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FOURTEENTH ANNUAL REPORT

**REPUBLICAN RIVER
COMPACT
ADMINISTRATION**

FOR THE YEAR 1973

Denver, Colorado

June 13, 1974

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Fourteenth Annual Report

REPUBLICAN RIVER COMPACT ADMINISTRATION

In conformity with the Rules and Regulations of the Republican River Compact Administration, the Fourteenth Annual Report is submitted as follows:

1. Pursuant to Rule 12, as amended, this report covers the period from June 18, 1973, to June 13, 1974.
2. Members of the Republican River Compact Administration are the officials of each of the States who are charged with the duty of administering the public water supplies, as follows:

Dan S. Jones, Jr., Director, Department of Water
Resources, Nebraska

C. J. Kuiper, State Engineer of Colorado

Guy E. Gibson, Chief Engineer, Division of Water
Resources, State Board of Agriculture, Kansas

3. The Fifteenth Annual Meeting of the Administration was held on June 13, 1974 in the Office of the State Engineer, Columbine Building, 1845 Sherman Street, Denver, Colorado. Minutes of the meeting are included in this report.
4. During the period covered by this report, one meeting of the Engineering Committee was held. A report from that Committee together with summary tabulations of the computed annual virgin water supply and the consumptive use for the 1973 water year in the Republican River Basin were presented to and accepted by the Administration at the Fifteenth Annual Meeting. Copies of these presentations are included elsewhere in this report.
5. On June 13, 1974, Mr. Guy E. Gibson, Kansas member of the Administration, was elected Chairman to serve until the next annual meeting of the Administration.

Minutes of the
Fifteenth Annual Meeting

Republican River Compact Administration

Denver, Colorado - June 13, 1974

The meeting was called to order by C. J. Kuiper, Chairman, at 10:00 a.m., in the Office of the State Engineer, Columbine Building, 1845 Sherman, Denver, Colorado.

The following were in attendance:

<u>Name</u>	<u>Agency</u>	<u>Location</u>
C. J. Kuiper	Official Member	Denver, Colorado
Guy E. Gibson	Official Member	Topeka, Kansas
Dan S. Jones, Jr.	Official Member	Lincoln, Nebraska
M. E. Ball	Chairman, Engr. Committee	Lincoln, Nebraska
Jeris A. Danielson	Division of Water Resources	Denver, Colorado
Glen E. Brees	Division of Water Resources	Denver, Colorado

Approval of the Minutes of the previous meeting:

Motion was made by Mr. Gibson and seconded by Mr. Jones that the minutes of the Fourteenth Annual Meeting, as published in the Thirteenth Annual Report, be confirmed as published. The motion was passed unanimously.

Report of the Chairman:

Mr. Kuiper stated that there had been an extremely dry spring and early summer in the Republican River area in Colorado. The wheat crops in the southern portion of the High Plains were seriously damaged and the need and value of irrigation was noted.

Report of Official Members:

Mr. Jones stated that the situation in the Republican Basin was not quite as bad as that in Colorado. Precipitation has been better this spring than in the last two. Mr. Jones further stated that the reservoirs are filled to the top of conservation capacity, with the exception of Enders Reservoir, which is about the same as it has been in the last three years.

Mr. Gibson stated that copies of the Thirteenth Annual Report had been sent to interested agencies. Norton Reservoir is very low again and it is doubtful whether any releases will be made. The District has installed a number of wells to supplement the supply. Mr. Gibson further stated that the wheat situation in the Republican River Basin was good in some places, and not so good in others. The main drought problem has been in the Southwest portion of Kansas, up through the Central part. In general, they have had a fair yield.

Unfinished Business:

There was no business carried over from the previous meeting that had not been concluded.

New Business:

A. Report of Engineering Committee

Mr. M. E. Ball, Engineering Committee Chairman, presented a report of the Engineering Committee. Several recommendations and changes were suggested by Mr. Gibson and the report was amended. After extensive discussion by all parties present, these changes were adopted and Mr. Jones moved that the report of the Engineering Committee be accepted. The motion was seconded by Mr. Gibson and carried unanimously. A copy of that report is attached hereto, and accompanying it are tabulations of the Computed Virgin Water Supply (Exhibit A), and the Computed Annual Consumptive Use (Exhibit B), for the 1973 Water Year.

B. Change in Annual Meeting Date

A brief discussion was held off the record, whereby, all members agreed that the July 1st deadline for the Annual Meeting was too short. After Considering Rule 9 of the Rules and Regulations, it was decided that it should be revised to allow for a deadline

of August 1st, instead of July 1st. Motion was made by Mr. Jones, seconded, and carried unanimously. Whereupon, the Annual Meeting of the Republican River Compact will now be held prior to August 1st of each year.

C. New Committee Formed

Mr. Gibson stated that there have been inquiries as to how the Compact Commission was prepared to handle a shortage of water supply on the river. After some discussion it was agreed that steps should be taken now to deal with the situation, should it ever exist. Mr. Gibson then suggested that a committee could be formed consisting of two members from each state (one member being a member of the Compact Engineering Committee, and the other being an appointed member) to take this matter under advisement and study. This committee would make recommendations to the Compact Commission as to the most equitable division of water, and the best solution possible in the event of shortage of water. This motion was heard and carried unanimously. The Chairman instructed the Compact Administration to give this new committee serious thought so the first meeting could be called.

D. Assignments to the Engineering Committee for the coming year:

1. Compute annual virgin water supply, 1974 water year;
2. Compute annual consumptive use, 1974 water year;
3. Compute adjusted allocations on annual, five-year average and ten-year average basis;
4. Any other special assignment that might be assigned to this committee by the Compact during the coming year.

Motion was made to accept these assignments and was carried unanimously.

E. Reports of Other Agencies

No other agency was represented at this meeting so, no other reports were given.

Election of Chairman:

A motion was made by Mr. Jones that the name of Guy E. Gibson, Official Member from Kansas, be placed in nomination for Chairman for the coming year. The motion was seconded by Mr. Kuiper and carried unanimously.

Adjournment:

Motion was made to close at this time, and carried unanimously. Whereupon, the Fifteenth Annual Meeting of the Republican River Compact Administration was adjourned at 12:30 p.m., June 13, 1974.

Respectfully submitted,

REPUBLICAN RIVER COMPACT ADMINISTRATION

By:


Colorado Member (Chairman)


Nebraska Member


Kansas Member

Report of Engineering Committee
Republican River Compact Administration

June 13, 1974

The Republican River Compact Administration at its 14th annual meeting held June 18, 1973, agreed the assignments to the Engineering Committee would be as follows:

1. Compute annual virgin water supply, 1973 water year;
2. Compute annual consumptive use, 1973 water year;
3. Compute inflow to Lovewell Reservoir and net evaporation of Republican River water stored in Lovewell, 1973 water year;
4. Compute adjusted allocations on annual, five-year average and ten-year average basis;
5. Continue investigations of depletions by wells in the alluvium.

The Engineering Committee held one meeting during the year, May 13-14, 1974, to study the virgin water supply and consumptive use of the water supply 1973. Submitted here and made a part of this report are the following:

1. (Exhibit A) Computed annual virgin water supply Republican River Basin, 1973 water year;
2. (Exhibit B) Computed annual consumptive use Republican River Basin, 1973 water year;
3. Computed inflow to Lovewell Reservoir and net evaporation of Republican River water stored in Lovewell, 1973 water year;
4. Computed adjusted allocations on annual, five-year average and ten-year average basis;
5. Continued investigations of depletions by wells in the alluvium.

It is the recommendation of the Engineering Committee that the computed annual virgin water supply and computed annual consumptive use for the 1973 water year be published in the 14th annual report of the Republican River Compact Administration.

Computations of inflow to Lovewell Reservoir gave a 1973 total inflow of 112,040 Ac. Ft. of which 20,650 Ac. Ft. was diverted from the Republican River. Computed operations of Lovewell Reservoir for 1973 gave a net evaporation loss of 600 Ac. Ft. from the Republican River water. Storage in Lovewell Reservoir at the beginning of the water year was 38,980 Ac. Ft. of which 6,700 Ac. Ft. was water from the Republican River. At the close of the water year, storage in Lovewell was 71,200 Ac. Ft. of which 0.0 Ac. Ft. was water from the Republican River.

The detailed computations of the virgin water supply and consumptive use, the adjusted allocations on an annual basis for 1973, and a five-year and ten-year average basis are available for inspection here at the Fifteenth Annual meeting.

No progress was made on Assignment 5 because of the lack of adequate basic data with respect to stream flow data, ground water levels and ground water extractions.

The following exhibits have been made available to the members of the Compact Administration with the recommendation that they not be published in the Fourteenth Annual Report.

- 10A. Computed Annual Virgin Water Supply, for the 1972 water year and 1973 water year;
- 10B. Adjusted allocations computed on the Basis of Annual Virgin Water Supply, for 1972 water year and 1973 water year;
- 10C. Average Annual Virgin Water Supply for Five-year Running Averages for 1968-1972 and 1969-1973, and Ten-year Running Averages for 1963-1972 and 1964-1973;
- 10D. Adjusted Allocations by Five-year and Ten-year Running Averages for same years as 10C.
- 10E. Computed Annual Consumptive Use by Years, by States for 1972 water year and 1973 water year.

The above computations made by the Engineering Committee followed the procedures of previous years.

Municipal and industrial uses are not included in the virgin water supply computations but, for the record, those available to the Committee are given below:

	<u>1973 Calender Year</u>
City of Norton	540 Ac. Ft.
Midwest Oil Co.	370 Ac. Ft.
L.V.O. Oil Co.	110 Ac. Ft.

Recorded diversions from the North Fork Republican River by the Haigler Canal for 1973 were:

Colorado	1,940 Ac. Ft.
Nebraska	<u>6,000</u> Ac. Ft.
Total	7,940 Ac. Ft.

Other recorded diversions from surface water in Colorado with the exception of the Hale Ditch were:

S. Fk. Republican River	1,820 Ac. Ft.
N. Fk. Republican River	2,880 Ac. Ft.
Arikaree River	0 Ac. Ft.
Beaver Creek	0 Ac. Ft.

Colorado diversions from groundwater were based on an average diversion of 169 Ac. Ft. per well producing from valley alluvium and are shown below in acre-feet:

S. Fk. Republican River	1,010
N. Fk. Republican River	510
Arikaree River	3,720
Beaver Creek	0

Nebraska recorded diversions from surface water by other than major canals are given below in acre-feet:

Frenchman Creek	1,340
Medicine Creek	1,420
Red Willow Creek	480

In other basins in Nebraska, surface water diversions were computed as 1.5 Ac. Ft. per acre intended to be irrigated. The 1.5 Ac. Ft. per acre was based on the following formula:

$$\frac{\text{Nebraska G.W. Diversions-Ac.Ft./Acre}}{\text{Kansas G.W. Diversions - Ac.Ft./Acre}} = \frac{\text{Nebraska S.W. Diversions-Ac.Ft./Acre}}{\text{Kansas S.W. Diversions - Ac.Ft./Acre}}$$
$$\frac{1.32 \text{ Ac.Ft./Acre}}{1.90 \text{ Ac.Ft./Acre}} = \frac{\text{Nebraska S.W. Diversions-Ac.Ft./Acre}}{2.16 \text{ Ac. Ft./Acre}}$$
$$\text{Nebraska S.W. Diversions} = 1.5 \text{ Ac.Ft./Acre}$$

Groundwater diversion rate used for 1973 in Nebraska was 1.3 Ac. Ft. per acre irrigated as determined from reports of irrigators for 10% of wells pumping from the valley alluvium.

Diversions by individual irrigators from alluvial wells and streams in Kansas were estimated on the basis of water use reports from 34% of the water users. Average of all reported diversions in the Republican River Basin in Kansas was 1.95 Ac. Ft./Ac. Average rate of diversion from groundwater was 1.90 Ac. Ft./Ac. and from surface water was 2.16 Ac. Ft./Ac.

Estimated diversions by individuals in Kansas for 1973 are given below in acre-feet:

<u>Sub-basin</u>	<u>Groundwater</u>	<u>Surface Water</u>
Arikaree River	480	0
S. Fk. Republican River	6,130	2,460
Beaver Creek	7,380	3,250
Sappa Creek	8,900	70
Prairie Dog Creek	12,500	2,260
Republican River above Hardy	400	1,040

Return flow percentages were computed for the major canals from data provided by the U. S. Bureau of Reclamation as follows:

<u>Canal</u>	<u>Return as Per Cent of Total Diversions</u>	<u>Canal</u>	<u>Return as Per Cent of Total Diversions</u>
Culbertson	42%	Franklin	53%
Culbertson Ext.	46%	Franklin pump	42%
Mesker-Driftwood	41%	Naponee	42%

<u>Canal</u>	<u>Return as Per Cent of Total Diversions</u>	<u>Canal</u>	<u>Return as Per Cent of Total Diversions</u>
Red Willow	42%	Superior	53%
Cambridge	40%	Courtland-Nebr.	28%
Bartley	35%	Courtland-Kans.	
Almena	46%	above Lovewell	47%
		below Lovewell	47%

Return flow percentages for other canals and diversions were estimated as given below:

Hale Ditch and Haigler Canal	38%
Champion and Riverside Canals	42%
Groundwater and surface water diversions	25%

Computation of return flow from the Courtland Canal in Nebraska is shown below:

<u>Item</u>	<u>Acre-Feet</u>
Courtland Canal-Headgate	50,040
Courtland Canal-Stateline	<u>- 43,970</u>
Total loss in Nebraska	6,070
Direct Supply to Nebraska Lands	<u>- 1,310</u>
Courtland Canal Transportation Loss in Nebraska	4,760
Return Flow Percentage	<u>x 75%</u>
Transportation Loss Returned to River	3,570
Direct Supply Returned to River (1,310 x 28%)	<u>+ 370</u>
Total Return Flow in Nebraska	3,940

In Kansas 61% of the irrigable land above Lovewell was irrigated in 1973 with an average diversion rate of 2.31 Ac. Ft. per acre. Based on this data it was estimated that 1,600 Ac. Ft. were diverted on 694 acres above Hardy and the return flows were 750 Ac. Ft.

Diversion of return flows between tributaries and main stem Republican remained the same percentages as for the 1972 computations and the results are given below:

<u>Canal</u>	<u>Diversions</u>	Return Flows %	<u>Ac. Ft.</u>	Division of Return Flows	
				<u>Frenchman</u>	<u>Main Stem</u>
Champion	2,770	42	1,160	1,160 (100%)	
Riverside	1,610	42	680	680 (100%)	
Culbertson	22,060	42	9,270	7,690 (.83%)	1,580 (17%)
Culbertson Ext.	<u>26,600</u>	46	<u>12,240</u>		<u>12,240 (100%)</u>
Totals	53,040		23,350	9,530	13,820

<u>Canal</u>	<u>Diversions</u>	<u>Return Flows</u>		<u>Division of Return Flows</u>	
		<u>%</u>	<u>Ac. Ft.</u>	<u>Frenchman</u>	<u>Main Stem</u>
Meeker-Driftwood	37,300	41	15,290	3,670 (24%)	11,620 (76%)
Red Willow	10,680	42	4,490	450 (10%)	4,040 (90%)

The 1973 annual virgin water supply was computed using the above together with stream-flow, diversion and reservoir records.

Net evaporation from Harlan County Reservoir was divided (45%) 2,520 Ac. Ft. to Kansas and (55%) 3,090 Ac. Ft. to Nebraska based on total diversions by the canals in each state below Harlan County Reservoir.

Computation of consumptive use in Kansas of water diverted from the main stem Republican River, including prorated shares of net evaporation from Harlan County Reservoir and Courtland Canal transportation loss thru Nebraska was 33,430 Ac. Ft. in the 1973 water year.

Consumptive use to mouths of tributaries in Nebraska were computed. The results are shown below:

Consumptive Use in Nebraska - 1973

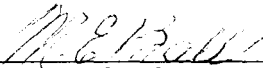
	<u>By Formula</u>	<u>Above Mouth</u>
	<u>Ac. Ft.</u>	<u>Ac. Ft.</u>
Prairie Dog Creek	0	480
Beaver Creek	7,230	9,470
Sappa Creek	7,840	8,040
Medicine Creek	8,990	9,840
S. Fk. Republican River	200	200
Buffalo Creek	1,240	1,240

The Committee computed adjusted allocations for each state based on the computed annual virgin water supply for the 1973 water year, the 1969-73 five-year average and the 1964-73 ten-year average.

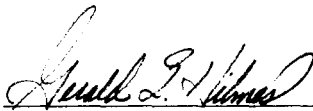
The Engineering Committee discussed the matters of derived virgin water supplies and allocations within the Compact Basin and if given

Compact allocations need be adjusted on basis of past computations.
No recommendations were made by the Engineering Committee concerning
the matter at hand.

Respectfully submitted,



Nebraska



Kansas



Colorado

Computed Annual Virgin Water Supply
Republican River Basin

<u>Drainage Basin</u>	<u>Compact Ac. Ft.</u>	<u>1973 W. Y. Ac. Ft.</u>
Prairie Dog Creek	27,600	16,030
Sappa Creek	21,400	21,040
Beaver Creek	16,500	16,440
Medicine Creek	50,800	41,910
Red Willow Creek	21,900	29,930
Driftwood Creek	7,300	5,230
Frenchman Creek	98,500	120,900
South Fork of the Republican River	57,200	44,220
Rock Creek	11,000	10,310
Buffalo Creek	7,890	5,800
Arikaree River	19,610	19,470
North Fork of the Republican River	44,700	46,910
Main Stem of the Republican plus Blackwood Creek	*94,500	275,620
TOTALS	478,900	653,810
*Main Stem Blackwood Creek	87,700 6,800	

Computed Annual Consumptive Use
Republican River Basin

1973 Water Year

<u>Drainage Basin</u>	<u>Colorado</u>	<u>Kansas</u>	<u>Nebraska</u>	<u>Total</u>
Prairie Dog Creek	-	15,210	480	15,690
Sappa Creek	-	6,730	8,040	14,770
Beaver Creek	0	7,980	9,470	17,450
Medicine Creek	-	-	9,840	9,840
Red Willow	-	-	10,240	10,240
Driftwood	-	0	520	520
Frenchman Creek	-	-	54,580	54,580
South Fork of the Republican River	5,290	6,440	200	11,930
Rock Creek	-	-	100	100
Buffalo Creek	-	-	1,240	1,240
Arikaree River	2,790	360	0	3,150
North Fork of the Republican River	3,740	-	3,720	7,460
Main Stem of the Republican River	-	33,430	146,130	179,560
TOTALS	11,820	70,150	244,560	326,530