

COMPOSITION OF MISSOURI RIVER WATER SAMPLES
TAKEN AT MONTHLY INTERVALS FROM MAY 15
TO SEPTEMBER 15, 1947

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The prevalence of the Missouri River in the news for the past several years has led us to believe that a report on the quality of its waters would be of economic importance. In this report, analyses were made only for mineral constituents, and while such analyses show the suitability of waters for irrigation and industrial purposes, the mineral content gives little indication of the sanitary conditions of the waters.

Experimental

A sample of Missouri River water was collected at Fort Pierre on May 15, 1947, and four other samples were secured at monthly intervals by Martin Reinholt of the Soil Conservation Service. On February 4, 1948 and May 28, 1948, the laboratory received samples of James River water taken near Redfield and the results of these analyses are also included in the report for comparison. Standard methods (1) were used for most of the determinations. Na and K were determined by means of a Perkin-Elmer flame photometer, Boron was determined by a potentiometric titration method. Total hardness in terms of CaCO_3 was calculated from the gravimetric determinations of Ca and Mg.

Results and Discussion

The results of the analyses are shown in p.p.m. (parts per million) in the following table.

The accuracy of an analysis as a whole is indicated by the error of the balance of the acids and bases. In graphically representing analyses, some plan of matching negative and positive ions is nearly always used. P.p.m. (parts per million) divided by combining or equivalent weights of the ions will give milli-equivalents/L. which are directly com-

TABLE I
Analyses of Missouri River and James River Waters

Determined	Date							
	5-15-47	6-14-47	7-14-47	8-15-47	9-15-47	*2-4-48	*5-28-48	
	p.p.m.	p.p.m.	p.p.m.	p.p.m.	p.p.m.	p.p.m.	p.p.m.	
Calcium, Ca	73.61	72.89	72.18	90.05	91.48	143.38	64.32	
Magnesium, Mg	15.07	14.42	13.54	17.91	20.53	93.16	21.85	
Sodium, Na	46.00	58.00	50.00	63.0	67.00	590.0	53.0	
Potassium, K	7.00	4.00	8.00	7.0	7.00	40.0	20.0	
Bicarbonate, HCO_3	122.0	122.0	124.0	120.0	134.0	572.0	176.8	
Carbonate, CO_3	8.0	12.0	0	12.0	12.0	72.0	0	
Sulfate, SO_4	181.90	195.48	184.37	262.14	268.46	849.81	141.29	
Nitrate, NO_3	6.55	6.50	5.67	6.48	6.55	40.0	1.87	
Chloride, Cl	9.00	10.20	9.00	11.8	11.0	355.0	44.0	
Phosphate, PO_4	2.31	4.35	3.31	2.64	3.45	11.8	2.08	
R_2O_3 (Fe_2O_3) \times (Al_2O_3)	2.0	3.50	5.5	4.5	1.5	4.0	3.00	
Silica, SiO_2	15.5	19.0	15.0	9.0	9.0	29.0	10.5	
Boron	0.0912	0.1064	0.1140	0.1140	0.1292	0.3800	0.0760	
Total Solids	470.0	652.0	736.0	1138.0	672.0	2688.0	432.0	
Total susp. Solids	50.0	212.0	308.0	651.0	182.0	72.0	10.0	
Total diss. Solids	420.0	440.0	428.0	487.0	490.0	2616.0	422.0	
Total Hardness	245.67	241.20	235.81	298.37	312.72	741.08	250.39	

*Water samples from James River taken near Redfield.

parable. In the graph the heights of the sections are proportional to the quantities of the constituents measured in equivalents. Three patterns are used for each side of the analysis.

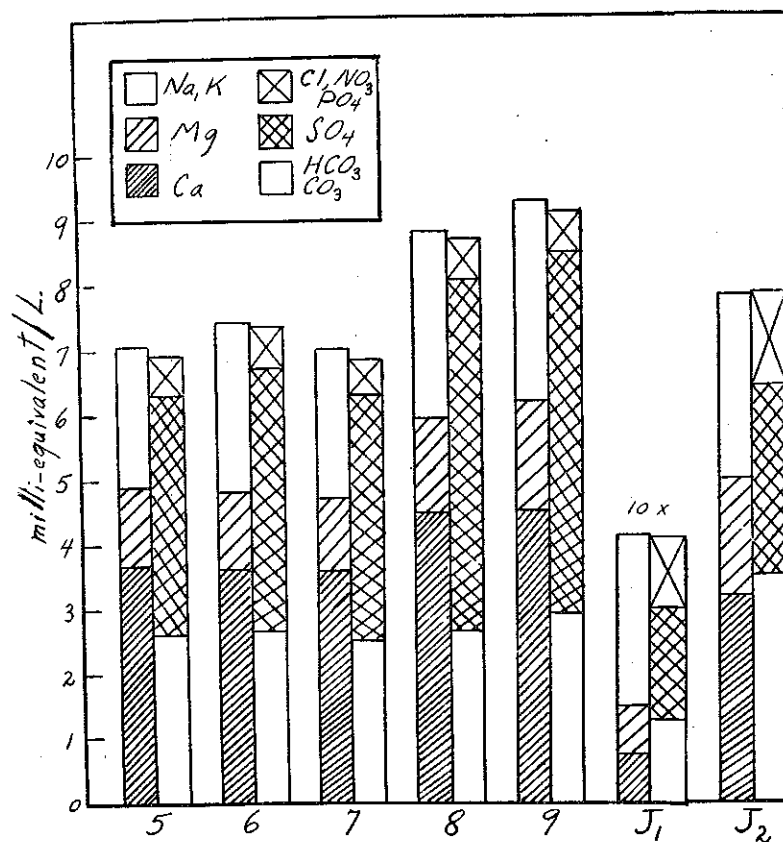


FIGURE 1

Graph showing milli-equivalents per liter of acidic and basic ions in the water samples.

Samples 5, 6, 7, 8, and 9 were taken from the Missouri river at Pierre on the 15th of May, June, July, August, and September, 1947. Sample J₁ was taken from the James river near Redfield on February 4, 1948 and sample J₂ was taken at the same location on May 28, 1948.

Scofield (2) has arranged an arbitrary table for classes of irrigation water with respect to certain of its characteristics. According to his table with respect to total dissolved solids, the Missouri River water samples and the 2nd James River sample fall in Class 2 (Good) while the first sample from the James River falls in class 5 (Unsuitable). Checking the milli-equivalents of SO₄ and Cl, the Missouri River water samples and the 2nd James River water sample fall in either class 1 (Excellent) or class 2 (Good) while the 1st James River water sample falls in class 3 (Permissible) or class 4 (Doubtful). The boron content is low enough so that all samples would fall in class 1 (Excellent) except the winter sample from the James River which would be in the class 2 (Good).

Summary

Analyses were made on five Missouri River and two James River water samples. Using Scofield's table the suitability of the waters for irrigation was determined.

BIBLIOGRAPHY

1. Standard Methods for the Examination of Water and Sewage. Eighth Edition. American Public Health Association, New York, New York, 1936.
2. Scofield, Carl S. The Salinity of Irrigational Water. The Smithsonian Report for 1935, 275-287.