.0	996.2	298.1	239.9	12462.3	90.5	
1925	356.2	389.8	272.6	258.6	400.4	601.8	1293.0	2125.0	2386.0	1436.0	729.1	1063.0	11311.5	82.2	
1926	999.9	606.8	444.5	358.0	350.2	639.4	1578.0	3356.0	3432.0	1382.0	534.9	294.6	13976.3	101.5	
1927	427.5	331.7	377.0	334.4	385.7	601.1	1213.0	3863.0	3643.0	2405.0	925.6	2034.0	16541.0	120.2	1/
1928	935.2	733.9	439.9	466.8	459.8	750.7	983.8	4340.0	3703.0	1527.0	622.5	344.6	15307.2	111.2	
1929	605.2	566.9	341.4	328.5	342.8	919.5	1674.0	4070.0	4805.0	2005.0	1891.0	1639.0	19188.3	139.4	
1930	921.5	558.6	435.7	294.8	481.3	568.9	1705.0	1976.0	3067.0	1061.0	1461.0	520.3	13051.1	94.8	
1931	547.9	422.7	287.1	262.2	364.7	426.5	564.0	1156.0	1384.0	447.3	245.7	267.9	6376.0	46.3	
1932	499.1	350.8	250.0	270.8	555.1	671.5	1637.0	3975.0	3617.0	2011.0	925.8	485.3	15248.4	110.8	
1933	334.3	377.4	271.2	270.1	252.6	497.4	495.3	1435.0	3972.0	1113.0	337.2	373.2	9728.7	70.7	
1934	374.0	296.4	316.7	306.1	300.9	332.9	453.4	1096.0	510.0	130.5	127.2	132.9	4377.0	31.8	
1935	151.9	178.9	227.3	253.6	272.5	337.4	651.9	1402.0	4003.0	1471.0	520.4	424.8	9894.7	71.9	
1936	346.7	318.6	264.4	260.4	314.6	457.7	1324.0	3591.0	2649.0	1003.0	864.3	541.2	11934.9	86.7	
1937	346.7	441.5	314.3	197.3	410.3	698.1	1512.0	3475.0	2352.0	1319.0	400.2	403.5	11869.9	86.2	
1938	452.4	376.4	382.5	317.4	346.2	784.2	1610.0	3356.0	4666.0	1722.0	501.6	899.5	15414.2	112.0	
1939	562.5	468.8	400.5	340.2	293.2	799.9	1153.8	2490.0	1665.1	418.3	220.1	547.5	9359.9	68.0	
1940	323.3	307.4	279.9	255.1	295.0	431.2	680.5	2022.1	1487.6	391.7	178.7	402.8	7055.3	51.3	
1941	684.8	401.2	357.8	348.3	422.9	668.5	1091.0	4974.0	4004.0	1666.0	797.7	608.1	16024.3	116.4	
1942	1797.0	902.8	575.7	406.7	396.3	630.1	2844.0	3209.0	4202.0	1317.0	453.8	275.3	17009.7	123.6	2/
1943	334.3	368.4	357.2	329.5	332.3	516.3	1450.0	2158.0	2729.0	1429.0	792.8	447.4	11244.2	81.7	
1944	377.5	456.4	394.9	278.5	343.9	509.1	1027.0	3251.0	4136.0	1782.0	417.3	228.7	13202.3	95.9	
1945	341.5	383.5	320.2	325.2	351.5	436.9	754.8	2805.0	2761.0	1668.0	1011.0	370.3	11528.9	83.8	
Mean 14-45	579.1	456.1	360.8	320.6	382.9	635.8	1253.8	3132.1	3741.9	1570.9	755.8	573.5	13763.3		

E - Estimated

NOTES
1/ - U.S.G.S. Water Supply Paper 918 (except E)
2/ - Annual U.S.G.S. Water Supply Papers

Lat. 36 52' 15" Long. 111 36' 30"
NW¼ NE¼ S. 13, T. 40 N., R. 7 E.
½ mile upstream from mouth
STATION LOCATION

PARIA RIVER at LEES FERRY, ARIZONA
NAME OF STATION

1550 Square Miles
DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN	
1914	2.8	1.6	1.4	1.5	2.8	3.3	1.6	0.8	0.4	2.8	5.2	6.9	E 31.1	122.9	
1915	1.3	0.8	0.7	0.7	1.3	1.6	0.7	0.4	0.2	1.3	2.5	3.3	E 14.8	58.5	
1916	3.4	2.0	1.7	1.9	3.5	4.1	2.0	1.0	0.5	3.5	6.4	8.6	E 38.6	152.6	
1917	3.0	1.7	1.5	1.7	3.1	3.6	1.7	0.9	0.4	3.1	5.6	7.6	E 33.9	134.0	
1918	2.6	1.5	1.3	1.5	2.7	3.1	1.5	0.8	0.4	2.7	4.9	6.5	E 29.5	116.6	
1919	1.5	0.9	0.8	0.8	1.5	1.8	0.9	0.4	0.2	1.5	2.8	3.8	E 16.9	66.8	
1920	1.7	1.0	0.9	1.0	1.8	2.1	1.0	0.5	0.3	1.8	3.3	4.4	E 19.8	78.3	
1921	2.1	1.2	1.1	1.2	2.1	2.5	1.2	0.6	0.3	2.1	3.9	5.2	E 23.5	92.9	
1922	2.4	1.4	1.2	1.3	2.4	2.9	1.4	0.7	0.4	2.4	4.5	6.0	E 27.0	106.7	
1923	2.2	1.3	1.1	1.2	2.2	2.6	1.3	0.6	0.3	2.3	4.1	5.5	E 24.7	97.6	
1924	0.9	2.1	1.3	0.9	1.7	1.5	1.3	0.3	0.2	2.2	0.4	6.0	18.8	74.3	
1925	1.2	1.3	0.8	0.6	1.6	1.3	0.7	0.2	0.2	2.4	7.6	11.7	29.6	117.0	
1926	17.7	1.3	0.9	1.2	1.3	0.9	3.4	0.7	0.1	0.8	1.3	2.6	32.2	127.3	
1927	1.0	2.1	1.1	1.3	3.0	3.3	0.4	0.1	1.1	2.9	4.4	25.2	45.9	181.4	
1928	0.9	1.4	1.1	1.2	1.8	2.5	0.4	0.5	0.1	1.9	3.9	0.4	16.1	63.6	
1929	0.8	1.3	1.0	0.9	1.4	1.6	0.5	0.2	0.2	8.1	10.7	8.4	35.1	138.8	
1930	0.8	0.7	0.7	0.9	1.6	0.8	0.3	0.4	0.3	3.1	7.0	2.4	19.0	75.1	
1931	1.7	1.8	0.5	0.5	1.7	0.7	0.4	0.6	0.3	0.9	1.1	1.3	11.5	45.5	1/
1932	1.3	1.1	0.6	0.9	8.5	3.6	1.1	0.5	0.2	4.0	14.6	1.5	37.9	149.8	
1933	1.2	1.0	0.9	0.7	1.3	2.4	0.6	0.5	0.2	3.1	2.4	2.4	16.7	66.0	
1934	1.3	1.0	1.8	1.6	1.2	0.8	0.3	3.2	0.5	1.0	5.9	0.8	19.4	76.7	
1935	0.4	0.8	1.5	1.6	1.9	2.4	2.6	0.8	0.2	0.9	1.8	2.5	17.4	68.8	
1936	0.5	1.1	1.2	1.3	2.5	1.3	0.5	0.2	0.2	10.6	9.5	6.5	35.4	140.0	
1937	1.8	1.6	1.0	0.5	4.2	6.4	2.8	0.5	0.3	2.5	2.7	2.7	27.0	106.8	
1938	1.2	1.1	1.3	1.5	1.4	10.7	1.2	0.7	1.1	0.5	1.5	3.6	25.8	102.0	
1939	1.1	1.1	1.3	1.3	1.0	2.2	0.7	0.2	0.2	0.1	1.1	23.5	33.8	133.6	
1940	1.0	1.0	1.1	2.4	2.4	0.8	0.3	0.2	0.2	0.2	2.4	14.3	26.3	104.0	
1941	2.1	1.4	1.5	2.1	4.2	4.2	5.1	2.3	0.5	2.5	0.9	0.9	27.7	109.5	
1942	5.8	1.9	1.4	1.5	1.3	2.1	1.5	0.4	0.2	1.0	2.0	0.6	19.7	77.9	2/
1943	1.4	1.2	1.4	1.9	2.1	1.9	0.8	0.2	0.2	0.3	5.3	2.1	18.8	74.3	
1944	4.8	0.9	1.4	1.0	1.8	4.9	1.8	1.1	0.5	0.2	0.4	0.3	19.1	75.5	
1945	0.4	1.0	1.0	1.3	1.6	2.2	1.2	0.3	0.2	0.7	4.2	2.4	16.5	65.2	
Mean 14-45	2.3	1.3	1.1	1.2	2.3	2.7	1.3	0.7	0.3	2.3	4.2	5.6	25.3		

E - Estimated

NOTES
1/ - U.S.G.S. Water Supply Paper 918
2/ - Annual U.S.G.S. Water Supply Papers

UPPER COLORADO RIVER COMPACT COMMISSION
ENGINEERING ADVISORY COMMITTEE

1 mile below mouth of Paria River

STATION LOCATION

COLORADO RIVER at LEE FERRY, ARIZONA (COMPACT POINT)

NAME OF STATION

1[illegible],[illegible]9 Square Miles

DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN
1914	648.5	536.9	329.2	365.0	401.9	876.8	1539.1	4449.1	5887.4	2626.1	1055.9	618.9	19334.8	140.2
1915	947.5	524.6	332.0	302.8	394.6	521.9	1439.5	2296.2	3248.9	1603.4	465.0	424.0	12500.4	90.7
1916	515.0	409.7	342.6	391.5	423.5	1389.7	1759.9	3525.6	4228.7	2068.0	1600.7	669.9	17324.8	125.6
1917	1393.1	493.7	368.2	261.6	353.6	507.1	1529.9	3678.4	7274.9	4245.0	1132.0	655.6	21893.1	158.8
1918	467.0	447.0	402.7	351.9	375.0	657.1	877.0	2499.6	4725.0	1716.6	553.8	576.9	13649.6	99.0
1919	538.6	494.9	408.5	287.4	313.9	651.4	1357.4	2930.2	1997.2	949.8	540.7	388.4	10858.4	78.7
1920	360.2	404.7	391.7	405.2	600.3	683.6	969.0	5679.2	6446.1	2402.6	925.0	471.1	19738.7	143.2
1921	516.5	595.7	403.2	409.9	455.6	943.6	898.2	3938.1	7952.3	2212.1	1637.9	751.7	20714.8	150.2
1922	429.8	416.5	449.3	350.3	439.5	908.1	1159.4	4448.7	5125.4	1440.4	708.5	426.5	16302.4	118.2
1923	291.1	400.1	397.6	373.8	340.7	449.4	1276.3	3609.6	4560.3	2326.3	1352.1	884.0	16261.3	117.9
1924	727.4	647.6	422.5	310.1	506.0	506.9	1636.3	3055.3	3126.2	998.4	298.5	245.9	12481.1	90.5
1925	357.4	391.1	273.4	259.2	402.0	603.1	1293.7	2125.2	2386.2	1438.4	736.7	1074.7	11341.1	82.3
1926	1017.6	608.1	445.4	359.2	351.5	640.3	1581.4	3356.7	3432.1	1382.8	536.2	297.2	14008.5	101.6
1927	428.5	333.8	378.1	335.7	388.7	604.4	1213.4	3863.1	3644.1	2407.9	930.0	2059.2	16586.9	120.3
1928	936.1	735.3	441.0	468.0	461.6	753.2	984.2	4340.5	3703.1	1528.9	626.4	345.0	15323.3	111.1
1929	606.0	568.2	342.4	329.4	344.2	921.1	1674.5	4070.2	4805.2	2013.1	1901.7	1647.4	19223.4	139.4
1930	922.3	559.3	436.4	295.7	482.9	569.7	1705.3	1976.4	3067.3	1064.1	1468.0	522.7	13070.1	94.8
1931	549.6	424.5	287.6	262.7	366.4	427.2	564.4	1156.6	1384.3	448.2	246.8	269.2	6387.5	46.3
1932	500.4	351.9	250.6	271.7	563.6	675.1	1638.1	3975.5	3617.2	2015.0	940.4	486.8	15286.3	110.9
1933	335.5	378.4	272.1	270.8	253.9	499.8	495.9	1435.5	3972.2	1116.1	339.6	375.6	9745.4	70.7
1934	375.3	297.4	318.5	307.7	302.1	333.7	453.7	1099.2	510.5	131.5	133.1	133.7	4396.4	31.9
1935	152.3	179.7	228.8	255.2	274.4	339.8	654.5	1402.8	4003.2	1471.9	522.2	427.3	9912.1	71.9
1936	347.2	319.7	265.6	261.7	317.1	459.0	1324.5	3591.2	2649.2	1013.6	873.8	547.7	11970.3	86.8
1937	348.5	443.1	315.3	197.8	414.5	704.5	1514.8	3475.5	2352.3	1321.5	402.9	406.2	11896.9	86.3
1938	453.6	377.5	383.8	318.9	347.6	794.9	1611.2	3356.7	4667.1	1722.5	503.1	903.1	15440.0	112.0
1939	563.6	469.9	401.8	341.5	294.2	802.1	1154.5	2490.2	1665.3	418.4	221.2	571.0	9393.7	68.1
1940	324.3	308.4	281.0	257.5	297.4	432.0	680.8	2022.3	1487.8	391.9	181.1	417.1	7081.6	51.4
1941	686.9	402.6	359.3	350.4	427.1	672.7	1096.1	4976.3	4004.5	1668.5	798.6	609.0	16052.0	116.4
1942	1802.8	904.7	577.1	408.2	397.6	632.2	2845.5	3209.4	4202.2	1318.0	455.8	275.9	17029.4	123.5
1943	335.7	369.6	358.6	331.4	334.4	518.2	1450.8	2158.2	2729.2	1429.3	798.1	449.5	11263.0	81.7
1944	382.3	457.3	396.3	279.5	345.7	514.0	1028.8	3252.1	4136.5	1782.2	417.7	229.0	13221.4	95.9
1945	341.9	384.5	321.2	326.5	353.1	439.1	756.0	2805.3	2761.2	1668.7	1015.2	372.7	11545.4	83.7
Mean 14-45	581.3	457.4	361.9	321.8	385.1	638.5	1255.1	3132.8	3742.3	1573.2	760.0	579.2	13788.6	

NOTES

Estimates not indicated, refer to tabulations of Colorado River at Lees Ferry, Arizona and Paria River at Lees Ferry, Arizona

UPPER COLORADO RIVER COMPACT COMMISSION
ENGINEERING ADVISORY COMMITTEE

Lat. 40°34', Long. 109° 56' SW¼ Sec. 18, T. 2 N., R. 1 E., Uinta Meridian.

STATION LOCATION

WHITEROCKS RIVER NEAR WHITEROCKS

NAME OF STATION

115 Square Miles

DRAINAGE AREA

STREAMFLOW IN 1000 ACRE FEET

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	TOTAL	% MEAN
1914	4.9 E	3.5 E	2.5 E	2.1 E	2.0 E	2.4 E	3.0 E	40.5 E	35.0 E	13.0 E	13.5 E	6.0 E	128.4	136.5
1915	5.7 E	4.2 E	2.7 E	2.4 E	1.9 E	2.0 E	4.8 E	25.0 E	36.0 E	13.0 E	7.0 E	6.7 E	111.4	118.4
1916	5.9 E	3.6 E	2.7 E	2.5 E	2.0 E	2.7 E	5.0 E	23.0 E	23.0 E	10.5 E	7.5 E	4.6 E	93.0	98.8
1917	6.1 E	3.9 E	2.7 E	2.3 E	1.7 E	2.0 E	2.4 E	25.0 •	70.0 E	25.5 E	10.2 E	7.2 E	159.0	169.0
1918	6.1 E	4.8 E	2.3	2.0	1.9	1.9	2.2	11.6	21.1	14.1	5.7	4.2	77.9	82.8
1919	5.1	3.0	2.1	1.8	1.7	2.0	3.2	15.7	2.4	3.9	5.1	4.2	50.2	53.3
1920	4.0	3.4	2.5	1.5	1.7	3.0	2.3	23.8	33.8	8.7	4.1	1.8	90.6	96.3
1921	1.5	1.1	.9	.9	.8	1.0	1.1	33.5 E	88.0 E	17.5 E	10.6	8.9	165.8	176.2
1922	5.0	3.8 •	2.8 E	2.7 E	2.2 E	2.4 E	2.6 E	33.4	82.1	19.0	12.1	7.2	175.3	186.3
1923	5.4 E	4.0 E	3.1 E	2.8 E	2.2 E	2.4 E	2.7 E	30.8	54.9	19.4	8.5	5.4	141.6	150.5
1924	5.2	3.4	2.6 E	2.4 E	2.1 E	2.3 E	2.8 E	18.0 E	7.2	4.5	3.5	3.0	57.0	60.6
1925	2.6	2.3	2.2 E	2.1 E	1.7 E	2.0 E	2.4	19.3	15.6	8.2	7.0 •	6.8	72.2	76.7
1926	7.7 E	4.9 E	3.1 E	2.5 E	1.9 E	2.1 E	4.6 •	20.5 E	10.0 E	8.5 E	6.7 E	4.0	76.5	81.3
1927	3.0	2.3 E	2.2 E	1.9 E	1.6 E	1.9 E	2.5 E	26.5 E	23.9	13.1	8.7	21.4	109.0	115.8
1928	8.1 E	5.7 E	3.2 E	2.9 E	2.3 E	2.3 E	3.5 E	34.5 E	16.0 E	9.2 E	4.9	4.1	96.7	102.8
1929	3.7 E	3.0 E	2.3 E	2.4 E	1.9 E	2.0 E	2.5 E	27.5 E	49.0 E	15.2 E	9.0 E	8.0 E	126.5	134.4
1930	6.5 E	4.4 E	3.0 E	2.9 E	2.1 E	2.3 E	4.8 E	24.0 E	23.0	10.3	12.5	7.1	102.9	109.4
1931	5.9	3.1	2.8	2.2	1.7	2.0	2.4	8.1	6.8	3.2	4.0	2.9	45.1	47.9
1932	3.0	2.4	2.2	2.0	1.7	1.9	2.7	29.8	25.6	11.9	8.1	4.3	95.6	101.6
1933	3.0	2.1	1.5	1.8	1.4	1.5	1.5	7.5	22.5	9.2	3.9	2.5	58.4	62.1
1934	2.3	2.0	1.5	1.4	1.1	1.1	3.4	6.3	3.0	1.4	4.2	2.9	30.6	32.5
1935	2.5	2.0	2.0	1.8	1.7	2.0	2.3	6.0	33.5	7.0	4.0	3.1	67.9	72.2
1936	2.5	2.0	2.0	1.9	1.6	1.6	2.5	14.5	9.7	7.9	9.9	8.2	64.3	68.3
1937	4.2	3.3	2.2	1.8	1.4	1.5	2.9	35.9	18.6	11.0	8.1	5.8	96.7	102.8
1938	4.0	2.3	1.9	1.9	1.7	1.9	3.9	21.7	35.6	11.2	7.2	7.8	101.1	107.4
1939	9.5	5.5	3.1	2.5	1.9	2.2	4.5	19.3	8.3	4.4	3.8	9.7	74.7	79.4
1940	6.6	3.3	2.5	2.0	1.6	1.8	3.9	12.3	5.6	3.0	2.6	6.0	51.2	54.4
1941	9.1	4.6	2.9	2.1	1.7	2.1	2.5	32.1	35.5	13.0	7.6	5.9	119.1	126.6
1942	8.3	5.4	3.6	2.7	2.0	2.2	3.9	18.8	33.8	12.4	7.5	3.9	104.5	111.1
1943	3.3	2.4	2.2	1.8	1.7	1.9	6.5	16.6	12.6	9.0	7.9	3.8	69.7	74.1
1944	3.3	2.6	2.3	2.2	1.7	1.7	2.2	22.0	49.5	20.9	8.3	3.8	120.5	128.1
1945	3.3	2.5	2.2	2.1	1.7	1.9	2.3	15.9	20.6	11.2	9.3	5.0	78.0	82.9
MEAN 14-45	4.9	3.3	2.4	2.1	1.8	2.0	3.2	21.9	28.5	10.9	7.3	5.8	94.1	

E - Estimated
• - Partly Estimated

U. S. G. S. Annual Water Supply Papers Unless Estimated

UPPER COLORADO RIVER BASIN COMPACT COMMISSION

ENGINEERING ADVISORY COMMITTEE

MONTHLY WATER YEAR RUNOFFS AT SELECTED POINTS OF MEASUREMENT FOR 1946-1947. UNIT 1,000 ACRE-FEET

Station	Year	October	November	December	January	February	March	April	May	June	July	August	September	Total
Green River at Green River, Wyoming	1946	59.0	41.5	32.7	34.2	26.0	54.2	171.8	212.0	303.0	142.0	65.9	47.7	1,190.0*
	1947	54.9	49.0	48.9	26.9	29.0	114.3	94.8	355.4	515.9	324.5	158.9	68.6	1,841.1*
Blacks Fork near Millborne, Wyoming	1946	2.9	2.6	2.3	2.0	1.7	2.5	17.7	27.2	29.0	9.2	3.7	1.9	102.7
	1947	2.1	1.9	1.8	0.9	1.1	1.8	3.0	42.5	39.8	23.3	8.2	4.6	131.0
East Fork of Smith Fork near Robertson, Wyoming	1946	1.0	0.7	0.7	0.6	0.6	0.8	5.4	7.5	7.6	3.4	1.0	0.5	29.8
	1947	0.7	0.7	0.6	0.5	0.5	0.6	0.9	9.8	11.3	7.0	2.6	1.2	36.4
West Fork of Smith Fork near Robertson, Wyoming	1946	0.3	0.3	0.3	0.3	0.3	0.4	4.5	5.3	1.7	0.3	0.1	0	13.8
	1947	0.3	0.3	0.3	0.2	0.2	0.5	1.1	9.0	4.4	1.3	0.6	0.2	18.4
Green River near Linwood, Utah	1946	66.7	46.4	36.4	34.5	29.1	82.1	217.5	282.2	343.0	155.0	75.6	56.4	1,424.9
	1947	61.7	55.3	56.1	27.7	32.5	185.5	125.1	471.9	579.4	347.2	207.6	85.4	2,235.4
Burnt Fork near Burnt Fork, Wyoming	1946	0.6	0.4	0.3	0.2	0.2	0.2	1.3	2.7	3.6	2.9	1.2	0.7	14.3
	1947	0.7	0.5	0.5	0.4	0.4	0.5	1.0	6.8	7.2	5.2	3.1	1.4	27.7
Henrys Fork near Lonetree, Wyoming	1946	0.7	0.4	0.3	0.3	0.2	0.3	2.4	5.9	6.9	2.7	1.2	0.7	22.0
	1947	0.8	0.6	0.6	0.5	0.5	0.6	1.2	10.7	9.6	5.9	2.2	1.1	34.3
Henrys Fork at Linwood, Utah	1946	3.7	3.2	3.1	2.8	2.1	4.3	13.7	6.0	2.8	1.8	0.9	2.8	47.2
	1947	3.7	3.4	3.2	1.9	2.7	6.7	5.0	18.5	22.3	10.7	6.6	2.8	87.5
Little Snake River near Dixon, Wyoming	1946	5.5	7.5	6.5	6.1	6.5	14.5	86.0	90.6	61.6	2.2	0.7	0.7	288.4
	1947	4.1	5.5	4.6	3.9	4.8	27.7	52.0	167.2	96.9	12.8	2.1	2.1	383.7
Little Snake River near Lily, Colorado	1946	6.3	8.1	5.3	4.3	7.7	20.0	89.7	122.6	63.0	4.2	3.1	0.3	334.6
	1947	9.5	10.7	5.6	4.1	5.3	32.9	57.5	193.7	114.2	21.4	5.2	7.1	467.2
Yampa River at Steamboat Springs, Colo.	1946	7.9	8.9	7.0	7.1	6.5	12.8	51.5	73.6	78.6	10.4	6.5	4.1	274.9
	1947	11.9	11.6	7.0	9.6	6.2	14.5	42.4	127.1	104.6	29.3	12.1	7.4	383.7
Yampa River near Maybell, Colorado	1946	16.9	19.0	16.2	14.0	18.3	39.7	215.0	220.4	228.0	43.3	16.1	8.9	855.8
	1947	20.5	24.6	19.6	13.9	15.0	75.8	164.2	492.2	317.0	118.6	32.4	16.6	1,310.4
Brush Creek near Jensen, Utah	1946	0.3	0.7	0.8	0.8	0.7	0.8	1.4	0.1	0.0	0.0	0.1	0.0	5.6**
	1947	0.6	0.8	1.2	1.2	1.1	1.3	1.1	9.5	10.4	1.6	1.2	0.2	30.2
Ashley Creek near Vernal, Utah	1946	3.8	2.2	1.6	1.4	1.1	1.1	6.4	9.6	8.0	5.0	3.3	3.8	47.3**
	1947	3.4	2.9	2.4	1.9	1.5	1.6	3.8	31.6	20.1	10.6	7.0	5.4	92.2
Duchesne River at Myton, Utah	1946	9.3	16.3	17.3	17.0	14.7	20.3	37.9	68.1	44.8	3.8	3.7	2.1	255.3**
	1947	10.6	22.9	22.6	18.8	21.9	23.9	19.7	108.1	95.4	22.5	11.1	5.2	382.7
Duchesne River near Randlett, Utah	1946	20.7	25.8	23.9	23.4	21.0	29.3	39.9	70.4	46.6	5.2	6.1	4.1	316.4**
	1947	16.5	32.2	30.4	25.6	35.7	35.5	23.3	143.4	158.4	32.6	24.6	11.8	570.0
White River near Meeker, Colorado	1946	22.4	22.7	20.1	17.6	15.6	16.8	41.8	66.0	80.1	22.9	21.0	16.6	363.6
	1947	23.8	19.3	18.2	17.4	16.2	23.1	31.2	154.3	128.3	65.1	33.5	23.5	553.9
White River near Watson, Utah	1946	24.8	26.6	20.5	22.1	20.7	30.3	43.4	68.1	66.7	21.0	29.3	20.8	394.3
	1947	27.6	24.4	23.0	16.6	19.4	42.6	35.2	139.9	116.0	60.9	37.3	26.3	569.2
Green River at Green River, Utah	1946	161.1	149.0	112.8	123.0	116.9	235.7	528.2	775.2	746.4	263.7	152.0	104.6	3,468.6
	1947	148.8	170.3	154.0	91.4	150.9	411.2	421.9	1,400.0	1,348.0	655.9	365.4	165.8	5,483.6
Colorado River at Hot Sulphur Springs, Colorado	1946	11.1	9.5	6.4	6.9	6.7	10.2	40.5	59.7	100.7	28.3	15.0	11.5	306.5
	1947	10.5	9.6	7.2	5.4	4.8	6.7	18.6	137.3	171.1	87.5	26.7	12.9	498.3
Colorado River at Glenwood Springs, Colorado	1946	77.8	73.3	70.7	67.2	54.0	63.8	197.5	283.8	361.6	163.6	83.2	59.5	1,556.0
	1947	70.0	61.0	77.3	51.7	53.7	68.3	123.2	486.1	605.9	438.0	146.9	79.4	2,261.5
Roaring Fork at Glenwood Springs, Colo.	1946	38.6	32.5	27.1	22.4	19.9	22.6	69.8	107.1	281.9	100.0	44.9	31.4	798.2
	1947	35.1	27.5	22.9	19.0	18.7	25.0	42.0	223.7	341.9	260.6	84.2	55.8	1,156.4
Colorado River near Cameo, Colorado	1946	126.1	125.1	116.7	109.3	91.3	99.4	284.5	448.5	689.5	266.6	126.4	92.4	2,575.8
	1947	122.3	103.6	120.6	82.4	82.1	107.1	177.5	809.1	1,027.0	732.5	239.6	142.8	3,746.6
Plateau Creek near Cameo, Colorado	1946	6.4	6.9	6.0	4.7	3.4	7.4	21.7	31.2	14.9	2.3	4.5	2.5	111.9
	1947	5.8	5.3	4.6	3.6	4.0	7.0	13.0	70.9	33.0	5.9	4.8	5.1	163.0
Gunnison River near Grand Junction, Colorado	1946	76.5	72.8	57.8	58.2	48.3	58.4	182.4	228.5	320.9	64.1	56.2	54.2	1,278.3
	1947	69.0	67.0	55.7	45.3	46.9	55.4	95.8	454.7	501.5	242.3	120.1	95.5	1,849.2
Dolores River at Gateway, Colorado	1946	14.5	10.4	8.8	11.2	10.0	16.0	72.2	53.5	58.7	16.4	17.8	10.1	299.6
	1947	9.0	10.6	10.0	8.5	10.8	15.0	48.7	172.6	110.6	47.7	36.7	30.0	510.2
Colorado River near Cisco, Utah	1946	216.9	224.1	182.8	174.2	154.9	190.7	524.6	725.9	1,027.0	309.5	195.7	135.5	4,061.8
	1947	206.3	206.3	208.2	145.2	150.4	189.1	315.5	1,423.0	1,594.0	984.6	369.3	259.0	6,050.9
Sum of the Rio Blanco, Rito Blanco, & San Juan Rivers at Pagosa Springs, Colo.	1946	5.1	3.4	2.7	3.0	3.8	7.1	31.1	35.6	11.6	7.8	8.7	8.6	128.5
	1947	10.7	8.4	6.5	4.5	5.1	8.9	21.9	85.9	66.0	15.0	20.4	15.7	269.0
Navajo River at Edith, Colorado	1946	2.8	2.3	1.6	1.7	1.9	3.5	9.9	10.6	10.8	3.0	3.3	2.8	54.2
	1947	3.6	3.2	2.5	2.0	2.5	3.8	6.9	22.3	15.2	5.2	6.0	4.4	77.6
Piedra River at Arboles, Colorado	1946													136.9*
	1947													218.9*
San Juan River at Rosa, New Mexico	1946	16.6	9.6	7.6	9.3	11.2	19.3	63.7	71.4	77.3	16.0	23.2	17.2	342.4
	1947	23.2	18.4	13.3	9.5	14.5	27.3	47.0	163.5	112.8	28.4	47.9	40.0	545.8**
Los Pinos River at Ignacio, Colorado	1946	4.6	5.4	3.2	3.3	3.1	3.3	2.4	2.0	2.7	5.0	4.1	3.2	42.3
	1947	3.2	2.7	3.7	4.0	3.9	4.2	2.7	22.3	19.5	7.0	12.8	9.6	95.6**
San Juan River near (at) Blanco, New Mexico	1946	24.8	15.6	10.9	12.9	15.0	23.6	63.0	71.7	78.7	23.9	28.8	23.8	392.7
	1947	29.1	21.1	16.5	13.2	18.9	31.0	43.6	186.8	137.0	36.8	80.8	52.6	667.4**
Animas River at Durango, Colorado	1946	20.0	15.4	11.6	12.3	10.2	12.2	45.2	67.7	140.1	41.6	27.3	18.2	421.8
	1947	19.2	16.0	14.1	12.1	10.8	13.8	31.4	157.7	164.5	85.6	56.6	44.1	625.9
Animas River near Cedar Hill, N. Mex.	1946	21.7	16.6	12.4	12.5	12.5	14.8	46.4	67.4	141.7	43.3	30.0	19.4	438.7
	1947	20.6	18.7	15.5	12.2	12.8	16.1	33.2	166.9	166.3	89.3	65.9	50.9	668.4**
Animas River at Farmington, New Mexico	1946	20.1	16.8	13.8	14.0	13.8	14.9	37.1	53.7	127.4	33.6	23.9	13.3	382.4
	1947	18.6	18.2	17.1	14.1	13.7	15.8	22.4	154.5	146.2	74.8	67.6	45.2	608.2**
San Juan River at Farmington, N. Mex.	1946	46.8	33.2	25.6	27.9	29.9	38.2	93.4	127.1	209.6	58.6	58.6	41.6	790.5
	1947	47.3	42.5	36.8	29.5	37.1	48.9	65.8	338.8	291.2	109.0	157.1	94.9	1,298.9
La Plata River at Colorado-New Mexico State Line	1946	0.5	0.4	0.3	0.4	0.7	0.8	1.8	1.8	1.7	0.4	0.5	0.6	9.9
	1947	0.2	0.4	0.4	0.3	0.6	0.7	0.6	4.4	2.3	0.7	1.1	0.2	11.9
San Juan River at Shiprock, New Mexico	1946	51.7	38.1	29.1	28.9	32.6	38.3	90.4	125.3	203.7	60.8	70.3	42.7	811.9
	1947	48.0	46.4	39.8	31.0	38.8	51.3	64.9	342.1	286.9	112.6	214.4	105.4	1,381.6**
Mancos River near Towaoc, Colorado	1946													15.0*
	1947													
McElmo Creek near Cortez, Colorado	1946	3.3	1.7	1.0	0.9	1.8	2.2	3.3	4.3	3.4	1.8	2.6	2.1	28.4D
	1947													
San Juan River near Bluff, Utah	1946	62.0	46.2	30.2	37.0	35.9	46.9	94.7	125.1	203.9	63.3	75.3	44.2	864.5
	1947	55.0	60.2	45.6	30.8	45.2	51.4	68.0	328.9	276.0	109.6	293.5	124.3	1,488.5
Colorado River at Lees Ferry, Arizona	1946	505.2	443.3	336.5	365.9	319.1	495.6	1,013.0	1,732.0	1,993.0	730.1	478.5	309.7	8,721.9
	1947	402.6	466.6	444.6	278.1	356.7	654.3	780.2	3,121.0	3,275.0	1,926.0	1,203.0	584.1	13,492.2
Paria River at Lees Ferry, Arizona	1946	5.0	1.1	0.9	1.0	1.3	1.3	1.0	0.2	0.2	2.1	8.0	0.7	22.8
	1947	3.3	1.8	1.5	0.9	1.3	0.9	0.4	0.4	0.2	0.3	11.6	0.5	23.1
Colorado River at Lees Ferry, Arizona (Compact Point)	1946	510.2	444.4	337.4	366.9	320.4	496.9	1,014.0	1,732.2	1,993.2	732.2	486.5	310.4	8,744.7
	1947	405.9	468.4	446.1	279.0	358.0	655.2	780.6	3,121.4	3,275.2	1,926.3	1,214.6	584.6	13,515.3

* Estimated

** Provisional Data

D Provided by the Durango Office of the U. S. B. R.

A P P E N D I X   B

"CONSUMPTIVE USE OF WATER RATES IN THE UPPER COLORADO RIVER BASIN"

CONSUMPTIVE USE OF WATER RATES IN THE UPPER COLORADO RIVER BASIN

(Provisional)

By

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Prepared under the direction of
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June 15, 1948

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to the
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CONSUMPTIVE USE OF WATER RATES IN THE UPPER COLORADO RIVER BASIN1/

INTRODUCTION

This report deals with the subject of rates of consumptive use of water by various agricultural crops and native vegetation and evaporation from water surfaces in the Upper Colorado River Basin, which includes portions of Arizona, Colorado, New Mexico, Utah and Wyoming.

Early in June 1947, the Upper Colorado River Basin Compact Commission requested a cooperative study of consumptive use in the Basin.2/ After the Compact Commission was created, it appointed an Engineering Advisory Committee with instructions to make certain engineering studies. Among the various Sub-committees of the Engineering Advisory Committee is one on depletion. In January 1948 the Chairman of the Sub-committee on Depletion appointed the following committee to assist the authors in compiling climatological and other data needed in preparing a report on consumptive use:3/

John R. Erickson, Office of State Engineer of New Mexico, Santa Fe, New Mexico.
H. P. Dugan, Office of Hydrology, Bureau of Reclamation, U. S. Department of Interior, Denver, Colorado.

A preliminary report (8) on tentative estimates of consumptive use of water rates for the frost-free period was submitted to the Engineering Advisory Committee for review on March 15, 1948. During May 1948, a field trip was made over the Upper Colorado River Basin for the purpose of obtaining additional information on irrigation period, depth of water applied, number of irrigations and water supply from federal, state and local agencies. (See figure 1.)

In water utilization investigations of areas such as the Upper Colorado River Basin, consumptive use of water is one of the most important factors

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1/ Prepared by Harry F. Blaney, Senior Irrigation Engineer and Wayne D. Criddle, Irrigation Engineer under the direction of George D. Clyde, Chief Division of Irrigation and Water Conservation, Soil Conservation Service Research, U. S. Department of Agriculture, June 15, 1948.

2/ Letter by H. W. Bashore, Chairman of Upper Colorado River Basin Compact Commission to George D. Clyde, Chief, Division of Irrigation and Water Conservation, June 7, 1947.

3/ Memorandum by Royce J. Tipton to Members of the Committee on Depletion of the Engineering Advisory Committee to the Upper Colorado River Basin Compact Commission, January 26, 1948.

to be considered. From a valley-wide standpoint, consumptive use includes all transpiration and evaporation losses from lands on which there is growth of vegetation of any kind, whether agricultural crops or native vegetation, plus evaporation from bare land and from water surfaces (4) (2). The term "consumptive use" is considered synonymous with the term "evapo-transpiration" and is defined (2) as: The sum of the volumes of water used by the vegative growth of a given area in transpiration or building of plant tissue and that evaporated from adjacent soil, snow, or intercepted precipitation on the area in any specified time. If the unit of time is small, such as a week or a month, the consumptive use rate is expressed in acre-inches per acre of depth in inches; whereas, if the unit of time is large, such as a crop-growing season or a 12-month period, the consumptive use rate is usually expressed as acre feet per acre or depth in feet. The sources of water to supply consumptive use are precipitation, surface and ground water.

The object of this report is to present the results of the study of the rates of water consumption at sites of use by agricultural crops and native vegetation in various irrigated areas of Wyoming, Utah, Colorado, New Mexico and Arizona in the Upper Basin. The use of water by all native vegetation in the Upper Basin is not important in the study requested by the Engineering Advisory Committee. The Committee is primarily concerned with stream depletion as well as water consumption resulting from irrigation and other man-made developments. Estimates of consumptive use by forest and other native vegetation growing in mountain watersheds have not been attempted. However, water consumption by native vegetation growing in irrigated valleys and along stream channels is considered important in this report.

PREVIOUS INVESTIGATIONS

Various methods have been used to determine the amount of water consumed by agricultural crops and native vegetation. Regardless of the method, the problems encountered are numerous and considerable time is required to make satisfactory measurements of consumptive use. The source of water used by plant life, whether from precipitation alone, irrigation plus rainfall, ground water plus precipitation, or irrigation plus ground water plus rainfall, is a factor influencing the selection of a method. Unit values of consumptive use may be determined for different kinds of native vegetation and agricultural crops by soil moisture studies, lysimeter or tank measurements, analysis of irrigation data, analysis of climatological data, and other methods (2). For irrigated crops, data on depth of irrigation water applied, number of irrigations per year, irrigation efficiency, water-holding capacity (field capacity) of soil and length of growing season may be used in estimating unit values of consumptive use (3). Unit values observed in one area may be used in estimating consumptive use for other areas having somewhat similar climatic conditions provided temperature and precipitation records are available for both areas (2).

The effect of sunshine and heat in stimulating transpiration was studied as early as 1691, according to a review of the literature by Abbe (1). Measurements of transpiration of various kinds of plants by Briggs and Shantz indicate a close correlation between transpiration and evaporation from free-water surfaces, air temperature, solar radiation, and wet-bulb depression readings (9).

Many formulas have been developed in the past for determining evaporation from meteorological observations. Formulas for estimating consumptive use are not so numerous. A few suggested methods of determing consumptive use, based on climatic factors, have been found to give reasonable results. For many years irrigation engineers have used temperature data in estimating valley consumptive use of water in arid and semi-arid areas of the West (4). Hedke developed the effective heat method on the Rio Grande (14). By this method consumptive use is estimated from a study of the heat units available to the crops of a particular valley (13). It assumes that there is a linear relation between the amount of water consumed and the quantity of available heat. From studies of the Bureau of Reclamation, conducted intermittently from 1937 to 1940 by Lowry and Johnson (15), a similar method was suggested which has been adopted quite generally by the Bureau of Reclamation in making its estimates of valley consumptive use. This method also assumes a direct relationship between temperatures and consumptive use. It assumes a linear relation between consumptive use and accumulated daily maximum temperatures above 32° Fahrenheit during the growing season.

Studies conducted by the Division of Irrigation, Soil Conservation Service, in 1939-41, in connection with the Pecos River Joint Investigation of the National Resources Planning Board, indicated that evaporation, evapo-transpiration, mean monthly temperature, monthly percent of daytime hours, growing season, monthly precipitation and efficiency of irrigation data could be used to estimate irrigation requirements (2). Later Blaney and Morin (5) developed empirical formulas from the Pecos River studies for estimating unit annual values of evaporation from free-water surfaces and consumptive use by native vegetation subsisting on ground water. This method gives consideration to temperature, daytime hours and humidity records and is applicable to those areas in which there is ample water to take care of evaporation and transpiration. Blaney and Morin also show how the formulas might be applied in estimating consumptive use by irrigated crops having access to an ample water supply. Various methods of determining consumptive use of water have been described by Blaney (6). In 1945 Blaney and Criddle simplified the Pecos formulas by eliminating the humidity factor (7).

During a four year investigation, 1938-41, Erickson (12) measured the consumptive use of water in the Lower Uncompahgre Project in the Upper Colorado River Basin by the inflow-outflow method (4) for the Colorado Water Conservation Board.

Annual consumptive use was determined by the Bureau of Reclamation by inflow-outflow and the effective-heat methods in New Fork Valley, Wyoming and the Michigan-Illinois area, Colorado (15).

DESCRIPTION OF UPPER COLORADO RIVER BASIN

The Upper Colorado River Basin is that area tributary to the Colorado River above Lee Ferry. This area is larger than New York, Pennsylvania and New Jersey combined. It includes parts of five Rocky Mountain States (Arizona, Colorado, New Mexico, Utah and Wyoming).

Rimmed by some of the highest mountains in America that are snow-capped throughout the year, it is the source of the greater part of the water reaching the Colorado River.

According to a report of the Bureau of Reclamation (11) there are 70,696,000 acres of land in the Upper Colorado River Basin, of which 1,325,000 acres are irrigated and 272,000 farmed without irrigation. The crops include alfalfa, wild hay, wheat, barley, corn, oats, deciduous fruits, potatoes, sugar beets and dry beans. The following tabulation shows the acreage irrigated in the Upper Basin as reported by the Bureau:

Division	Arizona	Colorado	New Mexico	Utah	Wyoming
Green		105,870		229,120	247,540
Grand		564,670		8,000	
San Juan	6,000	132,300	38,000	37,700	
Total	6,000	802,840	38,000	274,820	247,540

Farming without irrigation is generally unsuccessful in most areas of the Upper Basin because of the uncertain rainfall. The annual precipitation on the irrigated areas ranges from above six inches at Green River, Utah to 17 inches at Kendall, Wyoming, and the summer precipitation ranges from three inches in the lower valleys to nine inches in the higher areas.

CLIMATE

Climatologically, the upper Colorado River Basin has the extremes of year-round snow cover and heavy precipitation on the high peaks of the Rockies, snow-capped eight to ten months a year, and arid conditions with less than six inches of annual rainfall in the southern part.

In general the basin is arid except in the high altitudes of the head-water areas. Rainfall is insufficient in most valley areas for the profitable production of crops without irrigation.

Extremes of temperatures range from 50° below zero to 113° above zero. The northern portion is characterized by short, warm summers and long, cold winters, many mountain areas being blanketed by deep snow all winter. The southern portion has hot summers.

Precipitation and temperature records are available from 85 stations in the area. Climatological data for representative stations used in this report are summarized in table 1.

SOILS

The Bureau of Reclamation reports (11) that:

"The entire upper basin is underlain with sandstones, limestones, and shales composing the parent rock from which the soil forming material has been derived. Four types of soil are found: (1) alluvial soils made up from stream-deposited materials; (2) glacial soils in the form of glacial deposits on out-wash plains derived partly from granites and other igneous material of the higher mountains; (3) residual soils formed in place by the weathering of surface rocks but altered in places through deposition from higher residual lands; and (4) aeolian, or wind deposited soils, appearing in a few places as sand dunes and other formations.

"In the upper valleys lands suitable to agricultural development are largely composed of alluvial soils and are confined to the bottom lands, terraces, and valley fills. These soils are high in organic matter and are inherently fertile. They are generally of sandy loam to loam in texture. Most of these soils have good natural drainage provided by light textured soil over gravelly subsoil and a moderate slope. With the exception of small localized areas the soils in the upper valleys are free from harmful accumulations of alkali. The depth of the soil and the amount of rock on the surface usually determine the suitability of the lands for agriculture.

Table 1 - Average annual precipitation, mean annual temperature and frost-free period at Weather Bureau stations used in computing consumptive use in the Upper Colorado River Basin.
(Based on Weather Bureau records from 1914-1945, except as noted.)

No.	Station Location	Average annual precipitation	Mean annual temperature	Elevation	Average frost-free period: Years of record	From	To	To
		Inches	°F.	Feet				
	ARIZONA							
1	Chinle	9.50	51.3	5,538	22	May 16	Oct. 7	144
4	Kayenta	8.35	52.9	5,640	21	Apr.28	Oct.13	168
	COLORADO							
5	Aspen	19.11	39.8	7,913	17	June 10	Sep.15	97
7	Collbran	15.90	45.6	6,200	31	May 26	Sep.29	126
8	Cortez 1/	13.34	48.1	6,177	28	May 26	Sep.29	126
11	Delta 1/	8.45	50.4	5,115	32	May 5	Oct. 6	154
13	Durango 1/	19.70	45.5	6,554	32	June 1	Sep.26	117
New	Eagle 2/	14.44	42.0	6,598	8	June 19	Sep. 6	79
16	Fruita	9.75	50.9	4,525	32	May 6	Oct.10	157
17	Glenwood Sprgs.	18.37	47.3	5,823	30	May 17	Sep.29	135
18	Grand Junction	9.07	52.8	4,668	32	Apr.13	Oct.26	196
19	Gunnison 1/	10.52	37.4	7,683	28	June 18	Sep. 2	76
20	Hayden 1/	15.62	42.2	6,337	24	June 11	Sep.13	94
21	Ignacio 1/	16.36	45.7	6,425	32	June 5	Sep.23	110
25	Montrose	9.76	48.9	5,830	32	May 6	Oct. 6	153
27	Norwood	17.94	45.2	7,017	14	June 8	Sep.26	110
28	Pagosa Sprgs. 1/	24.22	41.1	7,108	15	June 23	Sep.13	82
30	Paonia	16.04	48.4	6,200	31	May 5	Oct.12	160
31	Rifle 1/	11.00	47.9	5,300	28	May 15	Oct. 3	141
33	Steamboat Spr. 1/	24.07	38.4	6,770	31	June 27	Aug.25	59
	NEW MEXICO							
37	Bloomfield	9.11	50.9	5,794	28	May 7	Oct.11	157
41	Dulce	18.83	43.6	6,767	26	June 11	Sep.20	101
47	Shiprock	7.96	53.1	4,945	14	May 3	Oct.15	165
	UTAH							
50	Blanding	13.46	49.4	6,035	32	May 11	Oct.13	155
52	Castledale	8.63	45.2	5,500	27	May 22	Sep.27	128
53	Duchesne	9.66	44.0	5,520	32	May 26	Sep.23	120
54	Emery	7.61	45.8	6,260	30	May 24	Sep.27	126
55	Escalante	12.56	47.5	5,258	24	May 15	Oct. 1	139
56	Ft. Duchesne	7.01	44.3	4,941	28	May 23	Sep.24	124
58	Green River	6.45	52.3	4,087	31	May 2	Oct. 9	160
59	Hanksville	5.16	52.4	4,200	29	May 2	Oct. 4	155

Table 1 (continued). - Average annual precipitation, mean annual temperature and frost-free period at Weather Bureau stations used in computing consumptive use in the Upper Colorado River Basin. (Based on Weather Bureau records from 1914-1945, except as noted.)

No.	Station Location	Average annual precipitation	Mean annual temperature	Elevation	Average frost-free period: Years of record	From	To	Total
		Inches	°F.	Feet				Days
	UTAH (Cont.)							
61	La Sal	12.82	46.6	6,775	21	May 25	Oct. 1	129
62	Loa	7.85	43.3	7,000	19	June 12	Sep. 9	89
63	Manila	10.35	43.5	6,225	15	June 13	Sep.14	93
64	Moab	9.94	54.6	4,000	31	Apr. 18	Oct.17	182
67	Myton	6.90	46.2	5,030	28	May 17	Sep.30	136
68	Price	10.39	48.8	5,500	24	May 18	Oct. 1	136
71	Tropic	12.69	47.7	6,296	15	May 25	Oct. 6	134
72	Vernal	8.77	44.3	5,335	25	June 1	Sep.18	109
	WYOMING							
75	Dixon 3/	12.00	41.2	6,359	24	June 4	Sep.11	99
76	Eden 4/	7.34	37.9	6,665	27	June 11	Sep.11	92
79	Kemmerer 5/	7.94	39.4	6,954		June 7	Sep.15	100
81	Lyman	11.49	40.7	6,800	16	June 9	Sep.17	100
82	Pinedale	11.42	35.7	7,180	20	June 22	Aug.29	68
New	Big Piney	9.25	34.8	6,820	10	June 22	Aug.29	68

1/ Based on some unpublished data.
2/ Average for period of record, 1905-1910 and 1944-45.
3/ Year 1932 estimated from temperature data.
4/ Year 1931 and 1932 estimated from temperature data.
5/ Estimated 32-year average for the period 1914-1945.

"Mesas, plateaus, basin-like depressions caused through erosion, and narrow valleys along the various streams characterize the lower sections of the upper basin. The broader valleys and depressions that have been covered with alluvial soils are more suitable for cultivation where soil is of sufficient depth. Vast areas of residual soils are too shallow or too alkaline for agricultural development. Extensive drainage is often necessary in the lower valleys where irrigation is practiced.

"Wind formed soils are not extensive. Some are found in small areas south of the San Juan River along the northeastern sides of ridges or other topographic uplifts which break the winds and harbor the deposited materials. The largest areas of arable aeolian soil is east of Chaco River on the high benches south of Farmington, New Mexico.

GENERAL PROCEDURE

Because of the limited measurements of consumptive use in the Upper Colorado River Basin, estimates of unit use by the various agricultural crops and native vegetation in this Basin are based largely on studies in other areas of the West, transferred to the Upper Colorado River Basin by the method suggested by Blaney and Criddle (7). Briefly, the procedure is to correlate existing consumptive use data with monthly temperature, percent of daytime hours and precipitation for the frost-free period or irrigation season and for the entire year. The coefficients so developed for different crops are used to transfer consumptive use data from one section to other areas where only climatological data are available.

Neglecting the unmeasured factors, consumptive use varies with the temperature and the daytime hours, and available moisture (precipitation, irrigation and/or ground-water). By multiplying the mean monthly temperature (t) by the monthly percent of daytime hours of the year (p), there is obtained a monthly consumptive use factor (f). Then it is assumed that the consumptive use varies directly as this factor when an ample water supply is available. Expressed mathematically, $U = KF = \text{sum of } kf$ where

- U = Consumptive use of crop (or evaporation) in inches for any period.
- F = Sum of the monthly consumptive use factors for the period (sum of the products of mean monthly temperature and monthly percent of annual daytime hours) ($t \times p$).
- K = Empirical coefficient (annual or irrigation season).
- t = Mean monthly temperature in degrees Fahrenheit.
- p = Monthly percent of daytime hours of the year.
- $f = \frac{t \times p}{100}$ = Monthly consumptive use factor.
- k = Monthly coefficient.
- $u = kf$ = Monthly consumptive use in inches.

By knowing the consumptive requirement of water by a particular crop in some locality an estimate of the use by the same crop in some other area may be made by application of the formula $U = KF$.

Consumptive use coefficients

The consumptive use coefficients (K) for the more important irrigated crops grown in the Upper Colorado River area and native vegetation and evaporation are shown in table 2. These coefficients were developed from actual measurements of consumptive use in tank and soil moisture field studies and inflow-outflow measurements made throughout the West over a period of years by the Division of Irrigation and Water Conservation and other agencies. These coefficients are based on the assumption that the crops receive a full water supply throughout the growing season or frost-free period (7). If the water supply is short during the latter part of the irrigation period some correction should be made.

Climatological data

For many years climatological data, such as temperature, precipitation and frost-free period (growing season) have been kept by the U. S. Weather Bureau in the Upper Colorado River Basin and other areas throughout the United States (10). The 1941 "Yearbook of Agriculture: Climate and Man" states:

> "The growing season of crops susceptible to frost damage - the so-called warm weather crops - is restricted by the number of days between the last killing frost in the spring and the first in the fall."

Table 2 - Coefficients used in computing consumptive use of water in the Upper Colorado River Basin.

Classification	Growing season or eriod	Consumptive use coefficient K 1/ Gro eriod:	Annual
IRRIGATED LAND			
Alfalfa	Frost-free period	0.85	
Alfalfa	Pre-frost free period	.70	
Grass, hay and pasture	Frost-free period	.75	
Grass, hay and pasture	Pre-frost free period	.60	
Beans and small grains	3 months	.75	
Corn and other annuals	4 months	.75	
Orchard (deciduous)	Frost-free period	.65	
INCIDENTAL AREAS			
Water surfaces	Frost-free period	0.95	0.85
Native vegetation	Frost-free period		
Very dense 2/	" " "	1.35	1.10
Dense 3/	" " "	1.20	1.00
Medium 4/	" " "	1.00	.90
Light 5/	" " "	.80	.65
Sparse 6/	" " "	(Precipitation only)	
Seeped areas 7/	" " "	.90	.75

1/ K = U = $\frac{\text{Consumptive use}}{\text{Consumptive use factor}}$ = Consumptive use coefficient.

2/ Large cottonwood trees, willows and grass. Adequate moisture available from high water table (or ground water).

3/ Willows, tamarisk, or small cottonwood trees. Adequate moisture available from high water table (or ground water).

4/ Small willows or tamarisk. Moisture available from high water table (or ground water).

5/ Salt grass, brush or weeds. Moisture available from ground water.

6/ Sage brush, grass and weeds. Moisture available from precipitation only. (Rainfall during the growing season plus 50 percent of winter precipitation stored in the root zone, not to exceed 3 inches.)

7/ Moist areas caused by seepage from canal, over-irrigation, ground water or poor drainage.

The average annual precipitation, mean annual temperature, and frost-free period for various stations in the Upper Colorado River Basin are shown in table 1. These data were compiled from U. S. Weather Bureau records by the Engineering Advisory Committee to the Upper Colorado River Basin Compact Commission for the period 1914 to 1945 (16).

IRRIGATION PRACTICES

The discussion thus far has assumed an adequate irrigation water supply properly distributed throughout the irrigation season and applied under normal irrigation practices. However, it was realized that these conditions do not exist in every irrigated area within the Upper Colorado River Basin. A field study was therefore made to determine the adequacy of the supply and the irrigation practices in each area before the estimates were applied to actual field conditions.

Some of the factors considered as influencing the rate of consumptive use and on which data were obtained are: The beginning date and length of irrigation season, number of irrigations applied each year, amounts of water applied each year, planting and harvesting dates, average yields, soil textures and root zone depths, rates at which water percolates into the soil, and several others considered of lesser importance. First-hand knowledge was obtained on as many of these factors as possible in the limited time allotted to the field investigation.

Method of obtaining data. - Through the courtesy of the various state representatives of the Engineering Advisory Committee to the Upper Colorado River Basin Compact Commission, interviews were arranged with representative farmers, water masters, state river commissioners, U. S. Bureau of Reclamation Engineers, County Extension Agents, Soil Conservation Service technicians and others acquainted with water supplies and irrigation practices in each area. Figures 2 to 17 show typical areas inspected by the authors in May 1948. In addition, information was obtained from personal observation of the areas and a study of various published and unpublished reports. All the data obtained through interviews, personal observation, or otherwise, were systematically recorded on a form developed especially for this work. (See appendix table H).

General Description of Practices

In some studies of water use in areas of the West, the growing season has been considered as the time between killing frosts, and the irrigation period has generally coincided fairly well with this growing period. However, for most perennial crops, growth starts as soon as the maximum temperature stays well above the freezing point for any extended period of days and continues so throughout the season in spite of later freezes. Sometimes growth persists even after the first so-called killing frost. Grasses may mature even though summer temperatures drop below freezing repeatedly.

In the Upper Colorado River Basin it was found that in the higher areas irrigation water is applied early in the spring in some instances even before growth begins but certainly before the beginning of the frost-free period. Irrigation water is thus consumed through evaporation and some transpiration before the beginning of the frost-free period.

As between States, irrigation practices do not differ materially from place to place under conditions of similar water supply, climatic conditions and elevation. Total water supply as well as its distribution throughout the irrigation season is probably the major reason for variance in irrigation practices applying to any one crop. It was found quite generally that those areas having the shortest late season water supply begin irrigation earliest in the spring in an attempt to supplement the soil moisture supply while water is available.

Following is a general discussion of the irrigation practices in each state of the Upper Colorado River Basin:

Wyoming. - Most of the irrigated land in the Colorado River Area of Wyoming is used in growing grass hay and pasture. The growing season is relatively short. Elevation of practically all the land is above 6,000 feet. According to Weather Bureau records, the frost-free period varies from about 100 days at the south end to less than 70 days in the vicinity of Pinedale. Mean annual temperatures vary from about 35° F to 41° F. The harvesting of the wild hay usually begins between the first and 15th of August and irrigation water must be taken off the meadows early enough to allow harvesting operations. Irrigation begins from May 5 at the lower end of the area to June 1 at the upper end. The major streams head high in the mountains, so that the irrigation period corresponds fairly well with the period of high streamflow. As a result, most of the ranchers get by fairly well with very little reservoir storage water, especially at the upper end of the basin.

Considerable areas that are classed as irrigated land receive natural overflow water when the rivers and streams are high. After the streamflow drops, these areas receive irrigation water until such time as they must be prepared for harvesting. Apparently, these areas have always been naturally flooded, and man in his farming operations has merely lengthened the period during which adequate water is available for good plant growth. The larger areas of the naturally overflowed lands are found in the vicinity of Pinedale and Big Piney and on Ham's Fork and Black's Fork.

The only major variation from the above described irrigation practices and crop distribution is the Eden Valley Irrigation Project located approximately 40 miles north of Rock Springs. About one-half of the irrigated area of this project is in alfalfa, an additional third is in small grains and the balance is in pasture and grass hay. The farmers on the Eden Project are able to make two cuttings of alfalfa each year with average yields of between 1.5 and 2.0 tons per acre. An adequate supply of storage water is available and the farmers apply an average of four irrigations per year to their alfalfa with the first one being applied between May 25 and 31 and the last one August 15. Small grains are irrigated from 2 to 3 times with the irrigation period beginning the middle of June and extending through July.

FIGURE 2
Alfalfa field, near Big Piney, Wyoming, May 22, 1948.

FIGURE 3
Alfalfa growing on bench lands two miles east of Lake Fork, Utah, May 13, 1948.

FIGURE 4
Alfalfa growing on Rogers Mesa, Colorado May 15, 1948.

FIGURE 5
Flooded river bottom, irrigated pasture, and very dense vegetation below Slater, Wyoming, May 20, 1948.

FIGURE 6
Yampa River overflowing bottom lands about eight miles below Steamboat Springs, Colo. May 19, 1948.

FIGURE 7
Flood irrigation of pasture about four miles from Bayfield, Colorado, on Pine River, May 10, 1948.

FIGURE 8
Peach orchard growing along Colorado River near Palisades, Colorado, May 17, 1948.

FIGURE 9
Grain field, flooded pasture, cottonwood trees in background along Colorado River Moab, Utah, May 12, 1948.

FIGURE 10
Farm in Green River Valley, Wyoming, near junction of East Fork and Green River. Sparse native vegetation in foreground, irrigated pasture and dense native vegetation in background, May 22, 1948.

FIGURE 11
Sage brush growing between Farson and Pinedale, Wyoming, May 21, 1948.

FIGURE 12
Little Snake River at high stage, Wyoming-Colorado. Cottonwood trees and willows are typical and very dense riparian vegetation, May 20, 1948.

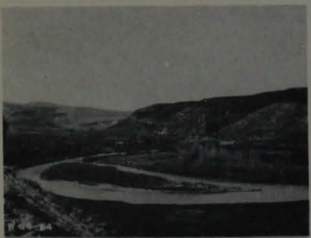

FIGURE 13
White River valley about 10 miles above Rangeley, Colorado. Medium native vegetation growing in river channel.
May 14, 1948.

FIGURE 14
Very dense native vegetation (cottonwoods) (willows) growing along Green River above irrigated lands Green River, Utah.
May 12, 1948

FIGURE 15
Dense Tamarisk (salt-cedar) growing along Colorado River near Moab, Utah, May 12, 1948.

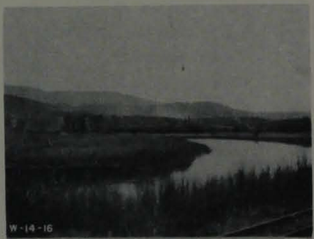

FIGURE 16
Dense willows growing along Animas River two miles above Durango, Colorado.
May 11, 1948.

FIGURE 17
San Juan River Valley about five miles below Blanco, New Mexico. Willows, Tamarisk and Cottonwood trees growing along river. May 9, 1948.

Colorado.- The characteristics of irrigated areas in the Colorado River Area of Colorado are widely variant. The elevation of the irrigated lands ranges from about 4,600 feet near Grand Junction to almost 8,000 feet in areas such as Aspen. The Weather Bureau frost-free period varies from about 60 days to almost 200 days. The mean annual temperature varies from about 35 degrees to 53 degrees. Water supplies are also extremely variable. Some areas such as the Florida project near Durango have extremely short water supplies and a medium long growing season. Some areas which are used for growing wild hay are naturally flooded each year and the irrigation period extends through only a month or less. Agriculture varies from a highly diversified and orchard type of farming in the vicinity of Grand Junction to a wild hay and pasture type toward the head of many of the streams. This is particularly true on the Upper Yampa River, White River, the Upper Main Colorado, Blue River and the Upper Gunnison areas. This natural flooding causes a considerable lowering in the irrigation water demand.

In the Grand Valley, which has a large percentage of its irrigated area in orchard, irrigation of alfalfa begins about the middle of April and continues until the first part of October. Orchards are irrigated approximately eight times each year, the first irrigation occurring about May 5 and the last one October 25. It is the common practice to plant grain as a nurse crop for alfalfa in this valley. The grain and alfalfa combined require five irrigations or more each year and the irrigation season extends from about April 5 until well toward fall. A large part of the irrigated area in Colorado depending upon the flow of the main streams, seems to have a full water supply. However, some of the smaller tributaries of the main rivers do not furnish an adequate late-season water supply for numerous small areas.

Utah.- Elevations of irrigated areas in the Utah part of the Colorado River Basin vary from 4,000 feet to nearly 7,000 feet. The Weather Bureau frost-free growing period for these areas varies from about 90 to 182 days. However, the majority of the irrigated areas have a growing season of about 125 days. Mean annual temperatures vary from 43 to 52 degrees. In most of the irrigated areas alfalfa, small grains and grass hay and pasture are the important irrigated crops. In a few small local areas, such as Green River and Moab, a large proportion of the irrigated land is in orchard, melons, potatoes, etc. A considerable acreage of sugar beets is grown in the Price Area. There is a relatively small percentage of the irrigated land in Utah that has an adequate water supply for full crop production. However, it is believed that for most of the land the shortage is not serious, although for some of the smaller areas, such as Blanding, the supplies are extremely deficient. In most cases inadequacy applies to late-season water. In Ashley Valley, one of the large contiguous irrigated areas in this State, alfalfa is ordinarily irrigated five times, the first application being made about the middle of May and the last one the latter part of August. Small grains receive two or more irrigations each year between the periods May 15 and June 5. In the Blanding area there are seldom more than two irrigations each year for alfalfa, the first one being about March 1 and the last not later than the middle of June. Grains and beans get by with one irrigation.

New Mexico.- The greater part of the New Mexico irrigated land within the Upper Colorado River Basin is irrigated from the San Juan and Animos Rivers and has a water supply adequate to mature crops. Elevation of this area is slightly over 5,000 feet and the frost-free growing period about 160 days. Alfalfa is irrigated at least four or five times a year and the hay yields vary between four and five tons per acre. Irrigation ordinarily begins by April 10 and continues until the middle of September. Small grains receive two or more irrigations per year, the first one the middle of May and the second one toward the end of June. Orchards receive five or more irrigations each year beginning the middle of May and extending pretty well through September with some farmers even irrigating later. The only other two areas in New Mexico considered were the La Plata and the Dulce, in each of which the irrigation supply is extremely short in the latter part of the summer. This shortage tends to move the beginning date of irrigation ahead and to increase the amount of water applied per application while the high flows are still in the rivers.

Arizona.- A large portion of the Arizona irrigated land within the Upper Colorado River Basin is located in the vicinity of Chinle and Kayenta and is farmed by Indians. The Weather Bureau frost-free period varies from about 140 days to over 200 days. The crops consist of about 65 percent corn and cereals, 10 percent alfalfa and 25 percent beans and miscellaneous. Of the 9,840 acres of irrigated land, 5,600 acres have an adequate water supply and 4,240 acres are irrigated only when flood waters are available (16).

ESTIMATES OF RATES OF CONSUMPTIVE USE

In computing rates of consumptive use of water, the Blaney-Criddle method and formula $U = KF$ are used. The values of coefficient (K) are shown in table 2. A consumptive use factor (F) for the growing, frost-free or irrigation period is used. Mean monthly temperature, precipitation records are shown in the appendix.

Irrigated crops

Rates of consumptive use of water by alfalfa and grass hay are established for three types of irrigation practice, which are different because of the character of the water supply, one or more of which is applicable to each area. These three types of irrigation practice are: (1) A water supply adequate to satisfy the requirements of crops and acreages now irrigated. (2) A definitely short late-season irrigation water supply, usually found on the smaller unregulated streams. It is assumed that the period of use of irrigation water is from the date of first irrigation to the date of last irrigation, plus two weeks for grass hay and pasture and three weeks for alfalfa. These periods after the last irrigation are added to take care of residual soil moisture which is used by the crops. However, in no case was the period extended beyond the end of the frost-free period. (3) Irrigation of crop lands normally flooded during the period of high run-off each year. This practice generally applies only to grass hay or pasture land. After the flow in the rivers declines, irrigation water is applied throughout the remainder of the season. Man-made consumption of irrigation water occurs only after the high water recedes and irrigation begins.

The irrigated areas, Weather Bureau stations and irrigation periods for alfalfa and grass hay used in computing water consumption rates are shown in table 3. It is assumed that the growing seasons for orchard and native vegetation are the same as the frost-free periods, that small grains and beans will grow for three months beginning at the last frost in the spring and that corn and other annuals will grow for four months. For crops grown in an area having a growing season greater than that shown as the average frost-free period for the area it is assumed that the crop will not always mature.

A sample of computations for rates of water consumption by irrigated crops in the Upper Yampa and Elk River areas, Colorado is shown in tables 4 and 5. The results of similar computations for normal water consumption rates for irrigated crops during the growing period for areas in the entire Upper Colorado River Basin are summarized in table 6. These estimates are based on the assumption that a water supply ample to satisfy the water requirement of the plants is available from precipitation and irrigation.

The estimates of rates of consumptive use shown in table 6 include moisture supplied by both irrigation and rainfall. By subtracting the growing-period rainfall from the rates of use, the rates of consumption at the point of use, as the result of irrigation, may be obtained provided this land was not naturally irrigated under virgin conditions. For example, the consumptive use for alfalfa in the Montezuma Area, Colorado is computed as 24.5 inches during the irrigation season with a full water supply. The normal rainfall during this period is 5.6 inches. Then 24.5 - 5.6 = 18.9 inches or 1.58 feet (acre-feet per acre) which is the consumption of irrigation water at point of use for alfalfa land during the irrigation season. Table 7 summarizes the results of computations of rates of consumptive use minus rainfall during the growing or irrigation season.

Under virgin conditions some of this land may have received moisture from a high water table or it may be received water from precipitation only. Also, land which formerly may have had a high water table may now be drained. In such instances it will be necessary to make allowances for these conditions in each area when estimating the consumption of irrigation water. It may be assumed that average consumptive use during the winter period under present conditions has not changed materially from what it was under virgin conditions.

Table 3 - Irrigated areas, Weather Bureau stations, and irrigation periods used in computing consumptive use of irrigation water - Wyoming, Colorado, Utah, Mexico and Arizona.

Unit No.	Unit Area	Weather Bureau station	Water 1/ supply	Frost-free 2/ period	Alfalfa 3/ irrigation season
	<u>WYOMING</u>				
1	Eden Valley	Eden	F	6/11 - 9/11	5/25 - 9/11
2	Pinedale	Pinedale	F	6/22 - 8/29	5/20 - 8/29
			N.O.		6/22 - 8/29
3	Big Piney	Big Piney	S	6/22 - 8/29	5/10 - 8/15
			N.O.		6/22 - 8/15
4	Ham's Fork	Kemmerer	F	6/7 - 9/15	5/15 - 9/15
			N.O.		6/20 - 9/15
5	Black's Fork	Lyman	S	6/9 - 9/17	5/10 - 8/15
			N.O.		6/20 - 8/15
6	Little Snake	Dixon	S	6/4 - 9/11	5/5 - 8/15
7	Henry's Fork	Manila	S	6/13 - 9/14	5/15 - 8/20
	<u>COLORADO</u>				
1	Upper Yampa and Elk River	Steamboat Springs	F	6/27 - 8/5	5/10 - 8/25
			S		5/10 - 7/31
			N.O.		7/8 - 7/31
2	Lower Yampa and tributaries	Hayden	S	6/11 - 9/13	5/5 - 7/31
3	Little Snake River	Dixon	S	6/4 - 9/11	5/15 - 8/20
4	White River direct	Meeker	F	6/10 - 9/11	5/15 - 9/11
			N.O.		7/12 - 9/11
5	White River tributaries	Meeker	S	6/10 - 9/11	5/15 - 7/20
			N.O.		7/12 - 7/13
6	Colorado River above Glenwood	Green Mt. Dam & Blue Valley Ranch	F	6/15 - 9/6	5/20 - 9/6
6a	Muddy Troublesome	Green Mt. Dam & Blue Valley Ranch	S	6/15 - 9/6	5/10 - 8/10
			N.O.		7/18 - 8/3
7	Blue River	Green Mt. Dam & Blue Valley Ranch	F	6/15 - 9/6	5/20 - 9/6
			N.O.		7/18 - 9/6
8	Eagle River and Upper Eagle River	Eagle	F	6/19 - 9/6	5/5 - 9/6
			N.O.		7/18 - 9/6
9	Gypsum Creek	Eagle	S		5/1 - 7/21
10	Roaring Fork above Basalt	Aspen	F	6/10 - 9/15	6/1 - 9/15
			S		6/1 - 9/1
11	Roaring Fork - Glenwood Sprgs. to Basalt	Glenwood Sprgs.	F	5/17 - 9/29	5/10 - 9/29
			S		5/10 - 8/15
12	Rifle (Silt to Glenwood Springs)	Rifle	S	5/15 - 10/3	5/25 - 8/1
12a	Plateau Creek	Collbran	S	5/26 - 9/29	5/1 - 7/15

Table 3 - (Cont'd) - Irrigated areas, Weather Bureau stations, and Irrigation periods used in computing consumptive use of irrigation water - Wyoming, Colorado, Utah, New Mexico and Arizona.

Unit No.	Unit Area	Weather Bureau station	Water 1/ supply	Frost-free 2/ period	Alfalfa 3/ irrigation season
	COLORADO (Cont'd)				
13	Grand Valley	Fruita and Grand Junction	F	4/24 - 10/18	4/15 - 10/18
14	Upper Gunnison	Gunnison	F	6/18 - 9/2	5/20 - 9/2
			N.O.		7/1 - 9/2
15	Tomichi and Cochetopa	Gunnison	S	6/18 - 9/2	5/20 - 8/10
			N.O.		7/1 - 7/26
16	North Fork Gunnison	Paonia	S	5/5 - 10/12	4/20 - 7/15
17	Upper Uncompahgre Cimarron and Dallas	Montrose and Gunnison	F	5/28 - 9/19	5/15 - 9/20
18	Uncompahgre Project	Montrose and Delta	F	5/5 - 10/6	5/1 - 10/6
19	Little Dolores	Grand Junction	S	4/13 - 10/26	4/15 - 9/1
19a	Lower Dolores	Fruita and Grand Junction	F	4/24 - 10/18	4/15 - 10/18
20	Dolores River	Cortez	S	5/26 - 9/29	6/10 - 9/1
21	San Miguel, Tilly lands, Disappointment	Norwood	S	6/8 - 9/26	5/8 - 8/1
22	Montezuma Area	Cortez	F	5/26 - 9/29	5/5 - 9/29
23	Upper San Juan Valley	Pagosa Springs	F	6/23 - 9/13	5/15 - 9/13
24	Pine River and Pedra Area	Ignacio	F	6/5 - 9/23	5/5 - 9/23
25	Animas River	Durango	F	6/1 - 9/26	5/1 - 9/26
26	Florida Area	Durango	S	6/1 - 9/26	5/1 - 7/21
27	La Plata (Colorado Area)	Cortez and Lewis	S	5/30 - 9/26	5/15 - 8/8
28	Mancos Area	Cortez	S	5/26 - 9/29	5/1 - 7/21
	UTAH				
1	Henry's Fork	Manila	S	6/13 - 9/14	5/15 - 8/20
2	Ashley Valley and Brush Creek	Vernal	F	6/1 - 9/18	5/10 - 9/18
3	Ouray	Myton	S	5/17 - 9/30	4/10 - 7/21
4	Valley lands - Uinta Basin	Myton) Ft. Duchesne)	S	5/20 - 9/27	4/15 - 9/15
5	Bench lands Uinta Basin	Duchesne)	S	5/26 - 9/23	4/20 - 9/15
6	Price River	Price	F	5/18 - 10/1	5/1 - 10/1

Table 3 - (Cont'd) - Irrigated areas, Weather Bureau stations, and irrigation periods used in computing consumptive use of irrigation water - Wyoming, Colorado, Utah, New Mexico and Arizona.

Unit No.	Unit Area	Weather Bureau station	Water 1/ supply	Frost-free 2/ period	Alfalfa 3/ irrigation season
	UTAH (Cont'd)				
7	Green River	Green River	F	5/2 - 10/9	4/10 - 10/9
8	Moab	Moab	S	5/18 - 10/17	4/1 - 8/31
9	La Sal	La Sal	S	5/25 - 10/1	4/15 - 7/25
10	Monticello	La Sal	S	5/25 - 10/1	4/15 - 7/31
11	Huntington, Castle Dale, Ferron	Castle Dale	S	5/22 - 9/27	4/15 - 8/31
12	Emery - Hanksville	Emery	S	5/24 - 9/27	4/15 - 8/31
13	Loa	Loa	S	6/12 - 9/9	5/1 - 8/15
14	Escalante	Escalante	S	5/15 - 10/1	4/15 - 8/15
15	Blanding	Blanding	S	5/11 - 10/13	4/15 - 7/31
16	Paria River	Tropic	S	5/25 - 10/6	4/15 - 8/15
	NEW MEXICO				
1	Dulce - Upper Navajo	Dulce	S	6/11 - 9/20	5/15 - 9/13
2	La Plata	Ft. Lewis and Bloomfield	S	5/21 - 10/1	5/15 - 8/8
3	Bloomfield - Shiprock	Bloomfield and Shiprock	F	5/5 - 10/13	4/10 - 10/13
	ARIZONA				
1	Chinle	Chinle	F	5/16 - 10/7	5/1 - 10/7
			S		5/1 - 7/15
2	Kayenta	Kayenta	F	4/28 - 10/13	4/10 -10/13
					4/10 - 7/15

1/ F = Full water supply for all crops.
S = Short water supply for alfalfa, grass hay and pasture.
N.O. = Natural overflow on grass hay meadows and pasture during flood stage of river or stream, provides moisture before irrigation begins.

2/ From U. S. Weather Bureau records.

3/ From interviews with farmers, county agents, water masters, river commissioners, and others. The end of the irrigation season is assumed to be the end of the frost free period in areas of full water supply. Where the water supply is short it is assumed that alfalfa would continue to use residual moisture in the soil for three weeks after the last irrigation. Grass hay and pasture are assumed to use residual irrigation water from the soil two weeks after the last irrigation.

Table 4 - Example of observed monthly temperatures, precipitation, percent of daytime hours and calculated consumptive use factor, in the Upper Yampa and Elk River areas of the Upper Colorado River Basin.

W. B. Station Steamboat Springs County Routt State Colorado

Sta. No. 33 Elevation 6,770 Ft. Latitude 40° 30 'N.

Month or Period	Water Supply				Full 1/ 5/10 - 8/25		Short 2/ 5/10 - 7/31		Natural over-flow 3/ 7/8 - 7/31	
	t	p	f	R	f	R	f	R	f	R
	°F.	Percent		Inches		Inches		Inches		Inches
January	13.9	6.72	0.93	2.31						
February	18.6	6.71	1.25	2.43						
March	26.2	8.33	2.18	2.39						
April	38.2	8.96	3.42	2.27						
May	48.2	10.05	4.84	2.23	3.23	1.49	3.23	1.49		
June	55.2	10.15	5.60	1.38			5.60	1.38		
1-27					5.04	1.24				
28-30					0.56	0.14				
July	61.6	10.26	6.32	1.58	6.32	1.58	6.32	1.58	4.74	1.18
August	59.4	9.56	5.68	1.76	4.58	1.42				
September	52.1	8.38	4.37	1.78						
October	41.7	7.73	3.22	1.99						
November	28.7	6.71	1.93	1.69						
December	16.9	6.48	1.10	2.26						
Total	38.4	100.00	40.84	24.07			15.15	4.45	4.74	1.18
5/10-6/27					8.27	2.73				
6/28-8/25					11.46	3.14				

t = Mean monthly temperature in degrees; p = Monthly percent of daytime hours; $f = \frac{t \times p}{100}$ = Monthly consumptive use factor; R = Precipitation in inches.

1/ Full water supply for all crops.
2/ Short water supply for alfalfa, grass hay, and pasture.
3/ Natural overflow on grass hay, meadows and pasture during flood stage of river or streams.

Table 5 - Example of computations of rates of consumptive use of water in the Upper Yampa and Elk River areas of the Upper Colorado River Basin.

Classification	Water supply	K	F (total f)	U	R	U minus R
				Inches	Inches	Inches
Irrigated crops						
Alfalfa	Full 1/	0.70	8.27	5.79	2.73)	9.66
	Full 1/	0.85	11.46	9.74	3.14)	
Alfalfa	Short 2/	0.85	15.15	12.88	4.45	8.43
Grass Hay	Full 1/	0.60	8.27	4.96	2.73)	7.69
	Full 1/	0.75	11.46	8.60	3.14)	
	Short 2/	0.75	15.15	11.36	4.45	6.91
	N. O. 3/	0.75	4.74	3.56	1.18	2.38
Incidental areas						
Water surfaces		0.94	11.46	10.88	3.14	7.74
Native vegetation						
Very dense		1.35	11.46	15.47	3.14	12.33
Dense		1.20	11.46	13.75	3.14	10.61
Medium		1.00	11.46	11.46	3.14	8.32
Light		0.80	11.46	9.16	3.14	6.02
Sparse			(Precipitation only)			
Seeped areas		0.90	11.46	10.31	3.14	7.17

$U = KF$ = consumptive use in inches. F = Sum of the monthly consumptive use factors for the period. $K = \frac{U}{F}$ Empirical coefficient determined experimentally. R = Precipitation in inches.

1/ Full water supply for all crops.
2/ Short water supply for alfalfa, grass hay, and pasture.
3/ Natural overflow on grass hay, meadows and pasture during flood stage of river or streams.

Table 6 - Summary of estimates of normal unit consumptive use of water rates for irrigated crops during the irrigation period for areas in the Upper Colorado River Basin.

Unit		Water supply	Normal rate consumptive use 1/				
No.	Area		Alfalfa	Grass Hay and pasture	Grains and beans	Corn and other annuals	Orchard
			Inches	Inches	Inches	Inches	Inches
	ARIZONA						
1	Chinle	F	28.3	24.2	15.4	20.1	-
	Chinle	S	13.9	10.8	15.4	20.1	-
2	Kayenta	F	32.5	28.7	15.2	20.5	-
	Kayenta	S	16.9	13.5	15.2	20.5	-
	COLORADO						
1	Upper Yampa and Elk River	F	15.5	13.6	8.6	8.6	-
	Upper Yampa and Elk River	S	12.9	11.4	8.6	8.6	-
	Upper Yampa and Elk River	N.O.	-	3.6	-	-	-
2	Lower Yampa and Tributaries	S	14.6	11.7	14.0	-	-
3	Little Snake River	S	16.9	13.8	13.9	-	-
	Little Snake River	N.O.	-	4.9	-	-	-
4	White River, direct	F	18.9	13.9	13.8	-	-
	White River, direct	N.O.	-	8.9	-	-	-
5	White River tributaries	S	11.2	8.9	-	-	-
	White River tributaries	N.O.	-	0.0	-	-	-
6	Colorado River above Glenwood	F	16.3	14.3	11.7	-	-
6a	Kremmling, Muddy, Troublesome	S	14.4	11.6	11.7	11.7	-
	Kremmling, Muddy, Troublesome	N.O.	-	2.4	-	-	-
7	Blue River	F	16.3	14.3	11.7	-	-
	Blue River	N.O.	-	7.0	-	-	-
8	Eagle River and Upper Eagle R.	F	18.5	16.2	11.6	11.6	-
	Eagle River and Upper Eagle R.	N.O.	-	7.1	-	-	-
9	Gypsum Creek	S	12.7	10.4	11.6	11.6	-
10	Roaring Fork, above Basalt	F	16.3	14.4	12.7	13.3	-
	Roaring Fork, above Basalt	S	14.7	13.0	12.7	13.3	-
11	Roaring Fork Glenwood Springs	F	24.2	21.4	14.6	19.0	17.8
	to Basalt	S	17.5	14.2	14.6	19.0	17.8
12	Rifle-Silt to Glenwood Springs	S	12.8	9.9	15.0	19.4	18.7
12a	Plateau Creek	S	12.8	11.3	14.5	18.5	16.3
13	Grand Valley	F	32.4	28.6	15.2	20.6	24.0
14	Upper Gunnison (excluding	F	15.8	13.8	10.9	10.9	-
	Tomichi and Cochetopa)	N.O.	-	9.2	-	-	-
15	Tomichi and Cochetopa	S	13.0	9.9	10.9	10.9	-
	Tomichi and Cochetopa	N.O.	-	3.9	-	-	-
16	North Fork Gunnison	S	14.5	11.5	14.6	19.3	20.5
17	Upper Uncompahgre, Cimarron and Dallas	F	21.2	18.7	14.9	19.7	20.2
18	Uncompahgre Project	F	27.9	24.6	15.2	20.0	20.6
19	Little Dolores	S	26.3	21.8	14.6	20.3	26.2
19a	Lower Dolores	F	32.4	28.6	15.2	20.6	24.0
20	Dolores River	S	15.1	11.9	14.8	18.9	16.7
21	San Miguel, Lilylands, Disappointment	S	14.3	11.1	14.1	-	-
22	Montezuma Area	F	24.5	21.5	14.8	18.9	16.7
23	Upper San Juan Valley	F	17.8	15.6	-	-	-

Table 6 (Cont'd) - Summary of estimates of normal unit consumptive use of water rates for irrigated crops during the irrigation period for areas in the Upper Colorado River Basin.

Unit		Water supply	Normal rate consumptive use 1/				
No.	Area		Alfalfa	Grass hay and pasture	Grains and Beans	Corn and other annuals	Orchard
	COLORADO (Continued)		Inches	Inches	Inches	Inches	Inches
24	Pine River and Piedra Area	F	22.4	19.6	14.2	18.6	14.2
25	Animas River	F	22.9	20.1	14.0	17.1	14.8
26	Florida Area	S	13.2	10.8	14.0	17.1	14.8
27	La Plata (Colorado portion)	S	14.4	11.6	14.2	17.2	15.1
28	Mancos Area	S	14.0	11.5	14.8	18.9	16.7
	NEW MEXICO						
1	Dulce	S	20.1	16.8	13.8	-	-
2	La Plata	S	15.0	12.0	12.0	-	-
3	Bloomfield-Shiprock	F	32.1	28.4	15.3	20.4	21.9
	UTAH						
1	Henry's Fork	S	16.8	14.0	14.0	-	-
2	Ashley Valley and Brush Creek	F	21.8	19.2	14.9	-	-
3	Ouray	S	17.1	14.2	-	-	-
4	Benchlands - Uinta Basin	S	23.4	20.6	14.6	18.2	15.7
5	Valleylands - Uinta Basin	S	25.0	22.1	15.1	19.3	17.6
6	Price River	F	26.7	23.5	15.4	19.9	18.7
7	Green River	F	32.5	28.6	16.2	21.7	23.0
8	Moab	S	28.8	24.2	15.3	20.9	25.3
9	La Sal	S	16.4	13.3	14.7	18.7	16.8
10	Monticello	S	17.6	14.3	14.7	18.7	16.8
11	Huntington, Castle Dale Ferron	S	23.1	19.3	14.6	18.7	16.7
12	Emery-Hanksville	S	22.5	18.8	14.2	18.2	18.6
13	Loa	S	17.7	14.5	13.3	-	-
14	Escalante	S	20.3	16.8	14.4	18.7	17.9
15	Blanding	S	18.2	14.8	14.8	19.4	20.1
16	Paria River	S	20.1	16.6	14.5	18.5	17.0
	WYOMING						
1	Pinedale	F	14.8	13.0	-	-	-
	Pinedale	N.O.	-	9.8	-	-	-
2	Big Piney	S	14.7	11.9	-	-	-
	Big Piney	N.O.	-	6.8	-	-	-
3	Eden Valley	F	17.2	15.1	13.4	-	-
4	Ham's Fork	F	18.6	16.3	13.2	-	-
	Ham's Fork	N.O.	-	12.2	-	-	-
5	Black's Fork	S	16.2	13.0	13.6	-	-
	Black's Fork	N.O.	-	7.5	-	-	-
6	Henry's Fork	S	16.8	14.0	14.0	-	-
7	Little Snake	S	16.9	13.8	13.9	-	-
	Little Snake	N.O.	-	4.9	-	-	-

1/ Includes irrigation water plus precipitation.
F = Full water supply for all crops.
S = Short water supply for alfalfa, grass hay, and pasture.
N.O.=Natural over-flow on grass hay, meadows and pasture during flood stage of river or streams, provides moisture for crops before irrigation period begins consumptive use rate is for irrigation period only.

Table 7 - Summary of estimates of normal unit "consumptive use of water rates minus precipitation" for irrigated crops for the irrigation period for areas in the Upper Colorado River Basin.

Unit No.	Unit Area	Water supply	Normal rate consumptive use 1/ Alfalfa	Grass hay and pasture	Grains and beans	Corn and other annuals	Orchard
			Inches	Inches	Inches	Inches	Inches
	ARIZONA						
1	Chinle	F	23.0	19.2	12.5	15.8	-
	Chinle	S	12.3	9.7	12.5	15.8	-
2	Kayenta	F	27.5	23.6	13.3	17.0	-
	Kayenta	S	15.3	12.2	13.3	17.0	-
	COLORADO						
1	Upper Yampa and Elk River	F	9.7	7.7	5.5	5.5	-
	Upper Yampa and Elk River	S	8.4	6.9	5.5	5.5	-
	Upper Yampa and Elk River	N.O.	-	2.4	-	-	-
2	Lower Yampa and Tributaries	S	11.0	8.4	10.1	-	-
3	Little Snake River	S	13.8	10.9	10.7	-	-
4	White River - Direct	F	13.2	10.9	9.2	-	7.4
	White River - Direct	N.O.	-	5.6	-	-	-
5	White River Tributaries	S	8.4	6.4	9.2	-	7.4
6	Colorado River above Glenwood	F	11.8	9.8	8.1	-	-
6a	Kremmling, Muddy, Troublesome	S	10.6	8.2	8.1	8.1	-
	Kremmling, Muddy, Troublesome	N.O.	-	1.7	-	-	-
7	Blue River	F	11.8	9.8	8.1	-	-
	Blue River	N.O.	-	4.7	-	-	-
8	Eagle River and Upper Eagle R.	F	13.3	11.0	8.2	8.2	-
	Eagle River and Upper Eagle R.	N.O.	-	4.8	-	-	-
9	Gypsum Creek	S	9.4	7.3	8.2	8.2	-
10	Roaring Fork above Basalt	F	11.5	9.6	8.5	8.5	-
	Roaring Fork above Basalt	S	10.7	9.0	8.5	-	-
11	Roaring Fork Glenwood Springs to Basalt	F	17.1	14.3	10.4	12.9	11.1
	Roaring Fork Glenwood Springs to Basalt	S	13.0	10.1	10.4	10.4	-
12	Rifle-Silt to Glenwood Springs	S	11.0	8.4	12.4	15.7	14.3
12a	Plateau Creek	S	10.0	8.5	11.1	13.4	11.0
13	Grand Valley	F	28.3	24.5	13.2	17.6	19.2
14	Upper Gunnison (excluding Tomichi and Cochetopa)	F	11.7	9.7	7.5	7.5	-
		N.O.	-	6.1	-	-	-
15	Tomichi and Cochetopa	S	10.1	7.4	7.5	-	-
	Tomichi and Cochetopa	N.O.	-	2.6	-	-	-
16	North Fork Gunnison	S	11.3	8.5	11.4	14.8	14.2
17	Upper Uncompahgre Cimarron and Dallas	F	16.8	14.3	12.5	16.0	15.5
18	Uncompahgre Project	F	23.2	20.0	13.0	16.6	16.2
19	Little Dolores	S	22.8	18.6	12.6	17.5	21.0
19a	Lower Dolores	F	28.3	24.5	13.2	17.6	19.2
20	Dolores River	S	11.9	9.2	11.6	13.9	11.6
21	San Miguel - Lily Lands - Disappointment	S	10.5	8.0	8.8	-	-
22	Montezuma Area	F	18.9	16.0	11.6	13.9	11.6
23	Upper San Juan Valley	F	11.0	8.8	-	-	-

Table 7 (Continued) - Summary of estimates of normal unit "consumptive use of water rates minus precipitation" for irrigated crops for the irrigation period for areas in the Upper Colorado River Basin.

Unit No.	Unit Area	Water supply	Normal rate consumptive use 1/ Alfalfa	Grass hay and pasture	Grains and beans	Corn and other annuals	Orchard
			Inches	Inches	Inches	Inches	Inches
	COLORADO (Continued)						
24	Pine River and Piedra Area	F	15.5	12.7	9.3	12.6	8.3
25	Animas River	F	14.9	12.1	8.8	10.2	7.9
26	Florida Area	S	9.8	7.8	8.8	10.2	7.9
27	La Plata - (Colorado Portion)	S	11.2	8.8	9.9	11.4	9.2
28	Mancos Area	S	12.0	9.7	11.6	13.9	11.6
	NEW MEXICO						
1	Dulce	S	13.1	10.3	7.9	-	-
2	La Plata	S	11.8	9.3	10.5	-	-
3	Bloomfield Shiprock	F	27.0	23.2	13.4	17.2	17.2
	UTAH						
1	Henry's Fork	S	13.9	11.3	11.3	-	-
2	Ashley Valley and Brush Creek	F	18.7	16.1	13.1	-	-
3	Ouray	S	15.1	12.3	13.2	-	-
4	Benchlands-Uinta Basin	S	19.0	15.7	11.6	14.2	11.7
5	Valleylands-Uinta Basin	S	21.9	18.9	13.2	16.6	14.6
6	Price River	F	21.7	18.5	12.7	15.8	14.1
7	Green River	F	28.8	25.0	14.7	19.3	19.7
8	Moab	S	24.8	20.4	13.1	17.8	20.3
9	La Sal	S	13.0	10.3	11.1	-	-
10	Monticello	S	13.9	11.0	11.1	-	-
11	Huntington-Castle Dale-Ferron	S	19.6	16.1	12.1	15.1	13.0
12	Emery-Hanksville	S	19.1	15.6	11.8	14.7	14.2
13	Loa	S	15.0	12.9	10.3	-	-
14	Escalante	S	16.3	13.3	11.0	13.6	12.1
15	Blanding	S	15.4	12.2	12.3	15.6	14.8
16	Paria River	S	16.4	13.3	11.1	13.5	12.0
	WYOMING						
1	Pinedale	F	11.4	9.6	-	-	-
	Pinedale	N.O.	-	7.5	-	-	-
2	Big Piney	S	11.9	9.3	-	-	-
	Big Piney	N.O.	-	5.7	-	-	-
3	Eden Valley	F	14.5	12.4	11.1	-	-
4	Ham's Fork	F	15.6	13.4	11.0	-	-
	Ham's Fork	N.O.	-	10.2	-	-	-
5	Black's Fork	S	12.9	9.9	10.9	-	-
	Black's Fork	N.O.	-	5.8	-	-	-
6	Henry's Fork	S	13.8	10.9	11.3	-	-
7	Little Snake	S	13.3	10.5	10.7	-	-
	Little Snake	N.O.	-	3.8	-	-	-

1/ Includes irrigation water only (consumptive use minus rainfall).
F = Full water supply for all crops.
S = Short water supply for alfalfa, grass hay and pasture.
N.O. = Natural over-flow on grass hay, meadows and pasture during flood stage of river or streams.

Native vegetation and incidental areas

Native vegetation generally has first use of the water of a region. The consumption of water by native vegetation thus becomes of increasing importance as greater land areas are irrigated, and during periods of drought. Careful consideration must be given to the consumptive water requirements of native vegetation before a complete inventory can be made of the water resources of the Upper Colorado River Basin.

Consumptive use of water by native vegetation varies according to the quantity of moisture available (17). Plants adapted to an extreme economy of water do not continue the same low rate of use during periods of more abundant supply. Precipitation, varying widely from year to year, produces a more vigorous growth that has a greater consumptive use in wet years than in dry. Drought periods are seldom so severe that there is a widespread destruction of vegetation from lack of moisture.

Adaptation of plants to natural moisture conditions has distributed vegetation in more or less dominant communities which may be roughly classified as drought-resistant, ground-water plants, and those that grow with roots submerged. Neither group is confined to any particular geograhical area but is governed by local conditions. There are no fixed boundary lines between groups, for as ground-water conditions change with increased or decreased precipitation, the dominant communities advance or recede according to moisture available in the soil.

Much of the arid region has ground water only at depths beyond reach of plant roots, and in these areas plants depend entirely upon the scanty rainfall and the moisture that is held in the upper soil horizon. Desert sage, sage brush, creosote bush, desert grass, and cacti are a few desert growths which subsist upon a meager rainfall.

Ground-water plants are those sending their roots to the water table or into the adjoining region of capillary moisture. Thus they are a middle group between desert growth that has no connection with ground water and plants that grow with their roots submerged. These comprise a great variety, ranging from small ground plants to large trees, Salt grass, seepweed, salt bush and some species of sacaton are in this group.

Riparian or river-bottom growths, such as salt cedars (tamarisk), willows, and cottonwoods, consume more water per given area than irrigated crops.

Plants growing in water, such as tules, cattails, and sedges, are users of large quantities of water.

Meteorological conditions influencing evaporation from water surfaces likewise affect transpiration from vegetation and evaporation from soils. Both evaporation and transpiration freely respond to temperature, wind movement, and humidity.

Seeped lands are moist areas within irrigation projects. These areas are the result of high ground water due to seepage from canals, over-irrigation, or both and poor drainage. Seeped lands are generally in greasewood,

Table 8 - Summary of estimates of normal unit consumptive use of water rates for native vegetation and areas receiving water incidentally to irrigation in the Upper Colorado River Basin.

Unit		Normal rate consumptive use 1/						
		Water surface	Native vegetation 2/					Seeped 3/ land
No.	Area		Very dense	Dense	Medium	Light	Sparse	
		Inches	Inches	Inches	Inches	Inches	Inches	Inches
	ARIZONA							
1	Chinle	28.7	40.8	36.2	30.2	24.2	7.2	27.2
2	Kayenta	33.5	47.6	42.3	35.2	28.2	6.6	31.7
	COLORADO							
1	Upper Yampa and Elk River	10.9	15.5	13.8	11.5	9.2	6.1	10.3
2	Lower Yampa and tributaries	18.0	25.5	22.7	18.9	15.1	7.0	17.0
3	Little Snake River	18.6	26.4	23.5	19.6	15.6	6.4	17.6
4	White River Direct	17.6	25.0	22.2	18.5	14.8	7.6	16.6
5	White River tributaries	17.6	25.0	22.2	18.5	14.8	7.6	16.6
6	Colo. River above Glenwood	14.9	21.1	18.8	15.6	12.5	-	14.1
6a	Kremmling, Muddy, and Troublesome	14.9	21.1	18.8	15.6	12.5	-	14.1
7	Blue River	14.9	21.1	18.8	15.6	12.5	-	14.1
8	Eagle River and Upper Eagle River	14.7	20.9	18.5	15.4	12.4	6.4	13.9
9	Gypsum	14.7	20.9	18.5	15.4	12.4	6.4	13.9
10	Roaring River above Basalt	16.8	23.9	21.3	17.7	14.2	7.5	15.9
11	Roaring Fork-Glenwood Springs to Basalt	26.0	36.9	32.8	27.3	21.9	9.7	24.6
12	Rifle-Silt to Glenwood Springs	27.3	38.8	34.5	28.8	23.0	7.4	25.9
13	Grand Valley	35.0	49.8	44.2	36.9	29.5	7.3	33.2
14	Upper Gunnison	13.8	19.7	17.5	14.6	11.7	6.4	13.1
15	Tomichi and Cochetopa	13.8	19.7	17.5	14.6	11.7	6.4	13.1
16	North Fork Gunnison	30.0	42.6	37.9	31.6	25.2	9.3	28.4
17	Upper Uncompahgre, Cimarron and Dallas	21.7	30.8	27.4	22.8	18.3	6.8	20.6
18	Uncompahgre Project	30.2	42.9	38.1	31.8	25.4	6.8	28.6
19	Little Dolores	38.4	54.5	48.4	40.4	32.3	7.7	36.3
20	Dolores River	24.4	34.6	30.8	25.6	20.5	8.1	23.1
21	San Miguel, Lilylands, Disappointment	20.6	29.3	26.0	21.7	17.4	9.4	19.5
22	Montezuma Area	24.4	34.6	30.8	25.6	20.5	8.1	23.1
23	Upper San Juan Valley	14.7	20.9	18.7	15.5	12.4	8.5	13.9
24	Pine River and Piedra Area	20.8	29.6	26.3	21.9	17.5	9.0	19.7
25	Animas River	21.6	30.7	27.3	22.7	18.2	9.9	20.5
26	Florida Area	21.6	30.7	27.3	22.7	18.2	9.9	20.5
27	La Plata (Colorado Area)	22.1	31.4	27.9	23.2	18.6	8.8	20.9
28	Mancos Area	24.4	34.6	30.8	25.6	20.5	8.1	23.1

Table 8 (Continued) - Summary of estimates of normal unit consumptive use of water rates for native vegetation and areas receiving water incidentally to irrigation in the Upper Colorado River Basin.

Unit		Normal rate consumptive use 1/						
		Water surface	Native vegetation 2/					Seeped land
No.	Area		Very dense	Dense	Medium	Light	Sparse 3/	
		Inches	Inches	Inches	Inches	Inches	Inches	Inches
	NEW MEXICO							
1	Dulce	18.8	26.7	23.8	19.8	15.8	9.5	17.8
2	La Plata Area	25.3	35.9	31.9	26.6	21.3	8.3	24.0
3	Bloomfield Shiprock	31.9	45.3	40.3	33.6	26.9	6.5	30.2
	UTAH							
1	Henry's Fork	17.8	25.4	22.6	18.8	15.0	5.7	16.9
2	Ashley Valley and Brush Creek	21.5	30.6	27.2	22.7	18.1	5.5	20.4
3	Ouray Area	27.3	38.8	34.5	28.7	23.0	5.1	25.9
4	Benchlands, Uinta Basin	23.0	32.7	29.0	24.2	19.4	6.8	21.8
5	Valley lands, Uinta Basin	25.7	36.5	32.4	27.0	21.6	5.0	24.3
6	Price River	27.3	38.8	34.4	28.7	23.0	7.5	25.8
7	Green River	33.5	47.7	42.4	35.3	28.2	4.9	31.8
8	Moab	36.9	52.5	46.6	38.9	31.1	7.5	35.0
9	La Sal	23.7	33.6	29.9	24.9	19.9	8.3	22.4
10	Monticello	23.7	33.6	29.9	24.9	19.9	8.3	22.4
11	Huntington Castledale Ferron	24.4	34.7	30.9	25.7	20.6	6.2	23.2
12	Emery-Hanksville	27.1	38.6	34.3	28.6	22.9	6.0	25.7
13	Loa	16.9	24.0	21.3	17.8	14.2	5.4	16.0
14	Escalante	26.1	37.1	33.0	27.5	22.0	8.8	24.8
15	Blanding	29.3	41.7	37.1	30.9	24.7	8.2	27.8
16	Paria River	24.9	35.3	31.4	26.2	20.9	8.4	23.6
	WYOMING							
1	Pinedale	12.4	17.6	15.6	13.0	10.4	5.2	11.7
2	Big Piney	12.4	17.6	15.6	13.0	10.4	5.0	11.7
3	Eden Valley	17.0	24.1	21.4	17.8	14.3	4.8	16.1
4	Ham's Fork	17.8	25.3	22.5	18.8	15.0	5.2	16.9
5	Black's Fork	18.4	26.1	23.2	19.4	15.5	6.0	17.4
6	Henry's Fork	18.6	26.4	23.5	19.6	15.6	5.7	17.6
7	Little Snake	17.8	25.4	22.6	18.8	15.0	6.4	16.9

1/ For frost free period only. Includes precipitation.
2/ See table 2 for types of native vegetation.
3/ Precipitation during the frost free period plus 5 percent of winter precipitation not to exceed 3 inches.

rabbit-brush, willows, and tules depending on the degree of moisture present. In some areas, where alkali is concentrated, no vegetation grows.

Evaporation and meteorological observations made from April 1939 to March 1943 at Montrose, Colorado (12) are shown in the appendix. These are used to establish coefficients to be used in estimating evaporation rates from free water surfaces in the Upper Colorado River Basin

The results of computations of normal water consumption rates for native vegetation, seeped land and water surface during the frost free period are summarized in table 8. The estimates for native vegetation are based on the assumption that a water supply ample to satisfy the water requirements of the plants is available.

The estimates of rates of consumptive use shown in table 8 include moisture supplied from all sources. By subtracting the frost-free period precipitation from these rates of use, the rates of consumption of ground water at point of use may be estimated. Table 9 summarizes the results of computations of normal unit "consumptive use of water rates minus precipitation" for native vegetation and areas receiving water incidentally to irrigation in the Upper Colorado River Basin during the frost free period.

APPLICATION OF CONSUMPTIVE USE RATES TO VALLEY AREAS

The unit consumptive use rates shown in tables 6, 7, 8 and 9, may be applied to large valley areas by the "integration" method (2) (3) to compute the total amount of water normally consumed for a given area in acre-feet. Briefly stated, consumptive use for a specified time, as determined by the integration method, is the summation of the products of consumptive use for each crop times its area, plus the consumptive use of native vegetation times its area, plus water surface evaporation times water surface area, plus evaporation from land times its area. Before this method can be used it is necessary to know the areas of agricultural crops, native vegetation, water surfaces and other classifications, as well as the unit consumptive use for each classification.

After acreages of irrigated crops and other water-consuming areas have been determined by members of the Engineering Advisory Committee to the Upper Colorado River Basin Compact Commission, the normal valley consumptive use for the areas shown in table 3 may be computed from these acreages and the unit rates of use shown in tables 6, 7, 8 and 9. Again it should be emphasized that not all use of water by native vegetation is the result of man's activities in the Upper Basin and only those areas using water because of man should be considered in determining the man-made consumptive use.

In 1938-41, Erickson in a four-year study of consumptive use of irrigation water in the Lower Uncompahgre Valley, made a survey of water-using areas for the Colorado Water Conservation Board and determined the average consumptive use, exclusive of precipitation, to be 195,200 acre-feet by inflow and outflow measurements (12). The average rates of "consumptive

Table 9 - Summary of estimates of normal "unit consumptive use of water rates minus precipitation" for native vegetation and areas receiving water incidentally to irrigation in the Upper Colorado River Basin.

Unit		Normal rate consumptive use 1/					
			Native vegetation 2/				
No.	Area	Water surface	Very dense	Dense	Medium	Light	Seeped land
		Inches	Inches	Inches	Inches	Inches	Inches
	ARIZONA						
1	Chinle	23.7	35.7	31.2	25.2	19.1	22.2
2	Kayenta	28.7	42.8	37.5	30.5	23.4	27.0
	COLORADO						
1	Upper Yampa and Elk River	7.7	12.3	10.6	8.3	6.0	7.2
2	Lower Yampa and Tributaries	14.0	21.6	18.7	15.0	11.2	13.1
3	Little Snake River	15.2	23.0	20.0	16.1	12.2	14.2
4	White River Direct	13.0	20.4	17.6	13.9	10.2	12.0
5	White River Tributaries	13.0	20.4	17.6	13.9	10.2	12.0
6	Colo. River above Glenwood	11.2	17.5	15.1	12.0	8.9	10.4
6a	Kremmling, Muddy, Troublesome	11.2	17.5	15.1	12.0	8.9	10.4
7	Blue River	11.2	17.5	15.1	12.0	8.9	10.4
8	Eagle River and Upper Eagle R.	11.3	17.4	15.1	12.0	8.9	10.5
9	Gypsum	11.3	17.4	15.1	12.0	8.9	10.5
10	Roaring River above Basalt	12.3	19.4	16.8	13.2	9.7	11.4
11	Roaring Fork - Glenwood Springs	19.3	30.2	26.1	20.6	15.2	17.9
12	Rifle-Silt to Glenwood Springs	22.9	34.4	30.1	24.4	18.6	21.5
13	Grand Valley	30.2	45.0	39.4	32.1	24.7	28.4
14	Upper Gunnison	10.5	16.3	14.1	11.2	8.3	9.7
15	Tomichi and Cochetopa	10.5	16.3	14.1	11.2	8.3	9.7
16	North Fork Gunnison	23.7	36.3	31.6	25.3	19.0	22.1
17	Upper Uncompahgre, Cimarron and Dallas	17.7	26.8	23.4	18.8	14.2	16.5
18	Uncompahgre Project	25.7	38.4	33.7	27.3	21.0	24.1
19	Little Dolores	33.1	49.2	43.2	35.1	27.0	31.0
20	Dolores River	19.3	29.5	25.7	20.5	15.4	18.0
21	San Miguel, Lilylands, Disappointment	14.2	22.9	19.7	15.3	11.0	13.1
22	Montezuma Area	19.3	29.5	25.7	20.5	15.4	18.0
23	Upper San Juan Valley	9.2	15.4	13.1	10.0	6.9	8.4
24	Pine River and Piedra Area	24.8	23.6	20.3	15.9	11.6	13.7
25	Animas River	14.7	23.8	20.4	15.9	11.3	13.6
26	Florida Area	14.7	23.8	20.4	15.9	11.3	13.6
27	La Plata - (Colorado Area)	21.2	24.5	21.0	16.3	11.7	14.0
28	Mancos Area	19.3	29.5	25.7	20.5	15.4	18.0
	NEW MEXICO						
1	Dulce	12.3	20.3	17.3	13.3	9.4	11.4
2	La Plata Area	19.6	30.2	26.2	20.9	15.6	18.3
3	Bloomfield Shiprock	27.4	40.8	35.8	29.0	22.3	25.7

Table 9 (Continued) - Summary of estimates of normal unit "consumptive use of water rates minus precipitation" for native vegetation and areas receiving water incidentally to irrigation in the Upper Colorado River Basin.

Unit		Normal rate consumptive use 1/					
			Native vegetation 2/				
No.	Area	Water surface	Very dense	Dense	Medium	Light	Seeped land
		Inches	Inches	Inches	Inches	Inches	Inches
	UTAH						
1	Henry's Fork	15.1	22.6	19.8	16.1	12.3	14.2
2	Ashley Valley and Brush Creek	19.0	28.1	24.7	20.2	15.6	17.9
3	Ouray Area	24.0	34.5	31.2	25.4	19.7	22.5
4	Benchlands, Uinta Basin	19.0	28.7	25.0	20.2	15.4	17.8
5	Valley lands, Uinta Basin	22.7	33.5	29.4	24.0	18.6	21.3
6	Price River	22.7	34.2	29.8	24.1	18.4	21.2
7	Greenriver	30.3	44.4	39.1	32.0	25.0	28.5
8	Moab	31.9	47.5	41.6	33.9	26.1	30.0
9	La Sal	18.4	28.4	24.6	19.6	14.6	17.1
10	Monticello	18.4	28.4	24.6	19.6	14.6	17.1
11	Huntington Castle-Dale Ferron	20.7	31.0	27.2	22.0	16.9	19.4
12	Emery-Hanksville	22.8	34.2	30.0	24.2	18.5	21.4
13	Loa	13.9	21.0	18.3	14.8	11.2	13.0
14	Escalante	20.3	31.3	27.2	21.7	16.2	18.9
15	Blanding	24.1	36.4	31.8	25.6	19.5	22.6
16	Paria River	19.4	30.0	26.0	20.8	15.5	18.1
	WYOMING						
1	Pinedale	10.1	15.3	13.4	10.8	8.2	9.5
2	Big Piney	10.4	15.6	13.6	11.0	8.4	9.7
3	Eden Valley	14.6	21.8	19.1	15.5	12.0	13.8
4	Ham's Fork	15.4	23.0	20.1	16.4	12.6	14.5
5	Black's Fork	15.4	23.1	20.2	16.4	12.5	14.4
6	Henry's Fork	15.2	23.0	20.0	16.1	12.2	14.2
7	Little Snake	15.1	22.6	19.8	16.1	12.3	14.2

1/ For frost-free or growing season. Does not include precipitation.
2/ See table 2 for types of native vegetation.

use minus precipitation" determined for the period 1938-41 by the methods described in this report were applied to the same area. The use of water thus determined amounted to 202,187 acre-feet as shown in table 10, or 3.6 percent greater than Erickson measured by the "inflow-out-flow" method. Similar comparisons were made in other areas with like results. These comparisons validate the rates of use computed herein.

Table 10 - Average consumptive use of water in the Lower Uncompahgre Valley, Colorado, 1938-41, computed by integration method.

Classification	Area 1/		Consumptive use		nsum minus t	
			Unit rate	Quantity	Unit rate	Q
	Percent	Acres	Feet	Acre feet	Feet	Acre feet
Irrigated Crops 2/						
Alfalfa	30	21,704	2.60	56,430	2.12	46,012
Hay and pasture	15	10,852	2.29	24,851	1.81	19,642
Small grain and beans	30	21,703	1.21	26,261	1.07	23,222
Corn	10	7,234	1.65	11,936	1.44	10,417
Potatoes	5	3,617	1.65	5,968	1.44	5,208
Sugar Beets	3	2,170	1.65	3,580	1.44	3,125
Orchard and truck	7	5,065	1.93	9,775	1.46	7,395
Total or weighted average	100	72,345	1.92	138,801	1.59	115,021
Incidental Areas						
Cropped land (seeped) 2/	38.5	14,180	2.67	37,861	2.20	31,196
Seeped land and moist 2/	43.0	15,815	2.67	42,226	2.20	34,793
River bottom and willows 3/	14.0	5,060	4.40	22,264	3.53	17,862
Towns 3/	3.0	1,020	1.92	1,958	1.59	1,622
Stream surfaces 3/	1.5	590	3.74	2,207	2.87	1,693
Total or weighted average	100.0	36,665	2.91	106,516	2.38	87,166
Total		109,010	2.25	245,317	1.85	202,187

1 The area does not include 5,875 acres of arable non-cropped land 15,980 acres of non-arable, non-cropped land and 38,135 acres of dry land. Survey by Erickson (12).

2/ Consumptive use for irrigation season only.

3/ Consumptive use for entire year.

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APPENDIX

Table A - Consumptive use coefficients for alfalfa based on measured consumptive use and temperature, records and percent of daytime hours and growing season in Western States

Location	Year	Growing season or period	Consumptive use (U)	Consumptive use factor (F)	Coefficient (K)
			Inches		
		Alfalfa			
Carlsbad, New Mexico	1940	4/18 - 11/10	38.6	43.59	0.885
Carlsbad, New Mexico	Normal	3/28 - 11/3	36.8	47.39	.778
Fort Stockton, Texas	1940	4/13 - 11/11	40.5	46.28	.875
Fort Stockton, Texas	Normal	3/31 - 11/12	39.7	48.97	.811
San Fernando, Calif.	1939	5/26 - 9/9	19.3	23.35	.827
San Fernando, Calif.	1940	4/1 - 10/31	37.4	43.73	.855
Bonners Ferry, Idaho	1940-44	5/4 - 9/19	22.8	27.18	.839
Scottsbluff, Nebr.	1932-35	5/11 - 9/26	26.7	29.70	.899
Bozeman, Montana	-	5/24 - 9/16	18.9	22.60	.836
Prosser, Washington	1940-41	4/28 - 10/14	29.65	35.24	.841
Logan, Utah	1902-11	5/12 - 10/9	26.91	31.66	.850
Vale, Oregon	1941-42	5/17 - 9/18	24.00	26.82	.895
				Mean	.849

Table B - Examples of consumptive use coefficients for native vegetation and evaporation based on measured consumptive use and temperature records, and percent of daytime hours and growing season

Location	Classification	Year	Depth to water table	Growing season or period	Consumptive use factor (F)	Consumptive use (U)	Coefficient (K) growing season	Annual F	Annual U	Annual K
			Feet			Inches				
Carlsbad, New Mexico	Salt Cedar	1940	2	April to Sept.	40.72	48.61	1.19	63.75	62.9	0.99
Carlsbad, New Mexico	Salt Cedar	1940	3	April to Sept.	40.72	43.95	1.08	63.75	57.2	.90
Carlsbad, New Mexico	Sacaton	1940	2	April to Sept.	40.72	37.98	.93	63.75	48.1	.75
Carlsbad, New Mexico	Sacaton	1940	4	April to Sept.	40.72	32.82	.81	63.75	41.4	.65
San Luis Rey, Calif.	Cotton and willows	1940-43	4	April to Sept.	36.27	48.99	1.35	61.38	62.5	1.02
San Luis Rey, Calif.	Tules	1940-43	0	April to Sept.	41.89	47.03	1.12	62.16	58.9	.95
Montrose, Colorado	Water surface	1939-43	0	Apr. 23 to Oct. 15	34.93	33.26	.95	52.23	43.7	.84

Table C - Average monthly evaporation and meteorological data at Montrose, Colorado 1939 to 1943 (12)

Month	Mean temperature	Percent daytime hours	Consumptive use factor (F)	Evaporation Pan	Evaporation Reservoir (U)	Coefficient Reservoir evaporation (K)
	F^o	Percent		Inches	Inches	
January	26.8	6.84	1.83	1.30	0.86	0.47
February	32.2	6.78	2.18	1.37	.95	.44
March	39.5	8.34	3.29	3.32	2.39	.73
April	48.8	8.92	4.35	4.95	3.46	.80
May	59.3	9.94	5.89	7.83	5.64	.96
June	67.1	9.98	6.70	10.29	7.51	1.12
July	73.4	10.13	7.44	10.41	7.60	1.02
August	71.0	9.49	6.74	8.55	6.24	.93
September	62.5	8.38	5.24	5.64	4.23	.81
October	50.6	7.78	3.94	3.53	2.54	.64
November	38.2	6.80	2.60	1.84	1.38	.53
December	30.7	6.62	2.03	1.23	.86	.42
Annual	50.0	100.00	52.23	60.26	43.66	0.84

$$K = \frac{U}{F} = \frac{43.66}{52.33} = 0.84,\text{ annual coefficient.}$$

$$K = \frac{U}{F} = \frac{33.26}{34.93} = 0.95,\text{ growing season coefficient.}$$

Table D - Summary of tentative estimates of normal unit consumptive use rates for irrigated crops and native vegetation and evaporation for the frost-free period at typical stations in the Upper Colorado River Basin

Normal Rate of Consumptive Use - Inches

STATION		IRRIGATED CROPS 1/					Water surface	NATIVE VEGETATION		
No.	Location	Alfalfa	Hay pasture	Small grain and beans	Corn and other annuals	Orchards		Dense	Medium and seeped land	Sparse
	ARIZONA									
1	Chinle	25.7	22.6	15.4	20.1	19.6	28.7	36.2	24.2	7.2
4	Kayenta	30.0	26.4	15.2	20.5	22.9	33.5	42.3	28.2	6.6
New	Lees Ferry	42.2	32.2	15.1	21.6	32.2	47.1	59.5	39.7	5.1
	COLORADO									
5	Aspen	15.1	13.3	12.7			16.8	21.3	14.2	7.5
7	Collbran	25.8	22.7	18.4	22.4	19.7	28.8	36.4	24.2	9.8
8	Cortez	21.8	19.2	14.8	18.9	16.7	24.4	30.8	20.5	8.1
10	Crested Butte	9.4	8.3				10.5	13.3	8.9	7.6
11	Delta	27.5	24.3	15.4	20.4	21.1	30.8	38.9	25.9	6.3
12	Dillon	9.1	8.0				10.2	12.8	8.5	6.4
13	Durango	19.3	17.1	14.0	17.1	14.8	21.6	27.3	18.2	9.9
15	Fraser	9.0	7.9				10.0	12.7	8.4	6.9
16	Fruita	28.4	25.0	15.7	20.8	21.7	31.7	40.0	26.7	7.0
17	Glenwood Springs	23.2	20.5	14.6	19.0	17.8	26.0	32.8	21.9	9.7
18	Grand Junction	34.3	30.3	14.6	20.3	26.2	38.4	48.4	32.3	7.7
19	Gunnison	12.3	10.9				13.8	17.4	11.6	6.4
20	Hayden	16.1	14.2	14.0			18.0	22.7	15.1	7.0
21	Ignacio	18.6	16.4	14.2			20.8	26.3	17.5	9.0
25	Montrose	26.5	23.3	14.9	19.7	20.2	29.6	37.3	24.9	7.2
27	Norwood	18.5	16.3	14.1			20.6	26.1	17.4	9.4
28	Pagosa Springs	13.2	11.6				14.7	18.6	12.4	8.5
29	Palisade	33.0	29.1	15.1	20.7	25.3	36.9	46.6	31.1	8.1
30	Panonia	26.8	23.7	14.6	19.3	20.5	30.0	37.9	25.3	9.3
31	Rifle	24.5	31.6	15.0	19.4	18.7	27.3	34.5	23.0	7.4

Table D - Summary of tentative estimates of normal unit consumptive use rates for irrigated crops and native vegetation and evaporation for the frost-free period at typical stations in the Upper Colorado River Basin (Continued)

Normal Rate of Consumptive Use - Inches

STATION		IRRIGATED CROPS 1/					Water surface	NATIVE VEGETATION		
No.	Location	Alfalfa	Hay pasture	Small grain and beans	Corn and other annuals	Orchards		Dense	Medium and seeped land	Sparse
	COLORADO (Cont.)									
32	Sapinero	15.4	13.6	12.5			17.2	21.8	14.5	8.6
33	Steamboat Springs	9.7	8.6				10.9	13.8	9.2	6.1
New	Eagle	13.1	11.6				14.7	18.5	12.4	6.4
	NEW MEXICO									
37	Bloomfield	27.6	24.3	15.2	20.1	21.1	30.8	38.9	25.9	7.0
41	Dulce	16.8	14.8	13.8			18.8	23.8	15.8	9.5
47	Shiprock	29.5	26.1	15.5	20.7	22.6	33.0	41.7	27.8	6.1
	UTAH									
50	Blanding	26.3	23.2	14.8	19.4	20.1	29.4	37.1	24.7	8.2
52	Castledale	21.9	19.3	14.6	18.7	16.7	24.4	30.9	20.6	6.2
53	Duchesne	20.6	18.2	14.6	18.2	15.7	23.0	29.1	19.4	6.8
54	Emergy	24.3	21.4	14.2	18.2	18.6	27.1	34.3	22.9	6.0
55	Escalante	23.4	20.6	14.4	18.7	17.9	26.1	33.0	22.0	8.8
56	Ft. Duchesne	21.7	19.2	14.9	19.0	16.6	24.3	30.7	20.4	4.9
58	Green River	30.0	26.5	16.2	21.7	23.0	33.5	42.4	28.2	4.9
59	Hanksville	28.9	25.5	16.0	21.2	22.1	32.3	40.8	27.2	3.9
61	La Sal	22.0	19.4	14.7	18.7	16.8	23.7	29.9	19.9	8.3
62	Loa	15.1	13.3	13.3			16.9	21.3	14.2	5.4
63	Manila	16.0	14.1	14.0			17.9	22.6	15.0	5.7
64	Moab	33.0	29.2	15.3	20.9	25.3	36.9	46.6	31.1	7.5
67	Myton	24.2	21.4	15.2	19.7	18.5	27.1	34.2	22.8	5.1
68	Price	24.4	21.5	15.4	19.9	18.7	27.3	34.4	23.0	7.5
71	Tropic	22.3	19.6	14.5	18.5	17.0	24.9	31.4	20.9	8.4

Table D - Summary of tentative estimates of normal unit consumptive use rates for irrigated crops and native vegetation and evaporation for the frost-free period at typical stations in the Upper Colorado River Basin (Continued)

Normal Rate of Consumptive Use - Inches

STATION		IRRIGATED CROPS 1/					Water surface	NATIVE VEGETATION		
No.	Location	Alfalfa	Hay pasture	Small grain and beans	Corn and other annuals	Orchards		Dense	Medium and seeped land	Sparse
	WYOMING									
75	Dixon	16.6	14.7	13.9			18.6	23.5	15.7	6.4
76	Eden	15.2	13.4	13.4			17.0	21.4	14.3	4.8
78	Green River	19.4	17.1	14.9			21.7	27.4	18.3	7.5
79	Kemmerer	15.9	14.1	13.2			17.8	22.5	15.0	5.2
81	Lyman	16.5	14.5	13.6			18.4	23.2	15.5	6.0
82	Pinedale	11.1	9.8				12.4	15.6	10.4	5.2

1/ Includes irrigation water and rainfall

Table E - Summary of tentative estimates of normal unit "consumptive use rates minus rainfall" for irrigated crops and native vegetation and evaporation for the frost-free period at typical stations in the Upper Colorado River Basin

Station		Rate of consumptive use - inches 1/							
		IRRIGATED CROPS						NATIVE VEGETATION	
No.	Location	Alfalfa	Hay pasture	Small grain and beans	Corn and other annuals	Orchards	Water surface	Dense	Medium and seeped land
	ARIZONA								
1	Chinle	20.6	17.6	12.5	15.8	14.6	23.7	31.2	19.1
4	Kayenta	25.2	21.7	13.3	17.0	18.2	28.7	37.5	23.4
	New Lees Ferry	38.1	28.9	14.1	19.9	28.2	43.1	55.5	35.6
	COLORADO								
5	Aspen	10.6	8.8	8.5			12.3	16.8	9.7
7	Collbran	19.0	15.9	13.4	15.7	12.9	22.0	29.6	17.4
8	Cortez	16.7	14.1	11.6	13.9	11.6	19.3	25.7	15.4
10	Crested Butte	4.8	3.7				5.9	8.7	4.2
11	Delta	23.4	20.1	13.4	17.2	16.9	26.6	34.7	21.7
12	Dillon	5.4	4.3				6.5	9.1	4.9
13	Durango	12.5	10.2	8.8	10.2	7.9	14.7	20.4	11.3
15	Fraser	5.1	4.1				6.2	8.8	4.6
16	Fruita	24.0	20.7	13.7	17.7	17.4	27.4	35.7	22.4
17	Glenwood Springs	16.5	13.8	10.4	12.9	11.1	19.3	26.1	15.2
18	Grand Junction	29.0	25.0	12.6	17.5	21.0	33.1	43.2	27.0
19	Gunnison	9.0	7.5				10.4	14.0	8.2
20	Hayden	12.1	10.2	10.1			14.0	18.7	11.2
21	Ignacio	12.6	10.5	9.3			14.8	20.3	11.6
25	Montrose	21.7	18.6	12.5	16.0	15.5	24.8	32.6	20.2
27	Norwood	12.1	9.9	8.8			14.2	19.7	11.0

Table E. - Summary of tentative estimates of normal unit "consumptive use rates minus rainfall" for irrigated crops and native vegetation and evaporation for the frost-free period at typical stations in the Upper Colorado River Basin (Continued)

Station		Rate of consumptive use - inches 1/							
		IRRIGATED CROPS					Water surface	NATIVE VEGETATION	
No.	Location	Alfalfa	Hay pasture	Small grain and beans	Corn and other annuals	Orchards		Dense	Medium and seeped land
	COLORADO (Cont.)								
28	Pagosa Springs	7.7	6.1				9.2	13.1	6.9
29	Palisade	27.2	23.3	12.8	17.4	19.4	31.1	40.8	25.3
30	Paonia	20.6	17.4	11.4	14.8	14.2	23.7	31.6	19.0
31	Rifle	20.1	17.2	12.4	15.7	14.3	22.9	30.1	18.6
32	Sapinero	9.8	8.0	7.5			11.6	16.2	8.9
33	Steamboat Springs	6.6	5.5				7.8	10.6	6.0
New	Eagle	9.7	8.2				11.3	15.1	8.9
	NEW MEXICO								
37	Bloomfield	22.8	19.6	12.8	16.5	16.3	26.1	34.2	21.2
41	Dulce	10.4	8.4	7.9			12.3	17.3	9.4
47	Shiprock	25.2	21.7	13.9	18.0	18.2	28.7	37.3	23.4
	UTAH								
50	Blanding	21.0	17.9	12.3	15.6	14.8	24.1	31.8	19.5
52	Castledale	18.2	15.6	12.1	15.1	13.0	20.7	27.2	16.9
53	Duchesne	16.6	14.2	11.7	14.2	11.7	19.0	25.1	15.4
54	Emery	19.9	17.1	11.8	14.7	14.2	22.8	29.9	18.5
55	Escalante	17.6	14.8	11.0	13.6	12.1	20.3	27.2	16.2
56	Ft. Duchesne	19.0	16.5	13.2	16.4	13.9	21.6	28.0	17.8

Table E - Summary of tentative estimates of normal unit "consumptive use rates minus rainfall" for irrigated crops and native vegetation and evaporation for the frost-free period at typical stations in the Upper Colorado River Basin (Continued)

Station		Rate of consumptive use - inches 1/							
		IRRIGATED CROPS						NATIVE VEGETATION	
No.	Location	Alfalfa	Hay pasture	Small grain and beans	Corn and other annuals	Orchards	Water surface	Dense	Medium and seeped land
	UTAH (Cont.)								
58	Green River	26.8	23.2	14.7	19.3	19.7	30.3	39.1	25.0
59	Hanksville	26.1	22.7	14.2	18.8	19.3	29.5	38.0	24.4
61	La Sal	16.7	14.1	11.1	13.7	11.5	18.4	24.6	14.7
62	Loa	12.1	10.3	10.3			13.9	18.3	11.2
63	Manila	13.2	11.4	11.3			15.1	19.8	12.3
64	Moab	28.0	24.1	13.1	17.8	20.3	31.9	41.6	26.1
67	Myton	20.9	18.0	13.2	16.7	15.2	23.7	20.8	19.5
68	Price	19.8	16.9	12.7	15.8	14.1	22.7	29.8	18.4
71	Tropic	16.8	14.2	11.1	13.5	12.0	19.4	26.0	15.5
72	Vernal	16.8	14.5	13.1			19.0	24.7	15.6
	WYOMING								
75	Dixon	13.2	11.2	10.7			15.2	20.0	12.2
76	Eden	12.9	11.1	11.1			14.7	19.1	12.0
78	Green River	16.4	14.1	12.3			18.7	24.4	15.2
79	Kemmerer	13.6	11.7	11.0			15.4	20.1	12.6
81	Lyman	13.5	11.5	10.9			15.4	20.2	12.5
82	Pinedale	8.8	7.5				10.1	13.4	8.2

1/ Normal rate of consumptive use minus rainfall during frost-free period.

Table F - Mean monthly temperatures in degrees Fahrenheit at stations in the Upper Colorado River Basin, recorded or estimated from Weather Bureau records for the period 1914 to 1945.

No.	Stations	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Mean Annual
						ARIZONA								
1	Chinle	28.4	34.4	41.9	49.5	58.9	69.0	74.6	72.6	64.3	52.3	39.6	30.1	51.3
4	Kayenta	27.9	37.6	44.1	51.9	61.5	70.9	76.3	73.5	66.0	54.2	40.7	30.2	52.9
New	Lees Ferry	35.0	42.8	52.0	60.2	70.1	79.4	86.2	83.7	75.5	61.5	46.8	37.0	60.9
						COLORADO								
5	Aspen	18.4	22.0	28.5	38.8	46.9	54.8	60.8	59.5	52.8	42.6	29.8	22.6	39.8
7	Collbran	21.8	27.6	36.1	45.6	53.7	62.4	68.4	66.5	58.5	47.2	35.2	24.1	45.6
8	Cortez	26.5	31.5	38.5	46.1	55.0	64.0	70.1	68.4	60.7	49.9	37.6	28.7	48.1
10	Crested-Butte	13.1	16.5	22.7	32.8	43.5	51.9	57.0	55.6	47.9	37.5	25.0	15.3	34.9
11	Delta	24.6	32.6	41.8	51.0	59.9	68.4	74.5	72.3	63.5	51.5	37.9	26.7	50.4
12	Dillon	13.3	16.0	21.0	31.7	41.7	49.1	54.8	53.4	46.8	36.3	24.0	15.2	33.6
13	Durango	24.3	29.5	36.8	44.5	51.9	60.1	66.1	65.0	57.8	47.5	36.2	26.3	45.5
New	Eagle	19.5	25.1	34.4	41.9	49.1	56.3	63.5	62.6	55.0	44.0	32.2	20.8	42.0
15	Fraser	11.7	15.2	21.3	32.0	40.9	49.1	54.1	52.6	45.9	35.6	23.0	13.5	32.9
16	Fruita	23.4	32.3	42.4	51.4	60.5	69.4	76.3	74.0	64.6	51.7	38.2	26.7	50.9
17	Glenwood Springs	23.9	29.2	38.1	47.1	56.2	63.1	69.5	68.1	60.3	49.6	36.4	26.3	47.3
18	Grand Junction	25.3	33.9	42.9	52.3	62.2	72.1	78.5	75.6	66.8	54.3	40.0	29.1	52.8
19	Gunnison	7.9	13.9	26.0	39.7	48.0	56.0	61.8	60.3	52.6	41.7	27.9	13.0	37.4
20	Hayden	16.9	21.4	29.7	42.0	51.2	59.9	66.6	64.9	55.9	45.8	31.7	20.5	42.2
21	Ignacio	22.2	28.6	36.6	44.7	53.0	61.5	67.6	66.3	58.8	47.8	35.8	26.3	45.7
25	Montrose	24.6	31.7	39.8	48.4	57.3	66.5	72.2	69.8	62.0	50.0	37.6	26.8	48.9
27	Norwood	22.5	27.7	35.3	43.7	52.5	61.7	67.4	65.3	58.1	47.8	34.9	25.6	45.2
28	Pagosa Springs	17.8	22.5	31.0	41.4	48.4	56.7	63.2	61.7	54.3	43.5	31.3	21.6	41.1
29	Palisade	26.5	34.8	43.2	53.2	62.4	71.8	78.0	75.5	67.0	54.5	41.4	30.6	53.2
30	Paonia	25.0	31.7	38.6	47.4	56.0	64.8	71.0	69.0	60.9	50.6	38.6	27.3	48.4
31	Rifle	22.4	30.1	38.8	48.5	57.0	65.4	72.0	67.6	60.8	49.0	37.1	26.2	47.9
32	Sapinero	17.0	20.8	28.1	37.1	46.0	54.6	59.9	58.6	51.7	41.4	29.8	19.4	38.7
33	Steamboat Springs	13.9	18.6	26.2	38.2	48.2	55.2	61.6	59.4	52.1	41.7	28.7	16.9	38.4

Table F (Cont'd) - Mean monthly temperatures in degrees Fahrenheit at stations in the Upper Colorado River Basin, recorded or estimated from Weather Bureau records for the period 1914 to 1945.

No.	Station	Jan	Feb	Mar.	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Mean Annual
						NEW MEXICO								
37	Bloomfield	26.0	34.1	41.1	49.6	58.9	68.2	74.9	72.6	64.6	52.2	38.9	29.0	50.9
41	Dulce	17.8	25.7	34.5	43.7	51.8	60.7	66.6	64.6	57.2	45.6	33.4	21.5	43.6
47	Shiprock	28.6	35.4	44.7	53.1	61.7	69.6	76.3	74.4	67.0	55.0	41.2	30.2	53.1
						UTAH								
50	Blanding	26.6	32.5	39.7	47.8	55.9	65.8	71.9	70.3	62.1	51.4	39.1	29.1	49.4
52	Castledale	18.5	26.2	36.9	45.3	54.3	63.3	69.2	67.1	58.3	46.8	34.9	22.0	45.2
53	Duchesne	15.6	23.4	35.3	45.2	54.0	61.7	68.9	66.8	57.8	46.5	32.5	20.6	44.0
54	Emery	24.0	29.0	36.7	44.5	53.1	61.2	67.3	65.6	57.7	47.5	36.5	26.8	45.8
55	Escalante	25.5	31.3	38.8	46.2	54.4	63.5	69.1	67.2	59.2	49.1	37.5	27.9	47.5
56	Ft. Duchesne	13.2	20.5	35.3	46.6	55.1	63.7	70.3	68.2	59.4	46.7	32.8	19.4	44.3
58	Green River	21.8	32.6	43.2	53.2	62.9	72.0	79.8	76.9	67.0	53.1	38.1	27.4	52.3
59	Hanksville	23.9	34.0	44.1	53.2	62.3	71.9	78.1	74.7	65.5	53.1	39.4	28.5	52.4
61	La Sal	24.7	29.3	35.7	45.2	53.9	63.1	69.4	67.8	59.5	48.3	36.8	25.3	46.6
62	Loa	21.8	26.1	33.6	41.9	51.2	59.8	66.5	64.0	55.0	43.8	32.7	22.8	43.3
63	Manila	21.3	25.8	33.6	41.6	51.1	59.7	67.4	64.8	56.8	46.4	33.5	19.3	43.5
64	Moab	29.0	36.9	46.7	55.6	64.6	72.8	79.0	76.3	67.5	54.0	41.6	31.3	54.6
67	Myton	15.4	24.4	37.0	47.6	57.2	65.5	72.2	70.4	61.5	49.4	33.6	20.9	46.2
68	Price	23.8	30.0	39.1	47.7	57.4	66.8	73.0	71.2	62.1	51.2	37.2	26.4	48.8
71	Tropic	28.2	31.2	38.8	45.9	53.7	62.6	68.7	66.5	59.3	49.2	38.7	30.0	47.7
72	Vernal	16.6	23.0	34.9	46.4	54.5	63.8	69.4	67.1	57.7	45.6	33.9	18.2	44.3
						WYOMING								
74	Big Piney	8.8	10.9	22.7	36.6	44.5	51.7	59.9	55.9	47.4	37.9	23.0	15.0	34.5
75	Dixon	16.5	21.6	29.4	40.9	50.2	58.2	65.4	63.3	54.4	44.0	30.4	19.7	41.2
76	Eden	9.8	15.6	26.7	38.4	48.1	56.9	64.0	61.7	52.1	41.4	27.0	12.8	37.9
78	Green River	18.3	23.8	32.2	42.8	52.9	61.7	69.9	67.2	57.1	45.3	32.2	20.9	43.7
79	Kemmerer	17.2	18.4	27.1	39.1	48.1	55.1	62.4	60.6	51.8	42.5	28.5	22.1	39.4
81	Lyman	17.0	21.7	28.9	38.1	49.7	58.7	65.3	62.2	52.4	43.1	29.4	22.2	40.7
82	Pinedale	11.7	15.3	23.0	35.0	44.9	53.2	60.8	57.9	49.3	39.0	23.3	14.5	35.7

Table G - Mean monthly precipitation in inches at stations in the Upper Colorado River Basin, recorded or estimated from Weather Bureau records for the period 1914 to 1945.

No.	Station	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
							ARIZONA							
1	Chinle	0.57	0.58	0.67	0.60	0.40	0.38	1.55	1.60	1.11	0.86	0.45	0.73	9.50
4	Kayenta	0.44	0.58	0.70	0.47	0.39	0.32	1.27	1.60	0.83	0.77	0.52	0.46	8.35
New	Lees Ferry	0.30	0.57	0.36	0.44	0.37	0.16	0.68	1.17	0.52	0.54	0.43	0.47	6.01
							COLORADO							
5	Aspen	1.96	1.99	1.91	1.89	1.64	0.96	1.44	1.61	1.63	1.40	1.27	1.41	19.11
7	Collbran	1.20	1.18	1.54	1.78	1.47	0.78	1.15	1.59	1.58	1.51	1.05	1.07	15.90
8	Cortez	0.93	1.23	1.28	1.11	0.67	0.40	1.41	1.47	1.77	1.36	0.70	1.01	13.34
10	Crested Butte	2.09	2.11	1.85	1.57	1.46	1.36	2.21	2.42	2.23	1.12	1.20	1.72	21.34
11	Delta	0.59	0.49	0.56	0.71	0.94	0.44	0.63	1.12	1.03	0.89	0.55	0.50	8.45
12	Dillon	1.23	1.45	2.02	2.19	1.64	0.99	1.80	1.88	1.38	1.39	1.03	1.26	18.26
13	Durango	1.61	1.60	1.79	1.59	1.14	0.87	2.08	2.19	2.02	1.86	1.24	1.71	19.70
New	Eagle	1.27	0.87	1.11	1.56	1.47	0.95	1.21	1.57	1.45	1.27	0.74	0.97	14.44
15	Fraser	1.55	1.75	1.87	2.17	1.91	1.24	2.11	1.75	1.29	1.35	1.12	1.29	19.40
16	Fruita	0.88	0.64	0.89	0.82	0.73	0.49	0.74	1.00	1.17	0.99	0.68	0.72	9.75
17	Glenwood Springs	1.64	1.77	1.69	1.72	1.58	1.04	1.48	1.88	1.64	1.43	1.18	1.32	18.37
18	Grand Junction	0.62	0.60	0.82	0.80	0.72	0.43	0.75	1.19	1.03	0.86	0.57	0.68	9.07
19	Gunnison	0.84	0.80	0.69	0.70	0.89	0.72	1.60	1.43	0.97	0.70	0.50	0.68	10.52
20	Hayden	1.24	1.20	1.34	1.42	1.60	1.03	1.25	1.34	1.63	1.47	0.89	1.21	15.62
21	Ignacio	1.21	1.27	1.44	1.27	0.95	0.90	1.92	1.99	1.72	1.43	1.01	1.25	16.36
25	Montrose	0.55	0.47	0.76	1.00	1.05	0.47	0.79	1.31	1.11	0.96	0.60	0.69	9.76
27	Norwood	1.10	1.45	1.67	1.82	1.26	0.83	2.02	2.18	1.84	1.50	0.98	1.29	17.92
28	Pagosa Springs	2.85	2.51	2.71	1.78	0.94	1.10	2.13	2.39	1.66	2.70	1.16	2.29	24.22
29	Palisade	0.63	0.62	0.87	1.15	0.91	0.53	0.77	1.08	1.28	1.16	0.72	0.67	10.39
30	Paonia	1.39	1.38	1.46	1.73	1.41	0.73	1.01	1.38	1.36	1.57	1.22	1.40	16.04
31	Rifle	0.91	0.67	0.91	1.05	1.03	0.49	1.08	1.06	1.13	1.14	0.74	0.79	11.00
32	Sapinero	2.08	2.15	2.51	2.28	1.75	0.96	1.62	2.17	1.75	1.50	1.46	1.95	22.18
33	Steamboat Springs	2.31	2.43	2.39	2.27	2.23	1.38	1.58	1.76	1.78	1.99	1.69	2.26	24.07

Table G (Cont'd) - Mean monthly precipitation in inches at stations in the Upper Colorado River Basin, recorded or estimated from Weather Bureau records for the period 1914 to 1945.

No.	Station	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
						NEW MEXICO								
37	Bloomfield	0.55	0.72	0.62	0.62	0.66	0.50	1.11	1.23	1.14	0.76	0.55	0.64	9.11
41	Dulce	1.40	1.58	1.63	1.39	1.24	0.91	2.49	2.09	1.95	1.36	1.21	1.58	18.83
47	Shiprock	0.34	0.55	0.73	0.67	0.59	0.29	0.74	1.02	1.49	0.52	0.46	0.56	7.96
						UTAH								
50	Blanding	1.29	1.40	1.09	0.98	0.75	0.46	1.15	1.23	1.35	1.39	0.97	1.40	13.46
52	Castledale	0.71	0.66	0.57	0.55	0.53	0.52	0.95	1.23	0.95	0.84	0.50	0.62	8.63
53	Duchesne	0.58	0.63	0.81	0.76	0.81	0.70	1.05	1.30	1.07	0.95	0.48	0.52	9.66
54	Emery	0.53	0.49	0.50	0.49	0.62	0.46	0.95	1.16	0.96	0.76	0.24	0.45	7.61
55	Escalante	1.13	1.01	0.97	0.66	0.56	0.49	1.57	2.06	1.38	1.12	0.60	1.01	12.56
56	Ft. Duchesne	0.44	0.37	0.50	0.72	0.70	0.51	0.53	0.65	1.01	0.83	0.38	0.37	7.01
58	Green River	0.45	0.39	0.45	0.54	0.39	0.55	0.60	0.78	0.75	0.76	0.35	0.44	6.45
59	Hanksville	0.41	0.31	0.28	0.32	0.38	0.33	0.69	0.73	0.56	0.53	0.24	0.38	5.16
61	La Sal	0.90	0.91	0.82	1.14	0.89	0.69	1.52	1.51	1.36	1.30	0.74	1.04	12.82
62	Loa	0.51	0.54	0.61	0.50	0.47	0.38	1.12	1.39	0.88	0.60	0.37	0.48	7.85
63	Manila	0.36	0.61	0.85	1.46	1.23	0.69	0.98	0.96	0.86	1.28	0.65	0.42	10.35
64	Moab	0.80	0.71	0.85	0.88	0.74	0.49	1.03	0.87	0.97	1.02	0.66	0.92	9.94
67	Myton	0.32	0.32	0.45	0.66	0.58	0.43	0.80	0.93	0.91	0.79	0.37	0.34	6.90
68	Price	0.83	0.78	0.73	0.79	0.74	0.71	0.95	1.33	1.27	0.96	0.53	0.77	10.39
71	Tropic	1.20	1.08	1.14	0.81	0.58	0.40	1.47	1.75	1.50	1.03	0.63	1.10	12.69
72	Vernal	0.63	0.60	0.55	0.95	0.86	0.43	0.63	0.76	1.15	0.97	0.66	0.58	8.77
						WYOMING								
74	Big Piney	0.36	0.35	0.42	0.84	1.13	0.97	0.70	0.77	1.17	1.06	0.34	0.29	8.40
75	Dixon	0.79	0.71	1.01	1.17	1.24	0.81	1.10	1.28	0.98	1.17	0.81	0.93	12.00
76	Eden	0.42	0.53	0.45	0.76	0.81	0.71	0.76	0.83	0.73	0.67	0.34	0.33	7.34
78	Green River	0.88	0.42	0.32	0.35	0.51	0.54	1.06	1.06	0.65	0.59	0.70	0.82	7.90
79	Kemmerer	0.56	0.61	0.67	0.66	0.76	0.72	0.77	0.77	0.56	0.67	0.59	0.60	7.94
81	Lyman	0.45	0.82	0.79	1.81	1.40	0.57	1.35	0.79	0.80	1.26	0.80	0.65	11.49
82	Pinedale	0.88	0.87	0.71	0.94	1.21	1.13	1.04	0.95	1.08	1.04	0.71	0.86	11.42

Table H - Form used in the Upper Colorado River water use survey, May 1948

ate__________ State__________ Area (Project)__________

ames - Persons Interviewed   Addresses

____

____

____

. Total area irrigated __________ acres. Area in Project __________ acres

. Irrigated lands

Crops	Acres
Alfalfa	
Grass, Hay	
Pasture	
Beans	
Small Grains	
Corn	
Orchard	

Incidental areas

	Acres
Water surface	
Native vegetation 1/	
Very dense	
Dense	
Medium	
Sparse	
Seeped land	

Miscellaneous areas

	Acres
Dry farm	
Pre-irrigated	
Towns	
Roads	
Riverbed	

1/ Describe types____________________

____

____

. Water supply

Sources____________________

____

____

Adequacy____________________

____

. Irrigation Practices

	Dates		Dates of irrigation		Depth of water applied		
	Planted	Harvested	First	Last	No.	Per irrig.	Year
Crops					Irrigs	Inches	Inches
Alfalfa							
Grass, Hay							
Pasture							
Beans							
Small grains							

Remarks____________________

____

Table H (Cont'd) - Form used in the Upper Colorado River water use survey, May 1948

6. SOILS

General textures

Root zone (Depths in feet)

____

Water holding capacities (Inches per foot depth ______________

____

Permeability rates (Fast, Medium, Slow)

____

7. MISCELLANEOUS INFORMATION ON AREA

____

____

COPY OF A LETTER
H. W. Bashore to George D. Clyde

June 6, 1947

Mr. George D. Clyde,
Chief, Division of Irrigation,
Soil Conservation Service,
College Hill, Box D,
Logan, Utah.

Dear Mr. Clyde:

As you probably know the states of Arizona, Colorado, New Mexico, Utah, and Wyoming have all formed a Compact Commission for the purpose of dividing the waters allocated to the Upper Colorado River Basin. I was appointed federal representative on the Compact Commission, and was later appointed by the Commission as Chairman. The Commission appointed an Engineering Advisory Committee to make a report on engineering problems involved in the division of the waters of the basin. Mr. Riter of the Bureau of Reclamation is chairman of that Committee.

Mr. Riter has informed me that information is needed on consumptive use of water rates in the basin. He has suggested that I request the services of Mr. H. F. Blaney and your department in this regard. Accordingly, I request that Mr. H. F. Blaney, Senior Irrigation Engineer, Division of Irrigation Soil Conservation Service, U. S. Department of Agriculture, and any other parties needed for assistance make a study of consumptive use at sites of use of irrigation water rates for irrigated crops, native vegetation, and incidental areas, within the Upper Colorado River Basin. It is further requested that Mr. Blaney prepare a report to the Engineering Advisory Committee on his findings, and that such report should be considered as confidential until released by the Compact Commission. It is understood that Mr. Blaney's compensation for this work will be provided by the Department of Agriculture in the same manner as usually provided as a matter of cooperation of the Federal Government with the Compact Commission. It is further understood that travel expenses incurred by Mr. Blaney in this work cannot be provided by the Department of Agriculture. I believe suitable arrangements can be made in this regard.

Very truly yours,

(Sgd.) H. W. Bashore
H. W. Bashore, Chairman,
Upper Colorado River Basin
Compact Commission.

APPENDIX C

HISTORIC AND VIRGIN STREAMFLOW CONTRIBUTIONS

PERIOD 1914-1945

PART I

UPPER COLORADO RIVER BASIN

TABLE - MEAN 1914-1945 HISTORIC STREAMFLOWS

AT

STATE LINES, KEY GAGES AND LEE FERRY

UPPER COLORADO RIVER BASIN
ANALYSIS OF CONTRIBUTIONS BY STATES BASED ON MEAN HISTORIC RUNOFF
FOR THE PERIOD 1914-1945

(UNITS 1000 A.F.)

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
GREEN RIVER ABOVE LINWOOD, UTAH.							
East Fork of Smith Fork	1.	0	0	0	31.4 (a)	1.1 (a)	32.5
West Fork of Smith Fork	2.	0	0	0	15.2 (a)	1.1 (a)	16.3
Blacks Fk. nr. Millburne, Wyo.	3.	0	0	0	110.5 (a)	2.7 (a)	113.2
Green River at Green River, Wyo.	4.	0	0	0	0	1260.5	1260.5
Sum of measured inflows (1/2/3/4)	5.	0	0	0	157.1	1265.4	1422.5
Unmeasured to Utah-Wyo. State Line	6.	0	0	0	0	99.0 1/	99.0 (b)
Vols. Convey. to State Line (5/6)	7.	0	0	0	157.1	1364.4	1521.5
Convey. losses to State Line	8.	0	0	0	¢ 2.2 *	$ 18.7 *	20.9 (c)
Meas. & unmeas. flows minus losses to Utah-Wyoming State Line	9.	0	0	0	154.9	1345.7	1500.6
Unmeas. State Line to Linwood	10.	0	0	0	1.6 1/	0	1.6 (b)
Vols. convey.State Line to Linwood	11.	0	0	0	156.5	1345.7	1502.2
Convey.losses " " " "	12.	0	0	0	$ 0.1 *	¢ 0.5 *	0.6 (c)
Meas. & unmeas. flows minus losses to Linwood, Utah gage	13.	0	0	0	156.4	1345.2	1501.6
HENRYS FORK ABOVE MOUTH.							
Henrys Fork at Linwood, Utah	14.	0	0	0	66.8 (d)	0	66.8
GREEN RIVER - LINWOOD TO UTAH - COLO. STATE LINE.							
Green River near Linwood, Utah	15.	0	0	0	156.4	1345.2	1501.6
Henrys Fork at Linwood, Utah	16.	0	0	0	66.8	0	66.8
Vols. convey. to Utah-Colorado State Line	17.	0	0	0	223.2	1345.2	1568.4

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
Convey. losses to Utah-Colorado State Line	18.	0	0	0	$ 2.3 *	¢ 14.0 *	16.3 (c)
Inflows minus losses to Utah-Colorado State Line	19.	0	0	0	220.9	1331.2	1552.1
GREEN RIVER-UTAH-COLORADO STATE LINE TO YAMPA RIVER.							
Vols. Convey, State L. to Yampa R.	20.	0	0	0	220.9	1331.2	1552.1
Convey.losses " " " " "	21.	0	0	0	¢ 1.5 *	¢ 8.6 *	10.1 (c)
Inflows minus losses State Line to Yampa River	22.	0	0	0	219.4	1322.6	1542.0
LITTLE SNAKE RIVER ABOVE LILY, COLO.							
Little Snake River at Colorado-Wyoming State Line	23.	0	230.9 #	0	0	249.8 #	480.7 #
Convey. losses State L. to Lily	24.	0	$ 4.0 *	0	0	¢ 4.3 *	8.3 (t)
Little Snake River nr. Lily, Colo.	25	0	226.9 (e)	0	0	245.5 (e)	472.4
YAMPA RIVER BELOW MAYBELL & LILY.							
Little Snake R. nr. Lily, Colo.	26.	0	0	0	0	245.5	472.4
Yampa River nr. Maybell, Colo.	27.	0	1189.5	0	0	0	1189.5
Vols. convey. to Green River	28.	0	1416.4	0	0	245.5	1661.9
Convey. loss " " "	29.	0	$ 17.0	0	0	¢ 3.0 *	20.0 (f)
Meas. flows minus convey. losses Maybell to Green River	30.	0	1399.4	0	0	242.5	1641.9
GREEN RIVER - YAMPA RIVER TO COLO.-UTAH STATE LINE.							
Meas. vols. convey. Yampa River to Colorado-Utah State Line	31.	0	1399.4	0	219.4	1565.1	3183.9
Unmeas. above Green River, Utah (Colorado and Wyoming)	32.	0	27.4 2/	0	0	15.1 2/	42.5

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
Vols. convey. Yampa River to Colorado-Utah State Line	33.	0	1426.8	0	219.4	1580.2	3226.4
Convey. losses Yampa River to Colorado-Utah State Line	34.	0	$ 0.8 *	0	¢ 0.1 *	¢ 0.9 *	1.8 (c)
Meas. & unmeas. flows minus losses Yampa River to Colo.-Utah State L.	35.	0	1426.0	0	219.3	1579.3	3224.6
GREEN RIVER - COLO.-UTAH STATE LINE TO BRUSH CREEK.							
Green River at Colo.-Utah State Line from item 35.	36.	0	1426.0	0	219.3	1579.3	3224.6
Unmeas. above Green R., Utah (Utah)	37.	0	0	0	121.8 2/	0	121.8
Vols. convey. State L. to Brush Cr.	38.	0	1426.0	0	341.1	1579.3	3346.4
Convey. loss " " " " "	39.	0	¢ 4.3 *	0	$ 1.0 *	¢ 4.8 *	10.1 (c)
Meas. and unmeas. flows minus loss Colo.-Utah State Line to Brush Cr.	40.	0	1421.7	0	340.1	1574.5	3336.3
Brush Creek near Jensen, Utah	41.	0	0	0	36.0	0	36.0
GREEN RIVER - BRUSH CR.-ASHLEY CR.							
Vols. convey. Brush Cr. to Ashley Creek from (40/41)	42.	0	1421.7	0	376.1	1574.5	3372.3
Convey. losses Brush Cr. to Ashley	43.	0	¢ 1.0 *	0	$ 0.3 *	¢ 1.2	2.5 (c)
Inflows minus losses to Ashley Cr.	44.	0	1420.7	0	375.8	1573.3	3369.8
Ashley Creek near Vernal, Utah	45.	0	0	0	78.0	0	78.0
GREEN RIVER - ASHLEY CR. TO DUCHESNE RIVER.							
Vols. convey. Ashley Cr. to Duchesne R. from (44 / 45)	46.	0	1420.7	0	453.8	1573.3	3447.8
Convey. losses Ashley to Duchesne	47.	0	¢ 14.7 *	0	$ 4.7 *	¢ 16.2	35.6 (c)
Inflows minus losses " " R.	48.	0	1406.0	0	449.1	1557.1	3412.2
Duchesne River nr. Randlett, Utah	49.	0	0	0	653.3	0	653.3

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
GREEN RIVER - DUCHESNE R. TO WHITE RIVER.							
Vols. convey. - Duchesne River to White River	50.	0	1406.0	0	1102.4	1557.1	4065.5
Convey. losses Duchesne to White	51.	0	¢ 0.3 *	0	$ 0.2 *	¢ 0.3 *	0.8 (c)
Inflows minus losses Duchesne R. to White River	52.	0	1405.7	0	1102.2	1556.8	4064.7
WHITE RIVER BELOW MEEKER, COLO.							
White River near Meeker, Colo.	53.	0	461.7	0	0	0	461.7
Unmeasured (Gain Meeker to Watson)	54.	0	114.5 3/	0	5.8 3/	0	120.3
Volumes Convey. Watson to Green R.	55.	0	576.2	0	5.8	0	582.0
Convey. losses " " " "	56.	0	¢ 17.8 *	0	$ 0.2 *	0	18.0 (g)
Inflows minus losses Watson to Green River	57.	0	558.4	0	5.6		564.0
GREEN R. - WHITE R. TO PRICE R.							
Vols. convey. White R. to Price R.	58.	0	1964.1	0	1107.8	1556.8	4628.7
Convey. losses " " " " "	59.	0	¢ 18.5 *	0	$ 10.4 *	¢ 14.6 *	43.5 (c)
Inflows minus losses " " "	60.	0	1945.6	0	1097.4	1542.2	4585.2
PRICE RIVER BELOW HEINER, UTAH.							
Price River near Heiner, Utah	61.	0	0	0	92.6	0	92.6
Convey. loss Heiner to Green R.	62.	0	0	0	$ 5.0	0	5.0 (h)
Meas. inflows minus loss Heiner to Green River	63.	0	0	0	87.6	0	87.6
GREEN RIVER - PRICE RIVER TO GREEN RIVER, UTAH.							
Vols. convey. Price R. to Green River, Utah from (60 ≠ 63)	64.	0	1945.6	0	1185.0	1542.2	4672.8

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
Convey. losses Price R. to Green River, Utah	65.	0	¢ 6.0 *	0	$ 3.7 *	¢ 4.7 *	14.4 (c)
Meas. and unmeas. flows minus losses Price R. to Green R., Utah	66.	0	1939.6	0	1181.3	1537.5	4658.4

SUMMARY ABOVE GREEN RIVER, UTAH
OF
ASSIGNED CHANNEL LOSSES AND CONTRIBUTIONS BY STATES AT STATE LINES AND AT GREEN RIVER, UTAH

	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
CHANNEL LOSSES ASSIGNED ABOVE GREEN RIVER, UTAH.							
Out of State Losses	67.	0	62.6	0	3.8	73.1	139.5
With in State Losses	68.	0	21.8	0	27.9	18.7	68.4
Total assigned Losses (67 ≠ 68)	69.	0	84.4	0	31.7	91.8	207.9
STATES CONTRIBUTIONS AT STATE LINES AND AT GREEN RIVER, UTAH.							
Meas. and unmeas. flows minus assigned losses above Green R., Utah - States contributions at Green River, Utah.	70.	0	1939.6	0	1181.3	1537.5	4658.4
States contributions at State Lines	71.	0	2002.2	0	1185.1	1610.6	4797.9

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
COLORADO RIVER ABOVE CISCO, UTAH.							
DOLORES RIVER BELOW GATEWAY.							
Dolores River at Gateway, Colo.	72.	0	764.6 (i)	0	23.5 (i)	0	788.1
Convey. losses Gateway to Colo.-Utah State Line	73.	0	$ 2.3 *	0	¢ 0.1 *	0	2.4 (j)
Meas. flows minus losses Gateway to Colorado-Utah State Line	74.	0	762.3	0	23.4		785.7
Convey. losses State L. to Colo.R.	75.	0	¢ 6.1 *	0	$ 0.2 *	0	6.3 (j)
Meas. flows minus losses Colo.-Utah State Line to Colorado R.	76.	0	756.2	0	23.2	0	779.4
COLORADO RIVER - CAMEO TO COLO.-UTAH STATE LINE.							
Colorado River near Cameo, Colo.	77.	0	3505.0	0	0	0	3505.0
Plateau Creek near Cameo, Colo.	78.	0	186.3	0	0	0	186.3
Gunnison River nr. Grand Jct.	79.	0	2054.9	0	0	0	2054.9
Sum of meas. flows (except Dolores)	80.	0	5746.2	0	0	0	5746.2
Unmeas. (in Colo. only)	81.	0	26.6 (k)	0	0	0	26.6
Stream depletion	82.	0	153.5 (m)	0	0	0	153.5
Sum of meas. and unmeas. flows minus stream depletion	83.	0	5619.3	0	0	0	5619.3
Losses - Cameo to State Line	84.	0	$149.4 (n)	0	0	0	149.4
Colorado R. at Colo.-Utah State Line from (83 - 84)	85.	0	5469.9	0	0	0	5469.9
COLORADO RIVER - COLORADO-UTAH STATE LINE TO CISCO, UTAH.							
Colorado R. at State L. (85)	86.	0	5469.9	0	0	0	5469.9
Unmeas. (in Utah only)	87.	0	0	0	17.7 (k)	0	17.7

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
Vols. convey. Colo.-Utah State Line to Cisco, Utah	88.	0	5469.9	0	17.7	0	5487.6
Convey. losses S.L. to Cisco	89.	0	¢ 80.7 *	0	$ 0.3 *	0	81.0 (n)
Colo. R. minus losses to Cisco	90.	0	5389.2	0	17.4	0	5406.6
Dolores R. from item 77.	91.	0	756.2	0	23.2	0	779.4
Colo. R. nr. Cisco from (90 + 91)	92.	0	6145.4	0	40.6	0	6186.0

SUMMARY ABOVE CISCO, UTAH
OF
ASSIGNED CHANNEL LOSSES AND CONTRIBUTIONS BY STATES AT STATE LINES AND AT CISCO, UTAH

	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
CHANNEL LOSSES ASSIGNED ABOVE CISCO, UTAH.							
Out of State Losses	93.	0	86.8	0	0.1	0	86.9
With in State Losses	94.	0	151.7	0	0.5	0	152.2
Total assigned losses (93 + 94)	95.	0	238.5	0	0.6	0	239.1
STATES CONTRIBUTIONS AT STATE LINES AND AT CISCO, UTAH.							
Meas. and unmeas. flows minus assigned losses above Cisco, Utah equals States Contributions at Cisco, Utah.	96.	0	6145.4	0	40.6	0	6186.0
Contributions at State Lines	97.	0	6232.2	0	40.7	0	6272.9

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
SAN JUAN RIVER ABOVE ROSA, N.M.							
Sum of Rio Blanco, Rito Blanco and San Juan Rivers nr. Pagosa	98.	0	399.5	0	0	0	399.5
Navajo River at Edith, Colo.	99.	0	122.2 4/	9.6 4/	0	0	131.8
Piedra River at Arboles, Colo.	100.	0	380.6	0	0	0	380.6
Sum of meas. inflows	101.	0	902.3	9.6	0	0	911.9
Unmeas. (no channel losses)	102	0	27.6 5/	17.1 5/	0	0	44.7
San Juan R. nr. Rosa, N.M.	103.	0	929.9	26.7	0	0	956.6
SAN JUAN R. - ROSA TO PINE RIVER.							
Vols. convey. Rosa To Pine R.	104.	0	929.9	26.7	0	0	956.6
Convey. losses " " " "	105.	0	¢ 10.3 *	$ 0.3 *	0	0	10.6 (p)
Inflows minus losses to Pine R.	106.	0	919.6	26.4	0	0	946.0
PINE R. - IGNACIO TO COLO.-N.M. S.L.							
Pine River at Ignacio, Colorado	107.	0	256.4	0	0	0	256.4
Unmeasured return flow	108.	0	35.0 (r)	0	0	0	35.0
Unmeas. Rosa to Blanco (Colo.)	109.	0	7.0 6/	0	0	0	7.0
Convey. loss Ignacio to S.L.	110.	0	$ 3.7	0	0	0	3.7 (p)
Meas. and unmeas. flows minus convey. losses Ignacio to S.L.	111.	0	294.7	0	0	0	294.7
PINE R. - COLO.-N.M. STATE LINE TO SAN JUAN RIVER							
Pine R. at State Line from 111.	112.	0	294.7	0	0	0	294.7
Convey. loss S.L. to San Juan R.	113.	0	¢ 6.3	0	0	0	6.3
Inflows minus losses to San Juan	114.	0	288.4	0	0	0	288.4

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
SAN JUAN R. - PINE R. TO BLANCO.							
San Juan R. to Pine R. (106)	115.	0	919.6	26.4	0	0	946.0
Pine R. to San Juan R. (114)	116.	0	288.4	0	0	0	288.4
Unmeas. Rosa to Blanco (N.M.)	117.	0	0	31.0 6/	0	0	31.0
Vols. convey. Pine R. to Blanco	118.	0	1208.0	57.4	0	0	1265.4
Convey losses " " " "	119.	0	¢ 5.0 *	$ 0.2 *	0	0	5.2
Inflows minus losses " "	120.	0	1203.0	57.2	0	0	1260.2
ANIMAS RIVER - CEDAR HILL, N.M. TO COLO.-N.M. STATE LINE							
Animas River nr. Cedar Hill, N.M.	121.	0	806.7	0	0	0	806.7
Unmeas. Blanco to Farmington, N.M. (in Colo. only)	122.	0	1.3 7/	0	0	0	1.3
Convey. losses Cedar Hill to Colo.-N.M. State Line	123.	0	$ 0.8	0	0	0	0.8 (p)
Meas. & unmeas. flows minus losses to Colo.-N.M. State L.	124.	0	807.2	0	0	0	807.2
ANIMAS RIVER - COLO. - N.M. STATE LINE TO FARMINGTON, N.M.							
Animas at State Line from 124.	125.	0	807.2	0	0	0	807.2
Unmeas. Blanco to Farmington (in N.M. only)	126.	0	0	6.5 7/	0	0	6.5
Convey. Losses S.L. to Farmington	127.	0	¢ 10.2 *	$ 0.1 *	0	0	10.3 (p)
Meas. & unmeas. flows minus losses S.L. to Farmington, N.M.	128.	0	797.0	6.4	0	0	803.4
SAN JUAN R. - BLANCO TO FARMINGTON.							
San Juan R. at Blanco from 120	129.	0	1203.0	57.2	0	0	1260.2

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
Unmeas. Blanco to Farmington (except on Animas R.)	130.	0	0	67.4 7/	0	0	67.4
Vols. convey. Blanco to Farm.	131.	0	1203.0	124.6	0	0	1327.6
Convey losses " " "	132.	0	¢ 17.8 *	$ 1.8 *	0	0	19.6 (p)
Meas. & unmeas. flows minus losses Blanco to Farmington	133.	0	1185.2	122.8	0	0	1308.0
Meas. & unmeas. flows on Animas minus losses to Farmington	134.	0	797.0	6.4	0	0	803.4
San Juan at Farmington, N.M. from (133 + 134)	135.	0	1982.2	129.2	0	0	2111.4
SAN JUAN RIVER FARMINGTON, N.M. TO LA PLATA RIVER.							
Vols. convey. Farmington to La Plata River	136.	0	1982.2	129.2	0	0	2111.4
Convey. losses to La Plata R.	137.	0	¢ 0.7 *	$ 0.1 *	0	0	0.8 (p)
Inflows minus losses Farmington to La Plata River	138.	0	1981.5	129.1	0	0	2110.6
LA PLATA RIVER - COLORADO-N.M. STATE LINE TO SAN JUAN RIVER.							
La Plata R. at Colo.-N.M. S.L.	139.	0	30.9	0	0	0	30.9
Convey. Losses to San Juan R.	140	0	¢ 5.0	0	0	0	5.0 (p)
Meas. inflows minus losses Colo. N.M. State Line to San Juan R.	141.	0	25.9	0	0	0	25.9
SAN JUAN R. - LA PLATA TO SHIPROCK.							
Vols. convey. La Plata to Shiprock from (138 + 141)	142	0	2007.4	129.1	0	0	2136.5
Convey. Losses to Shiprock	143.	0	¢ 23.6 *	$ 1.5 *	0	0	25.1 (p)
Inflows minus convey. losses La Plata to Shiprock	144.	0	1983.8	127.6	0	0	2111.4

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
SAN JUAN RIVER - SHIPROCK N.M. TO MANCOS RIVER.							
San Juan River at Shiprock 144	145.	0	1983.8	127.6	0	0	2111.4
Unmeas. Farmington to Bluff, Utah (in New Mexico only)	146.	0	0	59.6 8/	0	0	59.6
Vols. convey. Shiprock to Mancos	147.	0	1983.8	187.2	0	0	2171.0
Convey. losses " " "	148.	0	¢ 18.6 *	$ 1.8 *	0	0	20.4 (p)
Meas. & unmeas. flows minus losses Shiprock N.M. to Mancos R.	149.	0	1965.2	185.4	0	0	2150.6
MANCOS RIVER - TOWAOC TO COLO.-N.M. STATE LINE.							
Mancos River near Towaoc, Colo.	150.	0	51.0 9/	1.0 9/	0	0	52.0
Convey. losses to State Line	151.	0	$ 2.8 *	¢ 0.1 *	0	0	2.9 (p)
Meas. flows minus losses Towaoc to Colorado-N.M. State Line	152.	0	48.2	0.9	0	0	49.1
MANCOS RIVER COLO.-N.M. STATE LINE TO SAN JUAN RIVER.							
Mancos R. at State Line from 152	153.	0	48.2	0.9	0	0	49.1
Convey. losses S.L. to San Juan R.	154.	0	¢ 0.7 *	0 *	0	0	0.7 (p)
Meas. flows minus losses Colo.-N.M. State Line to San Juan River	155.	0	47.5	0.9	0	0	48.4
SAN JUAN R. - MANCOS RIVER TO COLO.-N.M. STATE LINE.							
Vols. convey. Mancos R. to S.L. from (149 ≠ 155)	156.	0	2012.7	186.3	0	0	2199.0
Convey. losses Mancos R. to S.L.	157.	0	¢ 2.9 *	$ 0.3 *	0	0	3.2 (p)
Inflows minus convey. losses Mancos R. to Colo.-N.M. S.L.	158	0	2009.8	186.0	0	0	2195.8

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
SAN JUAN RIVER - COLO.-N.M. STATE LINE TO COLO.-UTAH STATE LINE							
San Juan R. at Colo.-N.M. S.L.	159.	0	2009.8	186.0	0	0	2195.8
Convey. losses from S.L. to S.L.	160.	0	$ 1.5 *	¢ 0.1 *	0	0	1.6 (p)
Inflows minus convey. losses Colo.-N.M. S.L. to Colo.-Utah S.L.	161.	0	2008.3	185.9	0	0	2194.2
SAN JUAN RIVER - COLO.-UTAH STATE LINE TO McELMO CREEK.							
Vols. convey. S.L. to McElmo Cr.	162.	0	2008.3	185.9	0	0	2194.2
Convey. loss " " " " "	163.	0	¢ 20.9 *	¢ 1.9 *	0	0	22.8 (p)
Inflows minus convey. losses Colo.-Utah State Line to McElmo	164.	0	1987.4	184.0	0	0	2171.4
McELMO CREEK - NEAR CORTEZ TO COLO.-UTAH STATE LINE.							
McElmo Creek near Cortez, Colo.	165.	0	41.0	0	0	0	41.0
Unmeasured return flow	166.	0	15.0 (s)	0	0	0	15.0
Vols. convey. Cortez to S.L.	167.	0	56.0	0	0	0	56.0
Convey. loss " " " "	168.	0	$ 4.9	0	0	0	4.9 (p)
Inflows minus convey. losses Cortez to Colo.-Utah State Line.	169.	0	51.1	0	0	0	51.1
McELMO CREEK - COLO.-UTAH STATE LINE TO SAN JUAN RIVER.							
McElmo Cr. at S.L. from 169	170.	0	51.1	0	0	0	51.1
Convey. losses to San Juan River	171.	0	¢ 2.7	0	0	0	2.7 (p)
Inflows minus convey. losses Colo. -Utah S.L. to San Juan R.	172.	0	48.4	0	0	0	48.4

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
SAN JUAN RIVER - McELMO CREEK TO CHINLE CREEK							
San Juan R. at McElmo Cr. 164.	173.	0	1987.4	184.0	0	0	2171.4
McElmo Cr. at San Juan R. 172	174.	0	48.4	0	0	0	48.4
Unmeas. Farmington to Bluff, Utah (Colorado and Utah)	175.	0	13.5 8/	0	29.2 8/	0	42.7
Vols. Convey. McElmo Cr. to Chinle	176.	0	2049.3	184.0	29.2	0	2262.5
Convey. loss " " " "	177.	0	¢ 17.8 *	¢ 1.6 *	$ 0.2 *	0	19.6 (p)
Inflows minus convey losses McElmo Cr. to Chinle Cr.	178.	0	2031.5	182.4	29.0	0	2242.9
SAN JUAN RIVER - CHINLE CREEK TO BLUFF, UTAH							
San Juan R. at Chinle Cr. from 178	179.	0	2031.5	182.4	29.0	0	2242.9
Unmeas. Farmington to Bluff, Utah (Arizona)	180.	46.8 8/	0	0	0	0	46.8
Vols. convey. Chinle Cr. to Bluff	181.	46.8	2031.5	182.4	29.0	0	2289.7
Convey. losses " " " "	182.	¢ 0.3 *	¢ 12.5 *	¢ 1.1 *	$ 0.2 *	0	14.1 (p)
Meas. and unmeas. flows minus losses Chinle Cr. to Bluff, Utah	183.	46.5	2019.0	181.3	28.8	0	2275.6

SUMMARY ABOVE BLUFF, UTAH
OF
ASSIGNED CHANNEL LOSSES AND CONTRIBUTIONS BY STATES AT STATE LINES AND AT BLUFF, UTAH

	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
CHANNEL LOSSES ASSIGNED ABOVE BLUFF, UTAH.							
Out of State Losses	184.	0.3	155.0	4.8	0	0	160.1
With in State Losses	185.	0	13.7	6.1	0.4	0	20.2
Total assigned losses (184 ∤ 185)	186.	0.3	168.7	10.9	0.4	0	180.3
STATES CONTRIBUTIONS AT STATE LINES AND AT BLUFF, UTAH.							
Meas. and unmeas. flows minus assigned losses above Bluff, Utah equals States Contributions at Bluff, Utah.	187.	46.5	2019.0	181.3	28.8	0	2275.6
Contributions at State Lines	188.	46.8	2174.0	186.1	28.8	0	2435.7

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
COLORADO RIVER - CISCO, UTAH TO JUNCTION WITH GREEN RIVER.							
Colorado River nr. Cisco, Utah	189.	0	6145.4	0	40.6	0	6,186.0
Convey. losses Cisco to Green R.	190.	0	¢ 35.0 *	0	$ 0.2 *	0	25.2 (c)
Inflows minus convey. losses Cisco, Utah to Green River	191.	0	6110.4	0	40.4	0	6,150.8
GREEN RIVER - GREEN RIVER, UTAH TO JUNCTION WITH COLORADO R.							
Green River at Green R., Utah	192.	0	1939.6	0	1181.3	1537.5	4,658.4
Convey. losses to Colo. River	193.	0	¢ 21.9 *	0	$ 13.3 *	¢ 17.4 *	52.6 (c)
Inflows minus convey. losses Green R., Utah to Colorado R.	194.	0	1917.7	0	1168.0	1520.1	4,605.8
COLORADO RIVER - JUNCTION WITH GREEN RIVER TO SAN JUAN RIVER.							
Sum of Colorado and Green Rivers at junction	195.	0	8028.1	0	1208.4	1520.1	10,756.6
Unmeas. Green R., Cisco and Bluff to Lees Ferry, Ariz. (Utah only)	196.	0	0	0	777.3 10/	0	777.3
Vols. convey. Green R. to San Juan River	197.	0	8028.1	0	1985.7	1520.1	11,533.9
Convey. losses to San Juan R.	198.	0	¢ 40.2 *	0	$ 9.9	¢ 7.6	57.7 (c)
Inflows minus losses junction of Green & Colo. to San Juan R.	199.	0	7987.9	0	1975.8	1512.5	11,476.2
SAN JUAN RIVER - NEAR BLUFF, UTAH TO JUNCTION WITH COLORADO RIVER.							
San Juan R. near Bluff, Utah	200.	46.5	2019.0	181.3	28.8	0	2,275.6

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
Convey. losses Bluff, Utah to Colorado River	201.	¢ 0.6 *	¢ 27.2 *	¢ 2.4 *	$ 0.4 *	0	30.6 (c)
Inflows minus convey. losses Bluff, Utah to Colorado River	202.	45.9	1991.8	178.9	28.4	0	2,245.0
COLORADO RIVER - JUNCTION WITH SAN JUAN R. TO ARIZ.-UTAH S.L.							
Colo. & San Juan Rivers at Jct.	203.	45.9	9979.7	178.9	2004.2	1512.5	13,721.2
Unmeas. Green R., Cisco and Bluff to Lees Ferry (1/2 of Arizona's)	204.	39.7 10/	0	0	0	0	39.7
Vols. convey. San Juan R. to Ariz.-Utah State Line	205.	85.6	9979.7	178.9	2004.2	1512.5	13,760.9
Convey. losses to State Line	206.	¢ 0.1 *	¢ 16.6 *	¢ 0.3 *	$ 3.4 *	¢ 2.5 *	22.9 (c)
Inflows minus convey. losses San Juan R. to Ariz.-Utah S.L.	207.	85.5	9963.1	178.6	2000.8	1510.0	13,738.0
COLORADO RIVER - ARIZONA - UTAH STATE LINE TO LEES FERRY, ARIZONA.							
Colorado R. at S.L. from 207	208.	85.5	9963.1	178.6	2000.8	1510.0	13,738.0
Unmeas. Green R., Cisco and Bluff to Lees Ferry (1/2 of Arizona's)	209.	39.6 10/	0	0	0	0	39.6
Vols. convey. S.L. to Lees Ferry	210.	125.1	9963.1	178.6	2000.8	1510.0	13,777.6
Convey. losses " " " "	211.	$ 0.1 *	¢ 10.3 *	¢ 0.2 *	¢ 2.1 *	¢ 1.6 *	14.3 (c)
Inflows minus convey. losses Ariz.-Utah S.L. to Lees Ferry	212.	125.0	9952.8	178.4	1998.7	1508.4	13,763.3
COLORADO RIVER - LEES FERRY, ARIZ. TO LEE FERRY, ARIZ. (COMPACT POINT)							
Colo. R. at Lees Ferry, Ariz.	213.	125.0	9952.8	178.4	1998.7	1508.4	13,763.3
Paria R. nr. Lees Ferry, Ariz.	214.	7.2 11/	0	0	18.1	0	25.3
Colorado R. at Lee Ferry, Ariz.	215.	132.2	9952.8	178.4	2016.8	1508.4	13,788.6
Historical Contribution at Lee Ferry in % of total	216.	0.96	72.18	1.29	14.63	10.94	100.00

SUMMARY ABOVE LEES FERRY, ARIZONA TO GREEN RIVER, CISCO AND BLUFF
OF
ASSIGNED CHANNEL LOSSES

	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
CHANNEL LOSSES ASSIGNED ABOVE LEES FERRY, ARIZONA TO KEY GAGES.							
Out of State losses	217.	0.7	151.2	2.9	2.1	29.1	186.0
With in State losses	218.	0.1	0	0	27.2	0	27.3
Total assigned losses (217 ∔ 218)	219.	0.8	151.2	2.9	29.3	29.1	213.3

SUMMARY ABOVE LEE FERRY, ARIZONA
OF
ASSIGNED CHANNEL LOSSES AND CONTRIBUTIONS BY STATES AT STATE LINES AND AT LEE FERRY, ARIZONA

	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
CHANNEL LOSSES ASSIGNED ABOVE LEE FERRY, ARIZONA (COMPACT POINT).							
Out of State losses	220.	1.0	455.6	7.7	6.0	102.2	572.5
With in State losses	221.	0.1	187.2	6.1	56.0	18.7	268.1
Total assigned losses (220 ∔ 221)	222.	1.1	642.8	13.8	62.0	120.9	840.6
STATES CONTRIBUTIONS AT STATE LINES AND AT LEE FERRY, ARIZONA.							
Contribution at Lee Ferry, Ariz.	223.	132.2	9952.8	178.4	2016.8	1508.4	13,788.6
Contribution at State lines	224.	133.2	10408.4	186.1	2022.8	1610.6	14,361.1

EXPLANATORY NOTES

(a) According to Utah - Wyoming agreement as shown in joint memorandum of October 16, 1947.
(b) Determined by difference of inflow - outflow (Linwood) considering amount and location of channel losses.
(c) Channel losses as shown in U.S.B.R. Region IV evaporation study.
(d) According to Utah - Wyoming agreement. No channel losses assigned before junction with Green River.
(e) According to Colorado - Wyoming agreement shown in joint memorandum of April 7, 1947.
(f) Estimated by Engineering Advisory Committee as 45 miles @ 150 A.F./ mile and 43 miles @ 300 A.F./ mile.
(g) Estimated by Engineering Advisory Committee as 20 miles @ 600 A.F./ mile and 30 miles @ 200 A.F./ mile.
(h) Estimated by Engineering Advisory Committee as 80 miles @ 60 A.F./ mile.
(i) Estimated by U.S.B.R. in Denver as 69 A.F./ sq. mile in Utah (based on average weighted precipitation) drainage area in Utah - 340 sq. miles. Balance of flow at Gateway assigned to Colorado.
(j) Estimated by U.S.B.R. in Denver as 300 A.F./ mile which is about 3/4 of per mile loss on Colorado River.
(k) Estimated from average weighted precipitation.
(m) As furnished by the State of Colorado (Final).
(n) Total loss Cameo to Cisco (except Dolores) derived by difference in measured inflows (including Dolores at Gateway minus losses to mouth) plus unmeasured flows minus the stream depletions (m) and the Cisco flow. Losses in the section Cameo to Cisco considered to be a constant rate per mile and losses assigned based on the miles of channel in Colorado to the State Line thence pro-rated according to volumes conveyed through the section from the Colorado-Utah State Line to Cisco, Utah.
(p) According to Colorado - New Mexico agreement at the March 24-26, 1948 meeting.
(r) Estimated by Colorado - New Mexico
(s) According to Colorado - New Mexico agreement at the March 24-26, 1948 meeting.
(t) Estimated by the U.S.B.R. in Denver as miles @ A.F./ mile.
(#) Derived by adding the estimated conveyance loss (t) to the measured flow at Lily, Colorado.
* Pro-rated according to the volumes conveyed through the section.
¢ Out of state channel loss.
$ With in state channel loss.

1/ Pro-rated according to drainage areas (Utah 63 and Wyoming 6321)
2/ Pro-rated according to drainage areas (Colorado 1730, Utah 7694 and Wyoming 950)
3/ Pro-rated according to drainage areas (Colorado 3101 and Utah 157)
4/ Pro-rated according to drainage areas (Colorado 153 and New Mexico 12)
5/ Pro-rated according to drainage areas (Colorado 492 and New Mexico 304)
6/ Pro-rated according to drainage areas (Colorado 207 and New Mexico 913)
7/ Pro-rated according to drainage areas (Colorado 43 and New Mexico 225, Animas, 2327 San Juan)
8/ Pro-rated according to drainage areas (Arizona 4602, Colorado 1322, New Mexico 5854 and Utah 2873)
9/ Pro-rated according to drainage areas (Colorado 539 and New Mexico 11)
10/ Pro-rated according to drainage areas (Arizona 1880 and Utah 18, 425)
11/ As computed by the State of Arizona.

PART II

UPPER COLORADO RIVER BASIN

TABLE - MEAN 1914-1945 VIRGIN STREAMFLOWS

AT

STATE LINES, KEY GAGES AND LEE FERRY

UPPER COLORADO RIVER BASIN
ANALYSIS OF CONTRIBUTIONS BY STATES BASED ON MEAN VIRGIN RUNOFF
FOR THE PERIOD 1914-1945

Item numbers not in parenthesis are taken from the table based on historic runoff.

(UNITS 1000 A. F.)

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
GREEN RIVER ABOVE LINWOOD, UTAH.							
East Fork of Smith Fork	1.	0	0	0	31.4	1.1	32.5
West Fork of Smith Fork	2.	0	0	0	15.2	1.1	16.3
Blacks Fork nr. Millburne, Wyo.	3.	0	0	0	110.5	2.7	113.2
Green River at Green River, Wyo.	4.	0	0	0	0	1260.5	1260.5
Sum of measured inflows (1+2+3+4)	5.	0	0	0	157.1	1265.4	1422.5
Unmeasured to Utah-Wyo. State Line.	6.	0	0	0	0	99.0	99.0
Stream depletions	(1)	0	0	0	0	194.8	194.8
Undepleted vols. convey. to S. L.	(2)	0	0	0	157.1	1559.2	1716.3
Historic convey. losses " " "	8.	0	0	0	2.2	18.7	20.9
Undeplet. " " " " "	(3)	0	0	0	¢ 2.2	$ 20.0	22.2
Salvaged " " " " "	(4)	0	0	0	0	1.3	1.3
Undepleted flows minus undepleted convey. losses to Utah-Wyo. S. L.	(5)	0	0	0	154.9	1539.2	1694.1
Unmeas. State Line to Linwood	10.	0	0	0	1.6	0	1.6
Undepleted flows convey. to Linwood	(6)	0	0	0	156.5	1539.2	1695.7
Historic convey. loss to Linwood	12.	0	0	0	0.1	0.5	0.6
Undeplet. " " " "	(7)	0	0	0	$ 0.1	¢ 0.5	0.6
Salvaged " " " "	(8)	0	0	0	0	0	0
Undepleted flows minus undepleted convey. losses State L. to Linwood	(9)	0	0	0	156.4	1538.7	1695.1
HENRYS FORK ABOVE MOUTH							
Henrys Fork at Linwood, Utah	14.	0	0	0	66.8	0	66.8
Stream depletions	(10)	0	0	0	11.3	13.6	24.9
Undepleted flow - Henrys Fork at Linwood, Utah	(11)	0	0	0	78.1	13.6	91.7

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
GREEN RIVER LINWOOD TO UTAH-COLORADO STATE LINE							
Undepleted Green R. nr. Linwood	(12)	0	0	0	156.4	1538.7	1695.1
Undepleted Henrys Fk. at Linwood	(13)	0	0	0	78.1	13.6	91.7
Undepleted vols. convey. Linwood to Utah-Colo. State Line	(14)	0	0	0	234.5	1552.3	1786.8
Historic convey. losses to S. L.	18.	0	0	0	2.3	14.0	16.3
Undeplet. " " " " "	(15)	0	0	0	$ 2.4	¢ 15.6	18.0
Salvaged " " " " "	(16)	0	0	0	0.1	1.6	1.7
Undepleted flows minus undepleted convey. losses Linwood to S. L.	(17)	0	0	0	232.1	1536.7	1768.8
GREEN RIVER UTAH-COLORADO STATE LINE TO YAMPA RIVER							
Undepleted flows at S. L. (17)	(18)	0	0	0	232.1	1536.7	1768.8
Stream depletions	(19)	0	0	0	0	0	0
Undepleted vols. convey. Utah-Colorado State Line to Yampa R.	(20)	0	0	0	232.1	1536.7	1768.8
Historic convey. loss " " "	21.	0	0	0	1.5	8.6	10.1
Undeplet. " " " " "	(21)	0	0	0	¢ 1.5	¢ 9.5	11.0
Salvaged " " " " "	(22)	0	0	0	0	0.9	0.9
Undepleted flows minus undepleted convey. losses State L. to Yampa	(23)	0	0	0	230.6	1527.2	1757.8
YAMPA RIVER CRAIG TO MAYBELL							
Yampa R. at Craig 1/ (See Page 7)	(24)	0	1198.8	0	0	0	1198.8
Stream depletions (above Maybell)	(25)	0	53.0	0	0	0	53.0
Historic convey.loss Craig to Maybell	(26)	0	9.3	0	0	0	9.3
Undepleted convey. loss to Maybell	(27)	0	$ 9.5	0	0	0	9.5
Salvaged " " " "	(28)	0	0.2	0	0	0	0.2
Undepleted flows minus undepleted convey. losses Craig to Maybell	(29)	0	1242.3	0	0	0	1242.3

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
LITTLE SNAKE RIVER ABOVE LILY							
Little Snake River at Colo.-Wyo. State Line	23.	0	230.9	0	0	249.8	480.7
Stream depletions (above line)	(30)	0	11.3	0	0	19.3	30.6
Undepleted flow at Colorado-Wyoming State Line	(31)	0	242.2	0	0	269.1	511.3
Historic convey. loss State Line to Lily, Colorado	24.	0	4.0	0	0	4.3	8.3
Undepleted convey. loss to Lily	(32)	0	$ 4.1	0	0	¢ 4.5	8.6
Salvaged " " " "	(33)	0	0.1	0	0	0.2	0.3
Undepleted Little Snake R. nr. Lily, Colorado	(34)	0	238.1	0	0	264.6	502.7
YAMPA RIVER BELOW MAYBELL AND LILY							
Undepleted Little Snake nr. Lily	(35)	0	238.1	0	0	264.6	502.7
Undepleted Yampa R. nr. Maybelll	(36)	0	1242.3	0	0	0	1242.3
Undepleted vols. convey. Maybell and Lily to Green River	(37)	0	1480.4	0	0	264.6	1745.0
Historic convey. losses to Green R.	29.	0	17.0	0	0	3.0	20.0
Undeplet. " " " " "	(38)	0	$ 17.5	0	0	¢ 3.1	20.6
Salvaged " " " " "	(39)	0	0.5	0	0	0.1	0.6
Undepleted flows minus undepleted losses Maybell and Lily to Green River	(40)	0	1462.9	0	0	261.5	1724.4
GREEN RIVER YAMPA RIVER TO COLORADO-UTAH STATE LINE							
Undeplet. Yampa R. at Green R. (40)	(41)	0	1462.9	0	0	261.5	1724.4
Undepleted Green R. at Yampa R. (23)	(42)	0	0	0	230.6	1527.2	1757.8
Unmeas. above Green R., Utah in Colorado and Wyoming	32.	0	27.4	0	0	15.1	42.5
Stream depletions Vermillion Creek	(43)	0	1.1	0	0	0	1.1

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
Undepleted vol. convey. Yampa River to Colorado-Utah State Line	(44)	0	1491.4	0	230.6	1803.8	3525.8
Historic convey. losses to S. L.	34.	0	0.8	0	0.1	0.9	1.8
Undeplet. " " " " "	(45)	0	$ 0.8	0	¢ 0.1	¢ 1.0	1.9
Salvaged " " " " "	(46)	0	0.0	0	0	0.1	0.1
Undepleted flows minus undepleted losses Yampa R. to Colorado-Utah S. L.	(47)	0	1490.6	0	230.5	1802.8	3523.9
GREEN RIVER COLORADO-UTAH STATE LINE TO BRUSH CREEK							
Undepleted Green River at State Line	(48)	0	1490.6	0	230.5	1802.8	3523.9
Unmeas. above Green River, Utah in Utah	37.	0	0	0	121.8	0	121.8
Undeplet. vol. convey. to Brush Creek	(49)	0	1490.6	0	352.3	1802.8	3645.7
Historic convey. losses " " "	39.	0	4.3	0	1.0	4.8	10.1
Undeplet. " " " " "	(50)	0	¢ 4.4	0	$ 1.0	¢ 5.3	10.7
Salvaged " " " " "	(51)	0	0.1	0	0	0.5	0.6
Undepleted flows minus undepleted losses Colorado-Utah State Line to Brush Creek	(52)	0	1486.2	0	351.3	1797.5	3635.0
Brush Creek near Jensen, Utah	41.	0	0	0	36.0	0	36.0
GREEN RIVER BRUSH CREEK TO ASHLEY CREEK							
Undepleted vol. convey. Brush Creek to Ashley Creek from (52)+41	(53)	0	1486.2	0	387.3	1797.5	3671.0
Historic convey. losses to Ashley	43.	0	1.0	0	0.3	1.2	2.5
Undepleted " " " "	(54)	0	¢ 1.0	0	$ 0.3	¢ 1.3	2.6
Salvaged " " " "	(55)	0	0	0	0	0.1	0.1
Undepleted flows minus undepleted convey. losses Brush Cr. to Ashley Cr.	(56)	0	1485.2	0	387.0	1796.2	3668.4
Ashley Creek near Vernal, Utah	45.	0	0	0	78.0	0	78.0
Stream depletions (Ashley & Brush)	(57)	0	0	0	46.0	0	46.0

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
GREEN RIVER ASHLEY CREEK TO DUCHESNE RIVER							
Undepleted vol. convey. Ashley Cr. to Duchesne R. from items (56)/45/(57)	(58)	0	1485.2	0	511.0	1796.2	3792.4
Historic convey. losses Ashley Creek to Duchesne River	47.	0	14.7	0	4.7	16.2	35.6
Undepleted convey. losses	(59)	0	¢ 15.2	0	$ 5.2	¢ 18.0	38.4
Salvaged convey. losses	(60)	0	0.5	0	0.5	1.8	2.8
Undepleted flows minus undepleted convey losses Ashley to Duchesne	(61)	0	1470.0	0	505.8	1778.2	3754.0
Duchesne River near Randlett, Utah	49.	0	0	0	653.3	0	653.3
Stream depletions (Duchesne & Ouray)	(62)	0	0	0	337.4	0	337.4
GREEN RIVER DUCHESNE RIVER TO WHITE RIVER							
Undeplet. vol. convey. Duchesne R. to White R. (61)/49/(62)	(63)	0	1470.0	0	1496.5	1778.2	4744.7
Historic convey. losses to White R.	51.	0	0.3	0	0.2	0.3	0.8
Undeplet. " " " " "	(64)	0	¢ 0.3	0	$ 0.2	¢ 0.3	0.8
Salvaged " " " " "	(65)	0	0	0	0	0	0
Undepleted flows minus undeplet. convey. losses Duchesne to White R.	(66)	0	1469.7	0	1496.3	1777.9	4743.9
WHITE RIVER BELOW MEEKER, COLORADO							
White River near Meeker, Colorado	53.	0	461.7	0	0	0	461.7
Stream depletions	(67)	0	33.7	0	0	0	33.7
Unmeas. (Gain Meeker to Watson)	54.	0	114.5	0	5.8	0	120.3
Undepleted vol. convey. Watson to Green River	(68)	0	609.9	0	5.8	0	615.7
Historic convey. loss to Green R.	56.	0	17.8	0	0.2	0	18.0
Undeplet. " " " " "	(69)	0	¢ 18.4	0	$ 0.2	0	18.6
Salvaged " " " " "	(70a)	0	0.6	0	0	0	0.6
Undeplet. flows minus losses	(70)	0	591.5	0	5.6	0	597.1

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
GREEN RIVER WHITE RIVER TO PRICE R.							
Undepleted White R. at mouth	(71)	0	591.5	0	5.6	0	597.1
Undepleted Green R. at White R.	(72)	0	1469.7	0	1496.3	1777.9	4743.9
Undepleted vol. convey. White River to Price River	(73)	0	2061.2	0	1501.9	1777.9	5341.0
Historic convey. losses to Price	59.	0	18.5	0	10.4	14.6	43.5
Undepleted " " " "	(74)	0	¢ 19.2	0	$ 13.3	¢ 16.1	48.6
Salvaged " " " "	(75)	0	0.7	0	2.9	1.5	5.1
Undepleted flows minus undepleted convey. losses White R. to Price R.	(76)	0	2042.0	0	1488.6	1761.8	5292.4
PRICE RIVER BELOW HEINER, UTAH							
Price River near Heiner, Utah	61.	0	0	0	92.6	0	92.6
Historic convey. losses Heiner to Green River	62.	0	0	0	$ 5.0	0	5.0
Meas. inflows minus historic losses Heiner to Green River	63.	0	0	0	87.6	0	87.6
Stream depletions above mouth of Price River	(77)	0	0	0	31.5	0	31.5
Undepleted flow Price R. mouth	(78)	0	0	0	119.1	0	119.1
GREEN RIVER PRICE RIVER TO GREEN RIVER, UTAH							
Undepleted Green River at Price R.	(79)	0	2042.0	0	1488.6	1761.8	5292.4
Undepleted Price River at Green R.	(80)	0	0	0	119.1	0	119.1
Undepleted vol. convey. Price R. to Green River, Utah	(81)	0	2042.0	0	1607.7	1761.8	5411.5
Historic convey. loss to Green River	65.	0	6.0	0	3.7	4.7	14.4
Undepleted " " " " "	(82)	0	¢ 6.2	0	$ 4.7	¢ 5.2	16.1
Salvaged " " " " "	(83)	0	0.2	0	1.0	0.5	1.7
Undepleted flows minus undepleted convey. losses Price to Green R.	(84)	0	2035.8	0	1599.0	1756.6	5391.4
Stream depletions above Green R.	(85)	0	2035.8	0	1611.8	1756.6	5404.2

SUMMARY ABOVE GREEN RIVER, UTAH
OF (VIRGIN)
ASSIGNED CHANNEL LOSSES AND CONTRIBUTIONS BY STATES AT STATE LINES AND AT GREEN RIVER , UTAH

	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
CHANNEL LOSSES (UNDEPLETED) ASSIGNED ABOVE GREEN RIVER, UTAH.							
Out of State losses	(87)	0	64.7	0	3.8	80.4	148.9
With in State losses	(88)	0	31.9	0	32.4	20.0	84.3
Total assigned losses	(89)	0	96.6	0	36.2	100.4	233.2
STATES CONTRIBUTIONS (UNDEPLETED) AT STATE LINES AND AT GREEN RIVER, UTAH.							
Contribution at Green River, Utah	(90)	0	2035.8	0	1611.8	1756.6	5404.2
Contribution at state lines	(91)	0	2100.5	0	1615.6	1837.0	5553.1
DEPLETIONS AT SITES OF USE ABOVE GREEN RIVER, UTAH							
	(92)	0	99.1	0	435.0	227.7	761.8
SALVAGED CONVEYANCE LOSSES ABOVE GREEN RIVER, UTAH							
Out of State	(93)	0	2.1	0	0	7.3	9.4
With in State	(94)	0	0.8	0	4.5	1.3	6.6
Total salvaged loss	(95)	0	2.9	0	4.5	8.6	16.0

1/ Yampa River at Craig plus unmeasured equal to Yampa at Maybell plus losses.

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
COLORADO RIVER ABOVE CISCO, UTAH							
COLORADO RIVER GLENWOOD SPRINGS, COLORADO TO CAMEO, COLORADO							
Colorado River at Glenwood Springs, Colo.	(96)	0	2080.4	0	0	0	2080.4
Roaring Fork at Glenwood Springs	(97)	0	1028.0	0	0	0	1028.0
Unmeas. Glenwood To Cameo	(98)	0	411.6	0	0	0	411.6
Stream depletions above Glenwood	(99)	0	145.1	0	0	0	145.1
Historic convey. loss to Cameo	(100)	0	15.0	0	0	0	15.0
Undeplet. " " " "	(101)	0	$ 15.6	0	0	0	15.6
Salvaged " " " "	(102)	0	0.6	0	0	0	0.6
Stream depletions Glenwood to Cameo	(103)	0	63.3	0	0	0	63.3
Undepleted flows minus undepleted convey. losses Glenwood to Cameo	(104)	0	3712.8	0	0	0	3712.8
GUNNISON RIVER DELTA, COLORADO TO GRAND JUNCTION, COLORADO							
Gunnison R. at Delta (assumed to be Grand Junction flow plus losses)	(105)	0	2062.1	0	0	0	2062.1
Stream depletions above Grd.Junction	(106)	0	351.6	0	0	0	351.6
Historic convey. loss Delta to Grand Junction	(107)	0	7.2	0	0	0	7.2
Undepleted convey.loss to Grd.Jctn.	(108)	0	$ 8.3	0	0	0	8.3
Salvaged " " " " "	(109)	0	1.1	0	0	0	1.1
Undepleted flows minus undepleted convey. losses Delta to Grd. Jctn.	(110)	0	2405.4	0	0	0	2405.4
DOLORES RIVER DOLORES TO SAN MIGUEL RIVER							
Dolores R. at Dolores, Colorado	(111)	0	384.4	0	0	0	384.4
Stream depletions above Dolores, Colorado plus exportation	(112)	0	117.9	0	0	0	117.9

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
Historic convey. loss to San Miguel River from Dolores	(113)	0	11.3	0	0	0	11.3
Undepleted convey. losses to San Miguel	(114)	0	$ 14.0	0	0	0	14.0
Salvaged convey. losses to San Miguel	(115)	0	2.7	0	0	0	2.7
Undepleted flow minus undepleted convey. losses Dolores to San Miguel	(116)	0	488.3	0	0	0	488.3
<u>DOLORES RIVER SAN MIGUEL RIVER TO GATEWAY, COLORADO</u>							
Undepleted flow at San Miguel R.	(117)	0	912.4 *	0	23.5	0	935.9
Assumed historical flow	(118)	0	771.9	0	23.5	0	795.4
Assumed historic convey. losses San Miguel R. to Gateway	(119)	0	7.3	0	0	0	7.3
Undepleted convey. losses to Gateway	(120)	0	$ 8.3	0	0	0	8.3
Salvaged convey. losses to Gateway	(121)	0	1.0	0	0	0	1.0
* Includes stream depls. of 25.3							
Undepleted flows minus undepleted convey. losses San Miguel to Gateway	(122)	0	904.1	0	23.5	0	927.6
<u>DOLORES RIVER GATEWAY TO UTAH-COLORADO STATE LINE</u>							
Undepleted Dolores R. at Gateway	(123)	0	904.1	0	23.5	0	927.6
Historic convey. losses to S. L.	73.	0	2.3	0	0.1	0	2.4
Undepleted " " " " "	(124)	0	$ 2.6	0	¢ 0.1	0	2.7
Salvaged " " " " "	(125)	0	0.3	0	0	0	0.3
Undepleted flows minus undepleted convey losses Gateway to S. L.	(126)	0	901.5	0	23.4	0	924.9
<u>DOLORES RIVER UTAH - COLORADO STATE LINE TO COLORADO RIVER</u>							
Undepleted Dolores R. to State L.	(127)	0	901.5	0	23.4	0	924.9

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
Historic convey. loss to Colo. R.	75.	0	6.1	0	0.2	0	6.3
Undepleted " " " " "	(128)	0	¢ 7.0	0	$ 0.2	0	7.2
Salvaged " " " " "	(129)	0	0.9	0	0	0	0.9
Undepleted flows minus undepleted convey. losses S. L. to Colo. R.	(130)	0	894.5	0	23.2	0	917.7
COLORADO RIVER CAMEO TO COLORADO-UTAH STATE LINE *							
Undepleted Colorado R. at Cameo	(131)	0	3712.8	0	0	0	3712.8
Plateau Creek nr. Cameo, Colorado	78.	0	186.3	0	0	0	186.3
Stream depletions (Plateau Creek)	(132)	0	26.4	0	0	0	26.4
Undepleted Gunnison River nr. Grand Junction, Colorado	(133)	0	2405.4	0	0	0	2405.4
Sum of undepleted flows from (131/78/(132)/(133)	(134)	0	6330.9	0	0	0	6330.9
Unmeas. Cameo to Colo.-Utah State L.	81.	0	26.6	0	0	0	26.6
Undepleted vol. convey. to S. L.	(135)	0	6357.5	0	0	0	6357.5
Historic convey. losses Cameo to Colo.-Utah State Line	84.	0	149.4	0	0	0	149.4
Undepleted convey. losses to S. L.	(136)	0	$ 164.5	0	0	0	164.5
Salvaged " " " " "	(137)	0	15.1	0	0	0	15.1
Undepleted flows minus undepleted convey. losses Cameo to State Line	(138)	0	6193.0	0	0	0	6193.0
COLORADO RIVER COLORADO-UTAH STATE LINE TO CISCO, UTAH							
Undepleted Colo. River at State Line	(139)	0	6193.0	0	0	0	6193.0
Unmeas. Cameo to Cisco (in Utah)	87.	0	0	0	17.7	0	17.7
Historic convey. loss to Cisco	89.	0	80.7	0	0.3	0	81.0
Undepleted " " " "	(140)	0	¢ 88.9	0	$ 0.3	0	89.2
Salvaged " " " "	(141)	0	8.2	0	0	0	8.2
Undepleted Colo. R. flows (including Dolores River undepleted losses to Cisco, Utah	(142)	0	6998.6	0	40.6	0	7039.2

* See note, bottom Page 11.

SUMMARY ABOVE CISCO, UTAH OF
(VIRGIN)
ASSIGNED CHANNEL LOSSES AND CONTRIBUTIONS BY STATES AT STATE LINES AND AT CISCO, UTAH

	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
CHANNEL LOSSES (UNDEPLETED) ASSIGNED ABOVE CISCO, UTAH							
Out of state losses	(143)	0	95.9	0	0.1	0	96.0
With in state losses	(144)	0	213.3	0	0.5	0	213.8
Total assigned losses	(145)	0	309.2	0	0.6	0	309.8
STATES CONTRIBUTIONS (UNDEPLETED) AT STATE LINES AND AT CISCO, UTAH							
Contribution at Cisco, Utah	(146)	0	6998.6	0	40.6	0	7039.2
Contribution at state lines	(147)	0	7094.5	0	40.7	0	7135.2
DEPLETIONS AT SITES OF USE ABOVE CISCO, UTAH							
	(148)	0	783.1 *	0	0	0	783.1
SALVAGED CONVEYANCE LOSSES ABOVE CISCO, UTAH							
Out of state	(149)	0	9.1	0	0	0	9.1
With in state	(150)	0	20.8	0	0	0	20.8
Total salvaged loss	(151)	0	29.9	0	0	0	29.9

* Does not include 100,000 acre-feet transported to San Juan River Basin (avg. 1914-1945)
Does include 153,500 acre-feet stream depletion Cameo to Cisco.

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
SAN JUAN RIVER ABOVE ROSA, NEW MEXICO							
Sum of Rio Blanco, Rito Blanco and San Juan Rivers nr. Pagosa Springs	98.	0	399.5	0	0	0	399.5
Navajo River at Edith, Colorado	99.	0	122.2	9.6	0	0	131.8
Piedra River at Arboles, Colorado	100.	0	380.6	0	0	0	380.6
Sum of meas. inflows	101.	0	902.3	9.6	0	0	911.9
Unmeas. (no channel losses)	102.	0	27.6	17.1	0	0	44.7
Stream depletions	(152)	0	13.6	0.4	0	0	14.0
Undepleted San Juan at Rosa, N.Mex.	(153)	0	943.5	27.1	0	0	970.6
SAN JUAN RIVER ROSA TO PINE RIVER							
Undepleted vol.convey. Rosa to Pine River	(154)	0	943.5	27.1	0	0	970.6
Historic convey. losses Rosa to Pine River	105.	0	10.3	0.3	0	0	10.6
Undepleted convey. losses Rosa to Pine River	(155)	0	¢10.3	$ 0.3	0	0	10.6
Salvaged convey. losses Rosa to Pine River	(156)	0	0	0	0	0	0
Undepleted flows minus undepleted convey. losses Rosa to Pine R.	(157)	0	933.2	26.8	0	0	960.0
PINE RIVER IGNACIO TO COLORADO-NEW MEXICO STATE LINE							
Pine River at Ignacio, Colorado	107.	0	256.4	0	0	0	256.4
Unmeas. return flow	108.	0	35.0	0	0	0	35.0
Unmeas. Rosa to Blanco (in Colo.)	109.	0	7.0	0	0	0	7.0
Stream depletions	(158)	0	41.7	0	0	0	41.7
Historic convey. losses to S.L.	110.	0	3.7	0	0	0	3.7
Undepleted " " " " "	(159)	0	$ 3.9	0	0	0	3.9
Salvaged " " " " "	(160)	0	0.2	0	0	0	0.2
Undepleted flows minus undepleted convey. losses Ignacio to S. L.	(161)	0	336.2	0	0	0	336.2

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
PINE RIVER COLORADO-NEW MEXICO STATE LINE TO SAN JUAN RIVER							
Pine River (undepleted) at S. L.	(162)	0	336.2	0	0	0	336.2
Historic convey. losses S.L. to San Juan	113.	0	6.3	0	0	0	6.3
Undepleted convey. losses S.L. to San Juan	(163)	0	¢ 6.7	0	0	0	6.7
Salvaged convy. losses S.L. to San Juan	(164)	0	0.4	0	0	0	0.4
Undepleted flows minus undepleted convey. losses S.L. to San Juan R.	(165)	0	329.5	0	0	0	329.5
SAN JUAN RIVER PINE RIVER TO BLANCO							
Undepleted San Juan R. to Pine R.	(166)	0	933.2	26.8	0	0	960.0
Undepleted Pine R. to San Juan R.	(167)	0	329.5	0	0	0	329.5
Unmeas. Rosa to Blanco (in N. Mex.)	117.	0	0	31.0	0	0	31.0
Stream depletions (in N.Mex.on Pine)	(168)	0	0	1.2	0	0	1.2
Undepleted vol.convey.Pine to Blanco	(169)	0	1262.7	59.0	0	0	1321.7
Historic convey.losses to Blanco	119.	0	5.0	0.2	0	0	5.2
Undepleted " " " "	(170)	0	¢ 5.1	$ 0.2	0	0	5.3
Salvaged " " " "	(171)	0	0.1	0	0	0	0.1
Undepleted flows minus undepleted convey. losses Pine R. to Blanco	(172)	0	1257.6	58.8	0	0	1316.4
ANIMAS RIVER CEDAR HILL, NEW MEXICO TO COLORADO-NEW MEXICO STATE LINE							
Animas R. nr. Cedar Hill, New Mex.	121.	0	806.7	0	0	0	806.7
Unmeas. Blanco to Farmington, New Mexico (in Colorado)	122.	0	1.3	0	0	0	1.3
Stream depletions	(173)	0	30.0	0	0	0	30.0
Historic convey. losses to S. L.	123.	0	0.8	0	0	0	0.8
Undepleted " " " " "	(174)	0	$ 0.8	0	0	0	0.8
Salvaged " " " " "	(175)	0	0	0	0	0	0
Undepleted flows minus undepleted convey. losses Cedar Hill to S.L.	(176)	0	837.2	0	0	0	837.2

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
ANIMAS RIVER COLORADO-NEW MEXICO STATE LINE TO FARMINGTON, NEW MEX.							
Animas R. at State Line from (176)	(177)	0	837.2	0	0	0	837.2
Unmeas. Blanco to Farmington, New Mexico (in New Mexico on Animas)	126.	0	0	6.5	0	0	6.5
Historic convey. losses to Farmington	127.	0	10.2	0.1	0	0	10.3
Undeplet. " " " "	(178)	0	¢ 10.4	$ 0.1	0	0	10.5
Salvaged " " " "	(179)	0	0.2	0	0	0	0.2
Undeplet. flows minus undeplet. convey. losses state line to Farmington	(180)	0	826.8	6.4	0	0	833.2
SAN JUAN RIVER BLANCO, NEW MEXICO TO FARMINGTON, NEW MEXICO							
Undepleted San Juan to Blanco, New Mexico from (172)	(181)	0	1257.6	58.8	0	0	1316.4
Unmeas. Blanco to Farmington (in New Mexico on San Juan)	130.	0	0	67.4	0	0	67.4
Undepleted vol. convey. Blanco to Farmington	(182)	0	1257.6	126.2	0	0	1383.8
Historic convey. losses Blanco to Farmington	132.	0	17.8	1.8	0	0	19.6
Undepleted convey. losses Blanco to Farmington	(183)	0	¢ 18.2	$ 1.8	0	0	20.0
Salvaged convey. losses	(184)	0	0.4	0	0	0	0.4
Undepleted San Juan flows minus undeplet.convey. losses to Farmington	(185)	0	1239.4	124.4	0	0	1363.8
Undeplet. Animas River from (180)	(186)	0	826.8	6.4	0	0	833.2
Undeplet. San Juan R. at Farmington	(187)	0	2066.2	130.8	0	0	2197.0
SAN JUAN RIVER FARMINGTON, NEW MEXICO TO LA PLATA RIVER							
Vol. convey. (undepleted) Farmington to La Plata River (187)	(188)	0	2066.2	130.8	0	0	2197.0

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
Historic convey. loss to La Plata	137.	0	0.7	0.1	0	0	0.8
Undepleted " " " " "	(189)	0	¢ 0.7	$ 0.1	0	0	0.8
Salvaged " " " " "	(190)	0	0	0	-0	0	0
Undepleted flows minus undepleted convey.losses Farmington to La Plata River	(191)	0	2065.5	130.7	0	0	2196.2
LA PLATA RIVER COLORADO-NEW MEXICO STATE LINE TO SAN JUAN RIVER							
La Plata R. at Colo.-New Mex. S. L.	139.	0	30.9	0	0	0	30.9
Stream depletions above line	(192)	0	20.4	0	0	0	20.4
Undeplet. vol. convey. to San Juan	(193)	0	51.3	0	0	0	51.3
Historic convey.losses to San Juan	140.	0	5.0	0	0	0	5.0
Undepleted " " " " "	(194)	0	¢ 6.7	0	0	0	6.7
Salvaged " " " " "	(195)	0	1.7	0	0	0	1.7
Undeplet. flows minus undepleted convey. losses S. L. to San Juan	(196)	0	44.6	0	0	0	44.6
SAN JUAN RIVER LA PLATA RIVER TO SHIPROCK, NEW MEXICO							
Undepleted San Juan at LaPlata R.	(197)	0	2065.5	130.7	0	0	2196.2
Undepleted LaPlata at San Juan R.	(198)	0	44.6	0	0	0	44.6
Undepleted San Juan at Junction	(199)	0	2110.1	130.7	0	0	2240.8
Stream depletions (on LaPlata in New Mex. 6.2 and 59.5 on SanJuan	(200)	0	0	65.7	0	0	65.7
Undepleted vol. convey. LaPlata R. to Shiprock, New Mexico	(201)	0	2110.1	196.4	0	0	2306.5
Historic convey. losses to Shiprock	143.	0	23.6	1.5	0	0	25.1
Undepleted " " " "	(202)	0	¢ 24.2	$ 1.9	0	0	26.1
Salvaged " " " "	(203)	0	0.6	0.4	0	0	1.0
Undeplet. flows minus undepleted convey losses LaPlata to Shiprock	(204)	0	2085.9	194.5	0	0	2280.4

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
SAN JUAN RIVER SHIPROCK TO MANCOS R.							
Undepleted San Juan at Shiprock	(205)	0	2085.9	194.5	0	0	2280.4
Unmeas. Farmington, New Mexico to Bluff, Utah (in New Mexico)	146.	0	0	59.6	0	0	59.6
Stream depletions (Chaco River)	(206)	0	0	4.9	0	0	4.9
Undepleted vol. convey. Shiprock to Mancos River	(207)	0	2085.9	259.0	0	0	2344.9
Historic convey. loss to Mancos	148.	0	18.6	1.8	0	0	20.4
Undepleted " " " "	(208)	0	¢ 19.1	$ 2.2	0	0	21.3
Salvaged " " " "	(209)	0	0.5	0.4	0	0	0.9
Undepleted flows minus undepleted convey. losses Shiprock to Mancos	(210)	0	2066.8	256.8	0	0	2323.6
MANCOS RIVER TOWAOC TO COLORADO-NEW MEXICO STATE LINE							
Mancos River nr. Towaoc, Colorado	150.	0	51.0	1.0	0	0	52.0
Stream depletions	(211)	0	11.7	0	0	0	11.7
Undepleted vol. convey. to S. L.	(212)	0	62.7	1.0	0	0	63.7
Historic convey. losses " " "	151.	0	2.8	0.1	0	0	2.9
Undepleted " " " " "	(213)	0	$ 3.1	¢ 0.1	0	0	3.2
Salvaged " " " " "	(214)	0	0.3	0	0	0	0.3
Undepleted flows minus undepleted convey. losses Towaoc to S. L.	(215)	0	59.6	0.9	0	0	60.5
MANCOS RIVER COLORADO-NEW MEXICO STATE LINE TO SAN JUAN RIVER							
Undepleted Mancos at State Line	(216)	0	59.6	0.9	0	0	60.5
Historic convey. losses to San Juan 154	154.	0	0.7	0	0	0	0.7
Undepleted convey. losses to San Juan	(217)	0	¢ 0.8	0	0	0	0.8
Salvaged convey losses to San Juan	(218)	0	0.1	0	0	0	0.1
Undepleted flows minus undepleted convey. losses to San Juan	(219)	0	58.8	0.9	0	0	59.7

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
SAN JUAN RIVER MANCOS RIVER TO COLORADO-NEW MEXICO STATE LINE							
Undepleted San Juan River at Mancos	(220)	0	2066.8	256.8	0	0	2323.6
Undepleted Mancos at San Juan River	(221)	0	58.8	0.9	0	0	59.7
Undepleted vol. convey. Mancos River to Colorado-New Mexico State Line	(222)	0	2125.6	257.7	0	0	2383.3
Historic convey. losses to State Line	157.	0	2.9	0.3	0	0	3.2
Undepleted " " " " "	(223)	0	¢ 3.0	$ 0.4	0	0	3.4
Salvaged " " " " "	(224)	0	0.1	0.1	0	0	0.2
Undepleted flows minus undepleted convey. losses Mancos River to State Line	(225)	0	2122.6	257.3	0	0	2379.9
SAN JUAN RIVER COLORADO-NEW MEXICO STATE LINE TO COLORADO-UTAH STATE LINE							
Undepleted San Juan at Colorado-New Mexico State Line from (225)	(226)	0	2122.6	257.3	0	0	2379.9
Historic convey. losses Colorado-New Mexico State Line to Colo.-Utah S.L.	160.	0	1.5	0.1	0	0	1.6
Undepleted convey. losses Colorado-N. Mex. S. L. to Colo.-Utah S. L.	(227)	0	$ 1.6	¢ 0.1	0	0	1.7
Salvaged convey. losses	(228)	0	0.1	0	0	0	0.1
Undepleted flows minus undepleted convey. losses Colo.-N. Mex. State Line to Colo.-Utah State Line	(229)	0	2121.0	257.2	0	0	2378.2
SAN JUAN RIVER COLORADO-UTAH STATE LINE TO McELMO CREEK							
Undepleted San Juan at Colo.-Utah State Line from (229)	(230)	0	2121.0	257.2	0	0	2378.2
Utah State Line to McElmo Creek	163.	0	20.9	1.9	0	0	22.8
Undepleted convey. losses Colo.-Utah State Line to McElmo Creek	(231)	0	¢ 21.5	¢ 2.3	0	0	23.8

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
Salvaged convey. losses Colo.-Utah State Line to McElmo Creek	(232)	0	0.6	0.4	0	0	1.0
Undepleted flows minus undepleted convey. losses S. L. to McElmo Creek	(233)	0	2099.5	254.9	0	0	2354.4
MC ELMO CREEK CORTEZ TO COLO.-UTAH S.L.							
McElmo Creek near Cortez, Colorado	165.	0	41.0	0	0	0	41.0
Unmeas. return flow	166.	0	15.0	0	0	0	15.0
Stream depletions (above gage)	(234)	0	51.3	0	0	0	51.3
Importation from Dolores River	(235)	0	100.0	0	0	0	100.0
Undepleted McElmo Creek near Cortez	(236)	0	7.3	0	0	0	7.3
Historic convey. losses Cortez to Colorado-Utah State Line	168.	0	4.9	0	0	0	4.9
Undepleted convey. losses to S. L.	(237)	0	$ 2.7	0	0	0	2.7
Salvaged " " " " "	(238)	0	- 2.2	0	0	0	- 2.2
Undepleted flows minus undepleted convey. losses Cortez to State Line	(239)	0	4.6	0	0	0	4.6
MC ELMO CREEK COLORADO-UTAH LINE TO SAN JUAN RIVER							
Undepleted McElmo Creek at State Line	(240)	0	4.6	0	0	0	4.6
Stream depletions	(241)	0	11.9	0	0	0	11.9
Undepleted vol. convey. to San Juan	(242)	0	16.5	0	0	0	16.5
Historic convey. losses " " "	171.	0	2.7	0	0	0	2.7
Undepleted " " " " "	(243)	0	¢ 1.8	0	0	0	1.8
Salvaged " " " " "	(244)	0	- 0.9	0	0	0	- 0.9
Undepleted flows minus undepleted convey. losses State Line to San Juan River	(245)	0	14.7	0	0	0	14.7

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
SAN JUAN RIVER MC ELMO CREEK TO CHINLE CREEK							
Undepleted San Juan at McElmo Creek	(246)	0	2099.5	254.9	0	0	2354.4
Undepleted McElmo Creek at San Juan R.	(247)	0	14.7	0	0	0	14.7
Unmeas. Farmington, New Mexico, to Bluff, Utah (in Colo. and Utah)	175.	0	13.5	0	29.2	0	42.7
Undepleted vol. convey. to Chinle	(248)	0	2127.7	254.9	29.2	0	2411.8
Historic convey. losses to Chinle	177.	0	17.8	1.6	0.2	0	19.6
Undepleted " " " "	(249)	0	¢ 18.1	¢ 1.9	$ 0.2	0	20.2
Salvaged " " " "	(250)	0	0.3	0.3	0	0	0.6
Undepleted flows minus undepleted convey. losses McElmo Creek-Chinle	(251)	0	2109.6	253.0	29.0	0	2391.6
SAN JUAN RIVER CHINLE CREEK TO BLUFF, UTAH							
Undepleted San Juan River at Chinle	(252)	0	2109.6	253.0	29.0	0	2391.6
Unmeas. Farmington, New Mexico to Bluff, Utah, (in Arizona)	180.	46.8	0	0	0	0	46.8
Stream depletions (in Arizona-Utah)	(253)	4.0	0	0	9.0	0	13.0
Undepleted vol. convey. Chinle Creek to Bluff, Utah.	(254)	50.8	2109.6	253.0	38.0	0	2451.4
Historic convey. losses to Bluff	182.	0.3	12.5	1.1	0.2	0	14.1
Undepleted " " " "	(255)	¢ 0.3	¢ 12.7	¢ 1.3	$ 0.2	0	14.5
Salvaged " " " "	(256)	0	0.2	0.2	0	0	0.4
Undepleted flows minus undepleted convey. losses Chinle to Bluff	(257)	50.5	2096.9	251.7	37.8	0	2436.9

SUMMARY ABOVE BLUFF, UTAH
OF (VIRGIN)

ASSIGNED CHANNEL LOSSES AND CONTRIBUTIONS BY STATES AT STATE LINES AND AT BLUFF, UTAH

	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
CHANNEL LOSSES (UNDEPLETED) ASSIGNED ABOVE BLUFF, UTAH							
Out of state losses	(258)	0.3	159.3	5.7	0.0	0	165.3
With in state losses	(259)	0.0	12.1	7.0	0.4	0	19.5
Total assigned losses	(260)	0.3	171.4	12.7	0.4	0	184.8
STATES CONTRIBUTIONS (UNDEPLETED) AT STATE LINES AND AT BLUFF, UTAH							
Contribution at Bluff, Utah	(261)	50.5	2096.9	251.7	37.8	0	2436.9
Contribution at state lines	(262)	50.8	2256.2	257.4	37.8	0	2602.2
DEPLETIONS AT SITES OF USE ABOVE BLUFF, UTAH							
	(263)	4.0	180.6	72.2	9.0	0	265.8
SALVAGED CONVEYANCE LOSSES ABOVE BLUFF, UTAH							
Out of state	(264)	0.0	4.3	0.9	0.0	0	5.2
With in state	(265)	0.0	- 1.6	0.9	0.0	0	- 0.7
Total salvaged losses	(266)	0.0	2.7	1.8	0.0	0	4.5

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
COLORADO RIVER CISCO, UTAH, TO JUNCTION WITH GREEN RIVER							
Undepleted Colorado River nr. Cisco	(267)	0	6998.6	0	40.6	0	7039.2
Historic convey. losses Cisco, Utah to junction to Colo. and Green R.	190.	0	35.0	0	0.2	0	35.2
Undepleted convey. losses to Junct.	(268)	0	¢ 38.7	0	$ 0.2	0	38.9
Salvaged " " " "	(269)	0	3.7	0	0	0	3.7
Undepleted flows minus undepleted convey. losses Cisco to junction	(270)	0	6959.9	0	40.4	0	7000.3
Stream depletions (Moab - LaSal)	(271)	0	0	0	10.0	0	10.0
Undepleted Colo. River at Green R.	(272)	0	6959.9	0	50.4	0	7010.3
GREEN RIVER GREEN RIVER, UTAH, TO JUNCTION WITH COLORADO RIVER							
Undepleted Green R. at Green River, Utah	(273)	0	2035.8	0	1611.8	1756.6	5404.2
Stream depletions (San Rafael)	(274)	0	0	0	67.1	0	67.1
Undepleted vol. convey. to Colo. R.	(275)	0	2035.8	0	1678.9	1756.6	5471.3
Historic convey. losses Green R., Utah, to junct. with Colo. River	193.	0	21.9	0	13.3	17.4	52.6
Undepleted convey. losses to Colo. R	(276)	0	¢ 22.7	0	$ 17.7	¢ 19.2	59.6
Salvaged " " " " "	(277)	0	0.8	0	4.4	1.8	7.0
Undepleted flows minus undepleted convey. losses Green River, Utah, to Colorado	(278)	0	2013.1	0	1661.2	1737.4	5411.7
COLORADO RIVER JUNCTION WITH GREEN RIVER TO SAN JUAN RIVER							
Undepleted Colo. R. at Green River	(279)	0	6959.9	0	50.4	0	7010.3
Undepleted Green R. at Colo. River	(280)	0	2013.1	0	1661.2	1737.4	5411.7
Sum of (279) (280)	(281)	0	8973.0	0	1711.6	1737.4	12422.0
Unmeas. Lees Ferry to key gages at Cisco, Green R. and Bluff (Utah)	196.	0	0	0	777.3	0	777.3
Stream depletions (Dirty Devil)	(282)	0	0	0	12.3	0	12.3

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
Undepleted vol. convey. Green R. to San Juan River	(283)	0	8973.0	0	2501.2	1737.4	13,211.6
Historic convey. losses Green R. to San Juan River	198.	0	40.2	0	9.9	7.6	57.7
Undepleted convey. losses to SanJuan	(284)	0	¢ 43.8	0	$ 11.9	¢ 8.4	64.1
Salvaged " " " " "	(285)	0	3.6	0	2.0	0.8	6.4
Undepleted flows minus undepleted convey. los es Green R. to SanJuan	(286)	0	8929.2	0	2489.3	1729.0	13,147.5
Stream depletions (Escalante)	(287)	0	0	0	22.9	0	22.9
Undepleted Colo. R. at San Juan R.	(288)	0	8929.2	0	2512.2	1729.0	13,170.4
<u>SAN JUAN RIVER NEAR BLUFF, UTAH, TO JUNCTION WITH COLORADO RIVER</u>							
Undepleted San Juan R. near Bluff	(289)	50.5	2096.9	251.7	37.8	0	2,436.9
Historic convey. losses Bluff to junction with Colorado River	201.	0.6	27.2	2.4	0.4	0	30.6
Undepleted convey. losses to Colo.	(290)	¢ 0.6	¢ 28.0	¢3.1	$ 0.5	0	32.2
Salvaged " " " "	(291)	0	0.8	0.7	0.1	0	1.6
Undepleted flows minus undepleted convey. losses Bluff to Colo. R.	(292)	49.9	2068.9	248.6	37.3	0	2,404.7
<u>COLORADO RIVER JUNCTION WITH SAN JUAN RIVER TO ARIZONA-UTAH STATE LINE</u>							
Undepleted Colo. R. at San Juan R.	(293)	0	8929.2	0	2512.2	1729.0	13,170.4
Undepleted San Juan R. at Colo. R.	(294)	49.9	2068.9	248.6	37.3	0	2,404.7
Unmeas. Lees Ferry to key gages at Cisco, Green R. and Bluff (1/2 of Arizona's)	204.	39.7	0	0	0	0	39.7
Undepleted vol. convey. San Juan to Arizona-Utah State Line	(295)	89.6	10998.1	248.6	2549.5	1729.0	15,614.8
Historic convey. losses to S. L.	206.	0.1	16.6	0.3	3.4	2.5	22.9
Undepleted " " " " "	(296)	¢ 0.1	¢ 18.0	¢ 0.4	$ 4.1	¢ 2.8	25.4
Salvaged " " " " "	(297)	0	1.4	0.1	0.7	0.3	2.5
Undepleted flows minus losses San Juan R. to Ariz.-Utah State Line	(298)	89.5	10980.1	248.2	2545.4	1726.2	15,589.4

RIVER SECTION	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
COLORADO RIVER ARIZONA-UTAH STATE LINE TO LEES FERRY, ARIZONA							
Colorado R. at State Line from (298)	(299)	89.5	10,980.1	248.2	2,545.4	1,726.2	15,589.4
Unmeas. Lees Ferry to key gage at Cisco, Green R. and Bluff (1/2 Arizona's)	209.	39.6	0	0	0	0	39.6
Undepleted vol. convey. to Lees Ferry	(300)	129.1	10,980.1	248.2	2,545.4	1,726.2	15,629.0
Historic convey. losses to Lees Ferry	211.	0.1	10.3	0.2	2.1	1.6	14.3
Undepleted " " " " "	(301)	$ 0.1	¢ 11.2	¢ 0.3	¢ 2.6	¢ 1.8	16.0
Salvaged " " " " "	(302)	0	0.9	0.1	0.5	0.2	1.7
Undepleted flows minus undepleted convey losses S. L. to Lees Ferry	(303)	129.0	10,968.9	247.9	2,542.8	1,724.4	15,613.0
COLORADO RIVER LEES FERRY, ARIZONA TO LEE FERRY, ARIZONA (COMPACT POINT)							
Undepleted Colo. River at Lees Ferry	(304)	129.0	10,968.9	247.9	2,538.8	1,724.4	15,609.0
Paria River nr. Lees Ferry, Arizona	214.	7.2	0	0	18.1	0	25.3
Stream depletions (Paria River)	(305)	0	0	0	.2*	1,724.4	.2
Undepleted Colo. River at Lee Ferry, Arizona (Compact Point)	(306)	136.2	10,968.9	247.9	2,561.1	1,724.4	15,638.5
Undepleted contribution at Lee Ferry in % of total	(307)	0.87	70.14	1.58	16.38	11.03	100.00

* Excludes 4.0 importation

SUMMARY ABOVE LEE FERRY, ARIZONA TO GREEN RIVER, CISCO AND BLUFF
OF (VIRGIN)

ASSIGNED CHANNEL LOSSES AND CONTRIBUTIONS BY STATES AT STATE LINES AND AT LEE FERRY, ARIZ.

	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
CHANNEL LOSSES (UNDEPLETED) ASSIGNED ABOVE LEE FERRY, ARIZONA TO GREEN RIVER, CISCO AND BLUFF							
Out of state losses	(308)	0.7	162.4	3.8	2.6	32.2	201.7
With in state losses	(309)	0.1	0	0	34.4	0	34.5
Total assigned losses	(310)	0.8	162.4	3.8	37.0	32.2	236.2
STATES CONTRIBUTIONS (UNDEPLETED) AT STATE LINES AND AT LEE FERRY, ARIZONA (TO KEY GAGES ONLY)							
Contribution at Lee Ferry, Ariz.	(311)	136.2	10,968.9	247.9	2,561.1	1,724.4	15,638.5
Contribution at State Lines	(312)	136.9	11,131.3	251.7	2,563.7	1,756.6	15,840.2
DEPLETIONS AT SITES OF USE ABOVE LEE FERRY, ARIZONA TO GREEN RIVER, CISCO AND BLUFF							
	(313)	0	0	0	112.5	0	112.5
SALVAGED CONVEYANCE LOSSES ABOVE LEE FERRY, ARIZONA TO GREEN RIVER, CISCO AND BLUFF							
Out of state	(314)	0	11.2	0.9	0.5	3.1	15.7
With in state	(315)	0	0	0	7.2	0	7.2
Total salvaged losses	(316)	0	11.2	0.9	7.7	3.1	22.9

SUMMARY ABOVE LEE FERRY, ARIZONA
OF (UNDEPLETED)
ASSIGNED CHANNEL LOSSES AND CONTRIBUTIONS BY STATE AT STATE LINES AND AT LEE FERRY, ARIZONA

	ITEM	ARIZONA	COLORADO	NEW MEXICO	UTAH	WYOMING	TOTAL
CHANNEL LOSSES (UNDEPLETED) ABOVE LEE FERRY, ARIZONA							
Out of state losses	(317)	1.0	482.3	9.5	6.5	112.6	611.9
With in state losses	(318)	0.1	257.3	7.0	67.7	20.0	352.1
Total assigned losses	(319)	1.1	739.6	16.5	74.2	132.6	964.0
STATES CONTRIBUTIONS (UNDEPLETED) AT STATE LINES AND AT LEE FERRY, ARIZONA (COMPACT POINT)							
Contribution at Lee Ferry, Arizona	(320)	136.2	10,968.9	247.9	2,561.1	1,724.4	15,638.5
Contribution at state lines	(321)	137.2	11,451.2	257.4	2,567.6	1,837.0	16,250.4
DEPLETIONS AT SITES OF USE ABOVE LEE FERRY, ARIZONA							
	(322)	4.0	1,062.8	72.2	556.5	227.7	1,923.2
SALVAGED CONVEYANCE LOSSES ABOVE LEE FERRY, ARIZONA							
Out of state	(323)	0	26.7	1.8	0.5	10.4	39.4
With in state	(324)	0	20.0	0.9	11.7	1.3	33.9
Total salvaged losses	(325)	0	46.7	2.7	12.2	11.7	73.3

APPENDIX D

ENGINEERING ADVISORY COMMITTEE REPORTS

"Cheyenne, Wyoming
August 31, 1946

"Pursuant to the instructions received from the Commission, the Committee of Engineering Advisers listed below met at the State Engineer's Office in Cheyenne, Wyoming, August 30th and 31st 1946 to discuss and recommend a program of engineering studies to assist the Compact Commission in negotiating a Compact among the Upper Colorado River Basin.

Committee Members

J. R. Riter, Bureau of Reclamation, Denver, Colorado (Chairman)

R. Gail Baker, State Land Dept., Phoenix, Arizona

C. L. Patterson, 212 State Office Bldg., Denver, Colorado

John H. Bliss, State Engineer's Office, Santa Fe, New Mexico

F. W. Cottrell, Salt Lake City, Utah

H. T. Person, Engineering Bldg., Univ. of Wyoming, Laramie, Wyo.

Others Present

F. C. Merriell, Colorado River Water Conservation District,
Grand Junction, Colorado

John R. Erickson, 212 State Office Bldg., Denver, Colorado

H. W. Bashore, Federal Rep., U. C. R. B. C., Mitchell, Nebraska

H. P. Dugan, U. S. B. R., Denver, Colorado

L. C. Bishop, State Engineer, Cheyenne, Wyoming

C. O. Roskelley, Salt Lake City, Utah

C. S. Jarvis, Salt Lake City, Utah

E. C. Lorentzen, Salt Lake City, Utah

E. H. Watson, State Engineer, Salt Lake City, Utah

After discussion of the problems involved, the Committee recommends:

1. Preparation base maps for use by the Commission in its deliberations. The bureau of Reclamation will furnish two copies to each of the states of the maps on a scale of 1:1,000,000 which show the present and potential irrigation developments within the Upper Basin. Maps of the individual states are now available and are to be fitted together and mounted on cloth. The Colorado Water Conservation Board has under preparation a base map which can be adapted for use in showing the locations of stream gaging stations and watershed areas upstream from Lee Ferry. In the interim, copies of this map on its present scale of 1 inch equals 12 miles will be made available for use by the Engineering Advisers. In the near future Colorado will furnish Van Dykes from which copies of the map can be prepared on the scale of 1:1,000,000.

2. Studies to determine the water supply available from each State. This involves the following steps:

(a) Determination of historic stream flows at main stem gaging stations, and other stations located near the state lines and near the mouths of tributaries which enter the Colorado, Green and San Juan Rivers in Utah, Arizona and New Mexico. The Bureau of Reclamation compilation of discharge records will be supplemented to complete the records for the following list of gaging stations:

Stream	Location
Colorado River	at Lees Ferry, Arizona
San Juan River	near Bluff, Utah
San Juan River	at Farmington, New Mexico
San Juan River	at Shiprock, New Mexico
McElmo Creek	near Cortez, Colorado
Mancos River	near Towoac, Colorado
La Plata River	at Colorado-New Mexico State Line
Animas River	near Cedar Hill, New Mexico
Florida River	near Durango, Colorado
Animas River	at Farmington, New Mexico
Pine River	at Ignacio, Colorado
San Juan River	at Rosa, New Mexico
Navajo River	at Edith, Colorado
Paria River	at Lees Ferry, Arizona
Escalante River	below Escalante, Utah
Muddy River	near Hanksville, Utah
San Rafael River	at Hanksville, Utah Highway Bridge
Price River	at Woodside, Utah
Price River	at Heiner, Utah
Duchesne River	at Myton, Utah
Duchesne River	near Randlett, Utah
Uinta River	at Fort Duchesne, Utah
Ashley Creek	near Vernal, Utah

Stream	Location
Brush Creek	near Jensen, Utah
Henrys Fork	at Linwood, Utah
Green River	near Linwood, Utah
Burnt Fork	near Wyoming-Utah Line*
Blacks Fork	near Wyoming-Utah Line*
East Fork of Smith Fork	near Robertson, Wyoming*
West Fork of Smith Fork	near Robertson, Wyoming*
Green River	at Green River, Wyoming
Green River	at Green River, Utah
Little Snake River	near Dixon, Wyoming
Little Snake River	near Lily, Colorado
Savery Creek	near Savery, Wyoming
Battle Creek	near Slater, Colorado
Yampa River	near Maybell, Colorado
White River	near Watson, Utah
Colorado River	near Cisco, Utah
Dolores River	at Gateway, Colorado
Gunnison River	near Grand Junction, Colorado
Plateau Creek	near Cameo, Colorado
Colorado River	near Cameo, Colorado

*Record to be compiled by the State of Utah.

(b) Extension of available discharge records, where necessary, by correlation with records at other stations. To secure a representative period, the records will be extended back in time as far as practicable. (If possible, back to 1914 and forward through 1946.)

(c) Estimation of runoff from areas which are not measured by comparison with similar areas on which records are available, and from precipitation and other available data.

(d) Estimation of present depletions above key gaging stations based on information pertaining to present irrigated acreages shown in the Bureau of Reclamation Report dated March 1946 and unit rates of depletion now incorporated in the Bureau's report, as they may be modified by subsequent studies.

(e) Estimations of channel losses along the main streams as follows:

Green River from the Wyoming-Utah line to the Junction with the Colorado River;

San Juan River from Rosa, New Mexico to the Junction with the Colorado River;

Colorado River from the Colorado-Utah line to Lee Ferry.

3. Studies of river and reservoir operations to determine the extent to which the upper basin can make use of its allocated water supply during drought cycles and still meet its compact obligation at Lee Ferry.

The Report of the Bureau of Reclamation has been consulted and referred to, and contains information of great value to the studies herein proposed and to the states of the Upper Colorado River Basin. It describes present developments and lists potential projects and possibilities the aggregate effect of which, if all were constructed, would deplete the flow of the Colorado River at Lee Ferry by an estimated 9,100,00 acre-feet annually. Potential uses of water constitute important factors in dividing available supplies among individual states, and are considered to be involved up to the 7,500,000 acre-feet heretofore allocated to the Upper Basin by the Colorado River Compact.

Respectively submitted,

ENGINEERING ADVISORY COMMITTEE

John R. Riter, Chairman

R. Gail Baker, Arizona

C. L. Patterson, Colorado

John H. Bliss, New Mexico

F. W. Cottrell, Utah

H. T. Person, Wyoming"

Santa Fe, New Mexico

October 4, 1948

MEMORANDUM FROM ENGINEERING ADVISORY COMMITTEE

TO UPPER COLORADO RIVER BASIN COMPACT COMMISSION

At the Vernal, Utah meeting of the Compact Commission, the Engineering Advisory Committee was instructed to:

(a) Prepare additional studies of the inflow-outflow method of measuring uses in the Upper Colorado River Basin.

(b) Prepare a formula for incorporation in Article XIII pertaining to the Yampa River.

(c) Prepare a formula for incorporation in Article XIV pertaining to the San Juan River.

Subsequent to the Vernal meeting, Commissioner Watson of Utah requested the Committee to make a study of the future flows of the Green River at Linwood, Utah, above the mouth of Henrys Fork.

In addition to the above tasks, the Committee gave additional consideration to completion of its basic report.

The Engineering Advisory Committee has met several times since the Vernal, Utah meeting and reports progress as follows:

Supporting Data for Engineering Report

A rough draft of a document containing the supporting data for the report summary submitted July 7, 1948, has been prepared. This rough draft is now being reviewed by members of the Engineering Advisory Committee and will be revised and edited and is expected to be ready for submission to the Commission during December 1948.

Inflow-Outflow Manual

Assignments have been made to various engineers to study inflow-outflow relationships on tributaries as follows:

Green River near Linwood
Henrys Fork at Linwood
Yampa River at Maybell

Little Snake River near Lily
White River near Watson
Brush Creek near mouth
Ashley Creek near mouth
Duchesne River near mouth
Colorado River near Colorado-Utah line
Dolores River near Colorado-Utah line
Price River near mouth
San Rafael River near mouth
Dirty Devil River near mouth
Escalante River near mouth
Paria River near mouth
San Juan River and tributaries near Colorado-New Mexico line
San Juan River and tributaries between state line and Bluff
Chinle Creek near mouth
Main stream between key gaging stations (Cisco, Green River and Bluff) and Lees Ferry

While much progress has been made, the studies have not been completed. It is anticipated that a manual describing the inflow-outflow method will be prepared and submitted to the Compact Commission during December 1948. The purpose of the manual is for the guidance of the future administrative body to be created by the proposed compact.

Yampa River

After considering the stream flows of the Yampa River at Maybell and the prospective future uses of water in Colorado and Utah, the Committee recommends that Article XIII, in substance, be as follows:

ARTICLE XIII

Subject to the provisions of the compact, the rights to the use of the waters of the Yampa River, a tributary entering the Green River in Colorado, are hereby apportioned between Colorado and Utah in accordance with the following principles:

(a) Colorado will not cause the flow of the Yampa River at the Maybell Gaging Station to be depleted below an aggregate of 5,000,000 acre-feet for any period of ten consecutive years reckoned in continuing progressive series beginning with the first day of October next succeeding the ratification and approval by Congress of this Compact. In the event any diversion is made for the benefit of any Utah water use project from the Yampa River or from tributaries entering the Yampa River above the Maybell Gaging Station, then the gross amount of all such diversions for use in Utah less any returns from such diversions to the river above Maybell shall be added to the actual flow at the Maybell Gaging Station to determine the total flow at the Maybell Gaging Station.

(b) All consumptive uses of water of the Yampa River made either by Colorado or Utah shall be charged as uses under the apportionment to such states made by Article III of this compact.

San Juan River

The Vernal draft of the Compact contemplated the definition of schedules of water delivery to New Mexico. However, a review of project potentialities indicated this to be impractical in view of the alternative possibilities for use of water from the San Juan River and tributaries in both Colorado and New Mexico. A statement of principles for use of the water of the San Juan River and tributaries was prepared. The following suggested redraft of Article XIV has been approved as to principle by representatives of Colorado and New Mexico.

ARTICLE XIV

Subject to the provisions of this Compact, and within the apportionment made by Article III of this Compact, the consumptive use of the water of the San Juan River and its tributaries is hereby apportioned between Colorado and New Mexico as follows:

Colorado agrees to deliver to New Mexico from the San Juan River and its tributaries which rise in Colorado an amount of water which shall be sufficient, together with water originating in the San Juan Basin in New Mexico, to enable New Mexico to make full use of the water apportioned to New Mexico by Article III of this Compact, subject, however, to the following conditions:

(a) All uses of water made in either state at the time this Compact becomes finally effective and all uses of water now contemplated under water use projects authorized by the Congress of the United States shall be recognized as having a first and prior right.

(b) Colorado assents to diversions and storage of water in Colorado for use in New Mexico, subject to compliance with Article IX of this Compact.

(c) The uses of water of the San Juan River and any of its tributaries within either State which are dependent upon a common source of water and which are not covered by (a) hereof, shall in times of water shortages be reduced in such an amount so that the resulting consumptive use in each state will bear the same proportionate relation to the consumptive use made in each state during times of average water supply as determined by the Commission, provided that, if Indian uses of water shall be entitled under Article XIX to any preferment, then such Indian uses shall be excluded in determining the amount of curtailment to be made under this paragraph.

(d) The curtailment of water use by either state in order to make up deficiencies in Lee Ferry deliveries as required by Article IV of this Compact shall be independent of any and all conditions imposed by this Article and shall be made by each State, as and when required, without regard to any provision of this Article.

(e) All consumptive uses of water of the San Juan River and its tributaries made by either Colorado or New Mexico shall be charged as uses under the apportionment to such State by Article III of this Compact.

Green River Flows at Linwood

Historically, the flow of the Green River at Linwood (above the mouth of Henrys Fork) averaged about 1,500,000 acre-feet annually during the period 1914-1945, inclusive. The flow has varied from a low of 396,000 acre-feet in 1934 to a high of 2,415,000 acre-feet in 1917. Preliminary studies by the Bureau of Reclamation for the Central Utah Project show that with historic flows about 200,000 acre-feet of active storage capacity would be required above the dead storage pool of a dam constructed below the Utah-Wyoming line should it be decided that the project make its replacement to the Uinta Basin by gravity diversion in lieu of pumping from a reservoir at the Echo Park site.

Studies by the Engineering Advisory Committee indicate that ultimately the stream flow at the Linwood Gaging Station may be depleted to an average of about 790,000 acre-feet annually due to future developments permitted in Wyoming by the proposed Upper Basin Compact. The flow at Linwood would be further reduced by Utah uses of Green River water above the Linwood Station.

A number of studies have been made to estimate the probable depleted flow by years. The results vary in accordance with the assumptions made as to upstream storage, diversions, and return flows. These studies indicate, however, that it will be possible, through use of hold-over storage capacity, to regulate the ultimate depleted stream flows and supply the quantities of water needed for the gravity replacement diversion plan for the Central Utah Project. The exact amount of live storage capacity cannot be determined at this time. Within the various assumptions that were considered, the studies indicate that the live storage capacity ultimately needed at the site of the gravity diversion will lie between 500,000 acre-feet and 1,000,000 acre-feet.

It is concluded that the water supply of the Green River, if regulated, is of adequate quantity to permit Wyoming to use the water allocated to that state by the proposed Upper Colorado River Basin Compact and also to permit Utah to make a gravity replacement diversion to the Uinta Basin in connection with the Central Utah Project.

To permit the ultimate development of the water resources of the Green River Basin, both Utah and Wyoming will need annual regulation and holdover storage capacity at or above the sites of diversion. Holdover storage capacity should be reserved to the extent needed to regulate the water supply for project diversion purposes and should not be dedicated for the benefit of the entire Upper Basin in meeting the Lee Ferry demand. Similar situations will probably arise on other tributaries and in other states.

The regulation of flow required at any given time will depend upon the state of development which has been reached on the new projects in both of the States of Utah and Wyoming. It is considered that during the early stages of development in both Utah and Wyoming, only sufficient storage will be necessary for annual regulation of the Green River. As additional projects are constructed in the Upper Green River Basin they will first include additional annual storage capacity to be followed later by carryover storage which will ultimately be required by both states. This carryover capacity may be initially available in reservoirs primarily constructed for power development. The investment in these developments probably will be largely retired from power revenues, prior to the time that these reservoirs will be needed for consumptive purposes. The reservoir operations should, therefore, be gradually modified to accomodate these dominant uses which will arise at some distant future time.

Provision for change in use of reservoirs.

In line with the preceding discussion, the Committee recommends that Article V of the Vernal draft of the compact be modified to include the substance of the following principle:

> In the event that a reservoir site is available both to equate Lee Ferry flows and to store water for consumptive use in a state of the upper division, the storage of water for consumptive use shall be given preference. Any reservoir or

reservoir capacity hereafter used to equate Lee Ferry flows shall by order of the Commission be used to store water for consumptive use in a state provided the Commission finds that such storage is required to permit a state to make the use apportioned to it by Article III of this compact.

Respectfully submitted,

J. R. Riter, Chairman

R. I. Meeker, Arizona

R. J. Tipton, Colorado

F. C. Merriell, Colorado

R. M. Gildersleeve, Colorado

J. R. Erickson, New Mexico

C. O. Roskelley, Utah

R. D. Goodrich, Wyoming

H. P. Dugan, Bureau of Reclamation

C. B. Jacobson, Bureau of Reclamation

UPPER COLORADO RIVER COMPACT COMMISSION

INFLOW-OUTFLOW MANUAL

PREPARED BY

ENGINEERING ADVISORY COMMITTEE

AUGUST 1949

Salt Lake City, Utah

August 5, 1949

Upper Colorado River Basin Compact Commission

Gentlemen:

Pursuant to instructions given at your Vernal, Utah, meeting July 21, 1948 the Engineering Advisory Committee has investigated methods which might be adopted by the Commission for the measurement of stream depletions. On October 6, 1948, at Bishops Lodge the Engineering Advisory Committee appointed a sub-committee composed of R. D. Goodrich, Chairman, R. M. Gildersleeve, and John R. Erickson to prepare a manual on the inflow-outflow method of determining stream depletions in the Upper Colorado River Basin. The manual has been completed, and was reviewed and adopted by the Engineering Advisory Committee on July 1, 1949, in Denver, Colorado.

The manual submitted herewith provides examples of the administrative procedures which will be required to carry out the provisions of Article VI of the Upper Colorado River Compact.

Respectfully submitted,

(Signed) J. R. Riter, Chairman, Federal
J. R. Riter

(Signed) R. Gail Baker, Arizona
R. Gail Baker

(Signed) R. I. Meeker, Arizona
R. I. Meeker

(Signed) R. J. Tipton, Colorado
R. J. Tipton

(Signed) R. M. Gildersleeve, Colorado
R. M. Gildersleeve

(Signed) F. C. Merriell, Colorado
F. C. Merriell

(Signed) J. H. Bliss, New Mexico
J. H. Bliss

(Signed) J. R. Erickson, New Mexico
J. R. Erickson

(Signed) C. O. Roskelley, Utah
C. O. Roskelley

(Signed) R. D. Goodrich, Wyoming
R. D. Goodrich

(Signed) H. T. Person, Wyoming
H. T. Person

(Signed) H. P. Dugan, Federal
H. P. Dugan

UPPER COLORADO RIVER BASIN COMPACT COMMISSION

INFLOW - OUTFLOW MANUAL

INTRODUCTION

This manual has been prepared in accordance with the directions of the Upper Colorado River Basin Compact Commission to provide examples of the administrative procedures which will be required to carry out the provisions of Article VI of the Upper Colorado River Compact which reads as follows:

> "The Commission shall determine the quantity of the consumptive use of water, which use is apportioned by Article III hereof, for the Upper Basin and for each State of the Upper Basin by the inflow-outflow method in terms of man-made depletions of the virgin flow at Lee Ferry, unless the Commission, by unanimous action, shall adopt a different method of determination."

During the negotiations leading to the adoption of the Upper Colorado River Basin Compact, there was exhaustive discussion and very careful consideration of the problems arising from the necessity of measuring the amount of man-made depletion of the virgin flow of the Colorado River and its tributaries, especially at Lee Ferry and at State lines. After thorough discussion of available methods of measurement of consumptive use of water and stream depletion due to the activities of man, especially that caused by irrigation of agricultural crops, the Compact Commission, at the Vernal, Utah meeting, adopted the "Inflow-Outflow Method" as the most practical one for the required purpose.

At the Vernal meeting Mr. R. J. Tipton discussed the work of the depletions sub-committee and recommended that the Commission instruct the Engineering Advisory Committee to prepare a report outlining methods which could be adopted by the Commission for making these measurements.

Following that suggestion the Commission adopted the motion, made by Commissioner Stone as follows:

> "Mr. Chairman, to implement and to carry out the suggestions made by Mr. Tipton, I move that there be referred to the Engineering Advisory Committee for its study and report at the next meeting of the Commission, the matters which were suggested by Mr. Tipton and any other engineering matters which in the judgment of that committee should be included in its report at the next meeting of the Commission." (See page 332 of minutes of Meeting No. 7, held at Vernal, Utah, July 7-21, 1948).

As a result of discussions at previous meetings and in accordance with the action by the Commission indicated above, a sub-committee of the Engineering Advisory Committee was appointed at its meeting held on October 6, 1948, at Bishop's Lodge, with instructions to "write the manual on the inflow-outflow method of measuring consumptive use for the guidance of the future administrative body to be created by the proposed compact."

In the Final Report of the Engineering Advisory Committee, dated November 29, 1948, under the subject of Assignments by Compact Commission, it is stated that at the Vernal meeting the Engineering Advisory Committee was instructed, among other things, "to prepare additional studies of the inflow-outflow method of measuring uses in the Upper Colorado River Basin." (p. 10). On the same page of the Report it is also stated, that "Studies of the inflow-outflow method of measuring uses in the Upper Colorado River Basin are being continued. A manual will be presented to the Compact Commission for use by the administrative body when the studies are completed."

From these brief references to the inflow-outflow method in the proceedings of the Commission and its Engineering Advisory Committee, it is evident that its importance in the future administration of the Upper Colorado River is fully appreciated and that the method and its application should be made a matter of record and easy reference for the guidance of the Administrative Commission.

Article VIII, paragraph (d), of the Compact empowered the Commission to establish and maintain gaging stations, collect and analyze data on stream flow, storage and use of water, and to determine the quantity of water used each year in the Upper Colorado River System and the quantity delivered each year at Lee Ferry. All of these powers and duties are necessary and sufficient for the utilization of the inflow-outflow method in the administrative procedures of the Commission.

APPLICATION OF INFLOW-OUTFLOW METHOD

UPPER COLORADO RIVER BASIN

General Discussion

On all rivers utilized for irrigation purposes consumptive use or man-made depletion at the point of use differs in varying degrees from depletion at state lines or at the lower end of a valley or of a basin. This is a fact that depends upon the conditions which modify the quantities of water flowing down stream channels. Of the total amount of precipitation which falls upon any given drainage basin only a small portion ever reaches a stream in the form of actual discharge. After having been gathered from surface run-off and from springs and by seepage from the ground along creek and river banks, losses in stream flow continually occur along these natural banks and from the stream itself. These losses are mostly due to evaporation from the water surface and from the ground adjacent to the stream, especially where the banks are low and the ground water table is relatively high, and to transpiration from the native vegatation, trees, shrubs, or bushes and grasses which now and always have lined most rivers as well as the smaller tributaries. The operations of man do not change the nature of these losses but the quantity is affected in the degree to which the river system is controlled and utilized. Losses due to natural causes vary with the stage of flow in rivers and streams, being greater for high stages than for low stages.

Development of Pertinent Factual Data

After two years of exhaustive research, investigation and study, the Engineering Advisory Committee obtained and agreed upon rates and quantities of man-made depletions at sites of use and the effect of such depletions at key points on the Colorado River and its principal tributaries. The work was carried on by the sub-committee on Depletion, of which Mr. Tipton was chairman. The general studies to determine stream depletions were covered by the following investigations (page 40 of Engineering Advisory Committee Final Report).

1. "Determination of areas using water as a result of man-made irrigation."

2. "Determination of unit rates of consumptive use of irrigation water."

3. "Computation of stream depletions at sites of use by application of unit rates of consumptive use of irrigation to water using areas and summation of transmountain diversions, and other uses of water by man."

4. "Estimation of channel losses between sites of use of water and Lee Ferry, Arizona, for historic and virgin flows during the period 1914-45."

5. "Computation of stream depletions above certain key gages, at state boundaries, and at Lee Ferry."

Unit rates of consumptive use of irrigation water, (item 2 above) were determined by Mr. Harry F. Blaney and Mr. Wayne D. Criddle of the Soil Conservation Service, U. S. Department of Agriculture. These data can be found in Appendix B of the Engineering Advisory Committee Final Report.

All of this mass of detailed information was utilized in the determination of virgin flows and present stream depletions. As further man-made depletions occur through the development of additional irrigated areas and other uses, the effects of the several factors indicated above upon these depletions will be automatically integrated by the application of the inflow-outflow method.

This method was fully explained by the chairman of the sub-committee on Depletions at the joint meeting of the Legal and Engineering Advisory Committees held in Denver on June 29, and 30, 1948, and thoroughly discussed by them. As a result of the action at this meeting, a similar and more detailed presentation of the subject was made to the entire Commission on July 8, 1948, at Vernal, Utah, illustrated by maps and graphs showing results of earlier studies, and uses that have been made of the method.

The inflow-outflow method of measuring depletion by man's activity is particularly applicable to the Upper Colorado River Basin. A change in the flow of the river at Lee Ferry, because of man's activity in the basin, can be measured by the change in relationship between the sum of the virgin flows of certain key tributaries near the rim of the basin and the outflow at Lee Ferry. The upper rim stations are designated as inflow-index stations because it is not possible or practicable, nor is it necessary, to measure all of the inflow. It is, however, necessary to correct the inflow-index for man-made depletions above the points of measurement.

The depletion by man's activities in the various sub-basins of the Colorado River at or near the state lines can be measured by the change in relationship between the sum of inflow-index amounts and the outflows at points located at or near the state lines.

Practically all of the irrigation development in the Upper Basin will be limited to the irrigation of lands along tributaries and along the upper reaches of the main streams. The lowest major point of diversion of Green River water for irrigation purposes may be a short distance below the Wyoming-Utah state line. Below that point the Green River enters a series of deep canyons. After the Colorado River leaves Colorado and enters Utah it flows in a deep canyon and there is little opportunity to utilize the water in the Upper Basin for irrigation purposes from that point down. The same is true with respect to the San Juan after it leaves the State of New Mexico.

It is in the canyon sections of these rivers where the major reservoir capacity will be provided to generate hydro-electric energy and to enable the States of the Upper Division to comply with their obligation provided for under Article III (d) of the Colorado River Compact, not to deplete the flow of the Colorado River at Lee Ferry below 75,000,000 acre-feet in progressive ten-year series. The Upper Colorado River Basin Compact provides that the evaporation loss from such reservoirs used for the common good of the four States of the Upper Division shall be charged in proportion to the amount of beneficial consumptive use being made by each state at the time the loss occurs. The evaporation loss is to be measured in terms of depletion at Lee Ferry. The best method of determining this loss is by measuring the change in relationship between inflow to the section (which consists of the sum of the flows of the major tributaries and the main streams below the principal irrigated areas and above the main stem reservoirs) and the outflow from the basin at Lee Ferry.

The following discussion and the accompanying maps and curves are presented as a basis for determining future depletions in the Upper Colorado River Basin and within sub-divisions of the Basin. The inflow-outflow correlation curves have been determined from annual values of discharge. Adjustments have been made for transmountain diversions and depletions for irrigation above the inflow-index stations. Examples of such adjustments are given in the Appendix. As further data are accumulated, while development is proceeding, averages of the data in relation to the average for virgin conditions will measure the total depletion. These averages should be computed for periods which are long enough to define accurately the depletions for given stages of development. Prior to and during the construction of the main stem reservoirs the averages should be continuing until the aggregate capacity of such reservoirs have been filled, drawn-down and re-filled, at which time the period prior to the first filling should be dropped from the computation of continuing averages. The period for computing continuing averages shall then extend until the reservoirs have been drawn-down and fillèd a third time, when the years between the first and second filling shall be dropped, and so forth.

Plate No. 1 is an outline map of the Upper Colorado River Basin on which is shown the major stream system and the location of inflow-index gaging stations which are applicable to develop an inflow-outflow relationship for that basin. Shown also on the plate is the location of Lee Ferry, which is the outflow point for the basin.

Plate No. 2 is a correlation curve showing the relation between the historic flow at the inflow-index stations corrected for man-made depletion above those stations and the outflow at Lee Ferry. The points from which the curve was developed, are the annual values for the years 1932 through 1948.

The Engineering Advisory Committee to the Upper Colorado River Basin Compact Commission, by exhaustive studies, estimated the mean annual virgin flow at Lee Ferry at 15,638,500 acre-feet for the period 1914 to 1945.

It was estimated that the virgin flow at Lee Ferry for a virgin inflow-index of 5,657,000 acre-feet, which was the average for the period 1932 through 1948, amounts to 13,662,000 acre-feet. This is shown on the Plate, and there has been projected through that point a curve indicating estimated relationship between virgin inflow-index and virgin outflow. Actually, the slope of the curve may not be exactly as shown. As time goes on and more development takes place in the Upper Basin, new relationships will result between inflow-index and outflow and the change in slope of those curves will provide a guide for determining the proper slope of the virgin curve. Under ultimate conditions of development, the slope of the virgin curve will have little significance because the flow at Lee Ferry will be largely equated and the depletion at Lee Ferry by man's activity will be the difference between that equated flow and the long-time average virgin flow.

Table No. 1 indicates inflow-index stations that were used to develop the curve on Plate 2, and the annual run-off at each of those stations for the period used. The corrections made for man-made depletions above the stations are also shown.

Plate No. 3 is an outline map of the San Juan Basin above Bluff, Utah. Shown on the map is the main stem of the San Juan and its principal tributaries. There are indicated on the map the locations of inflow-index gaging stations, stations near the Colorado-New Mexico stateline, which measure the outflow from the upper San Juan Basin and inflow to the lower San Juan Basin, and the gaging station near Bluff, Utah, where the outflow from the basin is measured.

Plate No. 4 is a correlation curve, showing the relation between the sum of virgin flows at the inflow-index stations and the outflow at the station near Bluff, Utah, for the period 1932 through 1948.

Plate No. 5 is a correlation curve showing the relation between the virgin inflow at the inflow-index stations of the upper San Juan Basin and the outflow stations near the Colorado-New Mexico stateline.

Plate No. 6 shows the relation between the inflow to the lower San Juan Basin as measured by the flow past the stations near the Colorado-New Mexico stateline and the outflow from the basin near Bluff, Utah.

There are shown on Plates 4, 5, and 6 the virgin relationships, the shapes of which may be changed as more information is gathered in the future. The change in relation between the inflow as shown on Plate No. 5, and the outflow shown on that curve will measure the additional depletion made by man in Colorado above points near the Colorado-New Mexico stateline.

The curve shown on Plate 6 is intended to be the means of measuring additional depletion caused by man's activities in New Mexico and portions of Colorado, Utah and Arizona on the flow of the river near Bluff, Utah. The change in relationship as there is additional development in the states will be a measure of the depletion by man's activities in these states of the flow of the river at Bluff, Utah. The man-made depletion by Colorado and by the other states of the flow of the river at Bluff must be determined by adjustments in the changes in relationships of the inflow-outflow curves shown on Plates 4, 5, and 6 as development in the state proceeds.

The data from which Plates No. 4, 5, and 6 were derived are included in Tables No. 2, 3, and 4.

Plate No. 7 is an outline map of the Colorado River Basin above Cisco, Utah. It shows all the main stem of the Colorado River and its tributaries in Colorado. Included above Cisco is a small low water producing tributary drainage area in Utah. On the map are shown the locations of inflow-index gaging stations and the outflow station at Cisco.

Plate No. 8 is a curve showing the relationship between historic flow past the inflow-index stations corrected for man-made depletions above those stations and the outflow as measured at the gaging station near Cisco, Utah for the period 1932 through 1948. On the plate is shown the estimated virgin inflow-outflow relationship. As time goes on and additional developments are made of the waters of the Colorado River in Colorado, the relationship between the inflow-index and the outflow will change. This change will indicate the increased depletion of the flow of the river at Cisco by man's activities which will have taken place since the period covered by the basic curve, and will also show the depletion of the virgin flow of the river near Cisco.

The values determining the relationships shown in Plate No. 8 are given in Table No. 5.

Plate No. 9 is an outline map of the Green River Basin above Green River, Utah. It shows the Green River and its principal tributaries. Several sub-basins are shown on the map, including the White River above Watson, Utah, the Yampa River above Maybell, Colorado, the Little Snake River above Lily, Colorado, the Green River above Linwood, Utah, and Henry's Fork above Linwood, Utah.

Plate No. 10 shows an inflow-outflow curve for the White River above Watson, Utah. The inflow-index is measured at the gaging station near Meeker. The estimated virgin flow curve is shown on the plate.

On Plate No. 11 is an inflow-outflow curve of the Yampa River above Maybell, Colorado. The inflow stations are the Yampa River at Steamboat Springs and the Elk River at Clark; the outflow station is at Maybell. The period covered by the curve is 1932 through 1948. The estimated virgin relationship is shown on the plate.

The inflow-outflow relationship for the Little Snake River is shown on Plate 12. The inflow-index stations are the Little Snake River near Slater, Slater's Fork near Slater, and Savery Creek near Savery. The outflow station is at Lily, Colorado. The estimated virgin relationship is shown on the plate.

Plate No. 13 shows the inflow-outflow relationship for the Green River in Wyoming. The index-inflow is measured at Green River at Warren Bridge, North Piney Creek near Mason, Pine Creek at Pinedale, Fontenelle Creek near Fontenelle and Black's Fork near Millburne. The outflow is measured at Linwood, Utah. The estimated virgin relationship is shown on the Plate. The change in relationship of the inflow and outflow as shown on this curve will measure the increase in man-made depletion by Wyoming in the Green River basin, except for the Little Snake River and the Henry's Fork.

The curve on Plate 14 shows the inflow-outflow relationship for Henry's Fork above the outflow station on that tributary near Linwood, Utah. The estimated virgin relationship is also shown on this Plate.

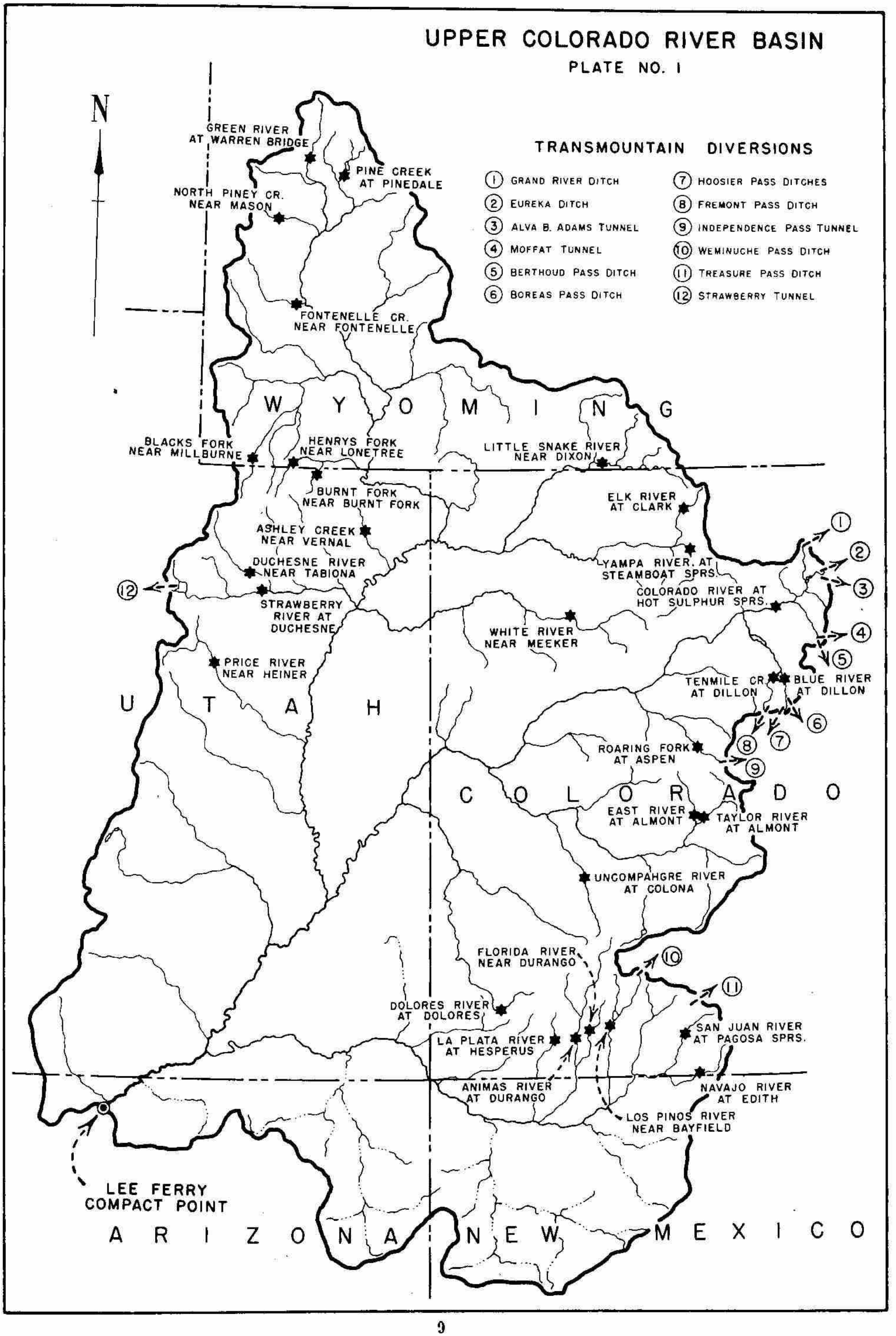
The values used to develop the curves shown on Plates 10 to 14 inclusive are given in Tables 6 to 10 inclusive.

Plate 15 shows the relationship between the inflow to the Green River below all major developments in Colorado and Wyoming and above all major developments in Utah and the outflow of the Green River at Green River, Utah. The inflow stations determining this curve are the White River near Watson, Utah, the Yampa River near Maybell, Colorado, the Little Snake River near Lily, Colorado, the Green River near Linwood, Utah, Henry's Fork near Linwood, Utah, Ashley Creek near Vernal, Utah, the Duchesne River near Tabiona, Utah, the Strawberry River at Duchesne, Utah, and the Price River near Heiner, Utah. The outflow station is at Green River, Utah. The records for the inflow-index of Ashley Creek, the Duchesne, Strawberry, and Price Rivers were corrected for the man-made depletions above the stations. This curve will serve as a temporary means of measuring man-made depletions in Utah of the flow of the Green River at Green River, Utah. There should be established or continued outflow stations on the major Utah tributaries, more specifically enumerated as follows: Sheep Creek, Carter Creek, Brush Creek, Ashley Creek, Duchesne River, and Price River. After records have been accumulated for a sufficient period, the Utah inflow-index stations related to the new outflow stations should be used to determine the man-made depletion of the Utah tributaries. The values used for Plate No. 15 are shown in Table No. 11.

Plate No. 16 shows the relationship between all of the inflow-index stations shown on Plate 15, plus the Colorado River at Cisco and the San Juan River at Bluff, and the outflow of the Colorado River at Lee Ferry. A change in the relationship shown on this curve can be used at the beginning of the administration to check the effect of Utah's future development on the virgin flow at Lee Ferry and the effect of main stem reservoirs which may be built. After records of flow have been accumulated near the mouths of the Utah tributaries named above and near the mouths of the San Rafael. Dirty Devil and Escalante Rivers, the records at those points should be substituted for the upper Utah stations used in computing the relationship shown on Plate 15. From that time on the correlation developed by such a relation can be utilized to determine the effect on the river at Lee Ferry of the operation of main stem reservoirs. The new records of flow near the mouths of the Utah tributaries will permit the substitution of at least two new relationships for the relationship shown on Plate 15. The new relationships will measure directly the Utah depletions and other changes caused by the activities of man.

As development proceeds, gaging stations may of necessity have to be abandoned and others may have to be added because of the pattern of development. For example, the creation of the Flaming Gorge Reservoir will necessitate the moving of the Green River station near Linwood, Utah, and the Henry's Fork station at Linwood, Utah to points upstream. In addition to moving the Henry's Fork station it will then be necessary to retain the existing station on Blacks Fork near Green River, Wyoming, and reestablish the Green River station at Green River, Wyoming. The development of the Yellow Jacket Project along the Yampa River in Colorado and/or the Deadman Bench Project along the White River in Colorado and Utah will necessitate some change in the locations of key stations. There will be other instances throughout the basin where changes in locations of gaging stations will be necessary, some of which will be mentioned later.

Table No. 12 includes the data relative to Plate No. 16.



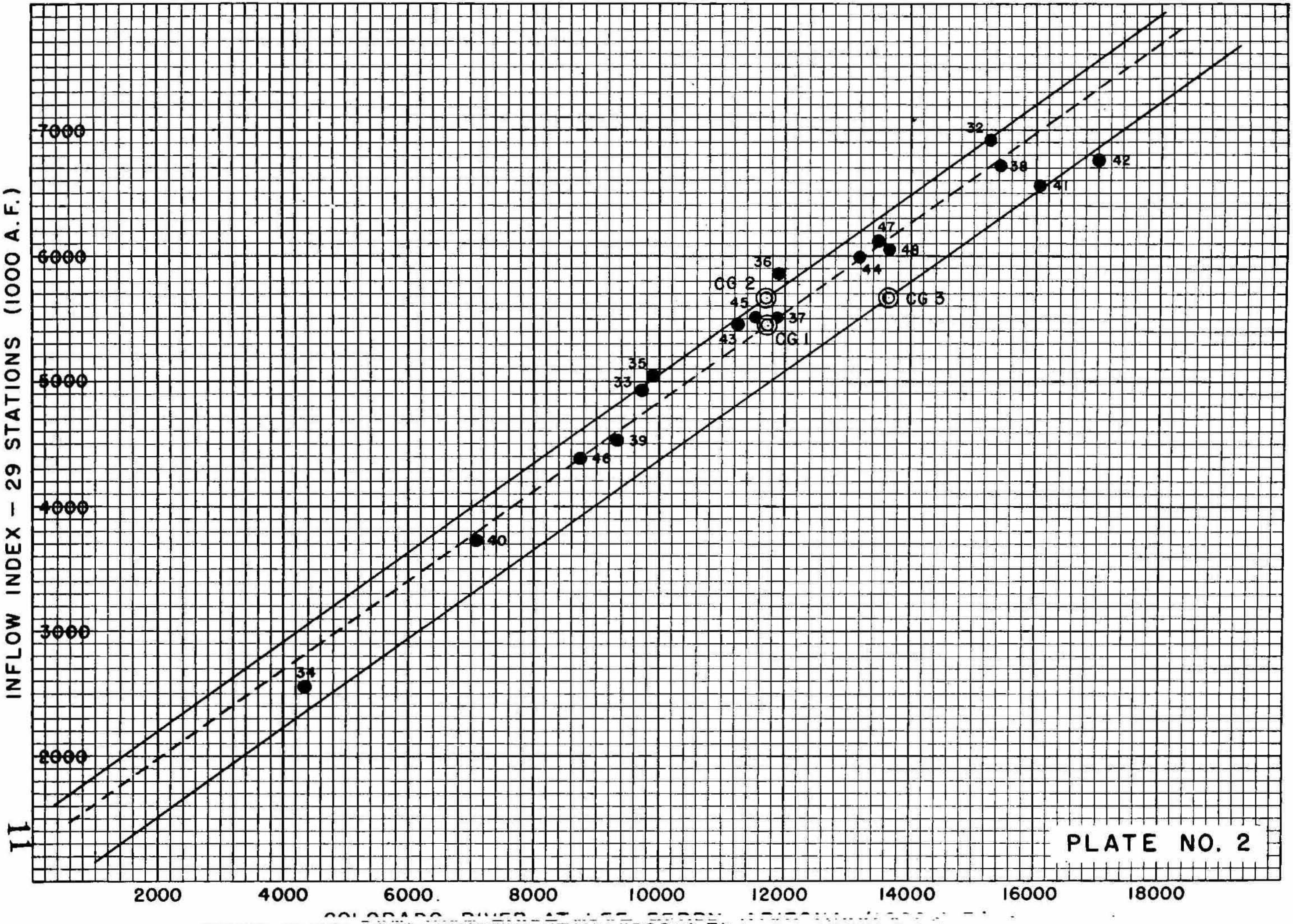
UPPER COLORADO RIVER BASIN
PLATE NO. I
N
TRANSMOUNTAIN DIVERSIONS
1 GRAND RIVER DITCH
2 EUREKA DITCH
3 ALVA B. ADAMS TUNNEL
4 MOFFAT TUNNEL
5 BERTHOUD PASS DITCH
6 BOREAS PASS DITCH
7 HOOSIER PASS DITCHES
8 FREMONT PASS DITCH
9 INDEPENDENCE PASS TUNNEL
10 WEMINUCHE PASS DITCH
11 TREASURE PASS DITCH
12 STRAWBERRY TUNNEL
GREEN RIVER AT WARREN BRIDGE
PINE CREEK AT PINEDALE
NORTH PINEY CR. NEAR MASON
FONTENELLE CR. NEAR FONTENELLE
WYOMING
BLACKS FORK NEAR MILLBURNE
HENRYS FORK NEAR LONETREE
LITTLE SNAKE RIVER NEAR DIXON
BURNT FORK NEAR BURNT FORK
ELK RIVER AT CLARK
ASHLEY CREEK NEAR VERNAL
DUCHESNE RIVER NEAR TABIONA
YAMPA RIVER AT STEAMBOAT SPRS.
COLORADO RIVER AT HOT SULPHUR SPRS.
STRAWBERRY RIVER AT DUCHESNE
WHITE RIVER NEAR MEEKER
PRICE RIVER NEAR HEINER
TENMILE CR. AT DILLON
BLUE RIVER AT DILLON
UTAH
ROARING FORK AT ASPEN
COLORADO
EAST RIVER AT ALMONT
TAYLOR RIVER AT ALMONT
UNCOMPAHGRE RIVER AT COLONA
FLORIDA RIVER NEAR DURANGO
DOLORES RIVER AT DOLORES
LA PLATA RIVER AT HESPERUS
SAN JUAN RIVER AT PAGOSA SPRS.
ANIMAS RIVER AT DURANGO
NAVAJO RIVER AT EDITH
LOS PINOS RIVER NEAR BAYFIELD
LEE FERRY COMPACT POINT
ARIZONA
NEW MEXICO

TABLE NO. 1
COLORADO RIVER BASIN ABOVE LEE FERRY
Units 1000 Acre Feet

WATER YEAR	INFLOW-INDEX San Juan Index (Table No. 2)	Upper Colo. R. Index (Table No. 5)	White R. near Meeker (Table No. 6)	Yampa R. Index (Table No. 7)	Little Snake R. near Dixon	Green R. Index (Table No. 9)	Henrys Fork Index (Table No. 10)	Utah Index (Table No. 11) (a)	Sum	OUTFLOW Colorado R. at Lee Ferry
1932	1887	1891	542	730	c 689	691	55	431	6916	15286
33	967	1496	485	582	c 487	532	46	341	4936	9745
34	579	923	245	256	c 67	315	12	148	2545	4396
35	1554	1581	366	476	c 215	553	30	299	5074	9912
36	1229	1944	419	682	c 320	745	47	478	5864	11970
37	1455	1515	330	492	c 440	644	68	580	5524	11897
38	1687	2154	496	662	411	724	79	518	6731	15440
39	969	1407	372	503	254	596	49	355	4505	9394
1940	798	1165	360	462	252	388	26	287	3738	7082
41	2317	1816	450	499	316	597	73	509	6577	16052
42	1926	2118	477	541	418	651	85	533	6749	17029
43	1170	1677	377	526	332	841	43	490	5456	11263
44	1746	1791	398	466	333	634	87	542	5997	13221
45	1248	1613	461	611	485	590	68	432	5508	11545
46	819	1359	364	491	288	622	47	388	4378	8745
47	1215	1928	554	643	384	808	88	496	6116	13515
48	1777	1934	459	558	298	598	52	375	6051	13689
AVERAGE									5451	11775
Adjustment	12.4	61.8	34.0	15.1	(b) 27.5	36.2	0	19.4	206.4	1887.1
ADJUSTED AVERAGE									5657	13662

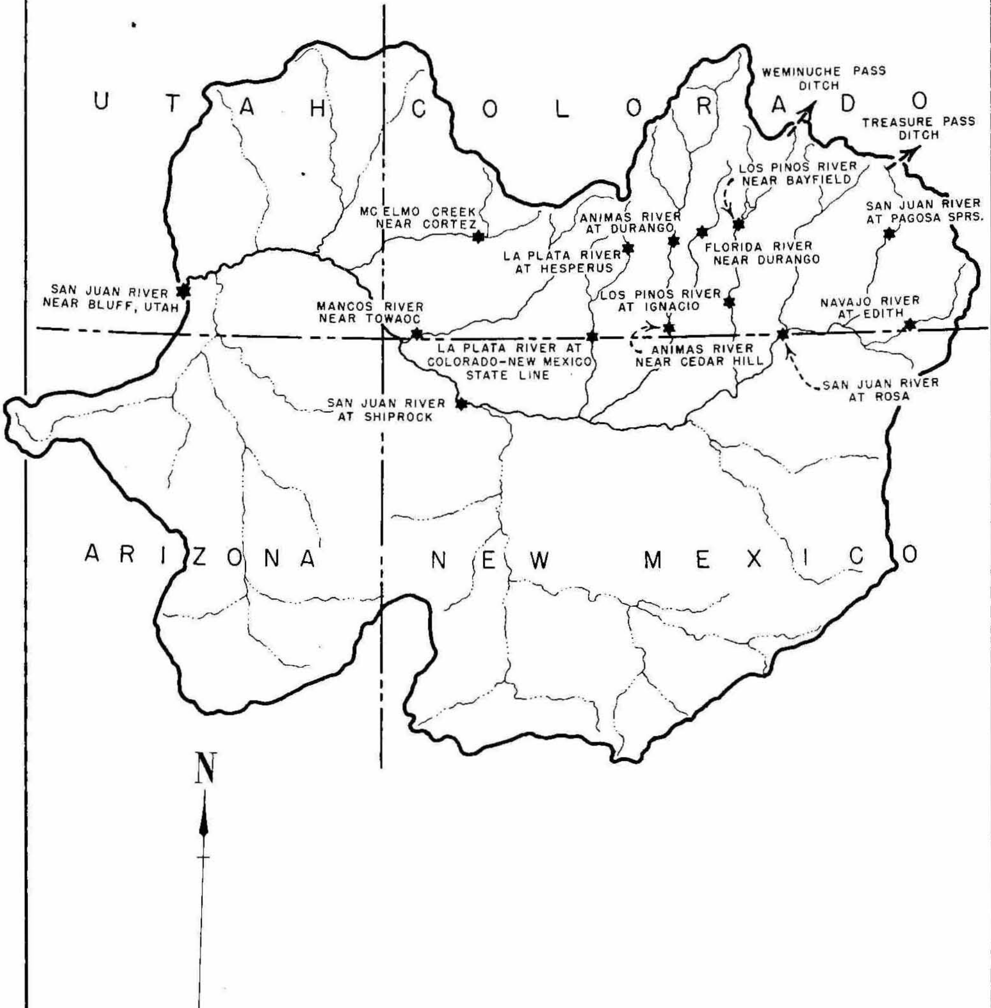
Depletion at sites of use above Lee Ferry	(d) 1960.4
Present salvage above Lee Ferry	73.3
DEPLETION OF VIRGIN FLOW AT LEE FERRY	1887.1

(a) - Sum-Ashley Cr. near Vernal, Duchesne R. near Tabiona, Strawberry R. at Duchesne and Price R. near Heiner corrected for transmountain diversions.
(b) - Adjustment for irrigation depletions of 9510 acres above station at rate of 1.42 acre feet per acre;
also for estimated by-passed water amounting to 14,000 acre feet to irrigate 3820 acres below the station.
c - Estimated by correlation.
(d) - Transmountain diversions in Colorado averaged 37,200 acre feet more for the 1932-1948 period than for the 1914-1945 period.


INFLOW INDEX – 29 STATIONS (1000 A.F.)
7000
6000
5000
4000
3000
2000
2000
4000
6000.
8000
10000
12000
14000
16000
18000
32
42
38
41
47
48
44
36
CG 2
45
37
CG 3
43
CG 1
35
33
39
46
40
34
PLATE NO. 2

SAN JUAN RIVER BASIN ABOVE BLUFF, UTAH

PLATE NO. 3



Units - 1000 Acre Feet

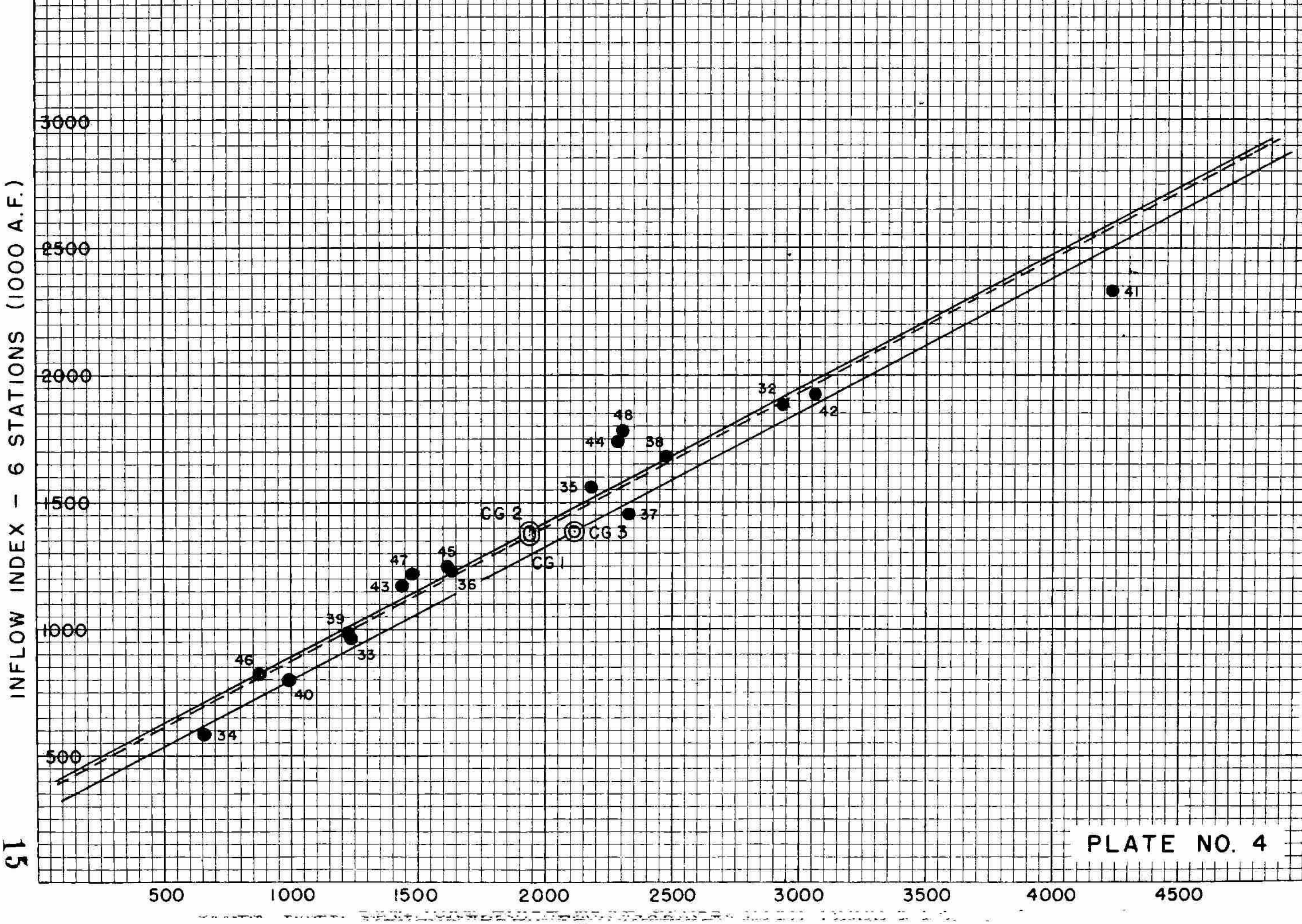
WATER YEAR	INFLOW - INDEX								OUTFLOW
	San Juan R. at Pagosa Spgs.	Navajo R. at Edith	Los Pinos R. near Bayfield	Animas R. at Durango	Florida R. near Durango	La Plata R. at Hesperus	Transmountain Diversions above Stations	Sum	San Juan near Bluff
1932	c 435	c 183	373	743	111	42	0	1887	2948
33	c 190	c 78	194	431	52	22	0	967	1242
34	c 105	c 57	125	250	28	14	0	579	662
35	c 375	c 155	317	567	100	40	0	1554	2183
36	233	115	255	522	72	32	0	1229	1631
37	342	170	284	540	80	38	1	1455	2336
38	345	142	351	710	98	40	1	1687	2466
39	184	86	208	426	46	17	2	969	1239
1940	157	70	149	361	40	20	1	798	996
41	528	218	412	949	142	66	2	2317	4242
42	401	191	350	832	105	46	1	1926	3078
43	225	89	221	538	62	32	3	1170	1445
44	351	116	382	768	87	41	1	1746	2289
45	290	119	192	548	68	29	2	1248	1620
46	120	54	166	422	39	16	2	819	865
47	205	78	211	626	67	26	2	1215	1488
48	353	103	411	769	102	37	2	1777	2319
AVERAGE								1373	1944
								12.4	162
ADJUSTED AVGE.								1385	21
Acres irrigated above station	3150	2930	0	4060	160	350			
Depletion rate a.f. per acre	0.81	1.25		1.16	1.00	0.90			
Acres irrigated by by-passed water	0	75	100	0	0	0			
Irrigation depletions above station	2.6	3.7	0	4.7	0.2	0.3			
Estimated by-passed water	0	0.4	0.5	0	0	0			
ADJUSTMENT TO INFLOW INDEX	2.6	4.1	0.5	4.7	0.2	0.3		12.4	

(a) = Transmountain diversions averaged 800 acre feet more for 1932-1948 period than for 1914-1945 period.

Depletion at sites of use above Bluff (a)166

Present salvage above Bluff

VI FLOW


INFLOW INDEX - 6 STATIONS (1000 A.F.)
3000
2500
2000
1500
1000
500
500
1000
1500
2000
2500
3000
3500
4000
4500
34
46
40
39
33
43
47
45
36
CG 2
CG 1
CG 3
35
37
44
48
38
32
42
41
PLATE NO. 4

SAN JUAN BASIN IN COLORADO
Units 1000 AF

WATER YEAR	INFLOW-INDEX San Juan Index (Table No. 2)	OUTFLOW San Juan R. at Rosa	Los Pinos R. at Ignacio	Animas R. near Cedar Hill	La Plata R. at Colo.-N.M. Stateline	Mancos R. near Towaoc	McElmo Cr. near Cortez	Sum
1932	1887	1401	362	c 925	30	58	c 45	2821
33	967	528	118	c 515	14	21	c 32	1228
34	579	321	59	c 300	8	9	c 30	727
35	1554	1143	272	758	22	35	c 41	2271
36	1229	741	173	636	25	37	c 38	1650
37	1455	1149	235	689	45	57	c 42	2217
38	1687	1096	281	879	28	53	c 46	2383
39	969	578	136	488	11	15	c 33	1261
1940	798	425	84	417	10	18	c 38	992
41	2317	1777	431	1240	70	87	59	3664
42	1926	1334	295	992	66	92	51	2830
43	1170	622	127	623	24	43	45	1484
44	1746	923	273	861	29	c 61	36	2183
45	1248	758	91	590	25	c 42	35	1541
46	819	342	42	439	10	c 15	(a) 28	876
47	1215	546	96	668	12	c 28	c 46	1396
48	1777	926	298	866	22	c 40	c 43	2195
AVERAGE	1373							1866
Adjustment	12.4							49.0
ADJUSTED AVERAGE	1385							1915

Depletion at sites of use above stateline stations	(d) 49.0
Present salvage above stateline stations	(b)
DEPLETION OF VIRGIN FLOW AT STATELINE STATIONS	49.0

(a) = Furnished by Durango office, U.S.B.R.
(b) = Not estimated by Engineering Advisory Committee
c = Estimated by correlation
(d) = Transmountain diversions averaged 800 acre feet more for 1932-1948 period than for 1914-1945 period.

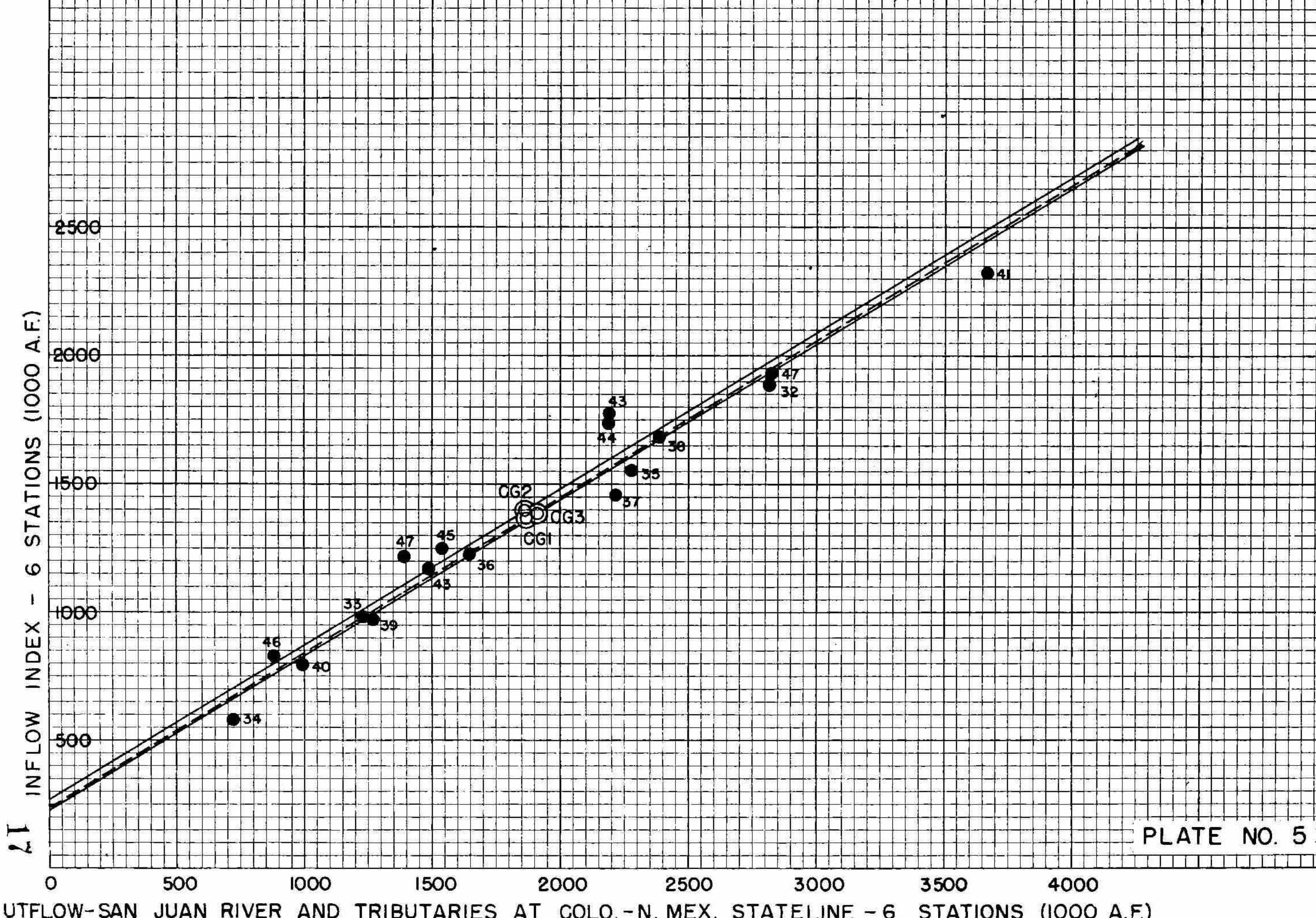

INFLOW INDEX - 6 STATIONS (1000 A.F.)
500
1000
1500
2000
2500
0
500
1000
1500
2000
2500
3000
3500
4000
UTFLOW-SAN JUAN RIVER AND TRIBUTARIES AT COLO.-N. MEX. STATELINE - 6 STATIONS (1000 A.F.)
34
46
40
33
39
47
45
43
36
CG2
CG3
CG1
37
35
38
43
44
47
32
41

PLATE NO. 5

TABLE NO. 4
SAN JUAN BASIN - COLO.-N.M. STATELINE TO BLUFF
Units 1000 AF

WATER YEAR	INFLOW-INDEX Table No. 3 (a)	OUTFLOW San Juan R. near Bluff
1932	2821	2948
33	1228	1242
34	727	662
35	2271	2183
36	1650	1631
37	2217	2336
38	2383	2466
39	1261	1239
1940	992	996
41	3664	4242
42	2830	3078
43	1484	1445
44	2183	2289
45	1541	1620
46	876	865
47	1396	1488
48	2195	2319
AVERAGE	1866	1944
Adjustment		113.1
ADJUSTED AVERAGE		2057

Depletions at sites of use - Stateline stations to Bluff	117.6
Present salvage - Stateline stations to Bluff	4.5
DEPLETION OF VIRGIN FLOW AT BLUFF - Stateline Stations to Bluff	113.1

(a) = Sum San Juan R. at Rosa, Los Pinos R. at Ignacio, Animas R. near Cedar Hill, La Plata R. at Stateline, Mancos R. near Towaoc, McElmo Cr. near Cortez.

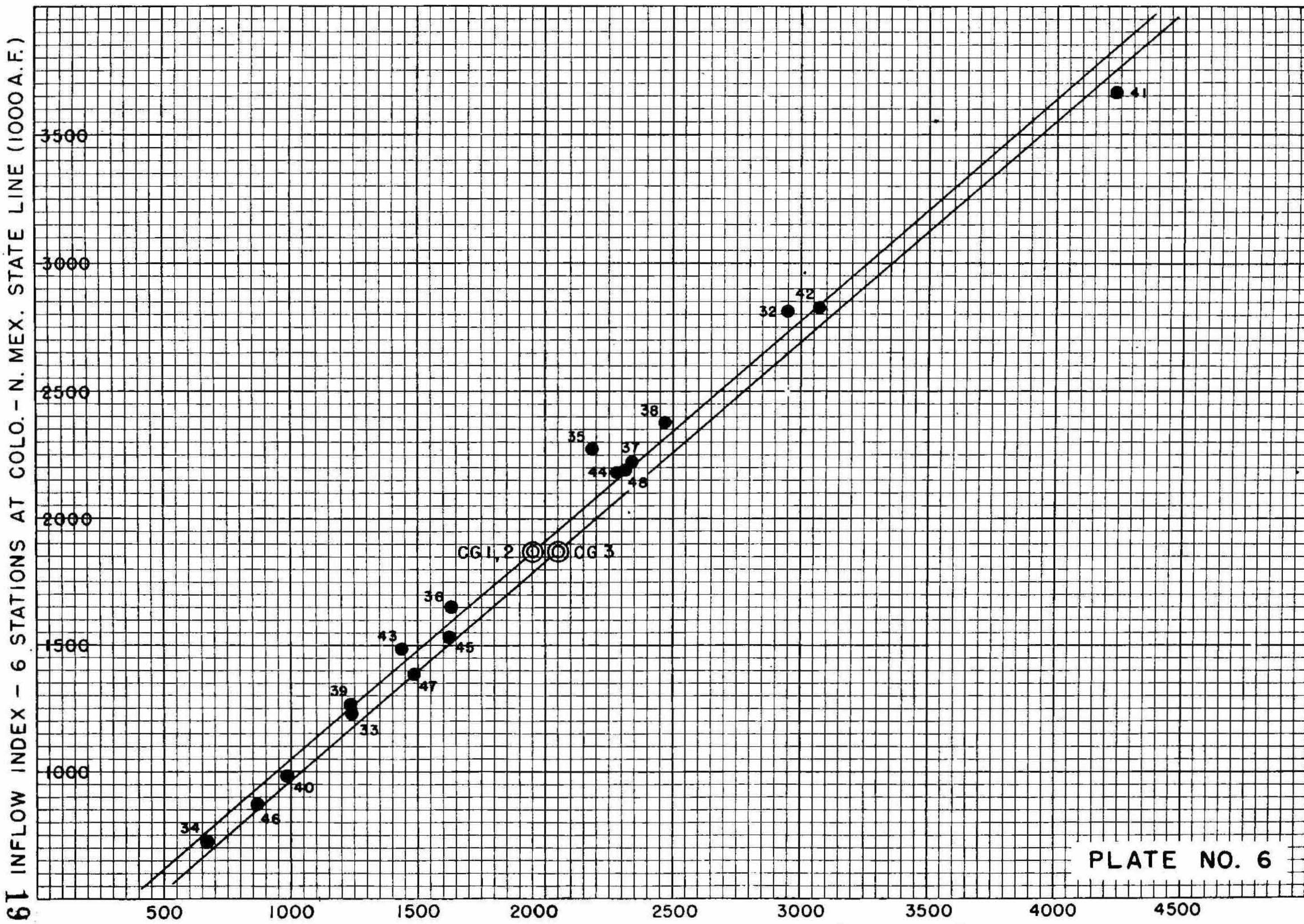


PLATE NO. 6
INFLOW INDEX - 6 STATIONS AT COLO.-N. MEX. STATE LINE (1000 A.F.)
3500
3000
2500
2000
1500
1000
500
1000
1500
2000
2500
3000
3500
4000
4500
41
42
32
38
35
37
44
48
CG 1, 2
CG 3
36
43
45
47
39
33
40
46
34

COLORADO RIVER BASIN ABOVE CISCO, UTAH

PLATE NO. 7

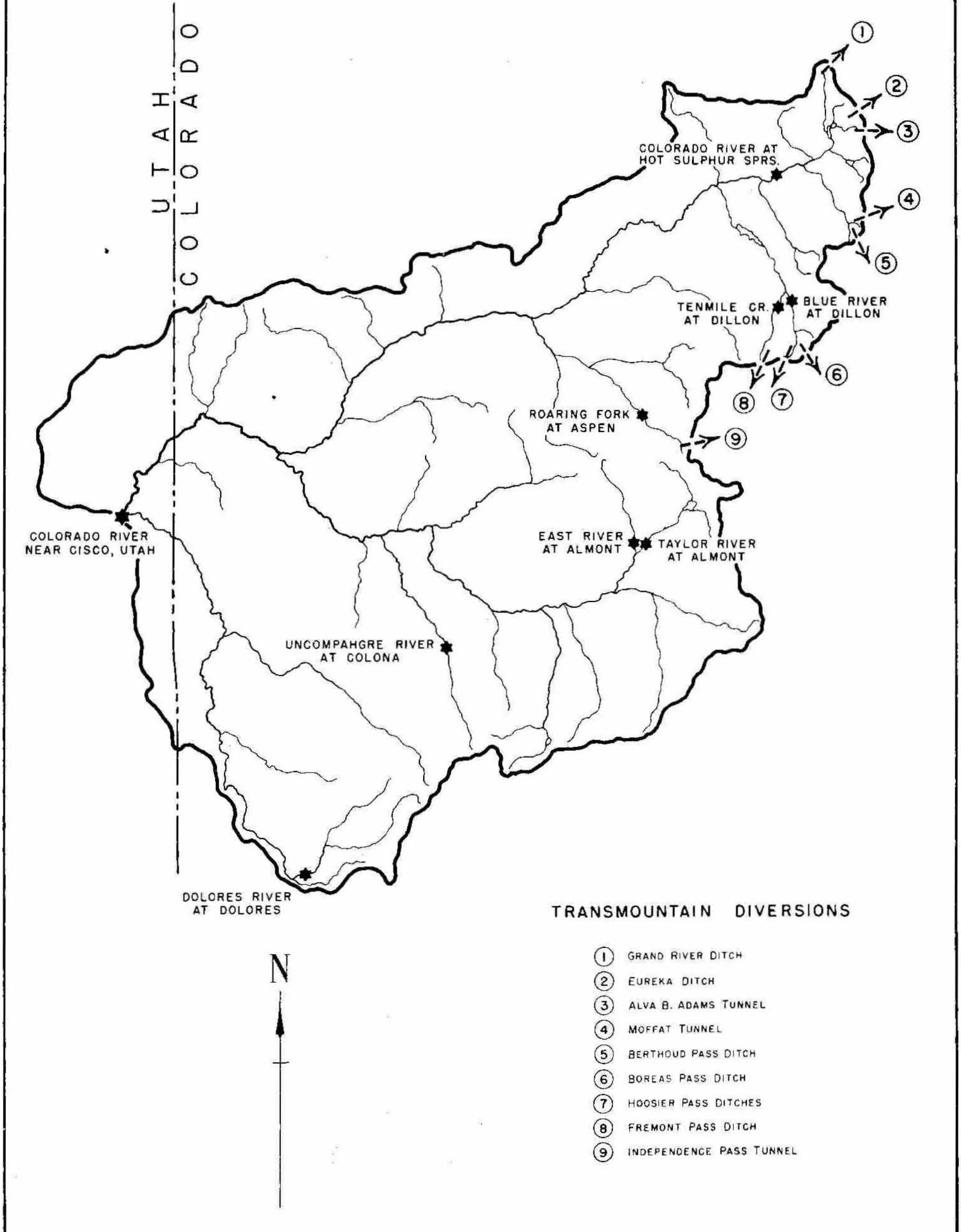


TABLE NO. 5
COLORADO RIVER BASIN ABOVE CISCO
Units - 1000 Acre Feet

WATER YEAR	INFLOW-INDEX: Colorado R. at Hot Sulphur Springs	Blue R. at Dillon	Tenmile Cr. at Dillon	Roaring Fork at Aspen	East R. at Almont	Taylor R. at Almont	Uncompahgre R. near Colona	Dolores R. at Dolores	Transmountain Diversions above stations	Sum	OUTFLOW: Colorado R. near Cisco
1932	462	76	81	c 114	c 238	232	216	453	19	1891	6687
33	466	70	88	* 104	c 197	192	150	213	16	1496	4631
34	254	54	55	* 63	c 144	138	102	102	11	923	2220
35	397	65	71	80	247	223	* 160	306	32	1581	4681
36	550	108	113	95	298	288	142	291	59	1944	5766
37	321	56	60	51	208	197	157	396	69	1515	4664
38	563	88	97	81	276	226	280	426	117	2154	7422
39	353	77	82	60	183	213	158	192	89	1407	4252
1940	293	49	53	35	135	149	160	216	75	1165	3463
41	358	70	67	53	243	138	272	522	93	1816	6576
42	434	78	77	96	232	261	323	572	45	2118	7706
43	376	77	88	67	247	228	170	325	99	1677	5137
44	334	63	70	57	232	256	260	448	71	1791	5903
45	388	75	82	57	217	156	204	328	106	1613	5406
46	306	74	78	56	194	191	153	216	91	1359	4062
47	498	108	112	103	271	217	212	316	91	1928	6051
48	373	93	94	85	280	317	226	389	77	1934	6587
AVERAGE										1665 61.8	5366 889.6
ADJUSTED AVERAGE										1727	6256
Acres irrigated above station	12710	143	201	120	7360	360	15510	2525			
Depletion rate - acre feet per acre	0.83	1.00	1.00	1.03	0.82	0.82	1.44	1.43			
Acres irrigated by by-passed water	140	0	0	2100	0	0	1500	0			
Irrigation depletions above station	10.5	0.1	0.2	0.1	6.0	0.3	22.3	3.6			
Estimated by-passed water	0.7	0	0	10.5	0	0	7.5	0			
ADJUSTMENT TO INFLOW-INDEX	11.2	0.1	0.2	10.6	6.0	0.3	29.8	3.6		61.8	
Depletion at sites of use above Cisco											(a) 919.5
Present salvage above Cisco											29.9
DEPLETION OF VIRGIN FLOW AT CISCO											889.6

c = Estimated by correlation
* = Runoff estimated for winter months

(a) = Transmountain diversions averaged 36,400 acre feet more for 1932-1948 period than for 1914-1945 period.

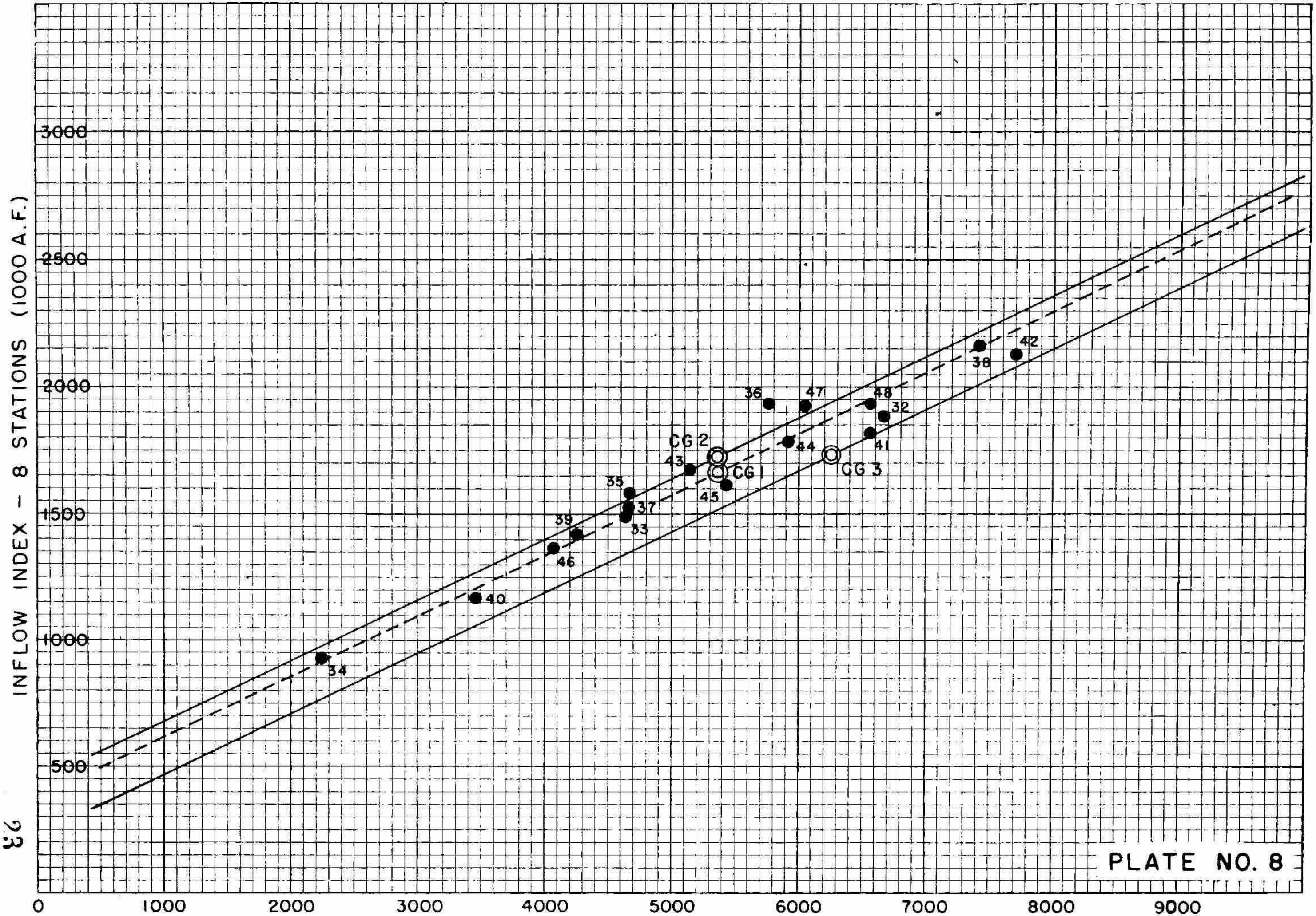


PLATE NO. 8
INFLOW INDEX - 8 STATIONS (1000 A.F.)
3000
2500
2000
1500
1000
500
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
34
40
46
39
33
37
35
43
45
CG 2
CG 1
44
36
47
CG 3
41
48
32
38
42

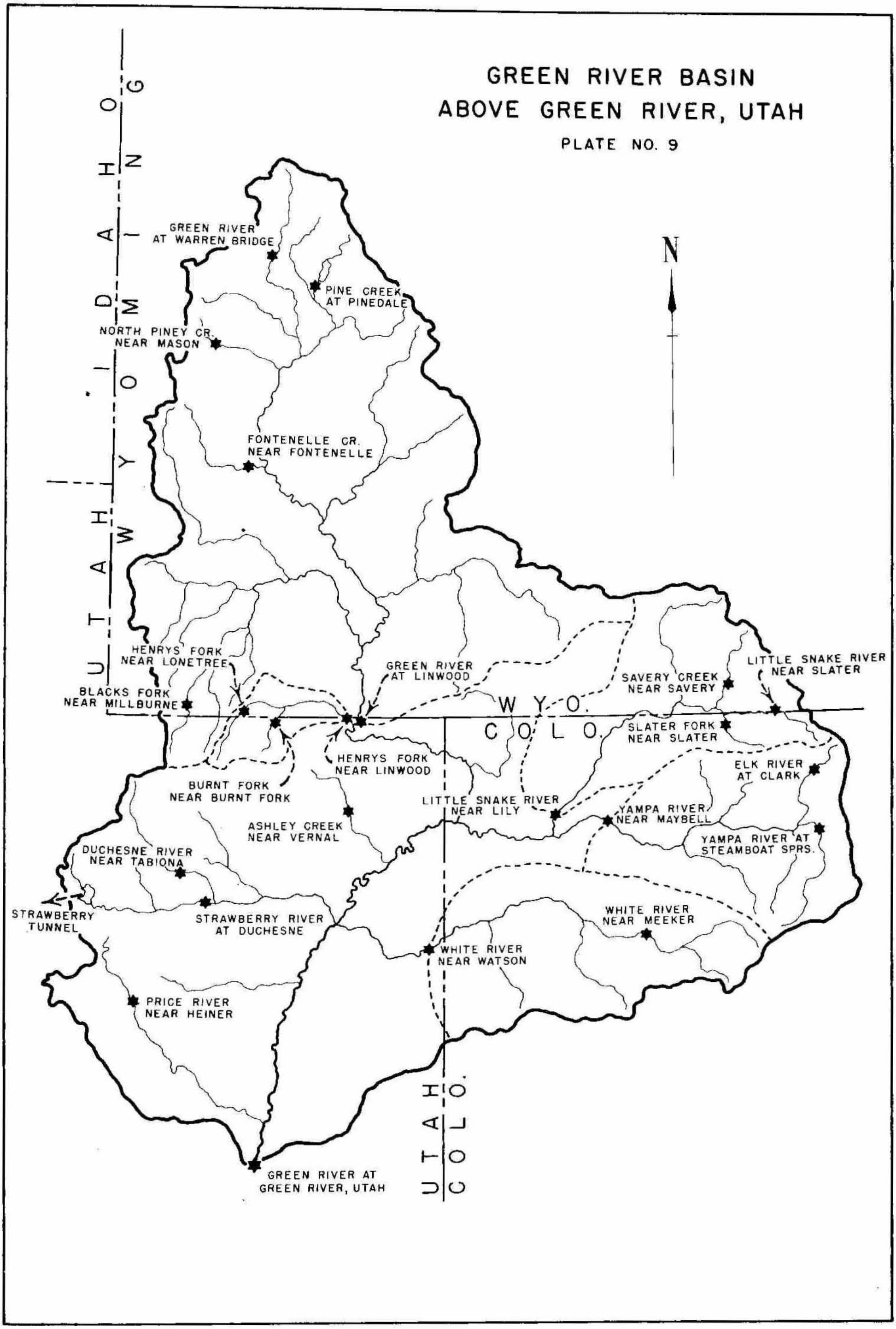

GREEN RIVER BASIN
ABOVE GREEN RIVER, UTAH
PLATE NO. 9
N
IDAHO
WYOMING
UTAH
WYO.
COLO.
UTAH
COLO.
GREEN RIVER
AT WARREN BRIDGE
PINE CREEK
AT PINEDALE
NORTH PINEY CR.
NEAR MASON
FONTENELLE CR.
NEAR FONTENELLE
HENRYS FORK
NEAR LONETREE
BLACKS FORK
NEAR MILLBURNE
GREEN RIVER
AT LINWOOD
SAVERY CREEK
NEAR SAVERY
LITTLE SNAKE RIVER
NEAR SLATER
SLATER FORK
NEAR SLATER
ELK RIVER
AT CLARK
HENRYS FORK
NEAR LINWOOD
BURNT FORK
NEAR BURNT FORK
LITTLE SNAKE RIVER
NEAR LILY
YAMPA RIVER
NEAR MAYBELL
YAMPA RIVER AT
STEAMBOAT SPRS.
ASHLEY CREEK
NEAR VERNAL
DUCHESNE RIVER
NEAR TABIONA
STRAWBERRY
TUNNEL
STRAWBERRY RIVER
AT DUCHESNE
WHITE RIVER
NEAR MEEKER
WHITE RIVER
NEAR WATSON
PRICE RIVER
NEAR HEINER
GREEN RIVER AT
GREEN RIVER, UTAH

TABLE NO. 6
WHITE RIVER BASIN
Units - 1000 Acre Feet

WATER YEAR	INFLOW-INDEX White River near Meeker	OUTFLOW White River near Watson
1932	542	595
33	485	537
34	245	281
35	366	402
36	419	472
37	330	392
38	496	599
39	372	448
1940	360	388
41	450	552
42	477	688
43	377	436
44	398	446
45	461	499
46	364	394
47	554	569
48	459	528
AVERAGE	421	484
	33.7	33.7
ADJUSTED AVGE.	455	518

Acres irrigated above station	12270
Depletion rate - acre feet per acre	1.28
Acres irrigated by by-passed water	3600
Irrigation depletions above station	15.7
Estimated by-passed water	18.0
ADJUSTMENT TO INFLOW-INDEX	33.7

Depletion at sites of use above Watson	33.7
Present salvage above Watson	(a)
DEPLETION OF VIRGIN FLOW AT WATSON	33.7

(a) = Not estimated by Engineering Advisory Committee

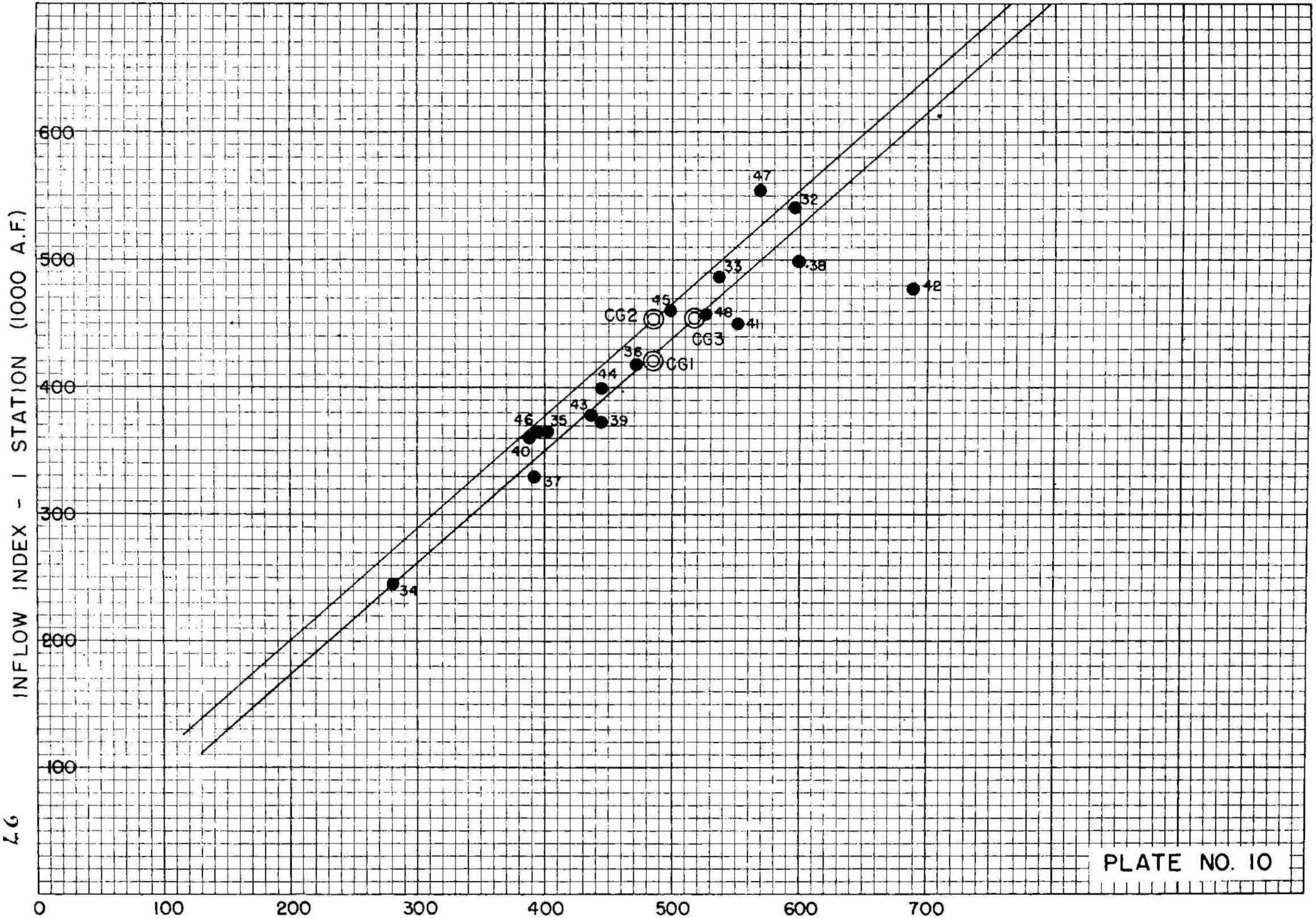

INFLOW INDEX - I STATION (1000 A.F.)
100
200
300
400
500
600
0
100
200
300
400
500
600
700
47
32
38
33
42
45
48
41
CG2
CG3
36
CG1
44
43
39
46
35
40
37
34

PLATE NO. 10

TABLE NO. 7
YAMPA RIVER BASIN
Units - 1000 Acre Feet

WATER YEAR	INFLOW-INDEX Yampa R. at Steamboat Springs	Elk R. at Clark	Sum	OUTFLOW Yampa R. near Maybell
1932	378	352	730	1388
33	342	240	582	1061
34	127	129	256	374
35	252	224	476	878
36	384	298	682	1144
37	231	261	492	940
38	374	288	662	1228
39	300	203	503	930
1940	260	202	462	847
41	303	196	499	990
42	317	224	541	1189
43	294	232	526	905
44	248	218	466	851
45	322	289	611	1243
46	275	216	491	856
47	382	261	643	1310
48	344	214	558	1183
AVERAGE	302	238	540	1019
			15.1	52.8
ADJUSTED AVERAGE			555	1072
Acres irrigated above station	19730	230		
Depletion rate - acre feet per acre	0.64	0.73		
Acres irrigated by by-passed water	0	460		
Irrigation depletions above station	12.6	0.2		
Estimated by-passed water	0	2.3		
ADJUSTMENT TO INFLOW-INDEX	12.6	2.5	15.1	

Depletion at sites of use above Maybell	53.0
Present salvage above Maybell	0.2
DEPLETION OF VIRGIN FLOW AT MAYBELL	52.8

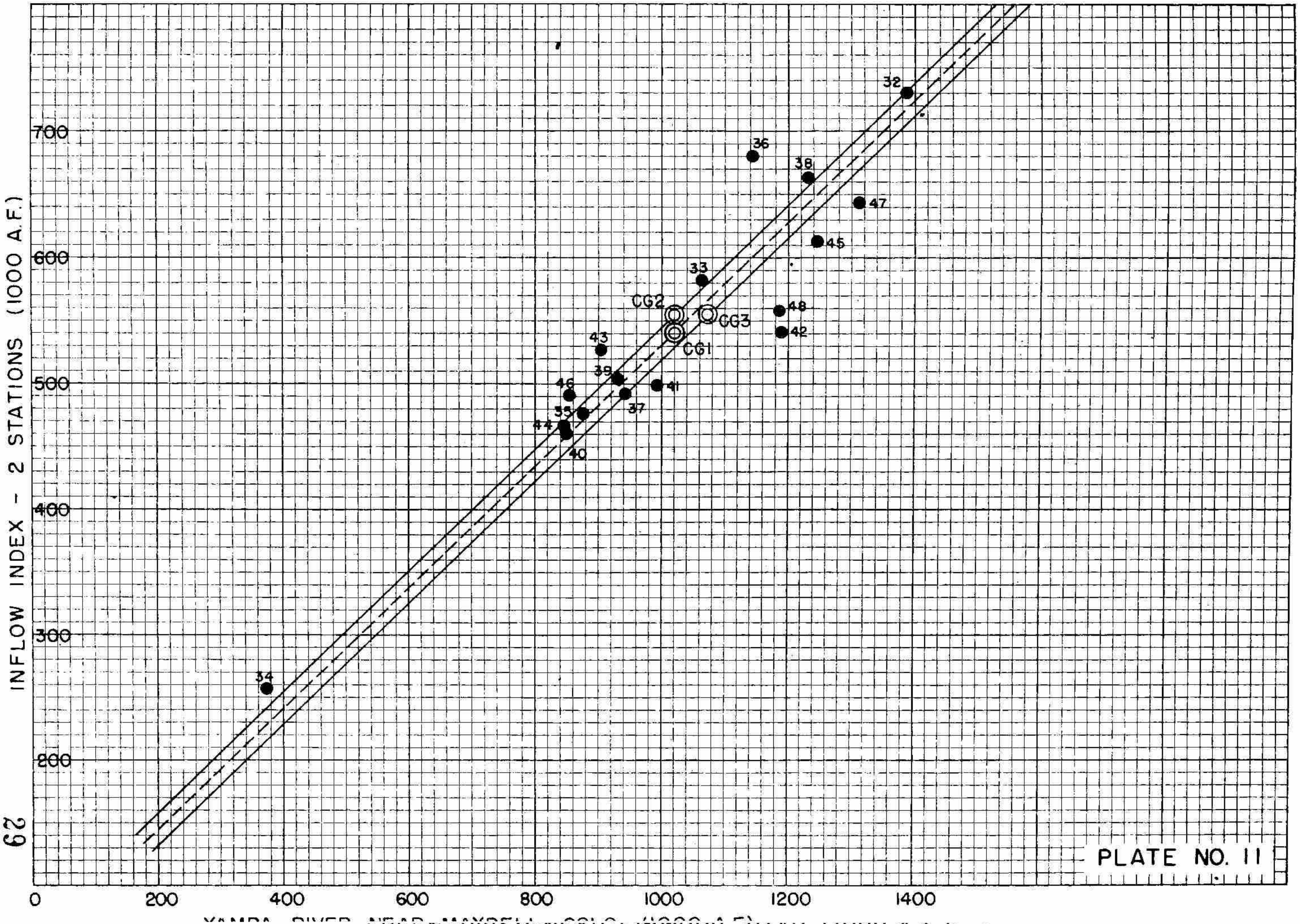

INFLOW INDEX - 2 STATIONS (1000 A.F.)
700
600
500
400
300
200
0
200
400
600
800
1000
1200
1400
32
36
38
47
45
33
CG2
CG3
48
42
CG1
43
39
41
46
37
35
44
40
34

PLATE NO. 11

TABLE NO. 8
LITTLE SNAKE RIVER BASIN
Units 1000 Acre Feet

WATER YEAR	INFLOW - INDEX				OUTFLOW
	Little Snake R. near Slater	Savery Cr. near Savery	Slater Fk. near Slater	Sum	Little Snake R. near Lily
1942	180	95	61	336	461
43	155	61	45	261	340
44	146	80	50	276	391
45	200	108	79	387	479
46	152	58	45	255	324
AVERAGE	167	80	56	303	399
				7.2	30.2
ADJUSTED AVERAGE				310	429
Acres irrigated above station	2000	1400	1300		
Depletion rate - acre feet per acre	1.42	1.42	1.42		
Acres irrigated by by-passed water	10	130	0		
Irrigation depletions above station	2.8	2.0	1.8		
Estimated by-passed water	0	0.6	0		
ADJUSTMENT TO INFLOW-INDEX	2.8	2.6	1.8	7.2	

Depletion at sites of use above Lily	30.5
Present salvage above Lily	0.3
DEPLETION OF VIRGIN FLOW AT LILY	30.2

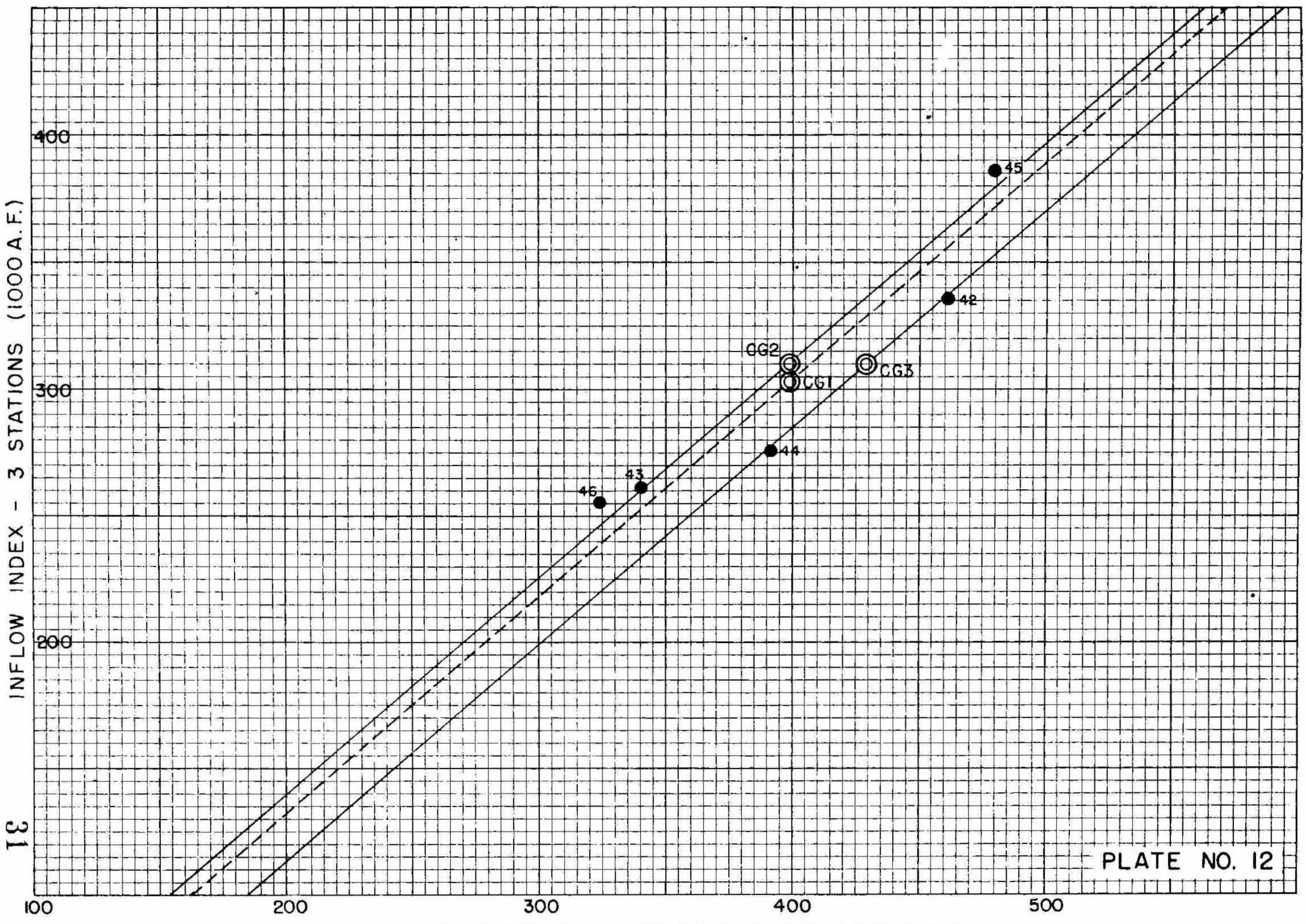


PLATE NO. 12
INFLOW INDEX - 3 STATIONS (1000 A.F.)
100
200
300
400
500
45
42
44
43
46
CG1
CG2
CG3

GREEN RIVER BASIN ABOVE LINWOOD
Units 1000 Acre Feet

WATER YEAR	INFLOW-INDEX: Green R. at Warren Br. near Daniel	N. Piney Cr. near Mason	Pine Cr. at Pinedale	Fontenelle Cr. near Fontenelle	Blacks Fork near Millburne	Sum	OUTFLOW: Green R. near Linwood
1932	375	* 45	* 100	* 55	c 116	691	1371
33	* 315	* 29	* 69	* 33	c 86	532	1054
34	209	* 18	* 28	* 7	c 53	315	396
35	319	* 34	78	28	c 94	553	917
36	433	* 52	103	66	c 91	745	1700
37	* 380	* 32	70	44	c 118	644	1368
38	394	* 43	115	51	c 121	724	1533
39	338	* 41	78	39	c 100	596	1132
1940	238	20	43	11	76	388	535
41	342	11	87	21	136	597	1255
42	392	27	94	19	* 119	651	1434
43	486	59	127	67	* 102	841	1938
44	375	36	77	36	* 110	634	1515
45	328	36	81	26	* 119	590	1304
46	345	40	90	44	103	622	1425
47	427	55	133	62	131	808	2235
48	341	40	67	46	104	598	1447
AVERAGE	355	36	85	38	105	619	1327
						36.2	193.6
ADJUSTED AVERAGE						655	1521
Acres irrigated above station	3600	620	200	3640	0		
Depletion rate - acre feet per acre	0.95	0.95	0.95	0.95			
Acres irrigated by by-passed water	500	200	5000	0	0		
Irrigation depletions above station	3.4	0.6	0.2	3.5			
Estimated by-passed water	2.5	1.0	25.0	0	0		
ADJUSTMENT TO INFLOW-INDEX	5.9	1.6	25.2	3.5	0	36.2	
Depletion at sites of use above Linwood							194.9
Present salvage above Linwood							1.3
DEPLETION OF VIRGIN FLOW AT LINWOOD							193.6

c = Estimated by correlation
* =

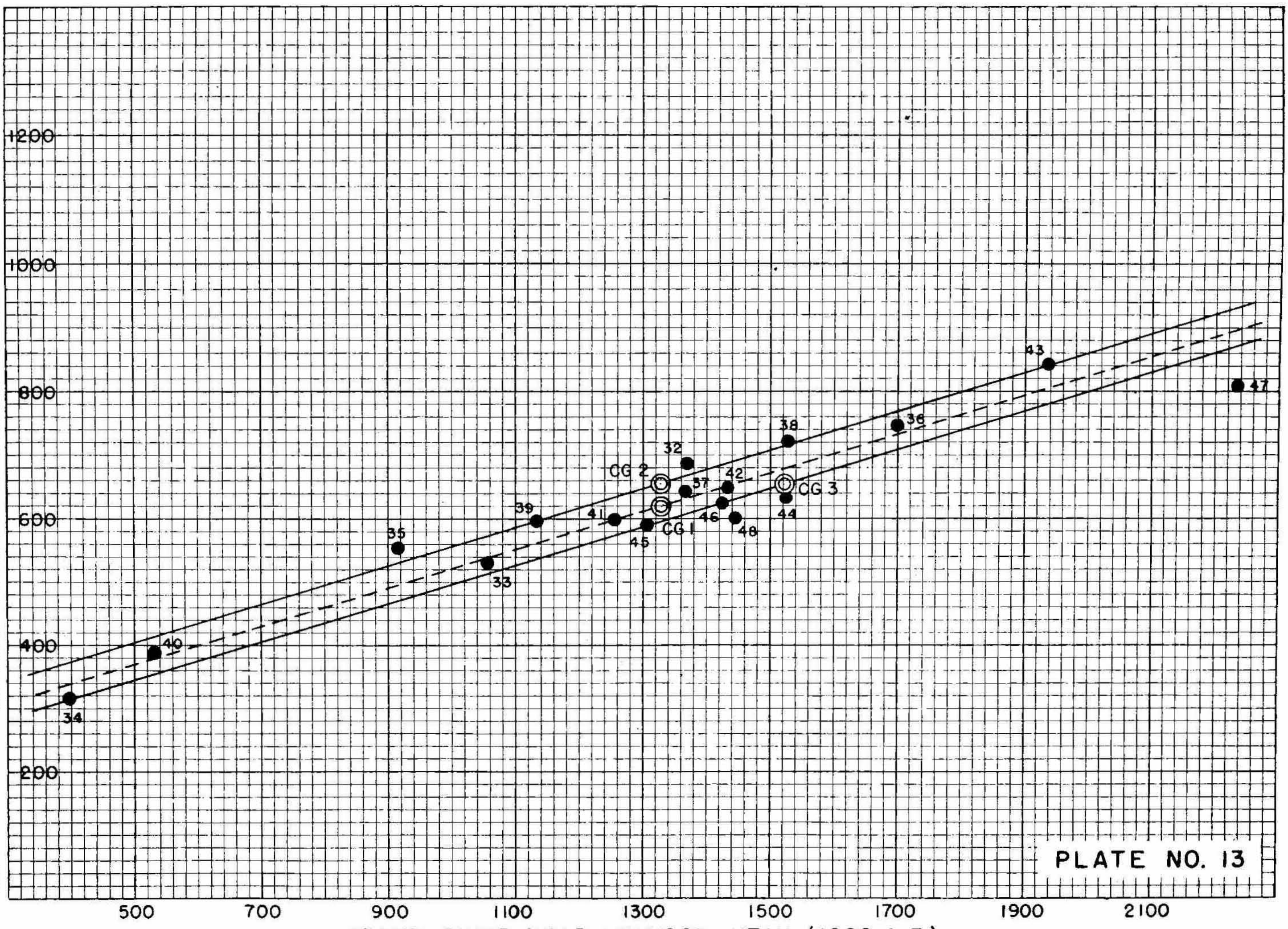

INFLOW INDEX — 5 STATIONS (1000 A.F.)
1200
1000
800
600
400
200
500
700
900
1100
1300
1500
1700
1900
2100
34
40
35
33
39
41
45
CG 1
CG 2
32
37
46
42
48
38
CG 3
44
36
43
47

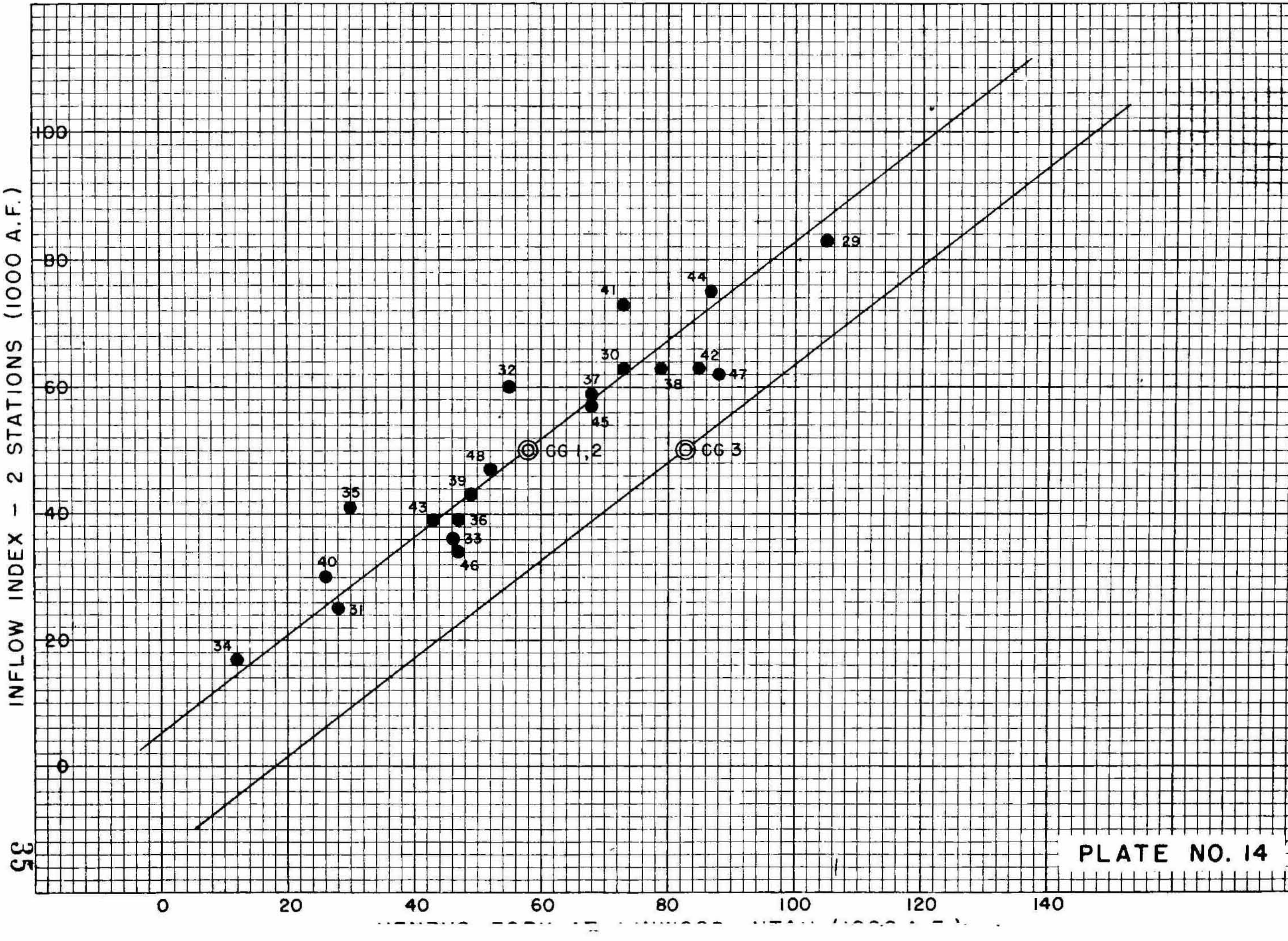
PLATE NO. 13

TABLE NO. 10
HENRYS FORK BASIN
Units 1000 Acre Feet

WATER YEAR	INFLOW-INDEX Henrys Fork near Lonetree	Burnt Fork near Burntfork	Sum	OUTFLOW Henrys Fork at Linwood
1929	c 46	c 37	83	105
1930	c 35	c 28	63	73
31	c 13	c 12	25	28
32	c 35	c 25	60	55
33	c 20	c 16	36	46
34	c 9	c 8	17	12
35	c 23	c 18	41	30
36	c 21	c 18	39	47
37	c 33	c 26	59	68
38	c 36	c 27	63	79
39	c 23	c 20	43	49
1940	c 16	c 14	30	26
41	c 41	c 32	73	73
42	c 35	c 28	63	85
43	* 22	* 17	39	43
44	* 41	* 34	75	87
45	* 35	* 22	57	68
46	20	14	34	47
47	34	28	62	88
48	25	22	47	52
AVERAGE	28	22	50	58
				24.9
ADJUSTED AVERAGE				83

Depletion at sites of use above Linwood	24.9
Present salvage above Linwood	(a)
DEPLETION OF VIRGIN FLOW AT LINWOOD	24.9

(a) = Not estimated by Engineering Advisory Committee
c = Estimated by correlation
* = Runoff estimated for winter months



INFLOW INDEX - 2 STATIONS (1000 A.F.)
0
20
40
60
80
100
120
140
29
44
41
30
42
38
47
32
37
45
CG 1,2
CG 3
48
39
35
43
36
33
46
40
31
34
PLATE NO. 14

TABLE NO. 11
GREEN RIVER BASIN ABOVE GREEN RIVER UTAH
Below Major Developments in Colorado and Wyoming
Units 1000 Acre feet

WATER YEAR	INFLOW-INDEX											OUTFLOW
	White R. near Watson	Yampa R. near Maybell	Little Snake R. near Lily	Green R. near Linwood	Henrys Fork at Linwood	Ashley Cr. near Vernal	Duchesne R. near Tabiona	Strawberry R. at Duchesne	Price R. near Heiner	Transmountain Diversion Operation (a)	Sum	Green R. at Green R., Utah
1932	595	1388	758	1371	55	74	145	92	58	62	4598	4822
33	537	1061	538	1054	46	48	107	73	65	48	3577	3525
34	281	374	80	396	12	31	57	23	26	11	1291	1307
35	402	878	242	917	30	64	94	49	48	44	2768	2850
36	472	1144	356	1700	47	42	167	106	86	77	4197	4147
37	392	940	487	1368	68	79	158	148	113	82	3835	4134
38	599	1228	480	1533	79	77	162	117	93	69	4437	4747
39	448	930	303	1132	49	66	117	70	61	41	3217	3420
1940	388	847	260	535	26	54	96	49	53	35	2343	2376
41	552	990	395	1255	73	92	150	106	107	54	3774	4242
42	688	1189	461	1434	85	101	144	107	122	59	4390	4990
43	436	905	340	1938	43	63	181	103	70	73	4152	4270
44	446	851	391	1515	87	94	164	115	98	71	3832	4476
45	499	1243	479	1304	68	63	144	88	67	70	4025	4159
46	394	856	324	1425	47	47	144	78	54	65	3434	3469
47	569	1310	467	2235	88	92	178	97	65	64	5165	5484
48	528	1183	285	1447	52	68	125	65	63	54	3870	4146
AVERAGE											3700	3917
											19.4	401.6
ADJUSTED AVERAGE											3719	4319
Acres irrigated above station						0	6915	3700	1000			
Depletion rate - acre feet per acre							1.60	1.60	1.70			
Irrigation depletions above stations						0	11.8	5.9	1.7		19.4	
ADJUSTMENT TO INFLOW-INDEX											19.4	

Depletion at sites of use below Colorado and Wyoming developments and above Green River, Utah	415.8
Present salvage in area	14.2
DEPLETION OF VIRGIN FLOW IN AREA	401.6

(a) = Information from Region IV, U.S.B.R.

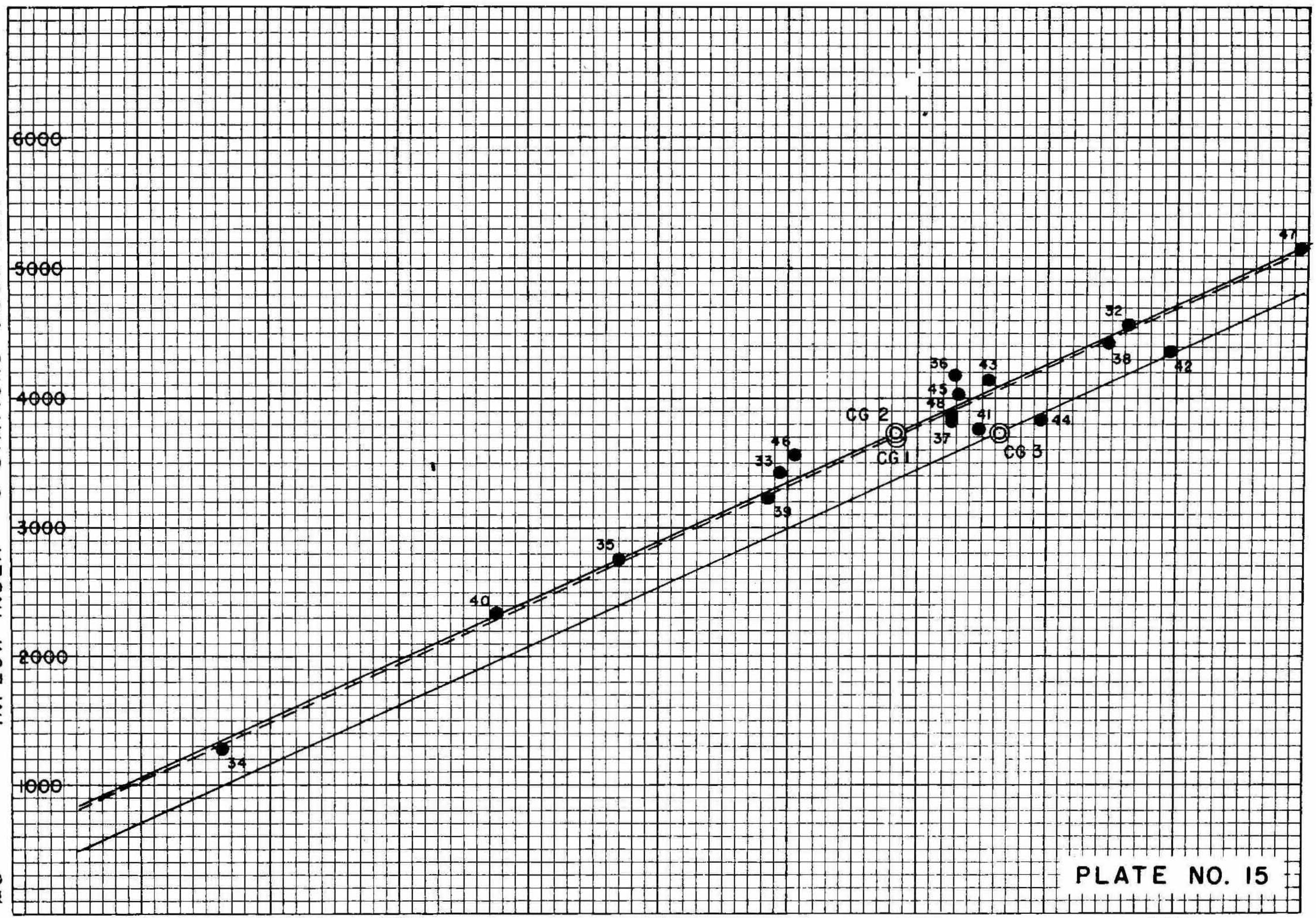
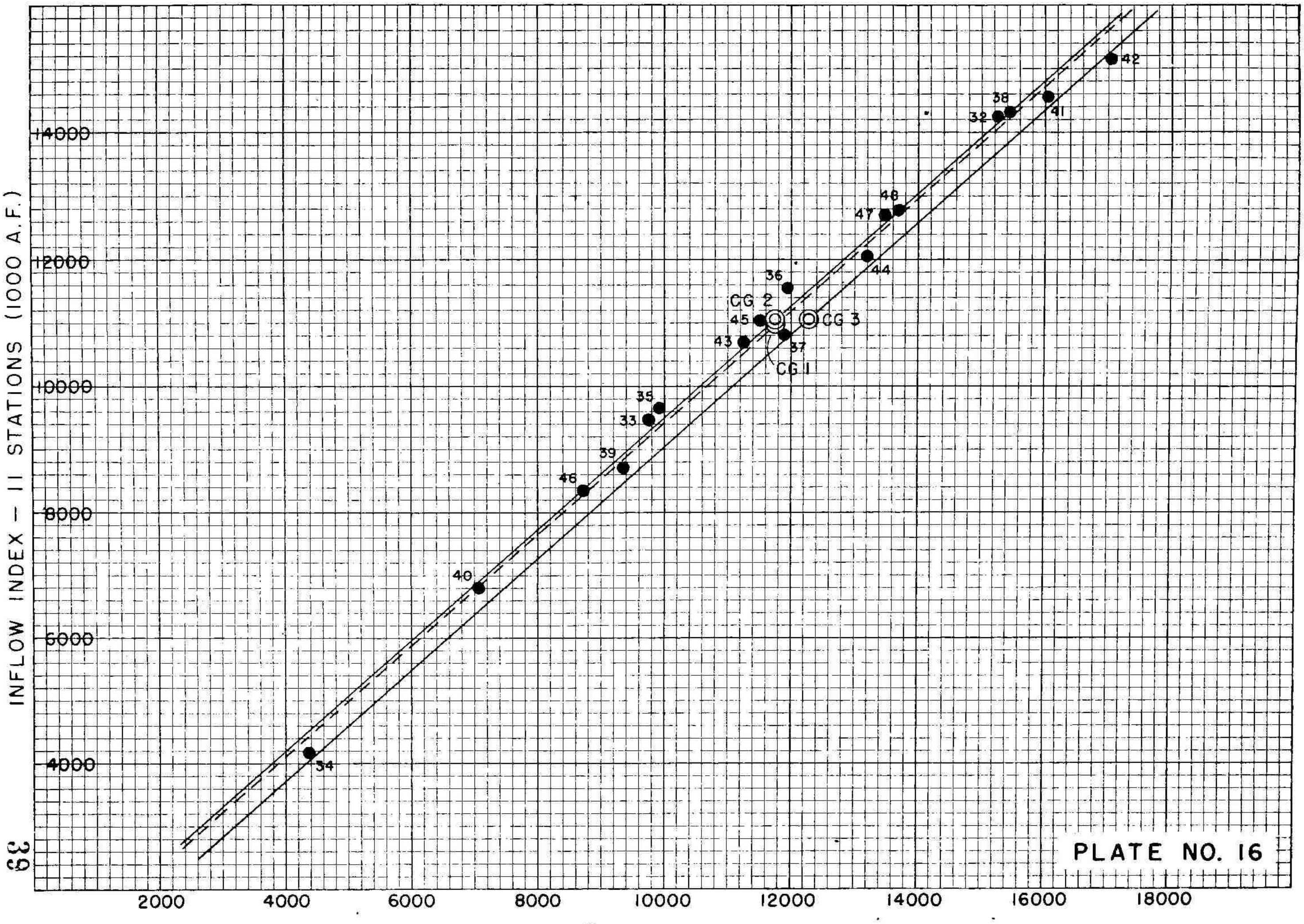

INFLOW INDEX - 9 STATIONS (1000 A.F.)
6000
5000
4000
3000
2000
1000
1000
2000
3000
4000
5000
47
32
38
42
36
43
45
48
41
37
44
CG 2
CG 1
CG 3
46
33
39
35
40
34
PLATE NO. 15

TABLE NO. 12
COLORADO RIVER BASIN ABOVE LEE FERRY
Below Major Developments in Colorado, Wyoming, New Mexico and Arizona
Units - 1000 Acre Feet

WATER YEAR	INFLOW-INDEX				OUTFLOW
	Sum-Inflow-Indices (Table No. 11)	Colo. R. near Cisco	San Juan R. near Bluff	Sum	Colorado R. at Lee Ferry
1932	4598	6687	2948	14233	15286
33	3577	4631	1242	9450	9745
34	1291	2220	662	4173	4396
35	2768	4681	2183	9632	9912
36	4197	5766	1631	11594	11970
37	3835	4664	2336	10835	11897
38	4437	7422	2466	14325	15440
39	3217	4252	1239	8708	9394
1940	2343	3463	996	6802	7082
41	3774	6576	4242	14592	16052
42	4390	7706	3078	15174	17029
43	4152	5137	1445	10734	11263
44	3832	5903	2289	12024	13221
45	4025	5406	1620	11051	11545
46	3434	4062	865	8361	8745
47	5165	6051	1488	12704	13515
48	3870	6587	2319	12776	13689
AVERAGE				11010	11775
Adjustment				(a)19.4	500.2
ADJUSTED AVERAGE				11029	12275

Depletion at sites of use in area and above Lee Ferry	537.3
Present salvage in area	37.1
DEPLETION OF VIRGIN FLOW IN AREA	500.2

(a) From Table No. 11



INFLOW INDEX — 11 STATIONS (1000 A.F.)
4000
6000
8000
10000
12000
14000
2000
4000
6000
8000
10000
12000
14000
16000
18000
42
41
38
32
48
47
44
36
CG 2
45
CG 3
43
37
CG 1
35
33
39
46
40
34

PLATE NO. 16

RECOMMENDATIONS

The Engineering Advisory Committee recommends that:

A. In General:

1. The Commission follow the basic procedure herein outlined as a means of measuring depletions by the inflow-outflow method until refinements or changes are made and agreed to by the Commission.

2. As records of run-off are accumulated the basic procedure be checked and relationships extended for the river sections covered by this report.

3. Studies be made by the Commission in regard to:

   a. Other areas and river sections which may require inflow-outflow relationships.

   b. Segregation of depletions between states in sections where more than one state is involved and where the water leaving the states passes through common carrier channels.

   c. A determination of virgin conditions, throughout the variation of meteorological conditions that can reasonably be expected.

4. Where new gaging stations are constructed to replace old ones, all be maintained concurrently for as long a period as necessary to establish a reliable correlation between the records of these stations.

B. Specifically:

1. The following existing stations were utilized in the determination of the inflow-outflow relationships described herein and should be retained for compact administrative purposes:

   a. LaPlata River at Hesperus, Colorado
   b. LaPlata River at Colorado-New Mexico State Line
   c. Animas River at Durango, Colorado
   d. Florida River near Durango, Colorado
   e. Animas River near Cedar Hill, New Mexico
   f. Los Pinos River near Bayfield, Colorado
   g. Los Pinos River at Ignacio, Colorado
   h. San Juan River at Pagosa Springs, Colorado
   i. Navajo River at Edith, Colorado
   j. San Juan River at Rosa, New Mexico
   k. Dolores River at Dolores, Colorado
   l. Uncompahgre River near Colona, Colorado
   m. Taylor River at Almont, Colorado
   n. East River at Almont, Colorado
   o. Roaring Fork at Aspen, Colorado
   p. Ten Mile Creek at Dillon, Colorado

q. Blue River at Dillon, Colorado
r. Colorado River at Hot Sulphur Springs, Colorado
s. White River near Meeker, Colorado
t. White River near Watson, Utah
u. Yampa River at Steamboat Springs, Colorado
v. Elk River at Clark, Colorado
w. Yampa River near Maybell, Colorado
x. Little Snake River near Slater, Colorado
y. Slater Fork near Slater, Colorado
z. Savery Creek near Savery, Wyoming
aa. Little Snake River near Dixon, Wyoming
bb. Little Snake River near Lily, Colorado
cc. Pine Creek at Pinedale, Wyoming
dd. Green River at Warren Bridge near Daniel, Wyoming
ee. North Piney Creek near Mason, Wyoming
ff. Fontenelle Creek near Fontenelle, Wyoming
gg. Black's Fork near Millburne, Wyoming
hh. Green River near Linwood, Utah
ii. Henry's Fork near Lonetree, Wyoming
jj. Burnt Fork near Burntfork, Wyoming
kk. Henry's Fork at Linwood, Utah
ll. Ashley Creek near Vernal, Utah
mm. Duchesne River near Tabiona, Utah
nn. Strawberry River at Duchesne, Utah
oo. Price River near Heiner, Utah
pp. Green River at Green River, Utah
qq. Colorado River near Cisco, Utah
rr. San Juan River near Bluff, Utah
ss. Colorado River at Lees Ferry, Arizona
tt. Paria River at Lees Ferry, Arizona

2. The following gaging stations which have been discontinued, be re-established:

a. South Fork White River near Buford, Colorado
b. North Fork White River near Buford, Colorado
c. McElmo Creek near Cortez, Colorado
d. Mancos River near Towaoc, Colorado
e. Green River at Green River, Wyoming

3. New gaging stations as follows be established:

a. Colorado River near Colorado-Utah State Line
b. Los Pinos River near Colorado-New Mexico State Line
c. McElmo Creek near Colorado-Utah State Line
d. Pine Creek near Fremont Lake, Wyoming
e. Fontenelle Creek above irrigation
f. Ham's Fork above irrigation
g. Dirty Devil near mouth
h. San Rafael near mouth

APPENDIX

APPENDIX

Statistical Method for Virgin Condition Correlations

Many of the early records of stream discharge in the basin were obtained under less favorable conditions than is the case in more recent years. In many instances, also, it was necessary to complete partial or missing records by estimating. A frequent necessity was that of extending records back for years on numerous tributary streams as well as at some points on the main river when discharge records were only for short periods. This was accomplished by correlations with flow at stations with longer records and usually with satisfactory results. For the present purpose, however, shorter series of years are used since a larger number of index stations can then be selected, including but few estimated values of discharge.

Example of Method as Applied to a Sub-Basin

Perhaps the best procedure for illustrating the methods used in deriving the correlation curves between inflows and outflows shown in the report is by the use of a typical example.

The data relative to which are shown in Table No. 5, Plate No. 8, and which has been previously presented as showing the inflow-outflow relationship for the Colorado River Basin above Cisco, Utah, is an example where both irrigation depletions and transmountain diversions are made above the inflow-index stations. Depletions above these stations due to irrigation have been comparatively constant from year to year during the period of correlation. However, during the same period the annual transmountain diversions made above the inflow-index stations varied between 11,000 acre-feet and 117,000 acre-feet.

The starting point for determining the inflow-outflow relationship was the correlation of historic data for selected inflow and outflow stations. In this case the annual amounts of transmountain diversions above the inflow stations were added to the recorded flows at those stations before the original correlation was made. The average of such adjusted inflow-indices was then plotted against the average of the outflows for the period of correlation as indicated by the point labeled C.G.1. The slope of the curve through the point C.G.1 was calculated from the annual data, and the coefficient of determination for this historic relationship computed to be 0.915. This shows in general 91.5 percent of the variation in outflow is due to corresponding variation in the inflow-index.

The correction for the smaller, more constant depletion due to irrigation was then applied to the average point described above, resulting in a point C.G.2, which is the point from which the average virgin relationship for the period may be determined.

The average of the transmountain diversions made in the entire basin above Cisco for the period of correlation, together with the average of all other man-made depletions in that basin were used in determining the point representing average virgin flow at Cisco for that period.

In the final report of the Engineering Advisory Committee the estimated average depletion at sites of use, due to irrigation, municipal uses, and reservoir evaporation losses, is given as 840,000 acre-feet. The salvage in the basin was also estimated to be 29,900 acre-feet. The average of the transmountain diversions made above Cisco is 79,500 acre-feet for the period of correlation. The sum of the average transmountain diversions and the average depletion at sites of use, minus the estimated salvage, is the average depletion of the virgin flow at Cisco for the period, which in this case amounts to 889,600 acre-feet.

A distance representing this amount was therefore laid off by scale to the right of C.G.2 and marked C.G.3. Lines were then drawn through the points C.G.1, C.G.2, and C.G.3 on the slope previously determined for the historic correlation, to indicate the probable relationship between virgin inflow-index and virgin outflow quantities. As stated in the description of the inflow-outflow curves previously presented, this virgin flow curve may not be exactly parallel to the historic trend lines, but until further data are obtained these curves may be used with reasonable results.

Inflow Stations Required for Index

Throughout the Colorado River Basin there are a few rim gaging stations with long records concurrent with outflow records. Correlations may be established for long periods by using the stations available, including some estimated values to complete missing portions of the record. A considerable number of additional stations have been installed on various tributaries in recent years. A study was made to determine the effect on a basic inflow-outflow relationship of the addition of more rim gaging stations to the original inflow-index, or the substitution of gaging stations for some which were used in the basic correlation.

The Colorado River Basin above Cisco was selected as an example, and the comparative results of the study are shown in the following tabulation:

Number of Inflow-Index Stations	Period of Correlation	Coefficient of Determination	Ratio of Inflow-Index to Outflow
9	1914-1947	0.952	31%
9	1939-1947	0.957	31%
15	1939-1947	0.966	46%
11	1939-1947	0.946	29%

A basic relationship between inflow-index at selected rim stations and outflow of the Colorado River at the gaging station near Cisco, Utah, was determined for the period 1914-1947. No corrections other than for annual transmountain diversions above them were made to the recorded flows at the index stations in determining this relation. The coefficient of determination (r^2), computed by least squares for the relation for individual years, is 0.952. Total corrected run-off at the inflow stations was about 31 percent of the run-off at Cisco for the period.

The inflow stations were selected primarily because of the long period of recorded run-off, rather than that they were ideally located to represent index inflow. The following tabulation lists the inflow stations used in the basic correlation, together with the approximate areas irrigated both above the gage and by water bypassing the gage. These areas were determined by a study of the U.S.B.R. land classification plane table sheets.

Gaging Stations	Acres Irrigated Above Gage	Acres Irrigated By water Bypassing Gage
Colorado River near Hot Sulphur Springs	12,710	140
Blue River at Dillon	143	0
Roaring Fork at Aspen	120	2,100
Plateau Creek near Collbran plus Buzzard Creek near Collbran	2,180	410
East River at Almont	7,360	0
Taylor River at Almont	360	0
Uncompahgre River at Colona	15,510	1,502
Dolores River at Dolores	2,525	0

By 1939 a number of gaging stations had been established on other tributaries of the Colorado River above Cisco. In order to determine the effect on the inflow-outflow relationship of the addition of inflow stations a correlation was first made between the combined run-off of the stations listed above and the run-off at the outflow station near Cisco for the period 1939-1947. It was assumed that no significant changes had occurred in acreages irrigated above the gages or in the amounts of bypassed water for the long or short periods. Run-off at the inflow stations was corrected for annual transmountain diversions above the stations. For this correlation, $r^2 = 0.957$. The combined corrected run-off of the inflow stations represents about 31 percent of the outflow run-off for the period.

A second annual correlation for the period 1939-1947 was made between inflow-index run-off and outflow run-off at Cisco. The combined run-off of the following gaging stations was added to that of the stations listed above.

Gaging Station	Acres Irrigated Above Gage	Acres Irrigated By water Bypassing Gage
Williams River near Leal	50	40
Snake River at Dillon	225	18,000 acre-feet (for power)
Ten Mile Creek at Dillon	201	0

Gaging Station	Acres Irrigated Above Gage	Acres Irrigated By water Bypassing Gage
rystal River near Redstone	115	2,040
orth Fork Gunnison River near Somerset	3,207	0
omichi Creek near Sargents	1,940	0

This group of inflow stations, together with those listed above, cludes gaging stations on the important tributaries of the Colorado River ystem above Cisco, with the exception of the Eagle River and the Lake Fork f the Gunnison River. Corrections to the recorded run-off at the inflow tations were made for transmountain diversions as for the other correlations. o corrections were made for diversions above or bypassing the stations. The alue for r^2, as computed for this correlation was 0.966. Total run-off of the flow stations was approximately 46 percent of the run-off at the outflow tation near Cisco.

Of the inflow stations represented in the latter correlation, there re some with considerable areas irrigated above the gages or comparatively arge amounts of water bypassing the gages. In some instances it might be ifficult to determine whether changes had occurred in depletions above the ages, or it might be expensive to make measurements of water bypassing the ages. As an example, the Granby and Shadow Mountain Lake Reservoirs, which re regulatory reservoirs for the Colorado-Big Thompson Transmountain Diver-ion Project, are being constructed above the gage on the Colorado River at ot Sulphur Springs, Colorado. In the future, the record at Hot Sulphur prings must necessarily be corrected for the operation of these reservoirs, cluding the net evaporation losses resulting from their operation.

A third correlation, for the 1939-1947 period was therefore made to certain the effect of eliminating some of the stations, or substituting other tations higher on the streams, so that the major portion of the consumptive ses would occur below the inflow stations and thus be automatically integrated to the inflow-outflow relationship. For this analysis, the stations on Colorado ver near Grand Lake and Fraser River at Winter Park were substituted for olorado River at Hot Sulphur Springs and the stations on Snake River at Dillon, rystal River near Redstone, Uncompahgre River at Colona, and Buzzard and Plateau reeks near Collbran were eliminated. Such elimination would preclude the ecessity for measuring winter flows around Snake River at Dillon or for asuring bypassed water at Colona and Redstone in several ditches. The flow stations used for the third correlation are listed in the following able:

Gaging Station	Acres Irrigated Above Gage	Acres Irrigated By water Bypassing Gage
Colorado River near Grand Lake	200	2,430
Fraser River at Winter Park	0	0
Blue River at Dillon	143	0
Ten Mile Creek at Dillon	201	0
Williams River near Leal	50	40
Roaring Fork at Aspen	120	2,100
East River at Almont	7,360	0
Taylor River at Almont	360	0
North Fork Gunnison River near Somerset	3,207	0
Tomichi Creek near Sargents	1,940	0
Dolores River at Dolores	2,525	0

The value for r^2 in this correlation was 0.946, with the total run-off at the inflow stations representing 29 percent of the total outflow, as compared with the ratio of 31 percent for the first correlation and 46 percent for the second.

The coefficient of determination for the third correlation is not significantly different from the coefficients for the other correlations for the 1939-1947 period, indicating that the final list of 11 stations would form the basis of a satisfactory inflow-outflow relationship. At the same time the list included only two stations with any considerable amounts of water bypassing them, and in each instance the major portion of this water may be measured in one canal. The irrigated areas above each of the stations is of the native hay meadow type, and these areas have become practically stabilized over a long period of years. Consumptive uses for presently contemplated projects, exclusive of transmountain diversions, will occur in most instances below the inflow stations.

The addition of a station which has been re-established on North Inlet to Grand Lake and stations above principal diversions on Crystal River and Eagle River might strengthen the relationship by increasing the ratio of total measured inflow to recorded outflow.

In any instance of the addition or elimination of inflow stations from those used as an original basis, the stations which are eliminated should be continued in operation for a sufficient length of time to permit correlations to be made so that the relations shown by any selected new group of inflow stations may be used in lieu of the original relation to insure continuity over a long period of time.

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