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ELEVENTH ANNUAL REPORT

Republican River  
Compact  
Administration

For the Year 1970

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LINCOLN, NEBRASKA  
June 4, 1971

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Eleventh Annual Report

REPUBLICAN RIVER COMPACT ADMINISTRATION

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


1. Pursuant to Rule 12, as amended, this report covers the period from May 26, 1970, to June 4, 1971.
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
  - R. V. Smrha, Chief Engineer, Division of Water Resources, State Board of Agriculture, Kansas
3. The Twelfth Annual Meeting of the Administration was held on June 4, 1971, in Room 2414 of the State Capitol Building, Lincoln, Nebraska. 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 consumptive use for the 1970 water year in the Republican River Basin were presented to and accepted by the Administration at the Twelfth Annual Meeting. Copies of these presentations are included elsewhere in this report.

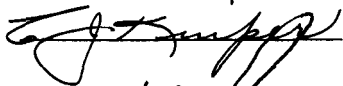
5. On June 4, 1971, Mr. Dan S. Jones, Jr., Nebraska member of the administration, was reelected Chairman to serve until the next annual meeting of the Administration.

Respectfully submitted,

REPUBLICAN RIVER COMPACT ADMINISTRATION

By:

  
\_\_\_\_\_  
Nebraska Member  
(Chairman)

  
\_\_\_\_\_  
Colorado Member

  
\_\_\_\_\_  
Kansas Member

Minutes of the  
Twelfth Annual Meeting

Republican River Compact Administration

Lincoln, Nebraska - June 4, 1971

The meeting was called to order by Dan S. Jones, Jr., Chairman,  
at 9:00 A.M., Room 2414, State Capitol Building, Lincoln, Nebraska.

The following were in attendance:

<u>Name</u>	<u>Agency</u>	<u>Location</u>
Dan S. Jones, Jr.	Official Member	Lincoln, Nebraska
R. V. Smrha	Official Member	Topeka, Kansas
C. J. Kuiper	Official Member	Denver, Colorado
M. E. Ball	Chairman, Engineering Committee	Lincoln, Nebraska
Harris L. Mackey	Engineering Committee	Topeka, Kansas
Glen E. Brees	Engineering Committee	Denver, Colorado
K. A. MacKichan	U.S. Geological Survey	Lincoln, Nebraska
Ray E. Aldrich	U.S. Bureau of Reclama- tion	McCook, Nebraska
Robert F. Bishop	Nebraska Department of Water Resources	Lincoln, Nebraska

Approval of the Minutes of Previous Meeting:

The minutes of the Eleventh Annual Meeting, as published in the Tenth Annual Report, had been previously signed and approved by correspondence. Mr. C. J. Kuiper moved that the minutes as published be approved. Mr. R. V. Smrha seconded the motion, and it was passed unanimously.

Report of the Chairman:

The Chairman noted that he had nothing to report with respect to the Republican River Compact other than that copies of the Tenth Annual Report have been furnished to various state and federal agencies. The Chairman recognized Mr. Ray Aldrich and Mr. K. A. MacKichan.

Reports of Official Members:

Mr. Smrha stated that copies of the Tenth Annual Report were distributed to all agencies as appears on page 8 of the Tenth Annual Report. Mr. Kuiper stated that he had nothing to report other than that he regretted that he had been unable to attend meetings the past two years.

Unfinished Business:

No unfinished business was reported.

New Business:

Mr. M. E. Ball, Chairman of the Engineering Committee, read the body of the engineering report for the past year. Copies of the report were distributed to those in attendance.

Mr. Harris Mackey presented computations of the Engineering Committee for annual virgin water supply and annual consumptive use in the basin in 1970 together with computations to show what the adjusted computations to each state would be if adjusted on the basis of the annual virgin water supply, five-year average, or ten-year annual average virgin water supply. Mr. Ball asked for discussion of the exhibits presented by Mr. Mackey which were the computations presented to the administration.

Mr. Smrha noted that no problems seem to have arisen and he doubted whether or not the Administration is ready to adjust the compact allocations, but stated that the Administration would probably need to adjust allocations at times in the future. Mr. Mackey read the portion of the Compact which deals with adjusted allocations, as follows:

"Should the future computed virgin water supply of any source vary more than ten (10) percent from the virgin water supply as hereinabove set forth, the allocations hereinafter made from such source shall be increased or decreased in the relative proportion that the future computed virgin water supply of such source bears to the computed virgin water supply used herein."

Mr. Ball requested a recommendation by the administration on the method of presenting the computed annual consumptive use by states as discussed in the engineering report for Prairie Dog Creek, Sappa Creek, Beaver Creek, and Medicine Creek. He explained that up to the present time the consumptive use computations by states for these streams contain only that consumptive use made above the

gaging stations. The balance has been thrown into the Main Stem of the Republican River. Mr. Smrha stated that he felt the computations of consumptive use in these basins should show the consumptive use for the entire stream, which could be used for comparison with the allocations to each state, from each stream. Mr. Smrha stated further that it should not be necessary to correct the computations for past years but this changed procedure should be followed in computing the consumptive use in future years.

Mr. Smrha stated further that he believed no action was required in changing formulas for the computations since it is provided for in the rules and regulations.

Mr. Ball stated that the committee would do what they could to improve the data. He mentioned the need of water measuring devices on stream pumps. Mr. Jones inquired as to how much water is diverted by such pumps. Mr. Ball stated that there were over 100 main stem pumps as taken from delivery schedule records.

Mr. Jones asked if there has been research on how irrigation wells are affecting virgin flow. Mr. Ball stated that studies started by Mr. LeFever should be continued on an annual basis. Mr. Smrha, also, stated that he felt studies should be continued along that line.

It was moved by Mr. Smrha that the report of the engineering committee be accepted by the Administration and that the committee be commended for a fine job. The motion was seconded by Mr. Kuiper and passed unanimously.

Motion was made by Mr. Kuiper that the engineering committee continue with the same assignments for the coming year:

1. Compute annual virgin water supply, 1971 water year;
2. Compute annual consumptive use, 1971 water year;
3. Compute inflow to Lovewell Reservoir and net evaporation of Republican River water stored in Lovewell, 1971 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;
6. Make a water-budget study, in cooperation with the U.S. Geological Survey, of the Trenton-Palisade to Cambridge reach of the Republican River.

Mr. Smrha seconded the motion and it was passed unanimously.

Reports of other Agencies:

Mr. Ray Aldrich commended the Administration on a fine job. Mr. Jones asked if the U.S. Bureau of Reclamation had done anything in the way of consumptive use studies. Mr. Aldrich indicated that they had not.



Mr. K. A. MacKichan commented that he felt the seepage run study was useful as far as pursued. Mr. MacKichan told of studies made by his office on ground water pumpage in other basins and stated that he felt the same could be done in the Republican River Basin.

Election of the Chairman:

Mr. Smrha nominated Mr. Jones to serve a second year as Chairman. The motion was seconded by Mr. Kuiper and passed unanimously.

Adjournment:

Upon motion by Mr. Kuiper and seconded by Mr. Smrha the Twelfth Annual Meeting of the Republican River Compact Administration was adjourned at 11:00 A.M., June 4, 1971.

Report of Engineering Committee  
Republican River Compact Administration

June 4, 1971

The Republican River Compact Administration at its 11th annual meeting held May 26, 1970, agreed the assignments to the Engineering Committee would include the following:

1. Compute annual virgin water supply, 1970 water year;
2. Compute annual consumptive use, 1970 water year;
3. Compute inflow to Lovewell Reservoir and net evaporation of Republican River water stored in Lovewell, 1970 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;
6. Make a water-budget study, in cooperation with the U.S. Geological Survey, of the Trenton-Palisades to Cambridge reach of the Republican River.

The Engineering Committee held one meeting during the year, May 6-7, 1971, the 18th meeting, to study the virgin water supply and consumptive use of the water year 1970. Submitted herewith and made a part of this report are the following:

1. Computed annual virgin water supply Republican River Basin 1970;
2. Computed annual consumptive use Republican River Basin, 1970;

The following exhibits are presented for discussion without recommendation:

1. Virgin water supply computation, 1970 water year;
2. Computation, annual inflow to Lovewell Reservoir, 1970 water year;
3. Computed operations of Lovewell Reservoir, 1970 water year;
4. Consumptive use computation-Kansas, main stem of the Republican River;
5. Computation of adjusted allocations on an annual basis, 1970 water year;
6. Adjusted allocations on a 5-year average basis, 1966-1970;
7. Adjusted allocations on a 10-year average basis, 1961-1970.

The municipal and industrial uses which have not been included in the virgin water supply or consumptive use formulas are given below:

	<u>1970 Calendar Year</u>
City of Norton	824 Ac. Ft.
Midwest Oil Co.	574 Ac. Ft.
L.V.O. Oil Co. (formerly Livingston Oil Co.)	17 Ac. Ft.
Hahn Petroleum Co.	3 Ac. Ft.

Recorded division of diversions from the North Fork Republican River by the Haigler Canal between Colorado and Nebraska for 1970 were:

Colorado	3,120 Ac. Ft.
Nebraska	6,720 Ac. Ft.
Total	<u>9,840 Ac. Ft.</u>

Recorded diversions from surface water in Colorado other than by the Hale Ditch were:

S. Fk. Republican River	1,940 Ac. Ft.
N. Fk. Republican River	4,090 Ac. Ft.
Arikaree River	0 Ac. Ft.
Beaver Creek	0 Ac. Ft.

All groundwater diversions in Colorado have been considered to be from upland wells and have not been included in the computations. It was agreed that Colorado for 1971 should try to determine the acreage irrigated by wells, if any, in the alluvium so that

groundwater diversions may be estimated.

Diversions by individual irrigators from alluvial wells or streams in Kansas were estimated on the basis of water use reports from 50% of the water users. Average of all reported diversions in the Republican River Basin in Kansas was 1.8 Ac. Ft./Ac. Average rate of diversion from groundwater alluvium was 1.8 Ac. Ft./Ac., and from surface water was 1.3 Ac. Ft./Ac.

Estimated diversions by individuals in Kansas for 1970 are given below in acre-feet:

<u>Sub-basin</u>	<u>Groundwater</u>	<u>Surface Water</u>
Arikaree River	200	0
S. Fk. Republican River	4,860	550
Beaver Creek	7,060	830
Sappa Creek	7,660	300
Prairie Dog Creek	10,140	1,950
Republican River above Hardy	160	680

The Nebraska records of diversion for surface water by other than major canals for the principal tributaries were:

Frenchman Creek	3,700 Ac. Ft.	
Medicine Creek	1,080 Ac. Ft.	(above gaging station)
Medicine Creek	60 Ac. Ft.	(below gaging station)
Red Willow Creek	450 Ac. Ft.	

In other basins in Nebraska including the main stem of the Republican River surface water diversions by stream pumps were computed as 1.3 Ac. Ft. per acre. Groundwater diversion rate used for 1970 was 1.6 acre-feet per acre as determined from a 10 percent sample by water use reports.

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	43%	Franklin	51%
Culbertson Ext.	46%	Franklin Pump	42%
Meeker-Driftwood	41%	Naponee	41%
Red Willow	46%	Superior	45%
Cambridge	40%	Courtland-Nebr.	25%
Bartley	38%	Courtland-Kans.	
Almena	35%	above Lovewell	42%
		below Lovewell	38%

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

Hale Ditch	38%	Groundwater Diversions	25%
Haigler Canal	38%	Surface Water Diversions	25%

The 1970 annual virgin water supply was computed using the above data together with pertinent stream-flow diversion and reservoir records. Based on canal diversions below Harlan County Reservoir the net evaporation from this reservoir was divided (58%) 16,070 Ac. Ft. to Kansas and (42%) 11,630 Ac. Ft. to Nebraska.

In past years the committee had thrown the water consumed in Prairie Dog Creek, Sappa Creek, Beaver Creek, and Medicine Creek Basin below the gaging stations near the mouths of these streams into the water consumed in the main stem of the Republican River. This was in accordance with the formulas for determining consumptive use as originally drafted and as presented in the corrected formulas in the meeting of the Administration last year. The committee decided to make additional computations for these streams to show the water consumed above the mouth of those streams with the water consumed in the streams above the gaging stations. This was done for comparative purposes to permit the Administration to study the matter and to determine whether the consumptive use from these streams below the gaging stations should be included

with water consumed in the balance of the streams or should be left a part of consumptive use at the Main Stem of the Republican River. The following is a consumptive use table for these streams showing the water consumed above the gaging stations and above the mouth.

Consumptive Use in Nebraska - 1970

	Above Gaging Sta. Ac. Ft.	Above Mouth Ac. Ft.
Prairie Dog Creek	0	0
Beaver Creek	7,050	9,840
Sappa Creek	8,690	9,350
Medicine Creek	8,820	8,860

The consumptive use of Nebraska in the Main Stem of the Republican for 1970 was 182,750 Ac. Ft. which would be reduced to 178,690 Ac. Ft. by the change of the formula.

No material advancement has been made in the results desired in Assignment No. 6 to the Engineering Committee for a water budget study. The committee agreed further study was needed in the future on the assignment to attempt to isolate the depletions by wells. No specific assignment was made by the committee to the U. S. Geological Survey to assist in these studies during the past year. The USGS will provide consultations to the committee in any future studies.

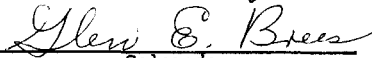
The results of the seepage runs in c.f.s. for the years 1967 to April of 1970 were summarized in a report from the U. S. Geological Survey provided information for the May 26, 1970, meeting of the administration. A conclusion was made that as a result of the data furnished that the seepage runs be discontinued. One additional seepage run was made November 5, 1970, as a final check. This run showed an inflow to the river reach studied of 2.5 c.f.s. This confirmed the April 1970 result of 1.33 c.f.s. which

was a drop of about 40 second-feet as shown in the two seepage runs during 1969.

Respectfully submitted,

  
\_\_\_\_\_  
Nebraska

  
\_\_\_\_\_  
Kansas

  
\_\_\_\_\_  
Colorado

Computed Annual Consumptive Use  
Republican River Basin

1970 Water Year

<u>Drainage Basin</u>	<u>Colorado</u>	<u>Kansas</u>	<u>Nebraska</u>	<u>Total</u>
Prairie Dog Creek	-	18,570	0	18,570
Sappa Creek	-	5,960	8,690	14,650
Beaver Creek	0	5,920	7,050	12,970
Medicine Creek	-	-	8,820	8,820
Red Willow	-	-	11,820	11,820
Driftwood Creek	-	0	720	720
Frenchman Creek	-	-	59,320	59,320
South Fork of the Republican River	6,930	4,050	320	11,300
Rock Creek	-	-	210	210
Buffalo Creek	-	-	690	690
Arikaree River	0	150	0	150
North Fork of the Republican River	5,000	-	4,170	9,170
Main Stem of the Republican River	-	73,120	182,750	255,870
TOTAL	11,930	107,770	284,560	404,260



Computed Annual Virgin Water Supply  
Republican River Basin

<u>Drainage Basin</u>	<u>Compact Ac. Ft.</u>	<u>1970 W.Y. Ac. Ft.</u>
Prairie Dog Creek	27,600	17,130
Sappa Creek	21,400	25,520
Beaver Creek	16,500	15,400
Medicine Creek	50,800	47,800
Red Willow Creek	21,900	23,470
Driftwood Creek	7,300	1,880
Frenchman Creek	98,500	122,720
South Fork of the Republican River	57,200	33,540
Rock Creek	11,000	10,160
Buffalo Creek	7,890	5,450
Arikaree River	19,610	7,240
North Fork of the Republican River	44,700	44,150
Main Stem of the Republican plus Blackwood Creek	● 94,500	160,130
TOTALS	478,900	514,590
*Main Stem Blackwood Creek	87,700 6,800	