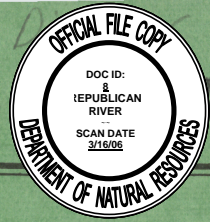


OFFICIAL



EIGHTH ANNUAL REPORT

Republican River
Compact
Administration

For the Year 1967



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Eighth Annual Report
REPUBLICAN RIVER COMPACT ADMINISTRATION

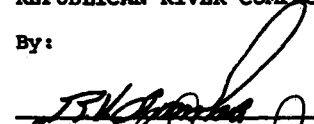
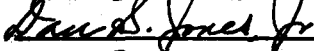

In conformity with the Rules and Regulations of the Republican River Compact Administration, the Eighth Annual Report of the Administration is submitted as follows:

1. Pursuant to Rule 12, as amended, this report covers the period from June 19, 1967, to June 3, 1968.
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:
 - A. Ralph Owens, State Engineer of Colorado
 - Dan S. Jones, Jr., Director, Department of Water Resources, Nebraska
 - R. V. Smrha, Chief Engineer, Division of Water Resources, State Board of Agriculture, Kansas
3. The Ninth Annual Meeting of the Administration was held June 3, 1968, in Room 260, Columbine Building, in Denver, Colorado. Minutes of that 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 a summary tabulation of the computation of virgin water supply for the 1967 water year and a summary tabulation of consumptive use for the 1967 water year were presented to and accepted by the Administration at the Ninth Annual Meeting. Copies of these presentations are included elsewhere in this report.
5. On June 3, 1968, Mr. R. V. Smrha, Kansas Member, was unanimously elected Chairman to serve until the next annual meeting of the Administration.

Respectfully submitted,

REPUBLICAN RIVER COMPACT ADMINISTRATION

By:

 _____	Kansas Member
 _____	Nebraska Member
 _____	Colorado Member (Chairman)

Minutes of the
Ninth Annual Meeting
Republican River Compact Administration

Denver, Colorado -- June 3, 1968

The meeting was called to order by the Chairman, A. Ralph Owens, at 9:30 A.M., in Room 260, Columbine Building, 1845 Sherman Street, Denver, Colorado.

The following were in attendance:

<u>Name</u>	<u>Agency</u>	<u>Location</u>
A. Ralph Owens	Official Member	Denver, Colorado
P. V. Smrha	Official Member	Topeka, Kansas
Dan S. Jones	Official Member	Lincoln, Nebraska
Marion Ball	Nebr. Water Resources	Lincoln, Nebraska
Harris L. Mackey	Kans. Div. of Water Res.	Topeka, Kansas
Glen Brees	Colo. Water Resources	Denver, Colorado
William R. Smith	Colo. Water Resources	Denver, Colorado
Harlan Erker	Colo. Water Resources	Denver, Colorado
William Mattern	Colo. Water Resources	Denver, Colorado
Clarence Kuiper	Colo. Water Cons. Board	Denver, Colorado
Stanley Miller	Colo. Water Cons. Board	Denver, Colorado

The Chairman stated that this meeting constitutes the regular annual meeting of the Administration in accordance with the Rules and Regulations which provide that such meeting be held in March or April of each year. Due to conflicts, all members agreed that the meeting could be held in June this year.

1. Approval of Minutes of Eighth Annual Meeting.

Mr. Jones noted the minutes of the Eighth Annual Meeting had been previously approved by each member through correspondence and moved that they be approved as published in the Seventh Annual Report. The motion was seconded by Mr. Smrha and passed unanimously.

2. Report of the Chairman.

No official action was taken during the year other than the calling of the annual meeting. The Chairman noted that under the Haigler Canal he had questioned the irrigated acreage in Colorado

and Nebraska and was surprised to find it to be much smaller than he had anticipated.

3. Reports of the Official Members or Representatives.

Neither Mr. Smrha nor Mr. Jones had any report from their states.

4. Unfinished Business.

There was no unfinished business other than the continuing assignments to the Engineering Committee.

5. New Business.

A. Report of the Engineering Committee: Mr. M. E. Ball, Chairman, presented a report of the Engineering Committee. A copy of that report is attached hereto as Exhibit "A". Accompanying the report are Exhibits "B" and "C", tabulations of the Computed Virgin Water Supply, and the Computed Annual Consumptive Use for the 1967 Water Year, respectively. Mr. Harris Mackey, the Kansas member of the Engineering Committee, discussed the various exhibits in the report and explained their preparation. Mr. Mackey advised the Administration that operations of the Lovewell Reservoir were computed, since gauging of the direct inflow from either the tributaries or White Rock Creek directly could not be accomplished. He further elaborated that on consumptive use calculations the formulas were used with some minor variations.

Mr. Mackey next advised the members that allocations of virgin water supply under the Compact were again determined with two different computations: one using an annual virgin water supply and the other on a five-year moving average adjustment.

Mr. Ball advised the Administration that Assignment 6, "Continue investigation of depletions by wells in the alluvium and the effect of well distance from a stream on those depletions,"

should perhaps be restated or reevaluated for greater significance. Following considerable discussion on the matter, the members of the Engineering Committee were advised by the Administration to have assistants, hydrologists or ground water geologists from either State or Federal Agencies who could assist in this assignment, accompany them at the next meeting of the Committee. Mr. Ball, on behalf of the Engineering Committee, accepted the recommendations of the Administration with regard to Assignment 6.

Mr. Glen Brees, the Colorado member of the Engineering Committee, commented on use of the state line gauge on the Haigler Canal in making computations of the amount of water delivered to Nebraska. He stated that the gauge was submerged most of the time; but, by figuring the percent of submergence and adjusting accordingly, he felt the Committee was able to come up with fairly accurate answers on delivery. It was moved and unanimously agreed that the report of the Engineering Committee be accepted with commendation for an excellent job.

B. Nelson Buck Project: No representatives were present from the U. S. Bureau of Reclamation.

The Kansas and Nebraska members of the Administration each reported that they had submitted comments on subject report and had no further comments at this time. Both agreed to furnish copies of their comments to Colorado.

C. Report from U. S. Geological Survey on Progress of Return Flow Studies: Mr. Ball advised that Mr. Kenneth MacKichan of the U. S. Geological Survey was unable to attend the meeting and Mr. Ball presented seepage data from the Survey's investigation, for river

runs or seepage returns that were made by the Survey in November, 1967 and March, 1968. Mr. Ball explained the calculations and advised of the basis for minor differences. He further explained how the analysis at the bottom of the sheet rationalized the differences which occurred.

The members of the Administration expressed their appreciation to the U. S. Geological Survey, Mr. Kenneth MacKichan, District Chief, Lincoln District, for the Survey's excellent cooperation in the past and requested that any additional return flow, seepage, or other informative studies made by the Survey be presented to the Administration at the next annual meeting.

6. Engineering Committee Assignments.

The Administration agreed to continue previous assignments to the Engineering Committee with one new assignment. These assignments are as follows:

1. Compute annual virgin water supply for 1968;
2. Compute annual consumptive use for 1968;
3. Continue studies of method of computing inflow to Lovewell Reservoir;
4. Continue study of proration of reservoir evaporation losses;
5. Compute adjusted allocations on annual, 5-year and average annual basis;
6. Continue investigation of depletions by wells in the alluvium and the effect of well distance from a stream on those depletions (see text of minutes for recommendation);

7. Explore the need for modifying Annual Virgin Water Supply and Consumptive Use Formulas to include municipal and industrial diversions from ground water and surface water;
8. Review procedures and formulas used by Engineering Committee and present such recommendations as are in order to the next meeting of the Administration.

7. Election of Chairman.

Mr. R. V. Smrha, Kansas member, was unanimously elected Chairman for the ensuing year.

8. Adjournment.

On motion of Mr. Jones, the meeting was adjourned at 11:25 A. M.


A. Ralph Owens
Chairman

Report of Engineering Committee
Republican River Compact Administration
June 3, 1968

The Republican River Compact Administration in its 8th annual meeting held June 19, 1967, agreed that the assignments to the Engineering Committee would include the following:

1. Compute annual virgin water supply for 1967;
2. Compute annual consumptive use for 1967;
3. Continue studies of method of computing inflow to Lovewell Reservoir;
4. Continue study of the proration of reservoir evaporation losses;
5. Compute adjusted allocations on annual, 5-year and average annual basis;
6. Continue investigation of depletions by wells in the alluvium and the effect of well distance from a stream on those depletions.
7. Explore the need for modifying Annual Virgin Water Supply and Consumptive Use Formulas to include municipal and industrial diversions from ground water and surface water.

The Engineering Committee held one meeting during the year; April 25-26, 1968, the 14th meeting of the Committee, to study these assignments. Submitted herewith and made a part of this report.

1. Computed Annual Virgin Water Supply, Republican River Basin, 1967
2. Computed Annual Consumptive Use, Republican River Basin, 1967.

The virgin flow and consumptive use formulas, presented in previous reports of the Committee, were used without change in the preparation of the above data. The following exhibits are presented for discussions without recommendations.

1. Virgin water supply computations, 1967 water year;
2. Computations of inflow to Lovewell Reservoir, 1967 water year;
3. Computed operations of Lovewell Reservoir, 1967 water year;
4. Consumptive use computations, Main Stem Republican River;
5. Computations of adjusted allocations, 1967 water year;
6. Adjusted allocations on a 5-year average basis, 1962 through 1967.

The 14th meeting of the Engineering Committee was attended only by members of the Committee.

No new investigations were made by the Committee concerning assignment Number 6 concerning depletion by wells and consequently no new data is furnished in this report. Assignment Number 7 suggested that the Committee explore the need for modifying the annual virgin water supply and consumptive use formulas to include municipal and industrial diversions.

The Committee decided since such diversions for which the Committee had records were relatively small that they would not be included in the 1967 computations. Listed below are the diversions available to the Committee:

	<u>Calendar Year</u>
City of Norton	609.0 Acre-Feet
Midwest Oil Co.	945.5 Acre-Feet
Livingston Oil Co.	30.5 Acre-Feet

Last year, bank storage loss studies in Hugh-Butler Lake on Red Willow Creek and in Norton Reservoir on Prairie Dog Creek showed substantial losses in each of these reservoirs which were included in the consumptive use studies in 1966.

Continued bank storage computations revealed a gain of 3540 acre-feet at Hugh-Butler Reservoir and a gain of 2730 acre-feet at Norton Reservoir. These gains will be reflected in the change in reservoir storage so no further accounting of this factor is necessary for 1967.

The Committee agreed to compute the diversions by the three States using the same formulas as have been used in the past.

Diversions from wells and individual irrigators in Kansas were estimated on the basis of water use reports from about 44% of the water users. The average of all reported diversions in Kansas was 1.5 acre-feet/acre overall; 1.6 acre-feet/acre for ground water alluvium and 1.25 acre-feet/acre for surface water diversions. Diversions in Nebraska by small stream pumps were assumed equal to the diversions from surface water in Kansas, or 1.25 acre-feet/acre with the following exception. The diversions in acre-feet were available for the following Nebraska streams:

Frenchman Creek	3770 Acre-Feet
Medicine Creek	750 Acre-Feet
Red Willow Creek	260 Acre-Feet

Records of diversions from surface water by the irrigation districts were available and the return flow for each of the canal systems was computed independently.

The diversions in Nebraska from ground water were computed as 0.9 acre-feet/acre for all irrigated acres irrigated in the valley alluvium, based on a sampling of use of water from irrigation wells made by Nebraska. Recorded diversions from surface water in Colorado were 2210 acre-feet from the South Fork of the Republican River and 3400 acre-feet from the North Fork of the Republican River. There were no recorded surface water diversions for the Arikaree and Beaver Creeks in Colorado. Again all ground water diversions in Colorado were assumed to be from upland wells.

Last year's report pointed out a difficulty in the measurements of water for the Haigler Canal at the headgate and at the gaging station at the State Line. Numerous measurements were made during the year at the State Line Station of the Haigler Canal and there allowed a reasonable determination of the diversions.

Colorado	3,810 Acre-Feet
Nebraska	<u>7,330 Acre-Feet</u>
Total	11,140 Acre-Feet

The return flow percentage for the Hale Ditch and the Haigler Canal were held at 38% and from other diversions at 25%.

Consumptive use in each State was computed and the results tabulated. Based on total diversions for the canals below Harlan County Reservoir, Kansas was charged with 61% and Nebraska 39% of that reservoir's only evaporation.

Consumptive use of the Courtland Canal transportation loss through Nebraska was divided between Nebraska and Kansas on the basis of the diversions.

Courtland Canal	Acre-Feet
Transportation Loss	5,510
Return to river	<u>4,130</u>
Transportation Consumptive Use	1,380

Since state line flows were 92% of total headgate diversions

Kansas Transportation consumptive use	= 92% x 1380
	= 1,270 acre-feet
Nebraska Transportation consumptive use	= 1,380 - 1,270
	= 110 acre-feet

Consumptive use by Nebraska from the Courtland Canal as computed from the monthly distribution form was used rather than data shown on the virgin water supply computation form. For 1967 this consumptive use was 1240 acre-feet, making a total of 1350 acre-feet including transportation loss.

It was noted that the consumptive use formulas should be revised on this basis some time in the future.

The U.S. Geological Survey supervised two seepage run studies during the past winter season to determine the pickup in the Republican River between Culbertson and Cambridge, Nebraska. These studies were made in November, 1967 and March, 1968. The discharge data has been tabulated and will be presented by the Chairman of the Engineering Committee at this meeting on behalf of the U.S. Geological Survey.

A concluding report summarizing the results of these two seepage runs has been prepared by the U.S. Geological Survey and it is intended that additional runs will probably be made next fall. The Chairman of the Engineering Committee will present the tabular data to the administration at this meeting for observation and discussion. The Engineering Committee has not had an opportunity to study or draw any conclusions from this data.

Respectfully submitted,

M. E. Ball
Nebraska

Harris J. Madson
Kansas

Glen E. Beer
Colorado

Computed Annual Consumptive Use
Republican River Basin

1967 Water Year

Drainage Basin	Colorado	Kansas	Nebraska	Total
Prairie Dog Creek	-	14,270	0	14,270
Sappa Creek	-	4,670	8,520	13,190
Beaver Creek	0	7,540	4,040	11,580
Medicine Creek	-	-	5,890	5,890
Red Willow Creek	-	-	9,210	9,210
Driftwood Creek	-	0	320	320
Frenchman Creek	-	-	42,560	42,560
South Fork of the Republican River	9,340	3,170	120	12,630
Rock Creek	-	-	120	120
Buffalo Creek	-	-	610	610
Arikaree River	0	150	0	150
North Fork of the Republican River	4,910	-	4,550	9,460
Main Stem of the Republican River	-	59,970	116,840	176,810
TOTALS	14,250	89,770	192,780	296,800

Computed Annual Virgin Water Supply
Republican River Basin

Drainage Basin	Compact Ac. Ft.	1967 W.Y. Ac. Ft.
Prairie Dog Creek	27,600	30,910
Sappa Creek	21,400	52,590
Beaver Creek	16,500	20,380
Medicine Creek	50,800	70,370
Red Willow Creek	21,900	35,280
Driftwood Creek	7,300	1,980
Frenchman Creek	98,500	137,750
South Fork of the Republican River	57,200	40,080
Rock Creek	11,000	10,500
Buffalo Creek	7,890	5,900
Arikaree River	19,610	13,180
North Fork of the Republican River	44,700	45,820
Main Stem of the Republican plus Blackwood Creek	*94,500	277,800
Totals	478,900	742,540
 *Main Stem Blackwood Creek	 87,700 6,800	