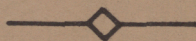


NINTH ANNUAL REPORT

**Republican River
Compact
Administration**

For the Year 1968



TOPEKA, KANSAS

June 30, 1969

NINTH ANNUAL REPORT

**Republican River
Compact
Administration**

For the Year 1968



TOPEKA, KANSAS

June 30, 1969

Ninth Annual Report

REPUBLICAN RIVER COMPACT ADMINISTRATION

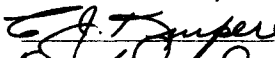
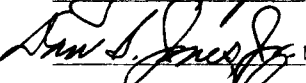

In conformity with the Rules and Regulations of the Republican River Compact Administration, the Ninth Annual Report of the Administration is submitted as follows:

1. Pursuant to Rule 12, as amended, this report covers the period June 4, 1968, to June 30, 1969.
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
(June 4, 1968, to January 31, 1969)
 - C. J. Kuiper, State Engineer of Colorado
(February 1, 1969, to June 30, 1969)
 - 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 Tenth Annual Meeting of the Administration was held on June 30, 1969, in the State Office Building, Topeka, Kansas. Minutes of the meeting are included in this report.
4. During the period covered by this report, two meetings of the Engineering Committee were held. A report from that Committee together with summary tabulations of the computed annual virgin water supply and consumptive use for the 1968 water year in the Republican River Basin were presented to and accepted by the Administration at the Tenth Annual Meeting. Copies of these presentations are included elsewhere in this report.
5. On June 30, 1969, Mr. R. V. Smrha, Kansas Member of the Administration, was elected Chairman to serve until the next annual meeting of the Administration.

Respectfully submitted,

REPUBLICAN RIVER COMPACT ADMINISTRATION

By:

 Colorado Member
 Nebraska Member
 Kansas Member
(Chairman)

Minutes of the
Tenth Annual Meeting

Republican River Compact Administration

Topeka, Kansas - June 30, 1969

The meeting was called to order by the Chairman, R. V. Smrha, at 10:00 a.m., in Room 1031-S, State Office Building, Topeka, Kansas.

The following were in attendance:

<u>Name</u>	<u>Agency</u>	<u>Location</u>
R. V. Smrha	Official Member	Topeka, Kansas
William R. Smith	Personal Representative of Colorado Member	Denver, Colorado
M. E. Ball	Personal Representative of Nebraska Member	Lincoln, Nebraska
Glen E. Brees	Colorado Water Resources	Denver, Colorado
Harlan W. Erker	Colorado Water Resources	Denver, Colorado
Donald H. Hamburg	Colorado Water Resources	Denver, Colorado
J. R. Carter	U. S. Geological Survey	Lawrence, Kansas
H. L. Mackey	Kansas Division of Water Resources	Topeka, Kansas

The Chairman stated that the Rules and Regulations provide the regular annual meeting of the Administration shall be held during March or April but such a meeting had been adjourned to this date so that the Engineering Committee could complete its assignments.

The Chairman noted that Mr. A. Ralph Owens, Official Member for Colorado had retired and Mr. C. J. Kuiper had been appointed to the office of Colorado State Engineer, effective February 1, 1969. The Chairman asked that evidence of Mr. Kuiper's appointment be provided for the record. Subsequent to this meeting a letter was received from the Honorable John A. Love, Governor of Colorado, certifying Mr. Kuiper's appointment to the position of State Engineer for the State of Colorado and designating Mr. Kuiper as Official Member for Colorado on the Administration. This letter is attached to these minutes as Exhibit "A".

Recognition of Personal Representatives:

Letters from Mr. C. J. Kuiper designating Mr. William R. Smith as his Personal Representative and from Mr. Dan S. Jones, Jr., designating Mr. M. E. Ball as his Personal Representative were presented and accepted by the Administration. These letters are attached as Exhibits "B" and "C" respectively.

Approval of the Minutes of Previous Meeting:

Mr. Smith noted that the minutes of the Ninth Annual Meeting had been previously approved by each member by correspondence and moved that the Administration approve the Eighth Annual Report which included the Minutes of the Ninth Annual Meeting. The motion was seconded by Mr. Ball and was passed unanimously.

Report of the Chairman:

The Chairman stated that no assignment had been given to the Chairman so he had no report to make at this time.

Mr. Smrha noted that while the Rules and Regulations do not provide specifically for copies of the proceedings of the Administration be sent to the President of the United States, he believed this would be desirable since the Federal Government is not officially represented on the Administration.

It was agreed by the Administration that a set of Annual Reports to date should be sent to the President by way of the Bureau of the Budget and a copy of each future Annual Report be sent when published.

Reports of Personal Representatives:

Mr. Smith reported that copies of the Seventh and Eighth Annual Reports had been distributed to interested State and Federal Agencies.

Mr. Ball had no report to present for Mr. Jones.

Unfinished Business:

Mr. Ball stated that he would make a brief report for Mr. K. A. MacKichan, District Chief, WRD, U. S. Geological Survey, Lincoln, on the series of seepage runs made along the Republican River between Culbertson and Cambridge, Nebraska. These seepage investigations were made to provide background information for possible future return flow studies on that reach of the river.

Mr. Ball reported that four seepage runs have been made to date with results summarized below:

<u>Date of Run</u>	<u>Unaccounted Inflow</u>
November 1967	2.89 c.f.s.
March 1968	2.59 c.f.s.
November 1968	7.79 c.f.s.
April 1969	47.90 c.f.s.

He said it was the conclusion of Mr. MacKichan that the large gain shown by the last seepage run was mainly spills from the canals in which the first diversions for the year coincided with the seepage run and that the increase did not indicate a trend in return flows from irrigated lands.

Mr. Ball moved that the Administration request Mr. MacKichan continue seepage investigations in the Culbertson-Cambridge reach of the Republican River. The motion was seconded by Mr. Smith and passed on vote of the Administration.

The Chairman asked that the record show the Administration's appreciation of the efforts of Mr. MacKichan and the U. S. Geological Survey in obtaining the seepage run data presented to the Administration in the past.

New Business:

The Chairman stated that the Rules and Regulations provide for a regular annual meeting during the months of March or April. These meetings are held upon the call of the Chairman but are dependent upon the availability of data that are used in computations by the Engineering Committee. In some years that data has been delayed so he felt it would be appropriate to extend the time in which an annual meeting could be held. Mr. Smith and Mr. Ball agreed this would be desirable.

Mr. Smith moved that Rule 9 of the Rules and Regulations as published in the First Annual Report and amended on March 30, 1960, be further amended to read:

"A regular annual meeting of the Administration shall be held upon the call of the Chairman prior to July 1 each year."

The motion was seconded by Mr. Ball and passed unanimously.

Mr. Smrha suggested that since this was the Tenth Annual Meeting it might be desirable to republish the Amended Rules and Regulations of the Administration. During discussion of this suggestion, it was pointed out that some of the Formulas for the Computation of Annual Virgin Water Supply as published in the First Annual Report and Formulas for the Computation of Annual Consumptive Use as published in the Fourth Annual Report have also been amended or revised. Since the last two items had not been fully reviewed by the Engineering Committee, it was agreed to republish all three in the Tenth Annual Report following the next annual meeting of the Administration.

Mr. M. E. Ball, Chairman of the Engineering Committee, presented the report of that committee to the Administration. That report, including the tabulations (1) the computed annual virgin water supply and (2) the computed annual consumptive use for the 1968 water year in the Republican River Basin, is attached as Exhibit "D".

Mr. Ball reported the Engineering Committee met in Denver, Colorado, on October 29, 1968, to study assignment No. 6-- "Continue investigations of depletions by wells in the alluvium and the effects of well distance from a stream on those depletions". The meeting was also attended by members of the U. S. Bureau of Reclamation and the Colorado Division of Water Resources. It was the consensus of the group that any improvement

of present computation procedures would require the collection of more accurate data on pumping rates, annual quantities and return flows and it was questioned whether the cost to obtain this information could be justified. It was also agreed that results of a research project on a relatively small area probably could not be applied to the entire basin due to differences in geology, concentration of wells and aquifer characteristics.

Mr. Ball also reported that, except for Harlan County Reservoir, the Committee had not decided on a method to prorate net evaporation losses from reservoirs in the Republican River Basin. Proration of these losses probably should be based on benefits derived but no satisfactory method to compute these benefits had been found.

Mr. Mackey presented computations of the Engineering Committee for annual virgin water supply and annual consumptive use in the Basin in 1968 together with computations that showed adjusted allocations to each State if adjusted on an annual, five-year average or 10-year average basis.

Upon the motion of Mr. Smith, the Administration accepted the report of the Engineering Committee and agreed to publish the summaries of the computations of annual virgin water supply and annual consumptive use for the 1968 water year which were attached to the Engineering Committee Report.

The Administration gave the following assignments to the Engineering Committee for the coming year:

1. Compute annual virgin water supply, 1969 water year;
2. Compute annual consumptive use, 1969 water year;
3. Compute inflow to Lovewell Reservoir and net evaporation of Republican River water stored in Lovewell, 1969 water year;
4. Continue study of proration of net evaporation losses from all reservoirs in the basin and possible effect upon consumptive use by each State;
5. Compute adjusted allocations on annual, five-year average and ten-year average basis;
6. Continue investigations of depletions by wells in the alluvium;
7. Bring up to date in form for publication the procedures and formulas used by the Engineering Committee for the computation of annual virgin water supply and annual consumptive use.

Mr. Hamburg discussed recent changes in Colorado water laws and stated there were now six ground-water management districts in operation and thought there was a very good possibility that these districts would be able to provide the States and the Administration with worthwhile information and data. Mr. Smrha stated he thought the ground-water management district approach had great potential and that Kansas had enacted legislation outlining the procedure for organizing such districts.

Election of Chairman:

Mr. R. V. Smrha, Official Member from Kansas, was re-elected to serve as Chairman of the Administration until the next annual meeting.

Adjournment:

The Tenth Annual Meeting of the Administration was adjourned at 3:15 p.m., June 30, 1969.



R. V. Smrha, Chairman

EXHIBIT A



State of Colorado

EXECUTIVE CHAMBERS

DENVER

JOHN A. LOVE
Governor

July 10, 1969

Mr. R. V. Smrha
Chairman, 1969 Republican River Compact
Division of Water Resources
State Office Building, 1026-S
Topeka, Kansas 66612

Dear Mr. Smrha:

It is my pleasure to inform you that effective February 1, 1969, Mr. C. J. Kuiper was certified to the position of State Engineer for the State of Colorado.

Article 9 of the Republican River Compact states, among other things, that it shall be the duty of the three states to administer this Compact through the official in each state who is now or hereafter charged with the duty of administering public water supplies. Under his appointment, set forth above, Mr. Kuiper is charged with this duty and is, therefore, the Administrator for Colorado for the Republican River Compact.

Sincerely,

A handwritten signature in cursive script that reads "John A. Love".

John A. Love

JAL:tte:m

JOHN A. LOVE
Governor



C. J. KUIPER
State Engineer

EXHIBIT B

DIVISION OF WATER RESOURCES

101 COLUMBINE BUILDING
1845 SHERMAN STREET
DENVER, COLORADO 80203

June 20, 1969

Mr. Harris L. Mackey
Division of Water Resources
1026-S State Office Building
Topeka, Kansas 66612

Dear Mr. Mackey:

In regard to your June 6, 1969 letter confirming the annual meeting of the Republican River Compact Administration in Topeka, Kansas on Monday, June 30, 1969.

I regret that I shall be unable to attend this meeting due to other commitments. Mr. William Smith, Deputy State Engineer for the State of Colorado, will attend this meeting and act in my absence.

I especially regret not being able to attend this meeting since this is the first Compact Administration Meeting since I have accepted the job as State Engineer, and was looking forward to becoming acquainted with the other commissioners and their staffs. I am looking forward to meeting them all in the near future.

Sincerely,


C. J. Kuiper
State Engineer

CJK/dhe

cc: Dan S. Jones, Jr.

DEPARTMENT OF WATER RESOURCES
Dan S. Jones, Jr.
Director

Irrigation, Water
Power and Drainage
Registration of Wells

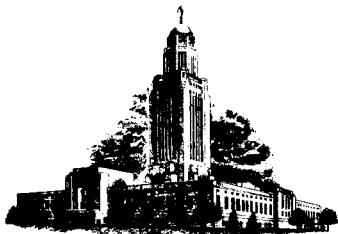


EXHIBIT C

State of Nebraska

NORBERT T. TIEMANN, Governor
P. O. Box 94607
LINCOLN 68509

IN REPLY REFER TO

June 30, 1969

Mr. R. V. Smrha, Chairman
Republican River Compact Administration
Division of Water Resources
1026-S State Office Building
Topeka, Kansas 66612

Dear Mr. Smrha:

I shall be unable to attend the annual meeting of the Republican River Compact Administration to be held in Topeka, Kansas on June 30, 1969; and, I hereby appoint Mr. M. E. Ball to serve as my personal representative in that meeting.

Sincerely yours,

A handwritten signature in cursive script, reading "Dan S. Jones, Jr.".

Dan S. Jones, Jr.
Nebraska Member
Republican River Compact Administration

DSJ:crb

Report of Engineering Committee
Republican River Compact Administration
June 30, 1969

The Republican River Compact Administration at its 9th annual meeting held June 3, 1968, agreed the assignments to the Engineering Committee would include the following:

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 10-year 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;
8. Review procedures and formulas used by Engineering Committee and present such recommendations as are in order to the next meeting of the Administration.

The Engineering Committee held two meetings during the year; October 29, 1968 the 15th meeting of the Committee to study assignment number 6 and May 19 - 20, 1969, to study the other assignments. Submitted herewith and made a part of this report are the following:

1. Computed annual virgin water supply, Republican River Basin, 1968.
2. Computed annual consumptive use, Republican River Basin, 1968.

The virgin flow and consumptive use formulas presented in the previous reports of the Committee were used with only minor changes

in the preparation of the above data. The following exhibits are presented for discussion without recommendations:

1. Virgin water supply computations, 1968 water year.
2. Computed annual computations of flow to Lovewell Reservoir, 1968 water year.
3. Computed operations of Lovewell Reservoir.
4. Consumptive use computations-Kansas, main stem of the Republican River.
5. Computations of adjusted allocations, 1968 water year.
6. Adjusted allocations on a 5-year average basis, 1962-1968.
7. Adjusted allocations on a 10-year average basis, 1959-1968.
- 8A. Computed annual virgin water supply, 1959-1968.
- 8B. Allocations in acre-feet, 1959-1968, adjusted per annual virgin water supply.
- 8C. Average-annual virgin water supply, 5-year average and 10-year average.
- 8D. Allocations in acre-feet adjusted by 5-year averages and by 10-year average, 1959-1968.
- 8E. Computed annual consumptive use by states, 1959-1968.

The 15th meeting of the Engineering Committee was attended by Jesse Honnold, Charles Huntly, Ray Aldrich of the Bureau of Reclamation, Harland Erker of the Colorado Division of Water Resources and by members of the Engineering Committee. As heretofore stated, the purpose of the meeting was to "continue investigations of depletions by wells in the alluvium and the effects of well distance from a stream on those depletions.

It was the consensus of the group that improvement of present computation procedures or additional studies by use of analog or computer models would require the collection of more accurate basic data on pumping rates, annual quantities and return flows. While theoretical studies possibly could give a range of values, they could not give a true answer for any one year. It was questioned whether the cost to improve present methods by collecting all the data needed could be justified. It was also questioned whether the results of a research project on a relatively small area could be applied to the entire basin due to differences in geology, concentration of wells and aquifer characteristics.

These conclusions are presented to the Administration for consideration without recommendations by the Engineering Committee.

No progress has been made by the Engineering Committee on assignment numbers 7 and 8. The Committee's conclusion was the same as for last year concerning the modification of the virgin water supply and consumptive use formulas to not include municipal and industrial diversions.

Listed below are the diversions available to the Committee.

1968 Calendar year

City of Norton	686 acre-feet
Midwest Oil Co.	664 acre-feet
Livingston Oil Co.	36 acre-feet

Information was available for the diversions for the Haigler Canal between Colorado and Nebraska for 1968 as follows:

Colorado	3,390 acre-feet
Nebraska	7,560 acre-feet

The Committee agreed to compute the diversions for the three states using the same formulas as had been used in the past, with exceptions as noted.

Diversion by individual irrigators from alluvial wells or streams in Kansas were estimated on the basis of water use reports from 51 percent of the water users. The average of all reported diversion in the Republican Basin in Kansas was 1.58 acre-feet per acre overall, 1.63 acre-feet per acre per groundwater alluvium and 1.39 acre-feet per acre for surface water diversions.

In Nebraska surface water diversions were computed at 1.4 acre-feet per acre shown as intended to be irrigated. Groundwater diversion rates used for 1968, based on a sample of use of water from irrigation wells by Nebraska was 1.6 acre-feet per acre. The diversions of surface water by stream pumps in the north side tributaries were:

Frenchman Creek	4,510 acre feet
Medicine Creek	910 acre-feet
Red Willow Creek	490 acre-feet

Recorded diversions from surface water in Colorado were 2,830 acre feet from the North Fork Republican River. There were no recorded surface water diversions from the Arikaree River and Beaver Creek in Colorado. All groundwater diversions in Colorado were assumed to be from upland wells and so were not included in the computations.

Consumptive use in each state was computed and the results tabulated. Return flow percentages were computed for the major

canals from data supplied by the U. S. Bureau of Reclamation. The return flow percentages for the Hale Ditch and Haigler Canal were held at 38 percent and from other diversions at 25 percent. For the first time, two canals, Champion and Riverside, which divert from the Frenchman River, had recorded diversions to be included in the computations of canals. Return flow percentages were assumed the same as for the Culbertson Canal or 38 percent, and for both the return flows were a Tributary to Frenchman River.

The annual virgin water supply and the consumptive use in each state was computed and the results are shown in attached Exhibits. Based on water diversions by canals below Harlan County Reservoir, Kansas was charged 57 percent (18,880 acre-feet) and Nebraska 43 percent (14,240 acre-feet) of that reservoirs net evaporation.

Except for Harlan County, the Engineering Committee has done nothing toward the proration of net evaporation losses from reservoirs from the Republican River Basin. Since this has been an assignment of the Engineering Committee (assignment number 4) the Committee decided to report these to the Administration for further instructions. As a matter of information, there is given below computed total net evaporation from all reservoirs as compared with that from Harlan County Reservoir, which, on the average, accounts for about 48 percent of the total.

Annual Net Evaporation in Basin in Acre-Feet

<u>Year</u>	<u>Total</u>	<u>Harlan County</u>
1959	60,130	30,070
1960	47,320	20,550
1961	41,870	18,100
1962	36,390	18,010
1963	64,340	32,020
1964	76,080	38,870
1965	25,000	7,660
1966	68,110	36,160
1967	53,580	26,670
1968	75,180	33,120
Average	54,800	26,220

The U. S. Geological Survey supervised two additional seepage runs during the past water year to determine the pickup in the Republican River between Culbertson and Cambridge, Nebraska. These seepage runs were made in November 1968 and March 1969. 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. The Engineering Committee has not had an opportunity to study or draw any conclusions from this data.

Respectfully submitted,

M. E. Ball
Nebraska

H. L. Mackey
Kansas

Glen E. Breen
Colorado

Republican River Compact Administration
June 30, 1969

Computed Annual Virgin Water Supply
Republican River Basin

Drainage Basin	Compact Ac. Ft.	1968 W.Y. Ac. Ft.
Prairie Dog Creek	27,600	17,920
Sappa Creek	21,400	29,380
Beaver Creek	16,500	15,630
Medicine Creek	50,800	51,580
Red Willow Creek	21,900	24,460
Driftwood Creek	7,300	4,290
Frenchman Creek	98,500	127,130
South Fork of the Republican River	57,200	30,830
Rock Creek	11,000	9,720
Buffalo Creek	7,890	5,050
Arikaree River	19,610	8,080
North Fork of the Republican River	44,700	45,700
Main Stem of the Republican plus Blackwood Creek	*94,500	132,400
Totals	478,900	502,170
*Main Stem Blackwood Creek	87,700 6,800	

Republican River Compact Administration
June 30, 1969

Computed Annual Consumptive Use
Republican River Basin

1968 Water Year

Drainage Basin	Colorado	Kansas	Nebraska	Total
Prairie Dog Creek	-	19,980	0	19,980
Sappa Creek	-	5,340	11,920	17,260
Beaver Creek	0	5,890	7,050	12,940
Medicine Creek	-	-	11,420	11,420
Red Willow Creek	-	-	13,910	13,910
Driftwood Creek	-	0	560	560
Frenchman Creek	-	-	62,730	62,730
South Fork of the Republican River	10,970	3,240	220	14,430
Rock Creek	-	-	140	140
Buffalo Creek	-	-	440	440
Arikaree River	0	60	0	60
North Fork of the Republican River	5,000	-	4,690	9,690
Main Stem of the Republican River	-	57,350	164,090	221,440
TOTALS	15,970	91,860	277,170	385,000