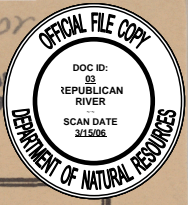


Director

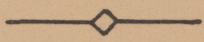
OFFICIAL OFFICE



THIRD ANNUAL REPORT

Republican River
Compact
Administration

For the Year 1962



TOPEKA, KANSAS

May 3, 1963

THIRD ANNUAL REPORT

**Republican River
Compact
Administration**

For the Year 1962



TOPEKA, KANSAS

May 3, 1963



OFFICIAL MEMBERS
REPUBLICAN RIVER COMPACT ADMINISTRATION
1962



Left to Right: Dan S. Jones, Jr., Director, Department of Water Resources, Lincoln, Nebraska; J. E. Whitten, State Engineer, Denver, Colorado; R. V. Smrha, Chief Engineer, Division of Water Resources, Board of Agriculture, Topeka, Kansas.

Third Annual Report

REPUBLICAN RIVER COMPACT ADMINISTRATION

For the Period March 24, 1962 to May 3, 1963

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

1. Provisions of Administration's Rules and Regulations for Annual Report

Rule No. 12 of the Rules and Regulations, as amended at annual meetings on March 23, 1962, and May 3, 1963, provides that "The Administration following each annual meeting shall adopt and enter upon its records a report covering a summary of its transactions and proceedings for the preceding year, the current status of its affairs and including such other matters as may be deemed appropriate by the official members. Copies of the report may be furnished to the President of the United States; the Governors of the States of Colorado, Nebraska and Kansas; officials of State and Federal agencies and others as determined by the Administration."

Pursuant to amended Rule 12, this report covers the period from March 24, 1962, to May 3, 1963.

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:

J. E. Whitten, 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 Fourth Annual Meeting was held on May 3, 1963, in the State Office Building, Topeka, Kansas. The minutes of this meeting are included elsewhere in this report.
4. One meeting of the Committee on Procedure for Computation of Annual Virgin Water Supply was held during the period and a progress report was presented to the Administration at the Fourth Annual Meeting. A copy of that report together with a summary tabulation of the computation of the virgin flows for the 1962 water year is included herein.
5. During the period covered by this report, Mr. F. F. LeFever, District Engineer, U. S. Geological Survey, Lincoln, Nebraska, continued an Investigation of Feasibility of a Study of Return Flow in the Republican River Basin in Nebraska. Presented at the Fourth Annual Meeting was a progress report on the studies made of the reach between

Trenton on the Republican River and Palisade on Frenchman Creek downstream to Cambridge. Precipitation in this area during the 1962 irrigation season was more than 50 per cent above normal and nearly equalled the amount of water normally applied for irrigation. About 48 per cent of the water applied for irrigation appeared as return flow to the river. The report concluded the reach could be utilized for a return flow study although there is a need to improve runoff records from the ungaged area. The Administration accepted the report and directed the Chairman to contact the Area Hydrologist, U. S. Geological Survey, Denver, regarding the continuation of the studies of return flow.

6. On May 3, 1963, R. V. Surha, Kansas Member of the Administration, was reelected Chairman to serve until the next Annual Meeting.

Respectfully submitted,

REPUBLICAN RIVER COMPACT ADMINISTRATION

By:

J. E. Wittner Colorado Member
David S. Day, Jr. Nebraska Member
R. V. Surha (Chairman)
Kansas Member

Minutes of the
Fourth Annual Meeting
of The
Republican River Compact Administration
Topeka, Kansas -- May 3, 1963

The meeting was called to order by the Chairman, R. V. Smrha, at 9:00 A.M., in Room 1031-S, State Office Building, Topeka, Kansas.

The following were in attendance:

J. E. Whitten, Official Member, Denver, Colorado
Dan S. Jones, Jr., Official Member, Lincoln, Nebraska
R. V. Smrha, Official Member, Topeka, Kansas
L. T. Burgess, Chief Hydrographer, State Engineers Office
Denver, Colorado
Hal K. Hall, Ass't. Dist. Engineer, U. S. Geological Survey
(S. W.) Topeka, Kansas
E. J. Kennedy, District Engineer, U. S. Geological Survey
(S. W.) Topeka, Kansas
Elroy C. Balke, Corps of Engineers, Kansas City, Missouri
C. A. Burgtorf, Corps of Engineers, Kansas City, Missouri
Floyd F. LaFever, District Engineer, U. S. Geological Survey
(S. W.) Lincoln, Nebraska
M. E. Ball, Ass't. Director, Nebraska Department of
Water Resources, Lincoln, Nebraska
John D. Winslow, Geologist, U. S. Geological Survey (G. W.)
Lawrence, Kansas
S. W. Fader, Hydraulic Engineer, U. S. Geological Survey
(G. W.) Lawrence, Kansas
Dale T. Corder, U. S. Bureau of Reclamation, McCook, Nebraska
Ray E. Aldrich, U. S. Bureau of Reclamation, McCook, Nebraska
Elwyn S. Krous, U. S. Bureau of Reclamation, McCook, Nebraska
H. L. Mackey, Kansas Division of Water Resources,
Topeka, Kansas

The minutes of the Third Annual Meeting had been previously approved by correspondence and confirmation of that approval was given by unanimous vote of the Administration.

Report of the Chairman:

The Chairman of the Administration stated Kansas had not been engaged in any activities during the past year relating to business of the Administration and there was no report to make at this time.

Reports of Official Members or Representatives:

The Official Members from Colorado and Nebraska had no reports to make.

Unfinished Business:

None.

New Business:

The Chairman of the Administration stated the assignment to the Committee on Procedure for Computation of Annual Virgin Water Supply was two-fold:

- (1) Virgin Water Supply computations for 1962;
- (2) Consumptive use computations for 1961 and 1962.

The Chairman of the Committee, Mr. M. E. Ball, presented a progress report to the Administration. A copy of the report with a tabulation of the results of computations of virgin water supply for the 1962 water year is attached as Exhibit "A" and made a part of these minutes. On motion by Mr. Whitten the report of the Committee was accepted.

The assignment of making consumptive use computations for 1961 and 1962 was not completed by the Committee. It will require first the development of a formula for the computation. Also problems of determining the consumptive use in Kansas of Republican River water and the proration of evaporation losses from Harlan County Reservoir between Nebraska and Kansas were not previously recognized.

The Chairman asked for discussion of return flow investigations.

Mr. F. F. LeFever, District Engineer, U. S. Geological Survey, Lincoln, Nebraska, discussed additional studies made during the year on the reach between Trenton on the Republican and Palisade on the Frenchman, downstream to Cambridge on the Republican. Precipitation during the 1962 irrigation season was nearly equivalent to water applied for irrigation, and the computations showed about 48% of the applied water was returned. Mr. LeFever concluded there is a need to improve records from ungaged areas and that perhaps precipitation on the valley floor should be taken into account. On motion by Mr. Jones the Administration accepted Mr. LeFever's report and requested a written report be submitted for inclusion in the minutes. The report is attached as Exhibit "B".*

On motion by Mr. Smrha the name "Committee on Procedure for Computation of Annual Virgin Water Supply" was changed to "Engineering Committee".

* Exhibit "B" is not included but is on file in the office of each Official Member.

Unanimous approval was given to the following assigned tasks for the Engineering Committee:

1. Virgin flow computations for 1963;
2. Establish formulas and make computations of consumptive use for 1961, 1962 and 1963;
3. In cooperation with representatives of the Bureau of Reclamation and Corps of Engineers, arrive at a method of computing Inflow to Lovewell Reservoir from White Rock Creek,
4. Establish a method of proration of evaporation losses from Harlan County Reservoir between Nebraska and Kansas and proration of evaporation losses from Lovewell Reservoir between White Rock Creek and Republican River waters.

On motion of Mr. Jones the Administration directed the Chairman to make a written request of Mr. S. K. Jackson, Area Hydrologist, for the U. S. Geological Survey to continue studies of return flows and to explore with him the question of funds for such studies.

Amendment of Rules and Regulations:

Mr. Jones moved that Paragraph 12 of Rules and Regulations be amended to read as follows:

"The Administration following each annual meeting shall adopt and enter upon its records a report covering a summary of its transactions and proceedings for the preceding year, the current status of its affairs and including such other matters as may be deemed appropriate by the official members. Copies of the report may be furnished to the President of the United States; the Governors of the States of Colorado, Nebraska and Kansas; officials of State and Federal agencies and others as determined by the Administration."

The motion to amend Paragraph 12 was seconded and unanimously passed.

The Chairman stated that the Rules and Regulations provide for an annual meeting to be held in March or April of each year. It is hereby recorded that the Chairman by personal communication called an annual meeting for April 24, 1963, and that in the absence of a quorum it was adjourned to May 3, 1963.

Representatives of the Bureau of Reclamation and Corps of Engineers expressed their appreciation for being invited to the meeting and assured the Administration of their willingness to cooperate in any way possible.

Mr. Whitten presented an office memo from Mr. M. M. Skinner, Civil Engineering Section, Colorado State University, regarding the establishment of an experimental ground-water recharge site in the valley of the Arikaree River about 15 miles upstream from Cope, Colorado. A copy of that memo is included in these minutes as Exhibit "C".

Mr. Sarha was reelected Chairman of the Administration to serve until the next annual meeting.

Adjournment:

The Fourth Annual Meeting of the Administration adjourned at 12:15 p.m.



R. V. Sarha, Chairman

Progress Report
of the
Committee on Procedure
for
Computation of Annual
Virgin Water Supply
to the
Republican River Compact Administration
May 3, 1963

The Republican River Compact Administration at its March 23rd meeting, 1962, assigned the subject committee the task to compute the virgin flow of the Republican River and its tributaries for the water year 1962 and to make computations of the consumptive uses within each of the sub-basins for the years 1961 and 1962. Presented herewith is a summary of the computed annual virgin water supply of the Republican River Basin dated March 15, 1963. This is the virgin water supply for the water year 1962. The annual report of the administration of March 23, 1962 contains the computations for the virgin water supply for the water years of 1959, 1960 and 1961.

The committee met on just one occasion during the past year at its 7th meeting of the committee held March 14th and 15th, 1963. The minutes of that meeting have been approved by the committee and furnished to members of the administration. Steps have been taken during the past year to continue to improve the data for use in the formula for the computations of virgin water supply. Following the example set by Kansas for obtaining records, the Nebraska Department of Water Resources prepared an "Irrigation Pumping Record Book" which has been designed for either keeping the records of pumping from streams or for keeping the records of pumping from wells. These record books were furnished to the irrigators pumping from streams in the Frenchman, Red Willow, and Medicine Creek Basins and to irrigators with wells pumping from the valley floor in all of the Republican River Basin in Nebraska.

In view of the fact that the Nebraska law does not require the keeping of records of pumping from wells, the information obtained in Nebraska for wells was furnished on a voluntary basis. Approximately 750 record books were mailed to land owners and we received a reply from approximately 35% of this number. The irrigation season was an unusual one with a dry spring with low rainfall in April and May, but with a greater than normal rainfall during June, July, August and September. As a consequence, many of the irrigation wells were not used. Also as a consequence, of the unusually high rainfall the indicated amount of water pumped from wells varied considerably depending upon the amount of rainfall. The results of this sampling indicated an average pumping rate of 0.32 acre-feet per acre as compared to the

average rate used last year of 1.6 acre-feet per acre for the wells. The Nebraska Department of Water Resources has again initiated this program of obtaining information from wells for the 1963 irrigation season, and we hope to continue to receive the cooperation from the land owners in providing us with such information so that we may be able to determine the variation in this use of ground water for different types of years.

Much valuable information was obtained from the information returned to the Nebraska Department of Water Resources in the pumping record booklets, such as many reported that they did not use their irrigation well because they received adequate water from their surface canal systems. This information indicates that in many cases wells are used to supplement pumping or diversion from a stream source. This explains in part the reason for a lower average diversion rate in Nebraska as compared to Kansas.

The Virgin Flow Committee indicated in its 1962 report that it was desirable to obtain better information for the Haigler canal diversion from the North Fork of the Republican River. In 1963 two records were obtained, one by the headgate keeper furnishing information to Colorado and one computed by Nebraska from information obtained from data furnished by the same headgate keeper to Nebraska. Colorado reported a total of 6,730 acre-feet diverted, while Nebraska reported 9,950 acre-feet diverted. After further investigation, it was found that the Nebraska records probably do not reflect the spills wasted to the North Fork of the Republican River immediately below the headgate, and it was agreed that the Colorado records of diversions would be used in the virgin flow study. This situation points up the necessity previously mentioned by the committee of requiring that suitable measuring devices be installed on the Haigler canal. We recommend that measuring devices be installed both at the headgate and at the point where the canal crosses the state line. Due to the fact that one irrigation district operates the entire system, it may be undesirable to request the district to place a measuring device at both points the same year. We recommend that Colorado continue to impress upon the district the necessity for the measuring device at the diversion point and that we delay requesting the measuring device at the state line until a later date.

The U. S. Geological Survey presented a study with certain recommendations for return flow investigations in the Republican Basin at the 1962 meeting of the administration. Nothing was done in the field during the 1962 irrigation season to obtain return flow data due to the unusually wet irrigation season. Floyd LeFever, District Engineer of the Surface Water Branch of the U. S. Geological Survey has compared the records for the 1962 irrigation season with those presented in the report which Herman Brice described to the

administration at the 1962 meeting. Mr. LeFever may, at this meeting, wish to comment further on the comparison of the 1962 records with the previous data.

The Bureau of Reclamation on April 3, 1963, presented its annual operating plan for the year 1963 at a public meeting held in Lincoln. That report indicated that the Bureau of Reclamation is concerned with the return flow from the projects along the Republican River, and representatives of the Virgin Flow Committee made the recommendation that the committee would like to cooperate with the Bureau of Reclamation in any studies made by that organization concerning return flow. It developed, however, that the Bureau of Reclamation is more interested in channel carriage losses than in the details of the return flow studies. Therefore, it would appear that nothing would be gained by a cooperative venture by the committee and the Bureau of Reclamation concerning the return flow studies.

The committee has not fulfilled its assignment concerning the computation of consumptive uses within each of the sub-basins of the Republican River Basin for the years 1961 and 1962. It became apparent during the meeting of the committee on March 14th and 15th that work needs to be done by the committee with the approval of the administration in the development of a formula for the computation of consumptive use. The problem of determining the consumptive use in Kansas and the proration of the Harlan County losses between the two states is a matter that will require confirmation by the administration. This point was not recognized until we approached the subject as a committee. Another point which should be resolved by the administration is the method of handling the return flow in the computation of consumptive use where return flow from a particular sub-basin does not return to the same sub-basin, but enters the main Republican River or another tributary basin. The matter of handling the return flow could affect the computation of consumptive use in a particular basin under the formulas provided in the compact.

Respectfully submitted,

M. E. Ball

M. E. Ball, Chairman
Virgin Flow Committee

Computed Annual Virgin Water Supply
 Republican River Basin

March 15, 1963

| Drainage Basin | Compact Ac. Ft. | 1962 W.Y. Ac. Ft. |
|--|--------------------|----------------------|
| Prairie Dog Creek | 27,600 | 35,250 |
| Sappa Creek | 21,400 | 37,740 |
| Beaver Creek | 16,500 | 42,710 |
| Medicine Creek | 50,800 | 102,810 |
| Red Willow Creek | 21,900 | 38,180 |
| Driftwood Creek | 7,300 | 11,090 |
| Frenchman Creek | 98,500 | 143,870 |
| South Fork of the Republican River | 57,200 | 51,550 |
| Rock Creek | 11,000 | 10,890 |
| Buffalo Creek | 7,890 | 6,980 |
| Arikaree River | 19,610 | 28,930 |
| North Fork of the Republican River | 44,700 | 51,920 |
| Main Stem of the Republican plus Blackwood Creek | *94,500 | 262,550 |
| Totals | 478,900 | 824,470 |
| *Main Stem Blackwood Creek | 87,700 6,800 | |

EXHIBIT "C"

OFFICE MEMO

TO: Mr. J. E. Whitten, State Engineer, **Date** 4/26/63
Denver, Colo.
FROM: M. M. Skinner, Civil Engineering Section,
Colorado State University.
SUBJECT: Experimental Ground-Water Recharge Site Along the Arikare
REMARKS: River in the Vicinity of Cope, Colorado

The Civil Engineering Section of the Colorado State University Experiment Station in conjunction with the Soil Conservation Service are interested in establishing an experimental ground-water recharge site in the Cope, Colorado area. The experimental recharge site would probably be located within the confines of the valley floor of the Arikare River within about 15 miles upstream from Cope, Colorado.

Preliminary considerations for the basic physical arrangement of the recharge site include:

1. A small, shallow holding pond of less than 100 acres located off to the side of the stream.
2. A means of diverting and transporting a portion of the intermittent flow of the Arikare River to the holding pond and
3. A series of small diameter test holes (for geologic logging and ground-water observation wells) in the vicinity of the holding pond to evaluate the dissipation of the ground-water recharge mound beneath the recharge site.

MMS:ezb

cc: G. W. Colburn
M. W. Bittinger