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Characteristics of Irrigation Waters In Idaho

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Organization	Location	Sampler
Big Lost River Irrigation District	Mackay	Mrs. George Bruno
Big Wood Canal Company	Shoshone	Lee Miles
Black Canyon Irrigation District	Notus	H. W. Van Slyke
Bruneau Buckeroo Ditch Company	Bruneau	Art Pence and Mrs. Eva Bertschy
Emmett Irrigation District	Emmett	Karl Mann and J. Currier
Farmers Cooperative Ditch Company	Parma	U. Piercy
Gem Irrigation District	Homedale	Harry Merchant
Last Chance Canal Company	Grace	Fred Van Fleet
Owsley Canal Company	Terreton	Robert Ferebauer
Portneuf-Marsh Valley Canal Company	Arimo	S. F. Hatch
Post Falls Irrigation District	Post Falls	Eugene Lavonture
Progressive Irrigation District	Idaho Falls	D. R. Anthony
Samaria Water and Irrigation Company	Malad	W. Davis and J. Isaacson
State Department of Reclamation	Shoshone	Leslie Bushby
Twin Falls Canal Company	Twin Falls	Alfred Peters
U. S. Bureau of Reclamation	Homedale	Forrest Thompson
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Utah Power and Light Company	Ashton	D. L. Dutton
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INTRODUCTION

Natural precipitation was an important factor in developing the characteristics of our virgin soils. When we irrigate we apply to the soil additional waters that have different chemical compositions than the rainfall. The irrigation water has dissolved in it quantities of mineral salts between the time it fell as rain and the time we intercept it for irrigation. Under intensive irrigation, as is common in Idaho, we can expect these dissolved salts to have certain influences on the soil.

Field and laboratory observations have indicated soil problems arising in some of the irrigated areas which are traceable to the influences of the irrigation water. Some of these problems are decreased soil permeability, development of saline and/or alkali soils, developments of chlorosis, and requirements for specific soil amendments. To keep irrigated land in high production, it is desirable to know the kinds and amount of salts present in the irrigation waters and to take suitable precautions where the salts are developing adverse conditions.

In 1947, the Idaho Experiment Station initiated a study to determine the influences of the quality of Idaho's irrigation water on soil characteristics. The investigation was divided into three objectives. The first objective was to study the composition of the principal irrigation waters and to determine the variation in their chemical make-up. The second objective was to determine the influences these waters are having on the soils under irrigation. The third objective was to determine practical methods of correcting the detrimental effects of poor quality water on the soil. This is a report on the first objective of the study.

Plan of Investigation

Sampling sites were selected on principal irrigation sources distributed to represent the irrigation throughout the state. It was necessary that each sampling location be near a stream gaging station. The final selection of each major water sampling site (Table 1) was made in cooperation with the local agency who

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took the samples. Figure I. shows the location of the sampling stations on the major irrigation waters.

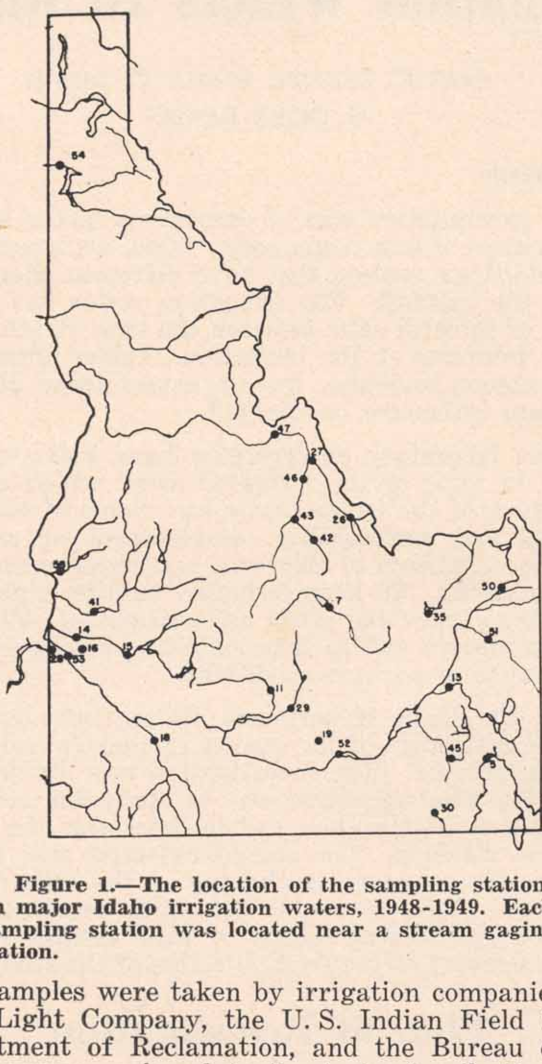

Figure 1.—The location of the sampling stations on major Idaho irrigation waters, 1948-1949. Each sampling station was located near a stream gaging station.

Water samples were taken by irrigation companies, the Utah Power and Light Company, the U. S. Indian Field Service, the State Department of Reclamation, and the Bureau of Reclamation. Each person assigned to the task of collecting the water was supplied with sampling equipment and tags for recording the time, date, place, and name of sampler.

Most of the major water sources were sampled three times per week throughout the irrigation season. The pint samples were sealed, labeled, and stored in a cool, dark place. A representative of the University of Idaho visited each sampling station at regular intervals during the summer and composited the samples by approximately 2 week intervals. He collected the field data and brought the composited samples back to the laboratory for chemical analysis.

Samples were taken once a week during the winter on several of the major sources by the field cooperator. Equal aliquot composites were made of six to eight of these samples and sent to the laboratory in special containers. The study was carried through the irrigation seasons of 1948 and 1949 and the winter of 1948-1949.

Table 1. The Water Source and the Laboratory Designation of the Major Irrigation Waters Studied

Source	Lab. No.	Source	Lab. No.
Bear river at Grace	5	Payette river at Black Canyon Dam	41
Big Lost river at Mackay	7	Pahsimeroi river above May	42
Big Wood river below Magic Dam	11	Pahsimeroi river at junction with Salmon	43
Blackfoot river at Presto	13	Portneuf river at Topaz	45
Boise river at Caldwell	14	Salmon river above Williams Creek	46
Boise river at Diversion	15	Salmon river at Shoup	47
Boise river return flow (Notus Canal)	16	Snake river Henry's Fork at Ashton	50
Bruneau river below Hot Springs	18	Snake river South Fork at Heise	51
Clawson Wells at Rupert	19	Snake river at Minidoka Dam	52
Lemhi river at Leadore	26	Snake river at Marsing	53
Lemhi river at Salmon	27	Spokane river at Post Falls	54
Little Wood river at Richfield (Dietrich Canal)	29	Weiser river at Diversion	58
Malad Big Spring	30		
Mud Lake	35		
Owyhee Reservoir water at tunnel outlet in Idaho	38		

The analysis for calcium was made by titrating the oxalate with a standard cerate solution. Magnesium was determined colorimetrically, using the phosphovanadomolybdate method. Sodium was precipitated as sodium zinc uranyl acetate and weighed. Potassium was determined colorimetrically using lithium dipicrylamine. Carbonates and bicarbonates were titrated with a standard sulphuric acid solution and chlorides with a standard silver nitrate solution. Sulphates were determined gravimetrically as barium sulphate. Boron determinations were made colorimetrically using the quinalizarin method.

Stream flow data at the stations were sent in by the cooperating agencies. Temperature data were taken from the published Weather Bureau records.

As the study progressed, it was possible to analyze additional water samples. Random samples were taken from miscellaneous sources, (Table 2) and analyzed by the same procedure as the major samples. Figure 2 shows the location of the miscellaneous waters included in the study.

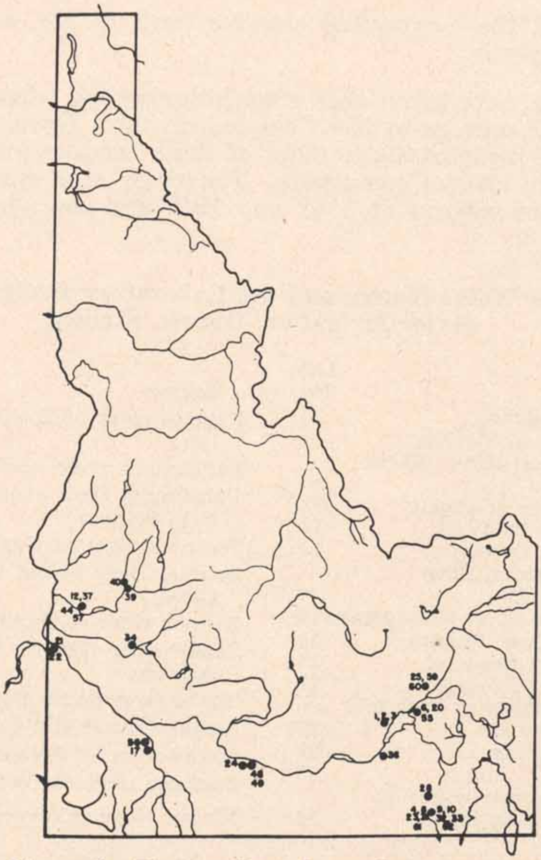

Figure 2.—The location of samples taken from miscellaneous waters in Idaho, 1948-1949. Improvement in laboratory procedure permitted some sample analyses beyond those of the regular major waters. The additional samples were taken on selected waters to inventory and interpret further the waters of the state. These waters were classified as "miscellaneous."

Table 2. The Water Source and the Laboratory Designation of the Miscellaneous Irrigation Waters Studied

Source	Lab. No.
Aberdeen Experiment Station Canal Water	1
Aberdeen Experiment Station Well	2
Aberdeen Jackson Well	3
Bastion, Merlin, Well at Malad	4
Big Jimmy Creek at Fort Hall	6
Big Malad Channel flow west of George White barn—Malad	8
Big Malad Channel flow at Holbrook Road—Malad	9
Big Malad Channel flow east of John Price farmstead—Malad	10
Bishop Drain at Emmett	12
Bruneau Hot Springs	17
Clear Creek at Fort Hall	20
Homedale Town Well	21

Source	Lab. No.
Homedale Drain	22
Jones Estate Well at Malad	23
Kaes Drain—Twin Falls	24
Larson Brothers Well—Blackfoot	25
Little Malad river at Elkhorn Dam	28
Malad Warm Springs	31
Malad Warm Springs—Roderick Thomas Spring	32
Malad Warm Springs—Southwest Spring	33
Moore's creek—Boise river	34
Neely Warm Springs near American Falls	36
Norwood Springs at Emmett—Payette return flow	37
Payette river—South Fork	39
Payette river—North Fork	40
Pevlar Drain—Emmett	44
Sharp's Coulee—Snake river return flow—Twin Falls	48
Snake river return flow seeps—Twin Falls	49
Spring Creek at Fort Hall	55
Valley Plunge Artesian Well at Bruneau	56
Walker Springs at Emmett—Payette return flow	57
Williams, J. E., Well at Blackfoot	59
Williams, Les, Wells at Blackfoot	60
Williams, J., Ditch at Samaria	61
Williams, J., Spring at Samaria	62

Results of Investigations

Fluctuations of Chemical Constituents:

The chemical composition of the water from each sampling location varied throughout the year. In order to determine the reasons for and the pattern of the changes, the individual chemical analyses were plotted throughout the sampling period for each source. These graphs were compared with graphs of the daily stream flow changes pertaining to each individual sampling station.

A general correlation was found between the rate of flow coming from a watershed and the salts dissolved in the water. In all cases, the total salt concentration was greatest, and the pH was highest when the watershed flow was lowest. The period of lowest flow came in the fall and winter months. In some cases, the concentration of certain ions actually became less with a decrease in flow from the watershed, even though the total salt increased (Note magnesium Figure 6). The patterns of the individual ion fluctuations in 1949 were markedly similar to those of 1948. In studying the graphs, it was noted that influence of stream control above the sampling station should always be considered in the interpretation of the flow hydrograph and the variations of the salts.

The major irrigation sources studied can be grouped by the degree of fluctuation of the chemical constituents throughout the year as follows:[2]

Sources having relatively minor changes in dissolved salts throughout the year: (No individual anion or cation fluctuates more than ¾ of an e.p.m.)[3]. Big Lost river at Mackay,

[2] Insufficient samples were taken on the Pahsimeroi, the Lemhi, and the Salmon rivers to determine accurately the fluctuations of the chemical constituents.
[3] See Page 36 of the Appendix for definitions.

Big Wood river below Magic Dam, Boise river at Diversion, Clawson wells at Rupert, Owyhee reservoir water at tunnel outlet in Idaho, Snake river Henry's Fork at Ashton, Spokane river at Post Falls, and Payette river at Black Canyon dam.

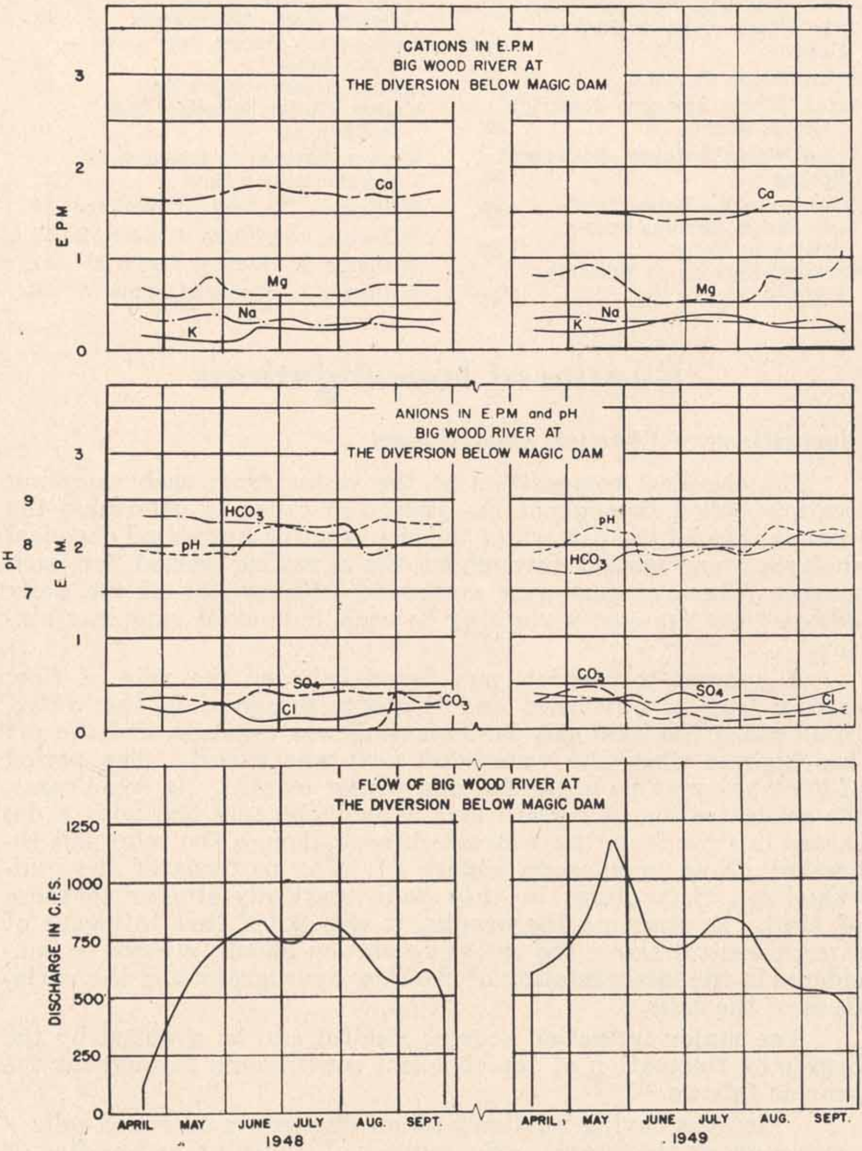

Figure 3.—The characteristics of the Big Wood river below Magic dam, 1948-1949. The hydrograph shows that the watershed run-off was stored and released only during the irrigation season. There was little change in the salts dissolved in this stream throughout the sampling period.

Sources having relatively pronounced variations in dissolved salts during the year: (One or more individual anions or cations fluctuate from 3/4 to 1 1/4 e.p.m.). Boise river return flow (Notus canal), Blackfoot river at Preston, Little Wood river at Richfield (Dietrich canal), Malad Big Spring, Snake river at Marsing, Snake river at Minidoka dam, and Weiser river at Diversion.

Sources having wide fluctuations in dissolved salts during the year: (One or more individual anions or cations fluctuate more than 1 1/4 e.p.m.) Bear river at Grace, Boise river at Caldwell, Bruneau river below Hot Springs, Mud lake, Portneuf river at Topaz, and Snake river, south fork at Hiese.

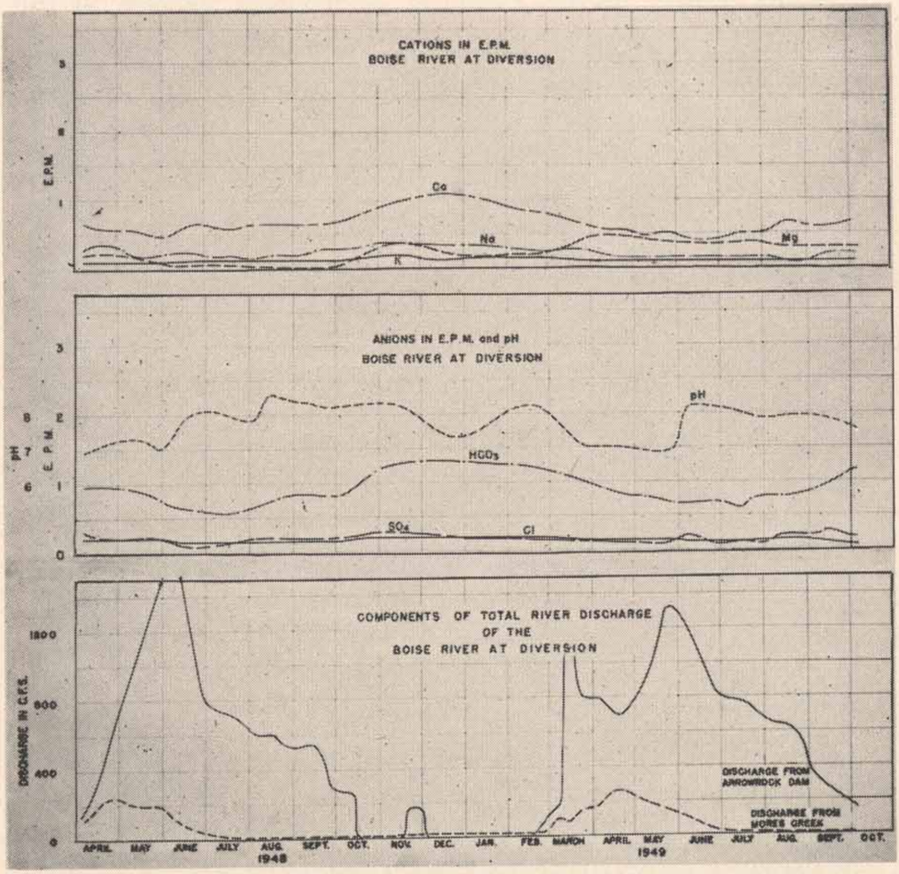

Figure 4.—The characteristics of the Boise river at Diversion, 1948-1949. Moore's creek, shown on the hydrograph, has no reservoir storage on its watershed. The peaks of the hydrograph at Arrowrock dam show that the stream was not completely controlled at the time of the study. Note the small change in salt components during the sampling period.

Figures 3 and 4 represent the data from waters having little chemical fluctuation throughout the year. All of the surface sources in this group (with the exception of the Clawson wells) are highly controlled by reservoir storage. It is believed that the underground supply for the Clawson wells is a large, slowly moving reservoir resulting in effects similar to that of a surface storage. It is probable that the mixture and massing influences of storages tend to even out salt fluctuations of streams flowing into them. In Figure 4 a minor uncontrolled source contributes to the flow of the Boise river above the sampling station. The peaks on the hydrograph for the discharge of Arrowrock dam indicate watershed yields in excess of storage.

The curves in Figures 5 and 6 show typical seasonal fluctuations for waters having relatively pronounced changes in salt

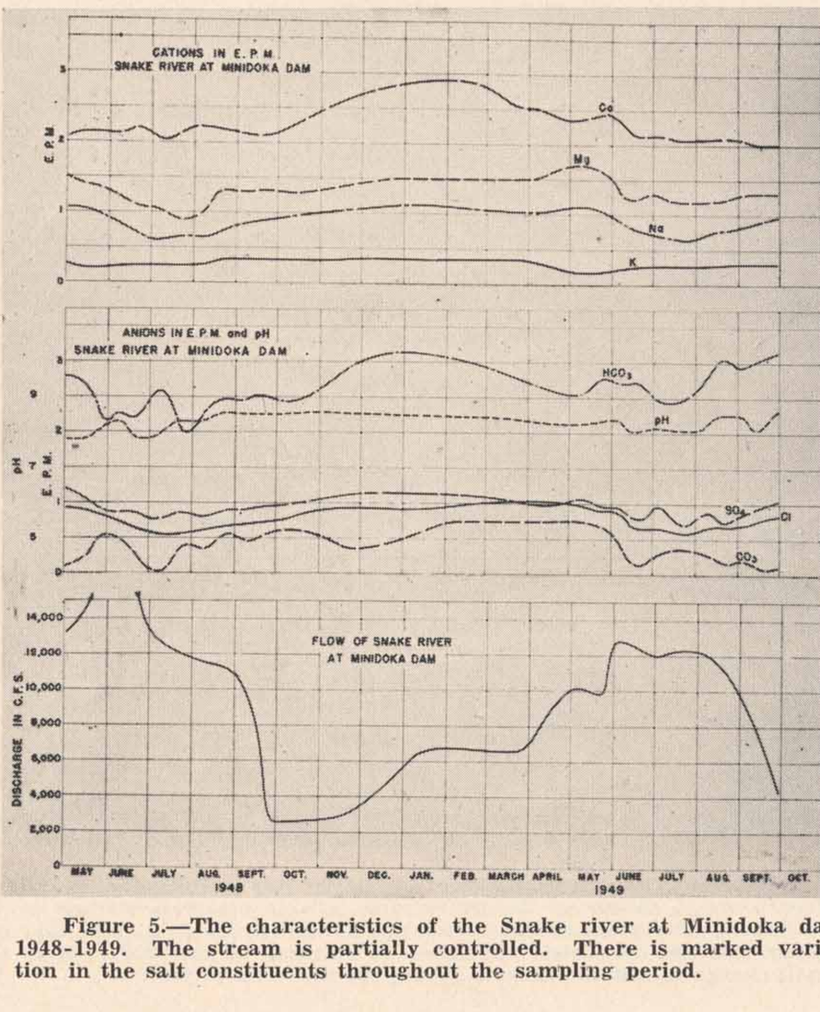

Figure 5.—The characteristics of the Snake river at Minidoka dam 1948-1949. The stream is partially controlled. There is marked variation in the salt constituents throughout the sampling period.

constituents throughout the year. All of the sources of this group were partially controlled during the two sampling years. The low flow on the Blackfoot river hydrograph (Figure 6) occurred when the storage gates on the reservoir were closed and the stream flow was only the inflow into the channel below the storage and above the sampling station. Figure 6 emphasizes the need to interpret the effect of stream control in correlating salt changes with the stream flow hydrograph.

Figures 7, 8 and 9 illustrate data of typical waters having wide fluctuations in salt constituents during the year. The Bruneau river (Figure 7) is a completely uncontrolled stream. There is a large hot spring entering the channel above the sampling station

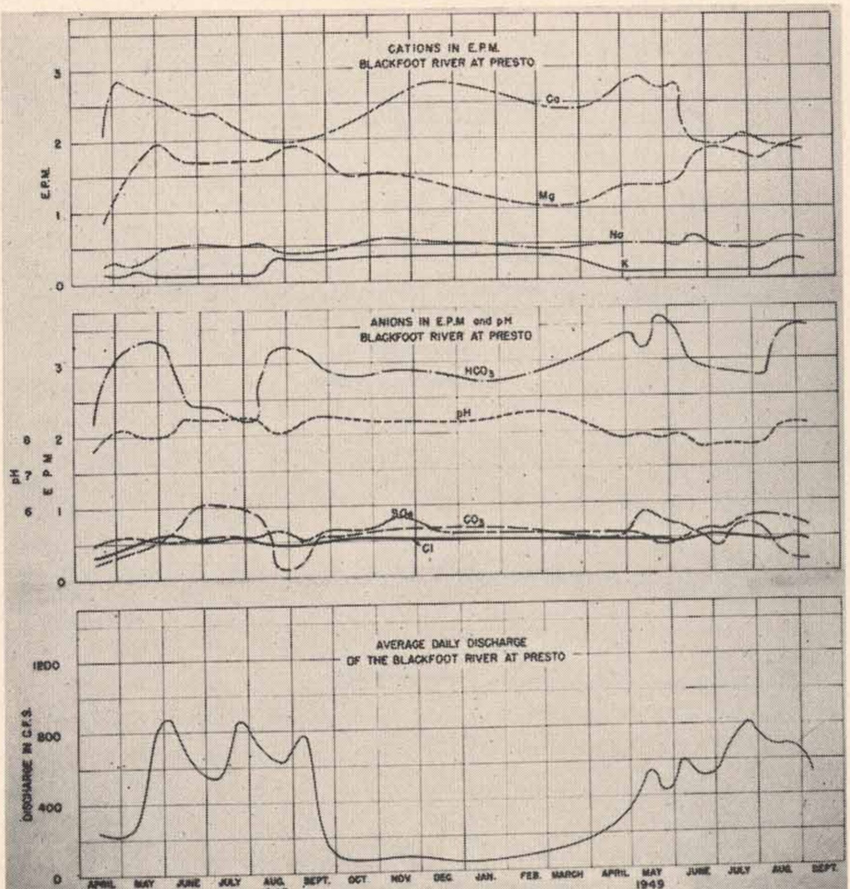

Figure 6.—Characteristics of the Blackfoot river at Presto, 1948-1949. The high flows on the hydrograph are storage releases for irrigation and the low flow is channel inflow below the storage and above the sampling station. There is considerable fluctuation in the salt make-up on this source during the sampling period.

which contributes a large proportion of the stream in periods of low flow. The chemical composition of the hot spring is quite different from that of the river water. It is possible in such cases, that the variation in the kind and amount of salts can be traced to one or a few individual sources.

The Bear river (Figure 8) is a highly controlled source at the Grace sampling station. Storage controls are largely for power. This figure shows that not all controlled streams have small fluctuations in salt makeup during the year. It is probable that the inflow of high salt waters in the vicinity of Soda Springs has a large influence on the changes in this stream. The large amount of magnesium in proportion to the other cations in the Bear river was also a characteristic of the Portneuf river.

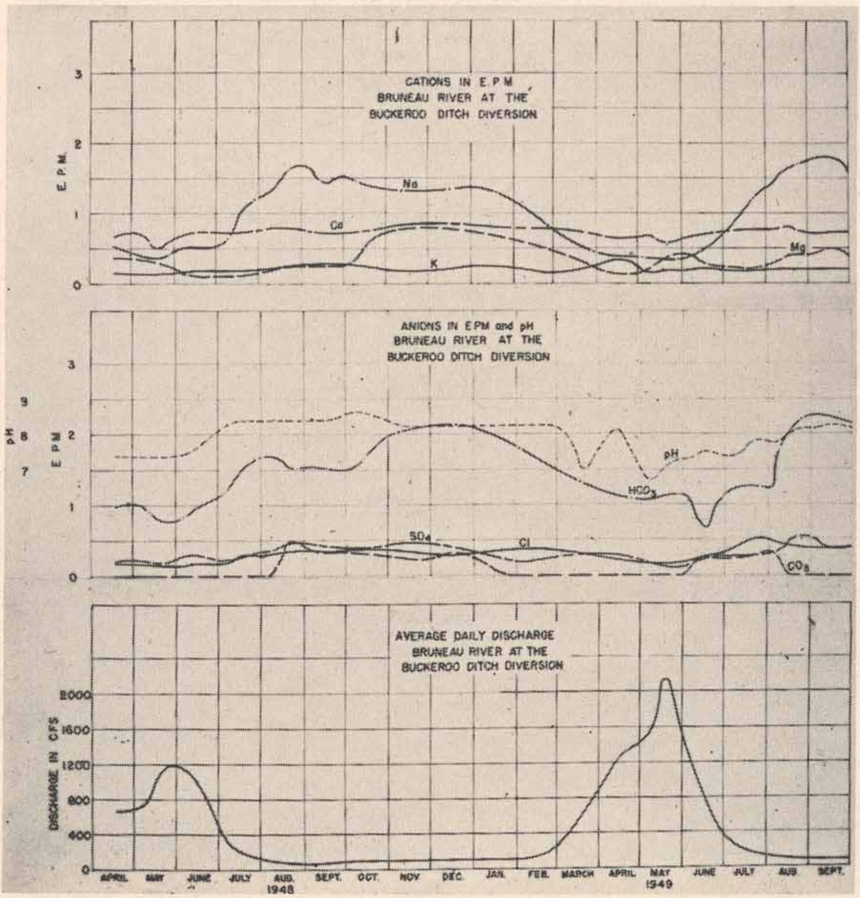

Figure 7.—Characteristics of the Bruneau river at the Buckeroo ditch diversion below Hot Springs. This river flow is completely uncontrolled by storage. Note the large fluctuation in salt components and the higher salts and higher pH during the low flow season.

The Boise river record at Caldwell[4] (Figure 9) shows the change in salt components which occurred as the river flow converted from higher watershed run-off to return flow. A large increase in the amount of sodium, carbonate, and bicarbonate ions in the return flow can be noted.

Graphs of daily mean temperature influencing the water-

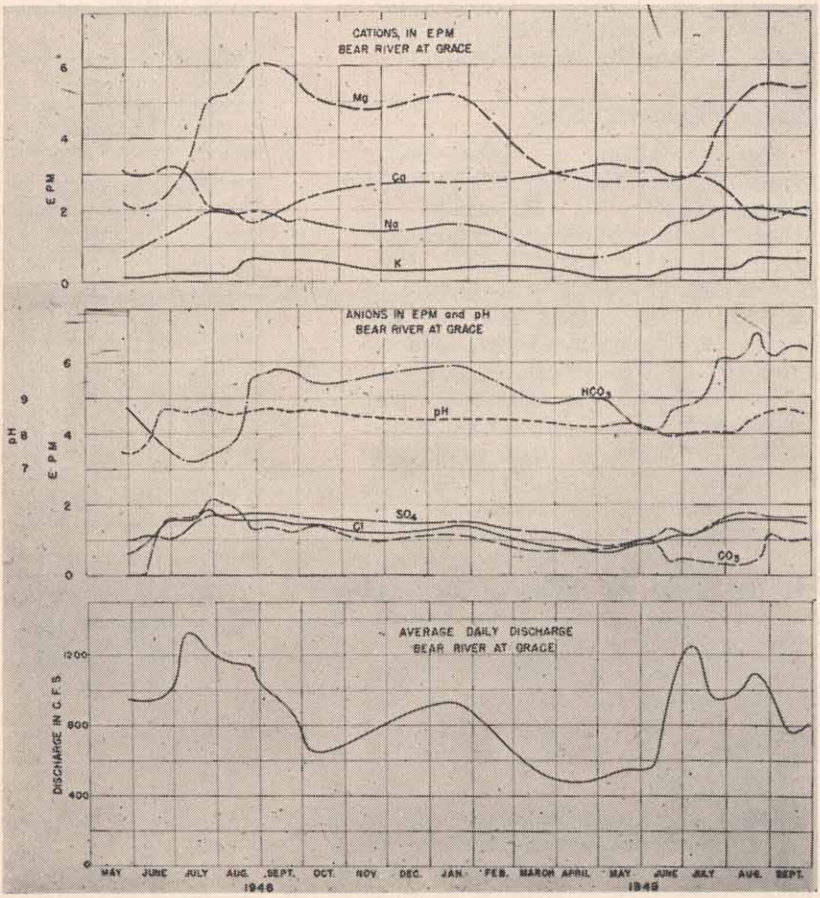

Figure 8.—Characteristics of the Bear river at Grace, 1948-1949. The Bear river is completely controlled; however, storage releases are largely for power. The wide changes in salt constituents on this stream indicates that, even though a stream may be highly controlled, frequent samples throughout a period are necessary to indicate the actual make-up of the watershed yield. Note change in e.p.m. scale.

[4] The Experiment Station facilities were transferred from the Boise river at Caldwell after the 1948 irrigation season to the Black Canyon Irrigation District on the Notus Canal (completely return flow of Boise river water) Facilities were also transferred at the end of the 1948 irrigation season from Big Lost river to the Owsley Canal Company at Mud Lake. Due to the uniformity of flow from year to year of the Big Malad Spring, sampling was conducted throughout one reservoir discharge season only. The facilities were used in 1949 to investigate other waters of the Malad area.

sheds were also plotted and compared with the graphs of salt variations. No direct correlation could be found between the fluctuations in chemical constituents dissolved in the waters and the average daily temperatures. It was concluded that temperature influenced the chemical components only indirectly by influencing the rate of run-off from the watershed.

Average Dissolved Salts

The variations in total salts throughout the irrigation season were averaged (Table A, Appendix) to characterize the chemical composition of each irrigation water source. Figure 10 shows graphically the average total salts in the major Idaho irrigation waters. The grouped comparisons on the left of Figure 10 are for stations at different locations on the same stream. The station sequence from left to right is from upstream to downstream. Idaho's major waters are relatively low in total salts, ranging from a conductance of less than .1 to .76 millimhos/cm, or, from about 60 to 460 parts per million. The total salts vary considerably from stream to stream. Where the river flow is modified by stream inflow or return flow, as was the case between all stations on the same streams, the total salts vary from location to location on each stream.

Table B, Appendix, and Figure 11 show the average total salts in the miscellaneous waters studied. The average salts varied from a conductance of less than .1 to 2.7 millimhos/-cm, or, from less than 60 to 1620 parts per million, (conductance x 600 = p.p.m.). Eleven of the miscellaneous water sources (those grouped to the left in Figure 11) were in the

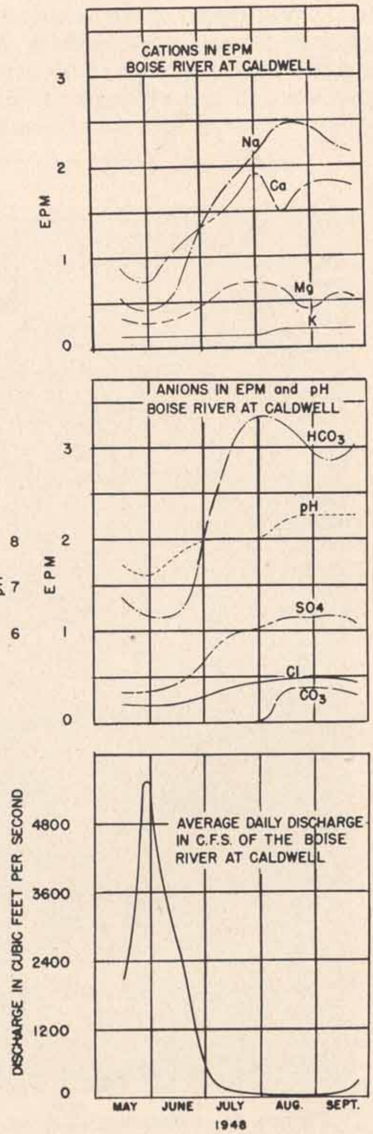

Figure 9.—The characteristics of the Boise river at Caldwell, 1948. The high flow during May and June is for unstored watershed runoff. The low flow supplying the irrigation needs during July, August, and September is return flow from water diverted for irrigation upstream. Note the high increase in all the salt components as return flow dominates, especially sodium (Na) and bicarbonate (HCO_3).

Malad area. Some waters in that area were found to be poor in quality for irrigation use. In comparison with the major water sources, several of the miscellaneous waters were relatively high in average total salt content.

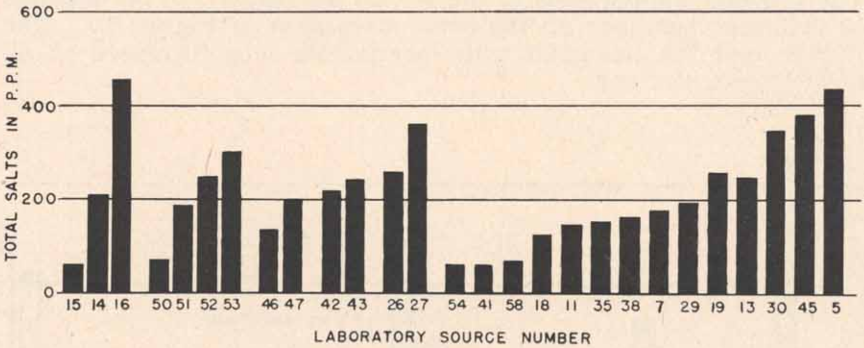

Figure 10.—The average total salts in PPM in major Idaho waters. The groupings of waters to the left of the figure are for sampling locations on the same stream — the uppermost station being to the left of the group and succeeding downstream stations in order to the right. Note that there is an increase in the total salt as water progresses downstream. Laboratory source numbers 54 through 5 are samples from separate sources.

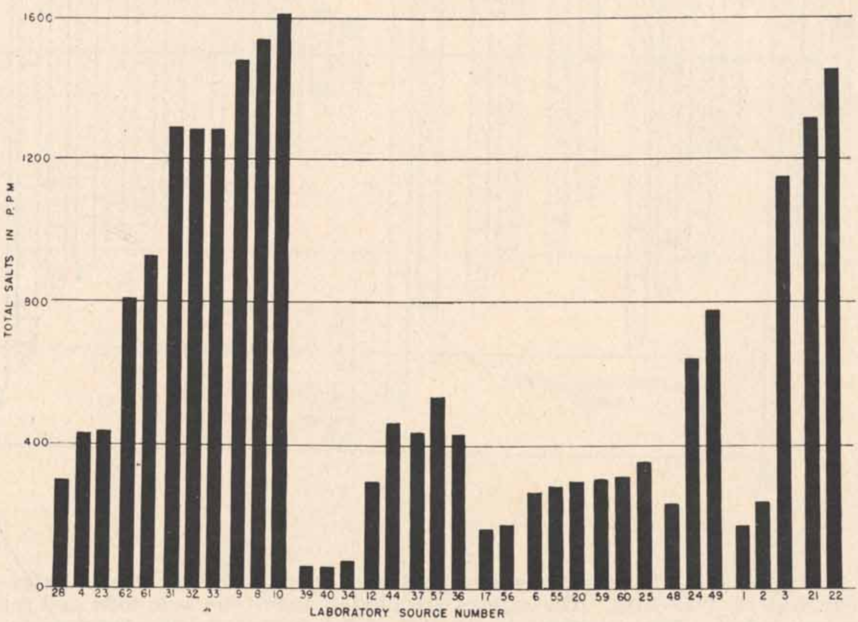

Figure 11.—The average total salts found in miscellaneous Idaho waters. Several of these waters had salt contents above 1000 p.p.m. (parts per million). The eleven waters grouped to the left of the figure are from the Malad area.

Figure 12 (see also Table A, Appendix) shows the breakdown of the average salts in the major water sources into their individual constituents. As the ions are plotted in e.p.m., the chemical significance of each constituent is pictured in the graph. The grouped comparisons to the left in the figure are for stations at different locations on the same stream as in Figure 10. The sodium and the carbonate plus bicarbonate ions increased at all downstream stations.

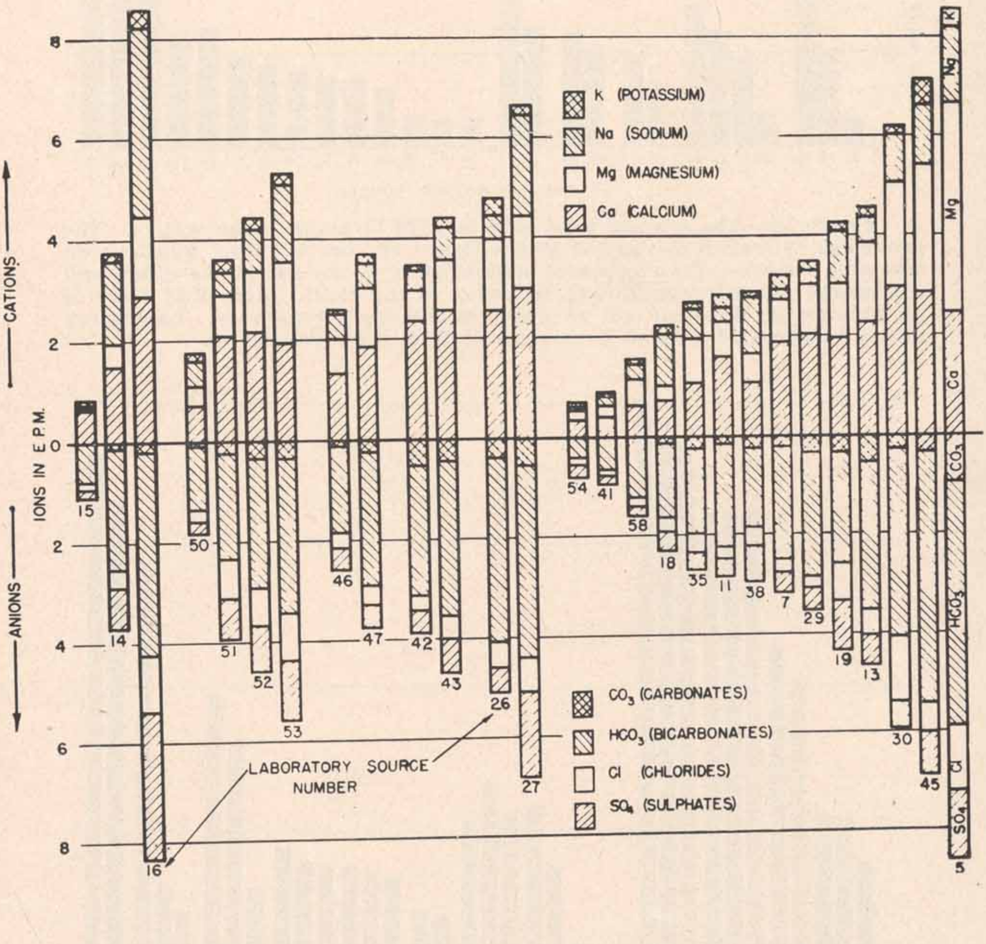

Figure 12.—The average salt constituents found in major Idaho irrigation waters, 1948-1949. The cations are plotted above the zero axis and the anions below. The groupings to the left of the figure are for upstream-to-downstream (from left to right) stations on the same stream. Note the increase in salts and the increases especially in sodium (Na) and carbonate-bicarbonate (CO_3+HCO_3) content. Laboratory source numbers 54 through 5 are on separate sources.

Figure 13 (also see Table B, Appendix) shows the individual constituent breakdown of the average salts occurring in the miscellaneous waters.

The average salt determinations appearing in the figures and graphs of averages were based on uniform stream flows throughout the irrigation period. These averages were used as canal diversion is somewhat uniform during the irrigation season and these figures would be most representative of the annual irrigation water on an irrigated area. These quantities were compared with salt content averages based on the actual stream flow for four of the stations. Figure 14, the graph of comparison, shows good agreement of the salts as determined by either method on three of the four sources. The fourth source was completely uncontrolled and showed only fair agreement. This comparison in-

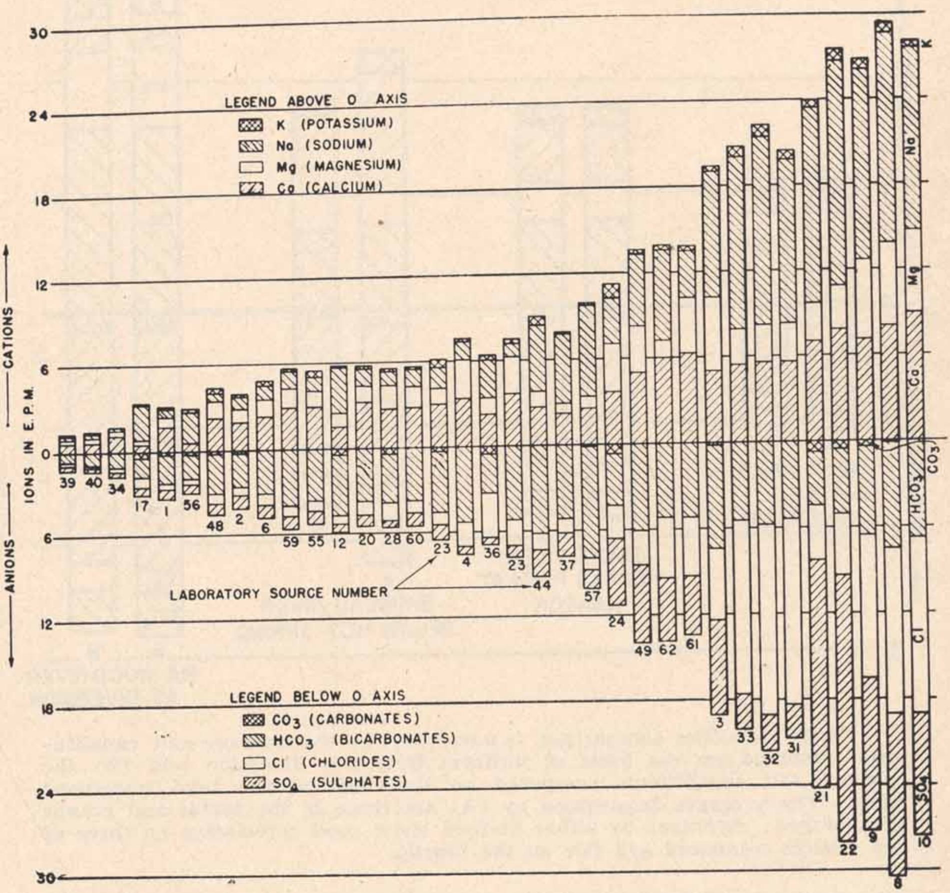

Figure 13.—The average salt components found in miscellaneous waters in Idaho, 1948-1949. Cations are plotted above the zero axis and anions below.

dicates that, in general, the analysis can also be used as the averages for the total annual flow. If complete storage is effected on the water shed these data can be applied.

As the study was concerned with the flow occurrences of 1948 and 1949, it was desirable to determine whether the runoff for these two years was representative of the watersheds. Opinions of several experienced men were solicited and hydrographs for 1948 and 1949 were compared with average watershed hydrographs. Comparisons were complicated because of influences induced by watershed control. Figure 15 is a comparison for a completely uncontrolled Idaho river. In general, the run-off for the 2 years was typical with the exception of the spring peak flow.

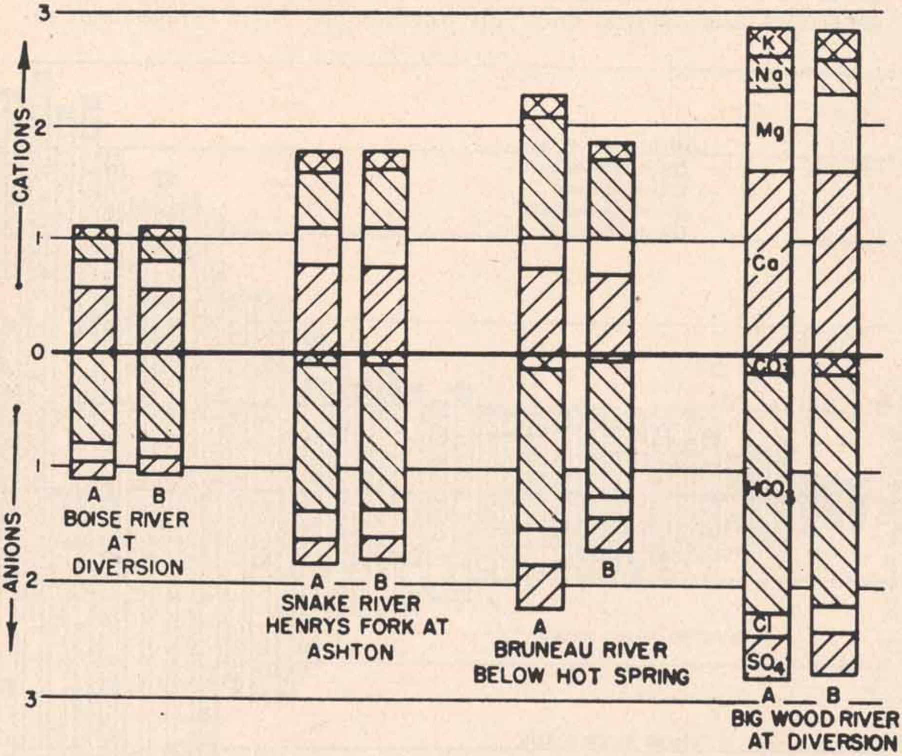

Figure 14.—The comparison (e.p.m.) of (A) the average salt constituents computed on the basis of uniform irrigation diversion and (B) the average salt constituents computed on the basis of the total watershed yield. The averages determined by (A) are those in the tables and graphs of averages. Averages by either method show good correlation on three of the sources compared and fair on the fourth.

The spring run-off was higher than average. It is believed, however, that the records obtained are representative for the stations in all cases where the samples were taken continuously.

Based on their general chemical characteristics, the water sources of the state may be divided into four general groups as follows:

1. Waters having low total salt content. The Boise, Payette, and Spokane rivers are characteristic of this group.
2. Waters having high calcium plus magnesium with accompanying high carbonate plus bicarbonate. The Bear and Portneuf rivers and Malad Big Spring are typical.
3. Water having high sodium in relation to calcium and magnesium. The Bruneau river, Malad Warm Spring, Homedale Drain and Bruneau Hot Spring are examples.
4. Water having relatively high calcium in relation to sodium. The Big Lost and Little Wood rivers and Moore's creek are examples.

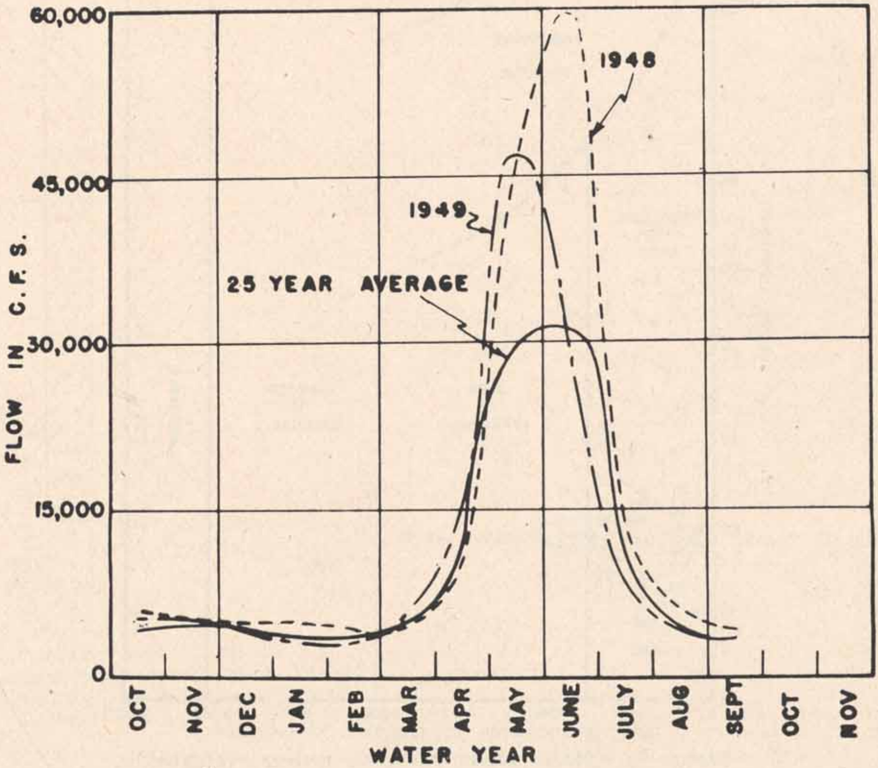

Figure 15.—The comparison of flows during 1948 and 1949 with average run-off for the Salmon river at Whitebird. This watershed is completely uncontrolled. The peak runoffs during the sampling years were higher than average. Otherwise the runoffs were quite similar.

Quality Standards for Interpreting Analysis

Evaluation Based On USDA Standards

The United States Department of Agriculture published a diagram developed at the Rubidoux Unit of the U. S. Regional Salinity and Rubidoux Laboratories) for interpreting analysis of irrigation water based on the proportion of sodium to other cations and the electrical conductivity or total salt content, if significant boron is not present.[5]. Significant quantities of boron were not

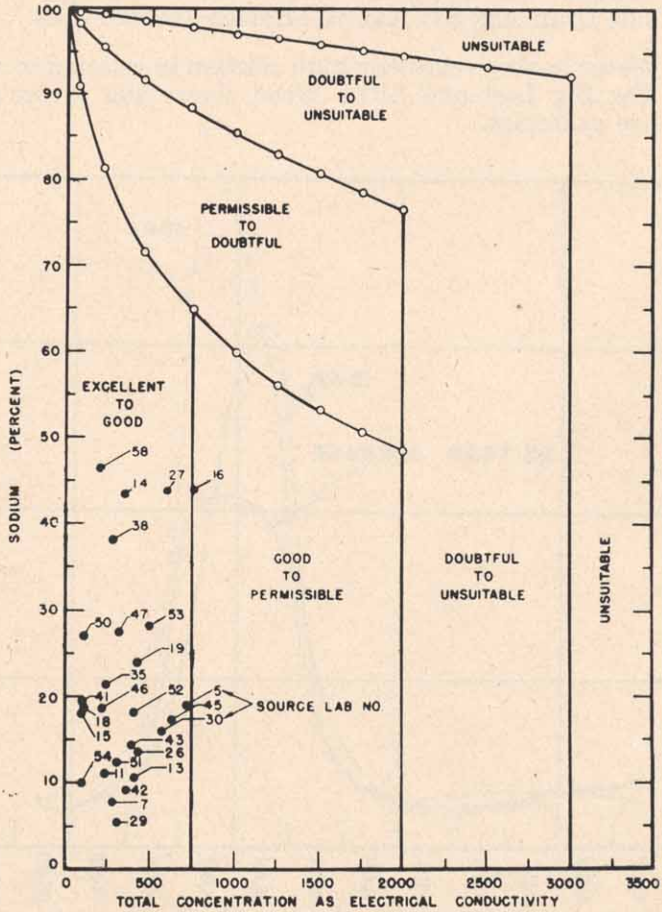

Figure 16.—Major Idaho irrigation waters evaluated by U.S.D.A. standards for interpreting their quality for irrigation.

[5] "Explanation and Interpretation of Analysis of Irrigation Waters" by L. V. Wilcox, U.S.D.A. Circular No. 784, May, 1948.

found in any of the waters studied. Figure 16 shows that all but one of Idaho's major waters studied would be classified as excellent in quality for irrigation usage. The one source falls into the classification for good to permissable water.[6]

Figure 17 shows the location of the miscellaneous waters on the interpretation diagram. Fortunately, the poorer quality waters are only small flows.

Evaluations Based On Carbonates + Bicarbonates

Problems arising in some areas of Idaho have prompted concern for several years over the possible influence on the soil of the high bicarbonate content of certain irrigation waters. In the

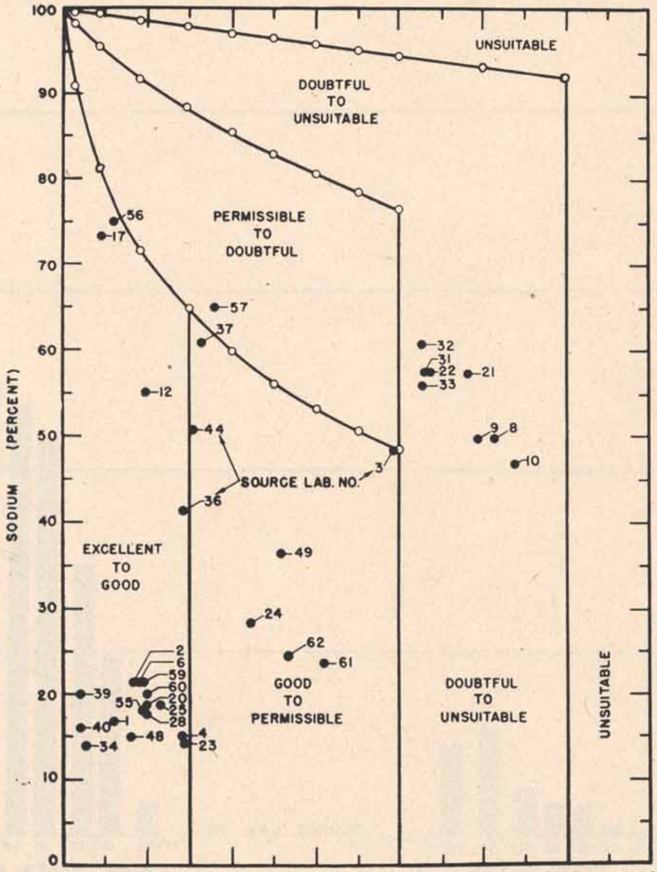

Figure 17.—The miscellaneous waters evaluated by U.S.D.A. standards for interpreting their quality for irrigation.

[6] Note that the conductivity recorded in Tables A and B is EC x 10^3 whereas conductivity as used in the U.S.D.A. chart is EC x 10^6.

February, 1950, issue of *Soil Science,* Eaton[7] suggested the consideration of the potential formation of sodium carbonate based on the chemical constituents in the irrigation water.

Eaton's suggested evaluation is based on the potential sodium carbonate remaining after the theoretical chemical reaction of calcium and magnesium with the carbonates and bicarbonates of the irrigation water. Thus, waters with a low initial percentage sodium may give rise to a high sodium soil solution by reason of calcium and magnesium carbonate precipitation. As the concentration of sodium carbonate increases in the soil, the replacement by sodium of the exchange calcium and magnesium brings about a progressive destruction of particle aggregates. This destruction

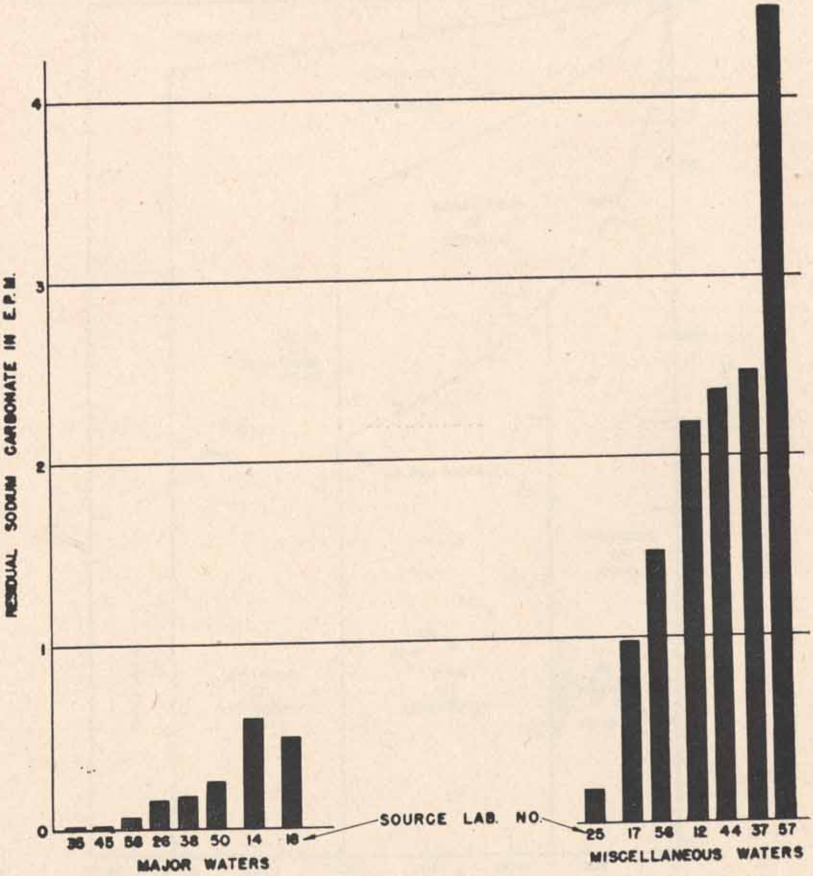

Figure 18.—Residual sodium carbonate, as determined by Eaton's suggested evaluation, in major irrigation and miscellaneous waters in Idaho, 1948-1949. Waters 12, 44, 37, and 57 are return flow (drainage) waters from the Payette river in the Emmett valley.

[7] "Significance of Carbonates in Irrigation Waters" by F. M. Eaton, **Soil Science,** Vol. 69, Number 2, February, 1950.

results in particle dispersion and reduced permeability, providing the soil solution is not more than slightly saline.

Potassium is disregarded in the evaluation due to its questionable influence and because it is seldom found in very large amounts in irrigation waters.[8] Table C, Appendix, shows Idaho's major waters evaluated by Eaton's proposal. Table D, Appendix, is the summary for the miscellaneous waters studied. Figure 18 shows the major and miscellaneous waters which contain residual sodium carbonate and the proportionate amounts. Although the waters of the Payette river at the diversion showed no residual sodium carbonate, all drains (return flow) on this source were exceedingly high.

Summary

A detailed 2 year investigation has been made on the quality of irrigation waters used in Idaho. Systematic sampling involving 442 composited samples was carried out on 27 major water sources. Each composite was made from six to eight individual samples. Also analyzed were 65 additional samples from 35 different miscellaneous water sources. Each analysis included determination of conductivity, pH, calcium, magnesium, sodium, potassium, carbonates, bicarbonates, sulphates, and chlorides. Samples from each source were also checked for boron content. The major waters investigated influence an approximate 2 million of the 2½ million irrigated acres in Idaho.

It is essential to consider both the concentration and the composition of the dissolved salts in irrigation water in good management of irrigated soils. A 2-year inventory of Idaho waters is here reported. Based on USDA standards, the major irrigation waters are high quality for irrigation usage. Based on Eaton's proposed evaluation some of the waters contain residual sodium carbonate due principally to their proportionately high bicarbonate content. These waters may require special management for suitable long-time irrigation usage.

The dissolved salts vary from (a) stream to stream, (b) from time to time at any station on the same stream, and (c) from station to station on the same stream if inflow or return flow occurs between the stations. The total salt content increased from upstream to downstream station. In general, the sodium and carbonate plus bicarbonate proportions also increased with progression downstream. Return flows showed marked increases in sodium and carbonate plus bicarbonate.

Systematic sampling throughout the year is necessary to factually evaluate the salt make-up of a stream.

Further interpretation of this inventory will be possible as the second and third phases of the study are advanced. The second phase to determine the influences the individual waters are having on the soil, is now being investigated. The third phase, the determination of practical management of waters having adverse influences, is planned to follow phase two.

[8] Personal correspondence.

Appendix

DEFINITIONS AND CONVERSION FACTORS

Definitions:

Anion—a negative ion—for example: carbonates (CO_3), bicarbonates (HCO_3), sulphates (SO_4), and chlorides (Cl).

C. f. s.—cubic feet per second.

Cation—a positive ion—for example: calcium (Ca), sodium (Na), magnesium (Mg), and potassium (K).

E..C. — (Electrical Conductivity)—the reciprocal of the electrical resistivity. The resistivity is the resistance in ohms of a conductor which is 1/cm. long and has a cross-sectional area of 1 sq. cm. $ECx10^3$ is millimhos/cm., the unit used in this bulletin.

Equivalent weight—atomic or formula weight divided by its valence.

E.p.m.—(Equivalents per million)—an equivalent per million is a unit chemical equivalent weight of salt per million unit weights of soil or solution. For solution, e.p.m. and milliequivalents per liter are numerically identical if the specific gravity of the solution is 1.0.

Hydrograph—a record of discharge rate plotted against time for a watershed.

P.p.m.—(Parts per million)—units of weight of salt per million units weight of ~~soil solution.~~ water. Calculated total salts are $ECx10^3$ multiplied by 600.

Percentage Sodium Found—is calculated as e.p.m. of Na x 100 divided by e.p.m. of Na + Ca + Mg.

Percentage Sodium Possible—is computed as e.p.m. of Na x 100 divided by e.p.m of (Na + Ca + Mg) — (HCO_3 + CO_3), the $HCO_3 + CO^3$ deduction not exceeding Ca + Mg.

Residual Sodium Carbonate—the amount of $HCO_3 + CO_3$ remaining after deduction of the concentrations of Ca and Mg.

Conversion Factors:

Conductivity to equivalents per million: E.p.m. = ~~600~~ 10 x $ECx10^3$ for irrigation waters in the range from 0.1 to 5.0 millimhos per cm.

Conductivity to parts per million: P.p.m. = 600 x $ECx10^3$ for irrigation waters in the range from 0.1 to 5.0 millimhos per cm.

Equivalents per million (from chemical analysis) to parts per million: multiply e.p.m. for each ion by its equivalent weight and obtain the sum.

Table A. — Average Chemical Composition of Major Irrigation Waters in Idaho

Lab. No.	Source	Irrigation Period	E. C. x10⁻³	Calculated Total Salts P.p.m.	Percentage Sodium	Constituents E.p.m. Cations Ca	Mg	Na	K	Anions CO_3	HCO_3	SO_4	Cl
5	Bear river at Grace	1948-49	0.72	432	19	2.47	4.06	1.57	0.34	0.96	4.96	1.40	1.38
7	Big Lost river at Mackay	1948	0.29	174	8	1.89	0.82	0.25	0.28	0.22	2.28	0.40	0.27
11	Big Wood river below Magic Dam	1948-49	0.24	144	10	1.60	0.70	0.29	0.25	0.17	2.05	0.36	0.22
13	Blackfoot river at Presto	1948-49	0.41	246	10	2.28	1.61	0.47	0.20	0.55	2.99	0.58	0.49
14	Boise river at Caldwell	1948	0.35	210	44	1.48	0.47	1.64	0.16	0.16	2.41	0.82	0.36
15	Boise river at Diversion	1948-49	0.10	60	18	0.57	0.23	0.20	0.11	0.00	0.80	0.17	0.15
16	Boise river return flow—Notus Canal	1948-49	0.76	456	44	2.89	1.57	3.75	0.34	0.21	4.14	3.00	1.13
18	Bruneau river below Hot Springs	1948-49	0.20	120	47	0.74	0.28	1.05	0.18	0.13	1.39	0.37	0.30
19	Clawson Wells at Rupert	1949	0.43	258	24	1.96	1.11	1.02	0.19	0.33	2.27	1.01	0.74
26	Lemhi river at Leadore	1949	0.43	258	10	2.54	1.40	0.46	0.35	0.40	3.69	0.50	0.51
27	Lemhi river at Salmon	1949	0.60	360	31	2.99	1.42	2.05	0.20	0.58	3.83	1.72	0.68
29	Little Wood river at Richfield—Dietrich Canal	1948-49	0.31	186	7	2.04	1.02	0.26	0.18	0.33	2.52	0.46	0.22
30	Malad Big Spring	1948-49	0.57	342	16	2.98	2.09	0.97	0.17	0.28	3.77	0.55	1.42
35	Mud Lake	1949	0.25	150	21	1.07	0.89	0.57	0.15	0.28	1.69	0.35	0.37
38	Owyhee Reservoir at tunnel outlet in Idaho	1948-49	0.27	162	38	1.08	0.57	1.11	0.14	0.25	1.58	0.71	0.37
41	Payette river at Black Canyon Dam	1948-49	0.10	60	20	0.40	0.23	0.18	0.10	0.00	0.63	0.18	0.12
42	Pahsimeroi river above May	1949	0.36	216	9	2.34	1.60	0.41	0.10	0.54	2.78	0.51	0.38
43	Pahsimeroi river at junction with Salmon	1949	0.40	240	15	2.57	1.00	0.65	0.20	0.48	3.07	0.62	0.48
45	Portneuf river at Topaz	1948-49	0.63	378	17	2.87	2.55	1.20	0.51	0.33	5.10	0.86	0.97
46	Salmon river above Williams Creek	1949	0.22	132	19	1.31	0.69	0.49	0.10	0.13	1.75	0.43	0.26
47	Salmon river at Shoup	1949	0.32	192	13	1.83	1.18	0.47	0.20	0.23	2.69	0.46	0.39
50	Snake river Henry's Fork at Ashton	1948-49	0.11	66	27	0.73	0.36	0.48	0.18	0.10	1.27	0.22	0.24
51	Snake river—South Fork at Heise	1948-49	0.31	186	12	2.09	0.90	0.45	0.28	0.25	2.11	0.83	0.52
52	Snake river at Minidoka	1948-49	0.41	246	19	2.15	1.29	0.84	0.26	0.34	2.59	0.91	0.74
53	Snake river at Marsing	1948-49	0.50	300	29	1.93	1.60	1.53	0.23	0.37	2.66	1.26	0.91
54	Spokane river at Post Falls	1948-49	0.10	60	10	0.33	0.20	0.07	0.10	0.00	0.42	0.23	0.14
58	Weiser river at Diversion	1948-49	0.12	72	19	0.64	0.51	0.30	0.12	0.00	1.21	0.25	0.19

Table B. — Average Chemical Composition of Miscellaneous Waters in Idaho

Lab. No.	Source	E. C. x 10^3	Calculated Total Salts P.p.m.	Percentage Sodium	Constituents — E.p.m.							
					Cations				Anions			
					Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl
1	Aberdeen Experiment Station Canal Water	0.30	180	17	1.75	0.70	0.54	0.20	0.32	1.94	0.68	0.37
2	Aberdeen Experiment Station Well	0.41	246	21	1.94	1.00	0.83	0.20	0.28	2.27	0.95	0.61
3	Aberdeen Jackson Well	1.98	1188	47	5.29	5.40	9.65	0.31	0.22	7.10	7.24	5.56
4	Bastion, Merlin, Well at Malad	0.72	432	15	3.44	2.75	1.17	0.20	0.00	5.28	0.57	1.71
6	Big Jimmy Creek at Fort Hall	0.45	270	21	2.33	1.20	1.01	0.38	Tr.	3.08	0.94	0.84
8	Big Malad Channel flow west of George White barn—Malad	2.58	1548	50	8.00	5.86	14.83	0.70	0.12	7.44	11.50	11.59
9	Big Malad Channel flow at Holbrook Road—Malad	2.48	1488	50	7.18	5.50	13.44	0.81	0.39	6.16	10.67	10.03
10	Big Malad Channel flow east of John Price farmstead—Malad	2.70	1620	47	8.85	5.83	13.03	0.30	0.00	6.77	8.50	12.27
12	Bishop Drain at Emmett	0.50	300	55	1.48	1.05	3.18	0.10	0.54	4.19	0.54	0.60
17	Bruneau Hot Springs	0.28	168	73	0.39	0.40	2.47	0.10	0.48	1.30	0.59	0.74
20	Clear Creek at Fort Hall	0.50	300	19	3.17	1.30	1.13	0.23	Tr.	3.75	0.82	0.91
21	Homedale Town Well	2.20	1320	57	7.02	2.74	13.76	0.50	0.77	3.72	15.94	3.79
22	Homedale Drain	2.42	1452	57	7.82	3.15	15.78	0.78	0.60	4.47	18.59	4.34
23	Jones Estate Well at Malad	0.73	438	14	3.67	2.50	1.04	0.34	0.00	5.21	0.83	1.79
24	Kaes Drain—Twin Falls	1.12	672	27	4.02	4.33	3.50	1.00	0.30	4.69	3.31	3.68
25	Larson Bros. Well—Blackfoot	0.59	354	19	2.98	1.47	1.16	0.53	0.41	4.21	1.12	0.80
28	Little Malad river at Elkhorn Dam	0.50	300	18	2.71	1.70	1.00	0.17	0.48	3.37	0.54	1.23
31	Malad Warm Spring	2.05	1230	57	5.23	2.95	11.59	0.61	0.00	5.15	2.40	12.99
32	Malad Warm Springs—Roderick Thomas Spring	2.15	1290	60	5.64	2.55	13.29	0.78	0.00	5.82	2.53	13.29
33	Malad Warm Springs—Southwest Spring	2.15	1290	59	5.39	2.50	12.15	0.70	0.00	5.53	2.40	12.10
34	Moore's Creek—Boise river	0.13	78	14	1.20	0.26	0.23	Tr.	0.00	1.12	0.32	0.35

Table B. — Average Chemical Composition of Miscellaneous Waters in Idaho (Continued)

Lab. No.	Source	E. C. x 10^3	Calculated Total Salts P.p.m.	Percentage Sodium	Constituents — E.p.m. Cations Ca	Mg	Na	K	Anions CO_3	HCO_3	SO_4	Cl
36	Neely Warm Springs Near American Falls	0.72	432	42	2.24	1.15	2.70	0.35	0.60	2.70	0.50	3.09
37	Norwood Springs at Emmett—Payette return flow	0.83	498	61	2.42	0.97	5.54	0.16	0.55	5.29	2.17	1.02
39	Payette river—South Fork	0.10	60	17	0.53	0.35	0.20	0.13	0.00	0.70	0.39	0.21
40	Payette river—North Fork	0.10	60	20	0.40	0.50	0.25	0.10	0.00	0.75	0.32	0.11
44	Pevlar Drain Emmett	0.78	468	51	2.70	1.10	4.63	0.60	0.00	6.17	1.82	1.15
48	Sharp's Coulee—Snake river return flow—Twin Falls	0.40	240	15	2.24	1.15	0.68	0.33	0.32	2.72	0.81	0.70
49	Snake river return flow seeps—Twin Falls	1.30	780	37	4.97	3.35	5.03	0.34	0.00	6.12	5.37	2.44
55	Spring Creek at Fort Hall	0.48	288	18	2.93	1.20	1.09	0.40	Tr.	3.66	0.86	0.74
56	Valley Plunge Artesian Well at Bruneau	0.30	180	75	0.50	Tr.	2.22	0.25	0.26	1.70	0.65	0.35
57	Walker Springs at Emmett—Payette return flow	0.90	540	65	2.51	0.88	6.48	0.12	0.13	7.78	1.32	0.81
59	Williams, J. E., Well at Blackfoot	0.52	312	21	2.94	1.40	1.20	0.20	0.00	4.00	0.91	0.71
60	Williams, Les, Wells at Blackfoot	0.53	318	21	2.82	1.46	1.19	0.20	0.00	3.76	0.97	0.81
61	Williams, J., Ditch at Samaria	1.55	930	26	7.25	4.67	4.20	0.35	0.00	5.56	5.20	5.71
62	Williams, J., Spring at Samaria	1.35	810	24	5.97	4.30	3.35	0.37	0.00	5.24	4.37	4.23

Table C. — Average Percentage Sodium and Residual Sodium Carbonate in Major Idaho Waters According to Eaton (9)

Lab. No.	Source	Percentage Sodium Found (10)	Percentage Sodium Possible	Residual Na_2CO_3 (E.p.m.)
5	Bear river at Grace	19	72	0.00
7	Big Lost river at Mackay	8	54	0.00
11	Big Wood river below Magic Dam	11	78	0.00
13	Blackfoot river at Presto	11	57	0.00
14	Boise river at Caldwell	46	100	0.62
15	Boise river at Diversion	20	100	0.00
16	Boise river return flow (Notus Canal)	46	97	0.00
18	Bruneau river below Hot Springs	51	100	0.50
19	Clawson Wells at Rupert	25	68	0.00
26	Lemhi river at Leadore	10	100	0.15
27	Lemhi river at Salmon	32	100	0.00
29	Little Wood river at Richfield—(Dietrich Canal)	8	55	0.00
30	Malad Big Spring	16	49	0.00
35	Mud Lake	23	100	0.01
38	Owyhee Reservoir water at tunnel outlet in Idaho	40	100	0.18
41	Payette river at Black Canyon Dam	22	100	0.00
42	Pahsimeroi river above May	9	40	0.00
43	Pahsimeroi river at junction with Salmon	15	97	0.00
45	Portneuf river at Topaz	18	100	0.01
46	Salmon river above Williams Creek	20	80	0.00
47	Salmon river at Shoup	14	84	0.00
50	Snake river Henry's Fork at Ashton	31	100	0.28
51	Snake river South Fork at Heise	13	42	0.00
52	Snake river at Minidoka Dam	20	62	0.00
53	Snake river at Marsing	30	75	0.00
54	Spokane river at Post Falls	12	39	0.00
58	Weiser river at Diversion	21	100	0.06

(9) Ibid footnote 7

(10) These values differ from those in Table A as potassium is excluded from these calculations.

Table D.—Average Percentage Sodium and Residual Sodium Carbonate in Miscellaneous Idaho Waters According to Eaton (9)

Lab. No.	Source	Percentage Sodium Found (10)	Percentage Sodium Possible	Residual Na_2CO_3 (E.p.m.)
1	Aberdeen Experiment Station Canal Water	18	74	0.00
2	Aberdeen Experiment Station Well	22	68	0.00
3	Aberdeen, Jackson Well	47	74	0.00
4	Bastion, Merlin, Well at Malad	16	56	0.00
6	Big Jimmy Creek at Fort Hall	22	69	0.00
8	Big Malad Channel flow west of George White barn—Malad	52	70	0.00
9	Big Malad Channel flow at Holbrook Road—Malad	51	69	0.00
10	Big Malad Channel flow east of John Price farmstead—Malad	47	62	0.00
12	Bishop Drain at Emmett	56	100	2.20
17	Bruneau Hot Springs	76	100	0.99
20	Clear Creek at Fort Hall	20	61	0.00
21	Homedale Town Well	58	72	0.00
22	Homedale Drain	59	73	0.00
23	Jones Estate Well at Malad	14	52	0.00
24	Kaes Drain—Twin Falls	30	51	0.00
25	Larson Brothers Well—Blackfoot	21	100	0.17
28	Little Malad river at Elkhorn Dam	18	64	0.00
31	Malad Warm Springs	59	79	0.00
32	Malad Warm Springs—Roderick Thomas Spring	62	85	0.00
33	Malad Warm Springs—Southwest Spring	61	84	0.00
34	Moore's Creek—Boise river	14	40	0.00
36	Neeley Warm Springs near American Falls	44	97	0.00
37	Norwood Springs at Emmett—Payette return flow	62	100	2.45
39	Payette river—South Fork	19	53	0.00
40	Payette river—North Fork	22	63	0.00
44	Pevlar Drain—Emmett			
48	Sharp's Coulee—Snake river return flow—Twin Falls	17	66	0.00
49	Snake river return flow seeps—Twin Falls	38	70	0.00
55	Spring Creek at Fort Hall	19	68	0.00
56	Valley Plunge Artesian Well at Bruneau	82	100	1.46
57	Walker Springs at Emmett—Payette return flow	66	100	4.54
59	Williams, J. E., Well at Blackfoot	22	78	0.00
60	Williams, Les, Wells at Blackfoot	22	70	0.00
61	Williams, J., Ditch at Samaria	26	40	0.00
62	Williams, J., Spring at Samaria	25	40	0.00

(9) Ibid footnote 7

(10) These values differ from those in Table B as Potassium is excluded from these calculations.

Table E. — Record of Individual Samples — Major Idaho Irrigation Waters

Lab. No.	Source	Period	Year	Av. Stream Flow (cfs)	ECx10³	pH	Constituents E.p.m. Cations Ca	Mg	Na	K	Anions CO_3	HCO_3	SO_4	Cl
5	Bear river at Grace	5/24 6/2	1948	945	0.55	7.50	3.13	2.20	0.67	0.13	0	4.74	0.99	0.60
		6/2 6/16	1948	938	0.58	7.50	2.94	2.05	0.94	0.13	0	4.30	1.08	0.82
		6/16 7/5	1948	974	0.60	8.60	3.12	2.30	1.24	0.23	1.54	2.70	1.05	1.49
		7/5 7/19	1948	1328	0.72	8.62	3.08	3.10	1.57	0.23	1.60	3.23	1.30	1.53
		7/19 8/4	1948	1214	0.85	8.68	2.18	4.90	1.91	0.23	2.10	3.36	1.67	1.84
		8/4 8/19	1948	1145	0.81	8.55	1.99	5.20	1.89	0.23	1.98	3.66	1.68	1.58
		8/19 9/1	1948	1133	0.85	8.51	1.66	5.80	1.93	0.60	1.32	5.48	1.74	1.54
		9/1 9/17	1948	977	0.90	8.70	1.74	6.07	1.94	0.60	1.36	5.72	1.74	1.57
		9/17 9/29	1948	870	0.89	8.65	2.03	5.90	1.68	0.60	1.22	5.78	1.66	1.46
		9/29 10/13	1948	665	0.85	8.65	2.28	5.30	1.71	0.60	1.36	5.50	1.62	1.44
		10/13 12/12	1948	733	0.73	8.52	2.67	4.76	1.43	0.40	1.00	5.51	1.57	1.21
		12/12 2/23	1948	923	0.80	8.43	2.73	5.20	1.58	0.35	1.16	5.92	1.53	1.40
		2/23 4/20	1949	535	0.60	8.36	2.95	3.15	0.88	0.35	0.68	4.86	1.23	0.84
		4/20 5/11	1949	498	0.55	8.20	3.23	2.72	0.67	0.10	0.72	4.49	0.82	0.64
		5/11 6/3	1949	549	0.60	8.30	3.15	2.75	0.86	0.10	0.87	4.36	0.91	0.79
		6/3 6/13	1949	559	0.59	8.20*	3.14	2.75	1.09	0.10	1.00	4.07	1.03	0.89
		6/13 6/29	1949	959	0.68	7.95*	2.89	2.75	1.52	0.30	0.40	4.55	1.30	1.07
		6/29 7/15	1949	1247	0.69	8.05*	2.94	2.85	1.68	0.30	0.44	4.80	1.10	1.11
		7/15 8/1	1949	949	0.80	8.00*	2.74	4.05	1.94	0.30	Tr.	6.06	1.50	1.45
		8/1 8/15	1949	982	0.82	8.05*	2.27	4.90	1.99	0.30	0.30	6.08	1.72	1.57
		8/15 8/26	1949	1095	0.63	8.40	1.73	5.40	2.03	0.60	0.39	6.80	1.75	1.58
		8/26 9/7	1949	990	0.53	8.60	1.66	5.50	1.97	0.60	1.16	6.17	1.63	1.57
		9/7 9/21	1949	767	0.81	8.70	1.89	5.40	1.87	0.60	0.96	6.41	1.61	1.55
		9/21 10/3	1949	813	0.80	8.60	2.01	5.40	1.80	0.60	1.06	6.36	1.62	1.47
7	Big Lost river at Mackay	4/12 4/24	1948	141	0.30	7.80	2.03	0.93	0.29	0.13	0.24	2.30	0.39	0.27
		4/24 5/8	1948	169	0.30	8.05	2.07	0.93	0.24	0.13	0.14	2.42	0.40	0.24
		5/8 5/22	1948	203	0.30	8.10	2.00	0.93	0.28	0.13	0.10	2.51	0.32	0.24
		5/22 6/5	1948	1031	0.29	7.79	1.83	0.83	0.22	0.13	0	2.33	0.32	0.23
		6/5 6/23	1948	1337	0.25	8.25	1.57	0.70	0.23	0.23	Tr.	2.08	0.37	0.30
		6/23 7/12	1948	733	0.25	8.40	1.58	0.80	0.23	0.23	Tr.	2.16	0.36	0.28
		7/12 7/31	1948	648	0.25	8.49	1.72	0.70	0.22	0.23	Tr.	2.31	0.39	0.36
		7/31 8/18	1948	468	0.27	8.50	1.91	0.70	0.26	0.23	Tr.	2.49	0.37	0.34

* The pH meter used during this period gave some erratic results regardless of constant checking. These values are questionable.

Table E.—Record of Individual Samples—Major Idaho Irrigation Waters (Continued)

Lab. No.	Source	Period	Year	Av. Stream Flow (cfs)	ECx10[3]	pH	Constituents E.p.m. Cations Ca	Mg	Na	K	Anions CO_3	HCO_3	SO_4	Cl
7	Big Lost river at Mackay (continued)	8/18 9/1	1948	459	0.30	8.50	1.92	0.83	0.27	0.50	0.42	2.17	0.52	0.24
		9/1 9/15	1948	267	0.30	8.52	1.99	0.83	0.26	0.50	0.58	2.19	0.54	0.26
		9/15 9/29	1948	135	0.30	8.52	2.07	0.83	0.28	0.50	0.64	2.18	0.46	0.26
		9/29 10/13	1948	62	0.31	8.60	2.06	0.83	0.28	0.50	0.56	2.26	0.46	0.26
11	Big Wood river below Magic Dam	3/31 5/5	1948	118	0.25	7.90	1.64	0.68	0.37	0.17	0	2.33	0.34	0.27
		5/5 5/17	1948	553	0.25	7.80	1.65	0.62	0.37	0.13	0	2.33	0.36	0.22
		5/17 5/31	1948	700	0.25	7.80	1.68	0.80	0.39	0.10	Tr.	2.66	0.31	0.28
		5/31 6/9	1948	779	0.25	7.80	1.76	0.63	0.34	0.10	Tr.	2.25	0.29	0.26
		6/9 6/25	1948	831	0.25	8.30	1.80	0.60	0.30	0.23	Tr.	2.27	0.41	0.10
		6/25 7/12	1948	723	0.25	8.40	1.75	0.60	0.34	0.23	Tr.	2.22	0.39	0.13
		7/12 7/28	1948	820	0.25	8.25	1.71	0.60	0.28	0.23	Tr.	2.21	0.39	0.13
		7/28 8/13	1948	768	0.25	8.25	1.66	0.60	0.28	0.23	Tr.	2.23	0.41	0.11
		8/13 8/25	1948	619	0.25	8.50	1.68	0.70	0.27	0.33	0.40	1.90	0.40	0.20
		8/25 9/6	1948	557	0.20	8.50	1.65	0.70	0.24	0.33	0.40	2.00	0.37	0.22
		9/6 9/17	1948	607	0.25	8.47	1.70	0.70	0.24	0.33	0.30	2.07	0.40	0.21
		9/17 9/29	1948	479	0.25	8.42	1.73	0.70	0.20	0.33	0.30	2.10	0.37	0.25
		3/21 5/4	1949	600	0.25	7.85	1.50	0.80	0.32	0.18	0.30	1.76	0.40	0.30
		5/4 5/16	1949	858	0.24	8.30	1.49	0.90	0.32	0.18	0.48	1.70	0.34	0.30
		5/16 5/27	1949	1169	0.24	8.33	1.46	0.80	0.28	0.18	0.32	1.73	0.36	0.29
		5/27 6/8	1949	986	0.24	8.25	1.46	1.00	0.29	0.18	0.24	1.92	0.36	0.31
		6/8 6/22	1949	730	0.21	7.35*	1.42	0.51	0.32	0.27	0.12	1.88	0.28	0.21
		6/22 7/8	1949	706	0.21	7.60*	1.39	0.51	0.31	0.35	0.14	1.90	0.39	0.22
		7/8 7/25	1949	829	0.21	7.91*	1.40	0.51	0.30	0.35	0.10	1.96	0.27	0.23
		7/25 8/10	1949	798	0.22	7.84*	1.49	0.51	0.29	0.35	0.09	1.87	0.35	0.21
		8/10 8/24	1949	601	0.22	8.40	1.58	0.77	0.25	0.27	0.13	1.95	0.34	0.19
		8/24 9/7	1949	592	0.22	8.30	1.57	0.77	0.27	0.27	0.13	2.10	0.34	0.22
		9/7 9/19	1949	519	0.24	8.30	1.57	0.77	0.28	0.27	0.16	2.07	0.36	0.25
		9/19 9/30	1949	421	0.24	8.30	1.62	1.05	0.17	0.27	0.18	2.09	0.44	0.27
13	Blackfoot river at Presto	4/5 4/23	1948	246	0.32	7.90	2.07	0.85	0.25	0.13	0.26	2.19	0.49	0.31
		4/23 5/10	1948	222	0.43	8.20	2.85	1.22	0.31	0.13	0.32	3.23	0.59	0.39
		5/10 5/26	1948	463	0.47	8.00	2.70	1.72	0.28	0.18	0.42	3.33	0.57	0.53
		5/26 6/11	1948	878	0.47	8.00	2.58	1.95	0.46	0.13	0.52	3.26	0.57	0.61

* The pH meter used during this period gave some erratic results regardless of constant checking. These values are questionable.

Table E.—Record of Individual Samples—Major Idaho Irrigation Waters (Continued)

Lab. No.	Source	Period	Year	Av. Stream Flow (cfs)	ECx10³	pH	Constituents E.p.m.							
							Cations				Anions			
							Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl
13	Blackfoot river at Presto (continued)	6/11 6/30	1948	620	0.45	8.50	2.41	1.70	0.53	0.10	0.94	2.44	0.57	0.55
		6/30 7/16	1948	542	0.45	8.45	2.39	1.70	0.53	0.10	1.04	2.39	0.59	0.54
		7/16 8/2	1948	859	0.43	8.48	2.22	1.70	0.52	0.10	0.98	2.22	0.58	0.58
		8/2 8/16	1948	679	0.40	8.45	2.03	1.70	0.53	0.10	0.88	2.21	0.57	0.55
		8/16 9/1	1948	629	0.40	8.05	1.97	1.80	0.45	0.32	0.22	3.22	0.66	0.46
		9/1 9/15	1948	772	0.40	8.25	1.97	1.90	0.40	0.32	0.26	3.19	0.52	0.45
		9/15 9/29	1948	212	0.41	8.50	2.18	1.70	0.42	0.32	0.54	2.99	0.60	0.49
		9/29 10/11	1948	81	0.40	8.50	2.13	1.60	0.42	0.32	0.58	2.84	0.66	0.51
		10/11 12/6	1948	77	0.40	8.32	2.47	1.50	0.60	0.35	0.66	2.89	0.76	0.53
		12/6 1/24	1948	54	0.40	8.32	2.53	1.30	0.53	0.35	0.70	2.78	0.60	0.53
		1/24 4/18	1949	121	0.40	8.56	2.43	1.20	0.44	0.35	0.60	2.91	0.58	0.49
		4/18 5/9	1949	332	0.43	7.80	2.75	1.32	0.49	0.20	0.56	3.37	0.48	0.49
		5/9 5/20	1949	536	0.45	7.90	2.87	1.32	0.48	0.20	0.86	3.18	0.55	0.47
		5/20 6/1	1949	431	0.44	7.80	2.73	1.32	0.49	0.20	0.34	3.63	0.44	0.48
		6/1 6/13	1949	599	0.45	7.90	2.75	1.35	0.46	0.20	0.68	3.36	0.44	0.41
		6/13 6/29	1949	511	0.40	7.56*	1.93	1.74	0.61	0.20	0.54	2.92	0.59	0.56
		6/29 7/15	1949	633	0.38	7.62*	1.90	1.85	0.45	0.20	0.34	3.06	0.62	0.53
		7/15 8/1	1949	804	0.39	7.61*	2.04	1.77	0.44	0.20	0.70	2.73	0.78	0.52
		8/1 8/15	1949	686	0.38	7.68*	1.95	1.70	0.43	0.20	0.60	2.75	0.64	0.46
		8/15 8/31	1949	681	0.37	8.20	1.85	1.85	0.57	0.50	0.29	3.42	0.66	0.49
		8/31 9/16	1949	521	0.38	8.20	1.96	1.82	0.55	0.50	0.19	3.47	0.60	0.47
14	Boise river at Caldwell	5/12 5/20	1948	2088	0.18	7.45	0.90	0.33	0.56	0.13	0	1.36	0.33	0.20
		5/20 6/8	1948	5560	0.15	7.20	0.72	0.27	0.42	0.13	0	1.25	0.27	0.19
		6/8 6/25	1948	2541	0.18	7.70	1.11	0.33	0.68	0.13	0	1.40	0.43	0.22
		6/25 7/23	1948	169	0.37	8.00	1.40	0.58	1.63	0.13	Tr.	2.27	0.87	0.36
		7/23 8/9	1948	38	0.46	8.00	1.91	0.71	2.10	0.13	Tr.	3.35	1.04	0.43
		8/9 8/23	1948	35	0.49	8.40	1.99	0.63	2.47	0.20	0.36	3.21	1.14	0.49
		8/23 9/3	1948	36	0.45	8.50	1.77	0.40	2.45	0.20	0.36	3.00	1.13	0.48
		9/3 9/17	1948	44	0.45	8.50	1.82	0.53	2.30	0.20	0.42	2.84	1.14	0.49
		9/17 9/30	1948	280	0.44	8.50	1.76	0.53	2.15	0.20	0.28	3.01	1.05	0.43
15	Boise river at Diversion	3/29 4/14	1948	831	0.10	6.90	0.67	0.20	0.27	0.10	0	0.95	0.28	0.19
		4/14 5/5	1948	3053	0.10	7.20	0.57	0.23	0.29	0.10	0	0.95	0.20	0.19

* The pH meter used during this period gave some erratic results regardless of constant checking. These values are questionable.

Table E.—Record of Individual Samples—Major Idaho Irrigation Waters (Continued)

Lab. No.	Source	Period	Year	Av. Stream Flow (cfs)	ECx10[3]	pH	Constituents E.p.m. Cations Ca	Mg	Na	K	Anions CO_3	HCO_3	SO_4	Cl
15	Boise river at Diversion (continued)	5/5 5/21	1948	5271	0.10	7.30	0.58	0.17	0.22	0.10	0	0.90	0.19	0.17
		5/21 6/7	1948	10169	0.10	7.00	0.48	0.10	0.20	0.10	0	0.75	0.17	0.15
		6/7 6/21	1948	7270	0.10	7.80	0.60	0.06	0.24	0.13	0	0.65	0.08	0.13
		6/21 7/7	1948	4053	0.10	8.10	0.61	0.06	0.20	0.13	0	0.61	0.11	0.13
		7/7 7/23	1948	3622	0.10	8.00	0.58	0.06	0.18	0.13	0	0.56	0.12	0.12
		7/23 8/9	1948	3115	0.10	7.80	0.60	0.06	0.16	0.13	0	0.68	0.21	0.15
		8/9 8/23	1948	3017	0.10	8.57	0.65	Tr.	0.20	0.13	0	0.75	0.20	0.16
		8/23 9/6	1948	2627	0.10	8.40	0.65	Tr.	0.19	0.13	0	0.83	0.16	0.14
		9/6 9/20	1948	2699	0.10	8.30	0.65	Tr.	0.25	0.13	0	0.81	0.20	0.16
		9/20 10/6	1948	1475	0.10	8.20	0.66	Tr.	0.30	0.13	0	0.80	0.22	0.16
		10/6 12/1	1948		0.10	8.30	0.99	0.35	0.33	0.20	0	1.25	0.30	0.23
		12/1 1/24	1948		0.10	7.30	1.07	0.20	0.37	0.15	0	1.32	0.22	0.22
		1/24 3/21	1949		0.10	8.20	0.81	0.18	0.24	0.15	0	1.20	0.16	0.18
		3/21 4/11	1949	3961	0.10	7.00	0.62	0.45	0.26	0.10	0	0.97	0.12	0.15
		4/11 4/27	1949	3468	0.10	7.00	0.57	0.47	0.17	0.10	0	0.82	0.13	0.16
		4/27 5/16	1949	4517	0.10	6.90	0.48	0.43	0.15	0.10	0	0.77	0.11	0.17
		5/16 6/1	1949	6588	0.10	6.99	0.41	0.50	0.13	0.10	0	0.71	0.09	0.15
		6/1 6/17	1949	5710	0.10	8.20*	0.41	0.35	0.16	0.10	0	0.70	0.24	0.13
		6/17 7/5	1949	4110	0.10	8.15*	0.40	0.35	0.14	0.10	0	0.70	0.11	0.13
		7/5 7/22	1949	3863	0.10	8.00*	0.50	0.35	0.13	0.10	0	0.63	0.14	0.13
		7/22 8/8	1949	3335	0.10	7.82*	0.49	0.35	0.16	0.10	0	0.77	0.11	0.13
		8/8 8/24	1949	3152	0.10	7.90	0.64	0.30	0.12	0.10	0	0.77	0.22	0.15
		8/24 9/9	1949	1979	0.10	7.90	0.60	0.30	0.09	0.10	0	0.85	0.22	0.14
		9/9 9/23	1949	1292	0.10	7.80	0.62	0.30	0.22	0.10	0	0.98	0.28	0.10
		9/23 10/10	1949	852	0.10	7.60	0.66	0.30	0.24	0.10	0	1.13	0.20	0.08
16	Boise river return flow (Notus Canal)	6/9	1948		0.70	7.70	2.91	1.50	3.57	0.23	0	4.00	3.34	1.04
		8/9	1948		0.83	8.20	3.19	1.30	4.01	0.47	Tr.	4.40	3.04	1.16
		10/7	1948		0.68	8.57	2.94	1.85	3.64	0.47	Tr.	4.20	2.98	1.50
		check	1948		0.70	7.70	2.65	1.43	3.28	0.11	0.38	3.32	2.62	0.91
		check	1948		0.78	7.80	3.10	1.50	3.73	0.11	0.36	3.76	2.82	0.98
		check	1948		0.75	7.90	2.92	1.56	3.44	0.11	0.32	3.83	2.75	0.95
		6/8 6/22	1949		0.76	8.20*	2.45	1.60	2.76	0.47	0.24	3.87	2.90	1.10

* The pH meter used during this period gave some erratic results regardless of constant checking. These values are questionable.

Table E.—Record of Individual Samples—Major Idaho Irrigation Waters (Continued)

Lab. No.	Source	Period	Year	Av. Stream Flow (cfs)	ECx10³	pH	Constituents E.p.m. Cations Ca	Mg	Na	K	Anions CO_3	HCO_3	SO_4	Cl
16	Boise river return flow (Notus Canal) (continued)	6/22 7/6	1949		0.79	8.20*	2.21	1.40	3.94	0.47	0.32	3.97	2.90	1.03
		7/6 7/25	1949		0.80	8.22*	2.32	1.40	3.98	0.47	0.30	4.02	2.85	1.02
		7/25 8/8	1949		0.81	8.18*	2.99	1.40	3.77	0.30	0.32	4.14	2.20	1.04
		8/8 8/26	1949		0.80	8.50	3.09	1.80	4.01	0.30	0.49	4.58	3.04	1.03
		8/26 9/13	1949		0.82	8.50	2.83	1.75	4.00	0.30	0.45	4.64	3.07	1.05
		9/13 9/26	1949		0.82	8.60	3.03	1.80	4.06	0.30	0.79	4.28	3.16	1.09
		9/26 10/10	1949		0.82	8.50	2.97	1.80	4.31	0.30	0.63	4.58	3.30	1.10
18	Bruneau river below Hot Springs	3/30 4/10	1948	371	0.40	8.50	1.50	0.47	2.12	0.25	0.57	1.41	1.88	0.66
		4/10 4/24	1948	668	0.15	7.40	0.66	0.37	0.53	0.15	0	0.98	0.18	0.18
		4/24 5/15	1948	707	0.15	7.40	0.72	0.37	0.43	0.13	0	1.00	0.21	0.16
		5/15 6/1	1948	1177	0.10	7.40	0.50	0.30	0.34	0.13	0	0.77	0.18	0.14
		6/1 6/22	1948	1060	0.10	7.52	0.73	0.10	0.51	0.17	0	0.93	0.30	0.17
		6/22 7/8	1948	499	0.15	8.10	0.73	0.10	0.53	0.17	Tr.	1.12	0.21	0.16
		7/8 7/27	1948	188	0.20	8.38	0.74	0.10	1.02	0.17	Tr.	1.50	0.27	0.27
		7/27 8/12	1948	106	0.21	8.38	0.77	0.17	1.27	0.17	Tr.	1.69	0.35	0.29
		8/12 8/26	1948	86	0.28	8.38	0.80	0.20	1.58	0.23	0.48	1.51	0.44	0.33
		8/26 9/9	1948	74	0.28	8.37	0.75	0.20	1.69	0.23	0.40	1.52	0.46	0.35
		9/9 9/23	1948	77	0.26	8.38	0.74	0.20	1.42	0.23	0.32	1.53	0.41	0.35
		9/23 10/7	1948	90	0.25	8.59	0.72	0.20	1.52	0.23	0.34	1.49	0.38	0.36
		10/7 12/1	1948	105	0.25	8.31	0.82	0.75	1.35	0.20	0.26	2.00	0.45	0.34
		12/1 1/26	1948	108	0.25	8.25	0.86	0.75	1.39	0.25	0.36	2.22	0.41	0.33
		1/26 3/23	1949	168	0.20	8.25	0.79	0.50	0.85	0.15	0	1.55	0.23	0.37
		3/23 5/2	1949	1184	0.10	8.12	0.63	0.15	0.40	0.35	0	1.15	0.27	0.25
		5/2 5/11	1949	1519	0.13	6.70	0.68	0.15	0.34	0.19	0	1.09	0.17	0.18
		5/11 5/25	1949	2132	0.11	7.10	0.58	0.35	0.32	0.19	0	1.06	0.12	0.19
		5/25 6/6	1949	1558	0.12	7.30	0.62	0.43	0.33	0.19	0	1.12	0.13	0.18
		6/6 6/22	1949	860	0.10	7.51*	0.69	0.30	0.45	0.20	0.26	0.78	0.23	0.26
		6/22 7/8	1949	372	0.11	7.40*	0.71	0.25	0.70	0.20	0.24	1.09	0.26	0.32
		7/8 7/25	1949	179	0.20	7.72*	0.77	0.20	1.06	0.20	0.30	1.29	0.29	0.40
		7/25 8/10	1949	111	0.24	7.78*	0.76	0.25	1.35	0.20	0.34	1.23	0.31	0.51
		8/10 8/26	1949	91	0.30	8.10	0.81	0.40	1.66	0.20	0	2.25	0.59	0.38
		8/26 9/9	1949	82	0.30	8.20	0.73	0.40	1.76	0.20	0	2.23	0.54	0.38

* The pH meter used during this period gave some erratic results regardless of constant checking. These values are questionable.

Table E.—Record of Individual Samples—Major Idaho Irrigation Waters (Continued)

Lab. No.	Source	Period	Year	Av. Stream Flow (cfs)	ECx10³	pH	Constituents E.p.m.							
							Cations				Anions			
							Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl
18	Bruneau river below Hot	9/9 9/23	1949	80	0.30	8.30	0.73	0.50	1.81	0.20	0	2.23	0.54	0.39
	Springs (continued)	9/23 10/7	1949	86	0.29	8.20	0.74	0.40	1.60	0.20	0	2.18	0.41	0.39
19	Clawson Wells at Rupert	6/10	1949		0.41	7.85*	2.02	1.00	0.94	0.23	0.30	2.20	1.00	0.68
		6/10	1949		0.41	8.23*	1.93	1.10	0.98	0.18	0.50	2.04	1.03	0.68
		6/10	1949		0.41	7.70*	1.91	1.30	1.04	0.15	0	2.50	1.04	0.69
		8/11	1949		0.46	7.49*	2.00	1.10	1.14	0.20	0.36	2.35	0.99	0.89
		8/11	1949		0.43	7.45*	1.91	1.10	1.04	0.20	0.36	2.39	0.93	0.75
		8/11	1949		0.43	7.38*	1.96	1.05	1.00	0.20	0.46	2.16	1.05	0.72
26	Lemhi river at Leadore	8/11	1949		0.43	8.14*	2.58	1.40	0.47	0.35	0.50	3.61	0.48	0.51
		7/30	1949		0.43	8.04*	2.50	1.40	0.46	0.35	0.30	3.76	0.52	0.51
27	Lemhi river at Salmon	8/10	1949		0.62	8.38*	3.17	1.45	2.23	0.20	0.66	4.00	1.88	0.72
		7/14	1949		0.58	8.20*	2.80	1.40	1.87	0.20	0.50	3.65	1.56	0.63
29	Little Wood River at	3/31 4/14	1948	166	0.40	7.80	2.80	1.15	0.31	0.13	0.20	3.29	0.54	0.28
	Richfield (Dietrich canal)	4/14 4/26	1948	181	0.36	8.10	2.44	1.15	0.28	0.13	0.28	2.94	0.45	0.23
		4/26 5/10	1948	143	0.35	7.60	2.35	1.13	0.30	0.13	Tr.	3.22	0.51	0.22
		5/10 5/24	1948	119	0.31	7.60	2.03	1.03	0.30	0.13	Tr.	2.94	0.45	0.20
		5/24 6/9	1948	77	0.27	7.10	1.73	0.73	0.35	0.13	Tr.	2.41	0.50	0.19
		6/9 6/25	1948	90	0.29	7.90	1.80	0.90	0.28	0.10	0.50	1.90	0.51	0.15
		6/25 7/12	1948	100	0.29	8.10	1.89	0.90	0.25	0.10	0.60	1.84	0.42	0.15
		7/12 7/26	1948	98	0.29	8.10	1.85	0.90	0.26	0.10	0.56	1.85	0.42	0.12
		7/26 8/11	1948	108	0.29	8.05	1.77	0.90	0.28	0.10	0.46	1.85	0.44	0.16
		8/11 8/25	1948	107	0.30	8.42	2.13	0.93	0.30	0.27	0.52	2.40	0.41	0.14
		8/25 9/6	1948	100	0.30	8.32	2.10	0.93	0.21	0.27	0.56	2.41	0.44	0.16
		9/6 9/17	1948	100	0.30	8.40	2.18	0.93	0.25	0.27	0.46	2.49	0.42	0.17
		9/17 9/29	1948	124	0.40	8.41	2.71	1.20	0.29	0.27	0.54	3.07	0.51	0.20
		9/29 11/28	1948	136	0.31	8.37	2.48	1.20	0.26	0.25	0.38	2.90	0.49	0.27
		11/28 1/30	1948	130	0.32	8.34	2.30	1.20	0.27	0.15	0.44	2.90	0.38	0.23
		1/30 3/27	1949	139	0.30	8.42	1.68	0.95	0.25	0.15	0.42	2.13	0.33	0.23
		3/27 4/20	1949	167	0.39	8.37	2.31	1.40	0.27	0.18	0.30	3.18	0.48	0.30
		4/20 5/6	1949	137	0.32	7.85	2.11	1.10	0.22	0.18	0.16	2.92	0.41	0.33
		5/6 5/23	1949	99	0.30	7.87	1.93	1.00	0.25	0.18	0.18	2.58	0.40	0.37
		5/23 6/8	1949	132	0.32	8.10	2.08	1.30	0.27	0.18	0.40	2.71	0.42	0.35

* The pH meter used during this period gave some erratic results regardless of constant checking. These values are questionable.

Table E.—Record of Individual Samples—Major Idaho Irrigation Waters (Continued)

Lab. No.	Source	Period	Year	Av. Stream Flow (cfs)	$ECx10^3$	pH	Constituents E.p.m.							
							Cations				Anions			
							Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl
29	Little Wood river at Richfield (Dietrich Canal) (continued)	6/8 6/22	1949	116	0.27	7.10*	1.92	0.95	0.24	0.20	0.38	2.28	0.57	0.24
		6/22 7/8	1949	126	0.30	7.26*	1.99	0.95	0.24	0.20	0.32	2.49	0.54	0.25
		7/8 7/25	1949	121	0.28	7.30*	1.78	0.95	0.25	0.20	0.32	2.38	0.47	0.24
		7/25 8/10	1949	86	0.26	7.30*	1.66	0.95	0.25	0.20	0.50	1.86	0.42	0.24
		8/10 8/24	1949	111	0.31	8.10	1.91	0.90	0.22	0.20	0.24	2.61	0.48	0.19
		8/24 9/7	1949	128	0.31	8.10	2.14	1.00	0.14	0.20	0.27	2.71	0.49	0.19
		9/7 9/19	1949	112	0.30	8.20	1.99	1.15	0.25	0.20	0.29	2.73	0.43	0.18
		9/19 9/30	1949	113	0.22	8.30	1.99	1.32	0.23	0.20	0.24	2.81	0.43	0.18
30	Malad Big Spring	5/20 6/1	1948		0.60	7.95	3.04	1.93	0.82	0.13	0	4.07	0.60	1.52
		6/1 6/15	1948		0.60	7.95	3.07	1.83	0.92	0.13	0.16	3.93	0.53	1.45
		6/15 6/29	1948		0.58	8.10	3.26	1.90	0.88	0.20	0.36	3.75	0.57	1.50
		6/29 7/9	1948		0.56	8.30	3.09	1.95	1.21	0.20	0.50	3.44	0.67	1.54
		7/9 7/21	1948		0.55	8.00	3.03	2.00	1.27	0.20	0.26	3.51	0.63	1.64
		7/21 8/31	1948		0.51	8.52	2.60	1.85	0.83	0.20	0.60	3.07	0.48	1.33
		8/31 9/16	1948		0.52	8.50	2.97	1.85	0.82	0.20	0.56	3.39	0.51	1.33
		9/16 9/29	1948		0.51	8.53	2.83	1.85	0.82	0.20	0.68	3.17	0.54	1.36
		9/29 10/9	1948		0.52	8.60	2.91	1.85	0.76	0.20	0.64	3.06	0.57	1.36
		8/16	1949		0.61	7.95*	3.21	1.90	1.05	0.10	0.28	3.97	0.51	1.42
		10/5	1949		0.57	7.90	2.77	2.70	0.96	0.20	0	4.12	0.54	1.37
35	Mud Lake	6/15	1949		0.30	8.20*	0.94	0.80	0.50	0.15	0.30	1.42	0.51	0.32
		6/30	1949		0.25	8.70*	0.87	0.85	0.60	0.15	0.40	1.32	0.25	0.33
		7/14	1949		0.20	9.22*	0.65	0.70	0.60	0.15	0.70	0.81	0.27	0.37
		7/28	1949		0.20	9.13*	0.69	0.70	0.73	0.15	0.32	1.22	0.34	0.41
		8/11	1949		0.20	8.87*	0.84	0.80	0.52	0.15	0.26	1.47	0.30	0.36
		9/10	1949		0.30	7.85	1.91	1.30	0.53	0.15	0	2.90	0.39	0.39
		10/3	1949		0.27	8.30	1.57	1.10	0.49	0.15	Tr.	2.69	0.37	0.38
38	Owyhee Reservoir water at tunnel outlet in Idaho	4/7 4/21	1948	108	0.33	7.90	1.08	0.74	1.25	0.13	0.24	1.73	0.82	0.41
		4/21 5/7	1948	289	0.33	7.90	1.15	0.55	1.17	0.13	0.16	1.84	0.83	0.44
		5/7 5/26	1948	346	0.33	7.00	1.17	0.55	1.11	0.13	0	1.83	0.75	0.39
		5/26 6/9	1948	384	0.31	7.90	1.11	0.74	1.17	0.07	0.26	1.54	0.79	0.42
		6/9 6/23	1948	335	0.30	8.50	1.19	0.60	1.36	0.13	0.40	1.53	0.80	0.38
		6/23 7/9	1948	419	0.29	8.50	1.19	0.60	1.34	0.13	0.40	1.48	0.78	0.38

* The pH meter used during this period gave some erratic results regardless of constant checking. These values are questionable.

Table E.—Record of Individual Samples—Major Idaho Irrigation Waters (Continued)

Lab. No.	Source	Period	Year	Av. Stream Flow (cfs)	$ECx10^3$	pH	Constituents E.p.m. Cations Ca	Mg	Na	K	Anions CO_3	HCO_3	SO_4	Cl
38	Owyhee Reservoir water (continued)	7/9 7/26	1948	463	0.27	8.40	1.14	0.60	1.22	0.13	0.30	1.52	0.86	0.35
		7/26 8/9	1948	348	0.25	8.35	1.11	0.60	1.17	0.13	0.28	1.52	0.84	0.31
		8/9 8/23	1948		0.27	8.40	1.16	0.45	1.19	0.27	0.34	1.64	0.65	0.35
		8/23 9/6	1948	Storage	0.27	8.40	1.09	0.50	1.17	0.27	0.52	1.45	0.64	0.36
		9/6 9/17	1948	Release	0.27	8.50	1.05	0.55	1.11	0.27	0.38	1.56	0.64	0.32
		9/17 9/29	1948		0.27	8.50	1.12	0.55	1.09	0.27	0.36	1.54	0.66	0.36
		4/13 4/25	1949	Only	0.29	8.20	1.36	0.55	1.43	0.11	0.48	1.52	1.00	0.40
		4/25 5/6	1949		0.30	8.30	1.33	0.55	1.33	0.11	0.48	1.56	0.89	0.42
		5/6 5/23	1949		0.30	8.10	1.24	0.35	1.25	0.11	0.32	1.55	0.66	0.36
		5/23 6/6	1949		0.29	8.20	1.24	0.30	1.23	0.11	0.40	1.50	0.77	0.38
		6/6 6/22	1949		0.25	7.90*	0.98	0.50	1.12	0.11	0.22	1.59	0.71	0.29
		6/22 7/8	1949		0.25	8.20*	0.96	0.51	1.01	0.11	Tr.	1.65	0.71	0.29
		7/8 7/25	1949		0.23	8.20*	0.88	0.45	0.90	0.11	Tr.	1.61	0.67	0.31
		7/25 8/8	1949		0.25	8.10*	0.88	0.45	0.88	0.11	0	1.53	0.60	0.29
		8/8 8/24	1949		0.20	7.40	0.86	0.63	0.86	0.10	0	1.64	0.34	0.56
		8/24 9/9	1949		0.19	7.80	0.87	0.70	0.92	0.10	0	1.59	0.35	0.56
		9/9 9/21	1949		0.20	8.30	0.86	0.75	0.74	0.11	0	1.55	0.56	0.26
		9/21 10/3	1949		0.20	8.20	0.89	0.85	0.73	0.11	0	1.50	0.52	0.30
41	Payette river at Black Canyon Dam	3/29 4/14	1948		0.10	7.25	0.49	0.33	0.30	0.13	0	0.73	0.12	0.10
		4/14 4/30	1948		0.10	6.90	0.39	0.23	0.22	0.07	0	0.55	0.09	0.09
		4/30 5/19	1948		0.10	6.85	0.39	0.17	0.28	0.07	0	0.50	0.05	0.08
		5/19 6/7	1948		0.10	6.60	0.34	0.13	0.13	0.02	0	0.46	0.04	0.11
		6/7 6/21	1948		0.10	7.08	0.27	0.10	0.13	0.10	0	0.47	0.13	0.10
		6/21 7/7	1948		0.10	7.35	0.33	0.10	0.12	0.10	0	0.53	0.11	0.08
		7/7 7/23	1948		0.10	7.40	0.41	0.10	0.14	0.10	0	0.57	0.10	0.11
		7/23 8/9	1948		0.10	7.30	0.43	0.10	0.14	0.10	0	0.56	0.11	0.09
		8/9 8/23	1948		0.10	7.68	0.35	0.20	0.15	0.13	0	0.64	0.20	0.14
		8/23 9/8	1948		0.10	7.55	0.40	0.20	0.16	0.13	0	0.61	0.18	0.14
		9/8 9/22	1948		0.10	7.70	0.43	0.20	0.23	0.13	0	0.73	0.20	0.15
		9/22 10/6	1948		0.10	7.82	0.44	0.20	0.24	0.13	0	0.75	0.20	0.15
		10/6 12/10	1948		0.10	8.17	0.94	0.30	0.29	0.15	0	0.96	0.39	0.21
		12/10 3/27	1948		0.10	7.97	0.79	0.20	0.33	0.20	0	1.16	0.18	0.17

* The pH meter used during this period gave some erratic results regardless of constant checking. These values are questionable.

Table E.—Record of Individual Samples—Major Idaho Irrigation Waters (Continued)

Lab. No.	Source	Period	Year	Av. Stream Flow (cfs)	ECx10³	pH	Constituents E.p.m. Cations Ca	Mg	Na	K	Anions CO_3	HCO_3	SO_4	Cl
41	Payette river at Black Canyon Dam (continued)	4/3 4/10	1949		0.10	7.60	0.65	0.20	0.28	0.10	0	1.00	0.19	0.19
		4/10 4/29	1949		0.10	7.80	0.33	0.30	0.08	0.10	0	0.64	0.05	0.13
		4/29 5/13	1949		0.10	7.02	0.33	0.30	0.16	0.10	0	0.61	0.10	0.12
		5/13 5/25	1949		0.10	7.60	0.36	0.30	0.19	0.10	0	0.65	0.18	0.12
		5/25 6/6	1949		0.10	7.85	0.33	0.30	0.16	0.10	0	0.60	0.10	0.14
		6/6 6/20	1949		0.10	7.50*	0.43	0.15	0.18	0.10	0	0.47	0.40	0.15
		6/20 7/4	1949		0.10	7.50*	0.42	0.15	0.15	0.10	0	0.46	0.39	0.13
		7/4 7/20	1949		0.10	7.50*	0.33	0.14	0.12	0.09	0	0.32	0.33	0.13
		7/20 8/8	1949		0.10	7.50*	0.31	0.13	0.11	0.09	0	0.37	0.36	0.13
		8/8 8/22	1949		0.10	6.80	0.31	0.30	0.12	0.10	0	0.66	0.10	0.20
		8/22 9/9	1949		0.10	7.30	0.40	0.50	0.17	0.10	0	0.87	0.08	0.16
		9/9 9/23	1949		0.10	7.50	0.56	0.40	0.20	0.10	0	0.99	0.08	0.22
		9/23 10/7	1949		0.10	7.50	0.56	0.50	0.19	0.10	0	0.93	0.08	0.17
42	Pahsimeroi river above May	7/1	1949		0.36	8.28*	2.34	1.60	0.41	0.10	0.54	2.78	0.51	0.38
43	Pahsimeroi river at junction with Salmon	7/1	1949		0.40	8.30*	2.57	1.00	0.65	0.20	0.48	3.07	0.62	0.48
45	Portneuf river at Topaz	5/16 5/31	1948	400	0.62	7.70	3.56	2.05	0.87	0.16	0	5.27	0.68	0.80
		5/31 6/15	1948	230	0.71	7.80	3.87	2.71	1.09	0.16	0	5.95	0.92	0.93
		6/15 6/28	1948	288	0.68	8.15	3.71	2.35	1.02	0.47	Tr.	5.61	0.74	0.92
		6/28 7/18	1948	216	0.68	8.10	3.62	2.30	1.09	0.47	Tr.	5.61	0.79	1.00
		7/18 8/3	1948	223	0.68	8.10	3.53	2.30	1.07	0.47	Tr	5.60	0.83	1.01
		8/3 8/16	1948	226	0.68	8.19	3.59	2.30	1.14	0.47	Tr.	5.60	0.84	1.24
		8/16 9/4	1948	206	0.63	8.36	2.62	2.60	1.20	0.85	0.64	4.70	0.91	0.96
		9/4 9/15	1948	196	0.59	8.27	1.91	2.75	1.23	0.85	0.58	4.15	0.94	0.93
		9/15 9/25	1948	223	0.70	8.30	2.99	3.05	1.34	0.85	0.62	5.56	1.08	1.13
		9/25 10/12	1946	146	0.66	8.18	1.86	3.30	1.51	0.85	0.60	4.58	1.10	1.16
		10/12 12/1	1948	152	0.68	8.12	4.62	3.15	1.27	0.53	0.40	6.73	1.05	1.17
		12/1 12/29	1948	150	0.67	8.14	4.18	2.93	1.42	0.35	0	6.70	0.93	1.18
		3/2 4/25	1949	250	0.73	7.80	4.00	2.40	1.21	0.31	0.34	6.00	0.71	0.97
		4/25 5/27	1949	300	0.55	7.90	2.87	1.85	0.92	0.31	0.34	4.12	0.58	0.76
		5/27 6/9	1949		0.66	7.80	3.64	1.95	1.09	0.31	0.30	5.41	0.60	0.88
		6/9 6/25	1949		0.51	7.80*	2.23	2.50	1.29	0.30	0.36	4.16	0.87	0.94
		6/25 7/21	1949		0.51	7.80*	1.65	2.25	1.14	0.40	0.41	3.73	0.89	0.82
		7/21 8/4	1949		0.65	7.91*	2.77	2.20	1.16	0.45	0.46	4.97	0.91	0.75
		8/4 8/16	1949		0.69	8.00*	3.45	2.50	1.26	0.50	0.78	4.96	1.14	0.96
		8/16 8/27	1949		0.57	8.30	2.37	2.80	1.31	0.60	0.39	4.82	0.84	1.00

* The pH meter used during this period gave some erratic results regardless of constant checking. These values are questionable.

Table E.—Record of Individual Samples—Major Idaho Irrigation Waters (Continued)

Lab. No.	Source	Period	Year	Av. Stream Flow (cfs)	ECx10³	pH	Constituents E.p.m. Cations Ca	Mg	Na	K	Anions CO_3	HCO_3	SO_4	Cl
45	Portneuf river at Topaz (continued)	8/27 9/8	1949		0.53	8.13	2.87	2.90	1.27	0.60	0.48	5.28	0.87	1.00
		9/8 9/18	1949		0.63	8.10	3.23	3.05	1.46	0.60	0.39	5.83	0.90	1.09
		9/18 10/3	1949		0.48	8.20	3.24	3.35	1.64	0.60	0.29	6.17	0.96	1.29
46	Salmon river above Williams Creek	7/1	1949		0.24	7.69*	1.30	0.45	0.55	0.10	0	1.97	0.46	0.27
		7/10	1949		0.20	8.11*	1.32	0.92	0.42	0.10	0.26	1.52	0.39	0.24
47	Salmon river at Shoup	7/6	1949		0.44	7.90*	2.53	1.70	0.47	0.20	0.26	3.82	0.50	0.51
		7/30	1949		0.21	7.99*	1.13	0.66	0.47	0.20	0.20	1.55	0.41	0.27
50	Snake river, Henry's Fork at Ashton	4/1 4/12	1948	1122	0.12	6.90	0.69	0.27	0.63	0.13	0	1.13	0.39	0.24
		4/12 4/28	1948	1481	0.12	7.60	0.67	0.27	0.55	0.13	Tr.	1.25	0.23	0.21
		4/28 5/14	1948	2661	0.10	7.60	0.68	0.27	0.44	0.13	0	1.19	0.27	0.16
		5/14 5/28	1948	2846	0.10	7.90	0.60	0.27	0.43	0.13	0	0.99	0.18	0.16
		5/28 6/11	1948	2407	0.10	7.80	0.63	0.30	0.43	0.13	0	1.09	0.21	0.18
		6/11 6/28	1948	1722	0.10	8.20	0.79	0.20	0.53	0.16	Tr.	1.27	0.09	0.20
		6/28 7/14	1948	1633	0.10	8.30	0.84	0.27	0.49	0.16	Tr.	1.35	0.15	0.22
		7/14 7/30	1948	2686	0.10	8.20	0.87	0.33	0.54	0.16	Tr.	1.45	0.22	0.21
		7/30 8/13	1948	2366	0.11	8.05	0.86	0.36	0.62	0.16	Tr.	1.45	0.13	0.22
		8/13 8/27	1948	1811	0.10	8.27	1.02	0.27	0.52	0.20	Tr.	1.52	0.24	0.22
		8/27 9/10	1948	1894	0.10	8.27	0.85	0.27	0.46	0.20	Tr.	1.50	0.23	0.22
		9/10 9/24	1948	1430	0.10	8.30	0.86	0.27	0.40	0.20	Tr.	1.44	0.18	0.25
		9/24 10/8	1948	1190	0.10	8.30	0.83	0.27	0.50	0.20	Tr.	1.38	0.19	0.26
		10/8 12/6	1948	1032	0.12	8.27	0.89	0.35	0.56	0.05	0.30	1.15	0.21	0.26
		12/6 1/31	1948	732	0.13	8.26	0.72	0.50	0.68	0.15	0.32	1.30	0.11	0.25
		1/31 3/28	1949	1036	0.16	8.22	0.84	0.35	0.55	0.15	0.28	1.36	0.11	0.29
		3/28 4/20	1949	1410	0.15	7.90	0.76	0.35	0.52	0.20	0.40	1.16	0.15	0.31
		4/20 5/4	1949	2429	0.12	7.65	0.57	0.25	0.51	0.20	Tr.	1.18	0.10	0.28
		5/4 5/18	1949	2362	0.12	7.80	0.67	0.30	0.37	0.20	Tr.	1.27	0.14	0.26
50	Snake river, Henry's Fork at Ashton	5/18 6/1	1949	2827	0.13	7.55	0.57	0.40	0.38	0.20	Tr.	1.24	0.09	0.27
		6/1 6/13	1949	2100	0.13	7.65*	0.63	0.35	0.37	0.20	Tr.	1.22	0.11	0.28
		6/13 7/4	1949	1552	0.10	7.30*	0.69	0.30	0.52	0.20	0.34	0.79	0.20	0.23
		7/4 7/27	1949	1986	0.10	7.33*	0.67	0.33	0.50	0.20	0.20	1.01	0.22	0.34
		7/27 8/17	1949	2476	0.10	7.32*	0.77	0.43	0.41	0.20	0.28	1.01	0.23	0.28
		8/17 8/29	1949	1869	0.15	8.50	0.74	0.60	0.46	0.20	0.10	1.53	0.33	0.17

* The pH meter used during this period gave some erratic results regardless of constant checking. These values are questionable.

Table E.—Record of Individual Samples—Major Idaho Irrigation Waters (Continued)

Lab. No.	Source	Period	Year	Av. Stream Flow (cfs)	$ECx10^3$	pH	Constituents E.p.m.							
							Cations				Anions			
							Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl
50	Snake river, Henry's Fork at Ashton (continued)	8/29 9/9	1949	1866	0.15	8.40	0.80	0.65	0.48	0.20	0.10	1.53	0.34	0.25
		9/9 9/21	1949	1720	0.15	8.40	0.69	0.60	0.49	0.20	0.10	1.53	0.37	0.25
		9/21 10/4	1949	1382	0.15	8.38	0.73	0.60	0.50	0.20	0.10	1.48	0.39	0.28
51	Snake river South Fork at Heise	5/25 6/4	1948	26250	0.26	7.70	1.76	0.73	0.29	0.13	0	2.08	0.74	0.32
		6/4 6/15	1948	15840	0.26	7.70	1.71	0.67	0.29	0.13	0	1.91	0.79	0.27
		6/15 6/30	1948	11981	0.30	8.26	1.95	0.75	0.41	0.36	Tr.	2.30	0.63	0.36
		6/30 7/16	1948	11692	0.28	8.30	1.89	0.80	0.44	0.16	Tr.	2.15	0.63	0.34
		7/16 7/30	1948	9198	0.28	8.20	1.73	0.75	0.44	0.30	Tr.	2.05	0.64	0.39
		7/30 8/15	1948	8173	0.30	8.25	1.97	0.80	0.54	0.36	Tr.	2.23	0.86	0.39
		8/15 8/29	1948	7265	0.31	8.35	1.91	0.85	0.49	0.35	0.32	1.98	0.89	0.43
		8/29 9/12	1948	4750	0.32	8.44	1.93	0.85	0.52	0.35	0.30	2.07	0.90	0.44
		9/12 9/26	1948	3092	0.35	8.50	2.62	1.25	0.57	0.35	0.40	2.50	1.25	0.55
		9/26 10/11	1948	2864	0.50	8.32	3.30	1.50	0.63	0.35	0.50	3.02	1.56	0.62
		10/11 12/4	1948	2290	0.42	8.41	2.27	1.50	0.65	0.30	0.22	2.12	1.56	0.69
		12/4 1/29	1948	2611	0.50	8.12	3.26	1.50	0.63	0.30	0.54	2.88	1.56	0.72
		1/29 3/26	1949	2611	0.47	8.40	2.93	1.50	0.67	0.30	0.62	2.62	1.34	0.72
		3/26 5/6	1949	6848	0.35	8.00	2.47	0.95	0.30	0.25	0.52	2.35	0.70	0.47
		5/6 6/2	1949	16029	0.28	8.10	2.14	0.75	0.29	0.25	0.60	2.00	0.57	0.40
		6/2 6/8	1949	15450	0.28	8.05	2.10	0.88	0.31	0.25	0.51	1.97	0.54	0.39
		6/8 6/14	1949	19783	0.25	8.05*	1.68	0.75	0.27	0.25	0.26	2.04	0.49	0.36
		6/14 6/30	1949	15962	0.26	7.58*	1.81	0.68	0.33	0.25	0.18	1.74	0.40	0.73
		6/30 7/15	1949	12053	0.29	7.51*	1.90	0.70	0.40	0.25	0.60	1.41	0.36	0.84
		7/15 7/31	1949	11243	0.27	7.52*	1.77	0.67	0.44	0.25	0.20	1.78	0.40	0.81
		7/31 8/17	1949	8763	0.31	7.58*	1.87	1.00	0.50	0.25	0.38	1.79	0.42	0.89
		8/17 8/31	1949	7458	0.30	8.45	1.86	0.80	0.50	0.30	0.13	1.90	0.96	0.45
		8/31 9/12	1949	8250	0.40	8.35	2.78	1.25	0.56	0.30	0.16	2.49	1.46	0.65
		9/12 9/23	1949	4688	0.40	8.20	2.82	1.30	0.60	0.30	0.25	2.44	1.44	0.68
		9/23 10/3	1949	4391	0.36	8.25	2.49	1.21	0.60	0.30	0.36	2.23	1.30	0.65
52	Snake river at Minidoka Dam Dam	4/26 5/7	1948	13118	0.47	7.80	2.12	1.52	1.09	0.27	0.10	2.78	1.20	0.92
		5/7 5/19	1948	14238	0.47	7.80	2.16	1.40	1.07	0.20	0.20	2.70	1.09	0.90
		5/19 5/31	1948	20404	0.44	8.10	2.16	1.35	0.98	0.20	0.50	2.25	0.94	0.84
		5/31 6/11	1948	23630	0.42	8.30	2.13	1.25	0.84	0.22	0.50	2.25	0.84	0.76

* The pH meter used during this period gave some erratic results regardless of constant checking. These values are questionable.

Table E.—Record of Individual Samples—Major Idaho Irrigation Waters (Continued)

Lab. No.	Source	Period	Year	Av. Stream Flow (cfs)	ECx10[5]	pH	Constituents E.p.m. Cations Ca	Mg	Na	K	Anions CO_3	HCO_3	SO_4	Cl
52	Snake river at Minidoka Dam (continued)	6/11 6/28	1948	16813	0.40	7.85	2.20	1.10	0.72	0.23	0.30	2.20	0.87	0.64
		6/28 7/14	1948	12817	0.38	7.90	2.05	1.05	0.59	0.23	Tr.	2.59	0.76	0.55
		7/14 7/30	1948	12040	0.38	8.30	2.12	0.90	0.66	0.23	0.38	2.03	0.86	0.57
		7/30 8/13	1948	11582	0.38	8.30	2.22	1.00	0.64	0.23	0.34	2.15	0.81	0.60
		8/13 8/27	1948	11320	0.37	8.52	2.17	1.30	0.73	0.34	0.50	2.45	0.85	0.64
		8/27 9/10	1948	10574	0.39	8.52	2.12	1.30	0.83	0.34	0.50	2.44	0.88	0.69
		9/10 9/24	1948	7599	0.41	8.51	2.10	1.30	0.88	0.34	0.50	2.52	0.94	0.73
		9/24 10/8	1948	2527	0.42	8.51	2.16	1.30	0.92	0.34	0.60	2.45	0.96	0.75
		10/8 12/27	1948	2959	0.47	8.55	2.68	1.35	1.06	0.35	0.40	2.87	1.11	0.94
		12/27 2/21	1948	6702	0.50	8.47	2.90	1.50	1.11	0.35	0.68	3.10	1.12	0.92
		2/21 4/18	1949	6578	0.47	8.40	2.56	1.50	1.04	0.35	0.74	2.80	1.01	1.03
		4/18 5/16	1949	10126	0.50	8.24	2.35	1.70	1.07	0.18	0.74	2.55	1.05	0.99
		5/16 5/28	1949	9866	0.50	8.32	2.43	1.65	1.06	0.18	0.50	2.75	0.93	0.89
		5/28 6/9	1949	12795	0.49	8.40	2.41	1.40	0.93	0.18	0.52	2.72	0.95	0.87
		6/9 6/23	1949	12533	0.36	8.04*	2.14	1.20	0.79	0.27	0.16	2.71	0.79	0.66
		6/23 7/9	1949	11987	0.37	8.16*	2.13	1.30	0.68	0.27	0.26	2.50	0.94	0.63
		7/9 7/26	1949	12275	0.35	8.11*	2.08	1.20	0.66	0.27	0.36	2.47	0.75	0.60
		7/26 8/11	1949	12157	0.37	8.11*	2.09	1.20	0.68	0.27	0.32	2.67	0.82	0.62
		8/11 8/25	1949	11343	0.40	8.52	2.10	1.21	0.78	0.30	0.20	3.05	0.75	0.68
		8/25 9/8	1949	9681	0.40	8.50	2.10	1.30	0.83	0.30	0.20	2.97	0.82	0.70
		9/8 9/22	1949	7245	0.41	8.10	2.01	1.30	0.90	0.30	0.10	3.05	0.96	0.76
		9/22 10/6	1949	4386	0.42	8.65	2.01	1.30	0.95	0.30	0.10	3.14	1.04	0.81
53	Snake river at Marsing	3/29 4/20	1948	12114	0.51	8.10	2.04	1.95	1.25	0.07	0.40	2.65	1.08	0.94
		4/20 5/7	1948	13076	0.50	7.90	1.73	1.82	1.24	0.13	0.32	2.50	1.05	0.92
		5/7 5/23	1948	11860	0.49	7.80	1.66	1.82	1.12	0.13	0.40	2.29	1.21	0.87
		5/23 6/7	1948	19213	0.49	7.80	1.94	1.72	1.11	0.13	0.32	2.55	1.08	0.88
		6/7 6/21	1948	16735	0.45	8.45	2.21	1.40	1.23	0.10	0.50	2.39	1.20	0.75
		6/21 7/5	1948	14102	0.45	8.35	2.06	1.40	1.30	0.10	0.46	2.50	1.18	0.76
		7/5 7/22	1948	7685	0.50	8.45	1.85	1.70	1.58	0.10	0.36	2.39	1.33	0.90
		7/22 8/9	1948	8331	0.53	8.50	2.09	1.70	1.72	0.10	0.64	2.42	1.43	0.95
		8/9 8/20	1948	9070	0.51	8.45	1.92	1.80	1.72	0.25	0.40	2.85	1.36	1.00
		8/20 9/5	1948	8190	0.52	8.45	1.95	1.80	1.69	0.25	0.46	2.81	1.42	0.95

* The pH meter used during this period gave some erratic results regardless of constant checking. These values are questionable.

Table E.—Record of Individual Samples—Major Idaho Irrigation Waters (Continued)

Lab. No.	Source	Period	Year	Av. Stream Flow (cfs)	ECx10[5]	pH	Cations: Ca	Cations: Mg	Cations: Na	Cations: K	Anions: CO_3	Anions: HCO_3	Anions: SO_4	Anions: Cl
53	Snake river at Marsing (continued)	9/5 9/20	1948	8950	0.53	8.45	2.16	1.70	1.74	0.25	0.48	2.94	1.43	0.98
		9/20 10/4	1948		0.46	8.50	2.44	1.80	1.75	0.25	0.52	3.15	1.44	0.99
		10/4 12/1	1948		0.55	8.62	2.19	1.70	1.66	0.35	0.50	3.06	1.40	1.00
		12/1 1/30	1948		0.52	8.50	2.56	1.50	1.49	0.35	0.56	3.12	1.26	1.00
		1/30 3/31	1949		0.50	8.60	2.48	1.30	1.26	0.35	0.76	2.77	1.07	0.92
		3/31 5/2	1949		0.45	8.00	2.26	1.05	1.31	0.30	0.60	2.60	0.94	0.76
		5/2 5/23	1949		0.45	8.00	2.01	1.05	1.41	0.30	0.60	2.38	1.01	0.78
		5/23 6/7	1949		0.48	8.10	2.03	1.12	1.49	0.30	0.70	2.52	1.03	0.83
		6/7 6/21	1949		0.45	8.09*	1.91	1.51	1.43	0.30	0.36	2.58	1.16	0.85
		6/21 7/6	1949		0.47	8.12*	1.71	1.51	1.50	0.30	0.30	2.76	1.19	0.90
		7/6 7/23	1949		0.50	8.12*	1.76	1.80	1.62	0.30	0.35	2.83	1.24	0.92
		7/23 8/9	1949		0.51	8.12*	1.92	1.80	1.66	0.30	0.34	2.99	1.32	0.98
		8/9 8/22	1949		0.52	8.10	1.60	1.60	1.73	0.30	0.18	2.77	1.37	0.94
		8/22 9/3	1949		0.52	8.20	1.80	1.50	1.72	0.30	0.22	2.63	1.45	0.95
		9/3 9/17	1949		0.57	8.30	1.93	1.50	1.87	0.30	0.22	2.71	1.44	0.96
		9/17 9/30	1949		0.57	8.10	1.97	1.60	1.71	0.30	0.22	2.80	1.38	0.94
54	Spokane river at Post Falls	4/2 4/21	1948	10887	0.10	7.15	0.36	0.17	0.22	0.07	0	0.37	0.23	0.09
		4/21 5/7	1948	24946	0.10	7.15	0.38	0.20	0.08	0.12	0	0.36	0.23	0.10
		5/7 5/28	1948	28657	0.10	6.80	0.34	0.20	0.08	0.12	0	0.38	0.18	0.09
		5/28 6/16	1948	30836	0.10	7.25	0.32	0.20	0.13	0.10	0	0.36	0.09	0.09
		6/16 7/2	1948	12508	0.10	7.17	0.34	0.10	0.08	0.10	0	0.35	0.18	0.12
		7/2 7/19	1948	1531	0.10	7.19	0.30	0.10	0.05	0.10	0	0.43	0.16	0.12
		7/19 8/4	1948	3141	0.10	7.35	0.33	0.10	0.05	0.10	0	0.45	0.13	0.12
		8/4 8/20	1948	1568	0.10	7.35	0.32	0.10	0.08	0.10	0	0.46	0.12	0.12
		8/20 9/3	1948	940	0.10	7.50	0.38	0.20	0.03	0.13	0	0.50	0.22	0.19
		9/3 9/17	1948	577	0.10	7.43	0.35	0.20	0.02	0.13	0	0.50	0.26	0.19
		9/17 9/29	1948	894	0.10	7.50	0.33	0.20	0.06	0.13	0	0.47	0.24	0.18
		9/29 10/11	1948	1232	0.10	7.49	0.33	0.20	0.08	0.13	0	0.49	0.26	0.18
		10/11 12/4	1948	1711	0.10	7.59	0.46	0.10	0.06	0.25	0	0.52	0.24	0.12
		12/4 1/29	1948	3064	0.10	7.63	0.43	0.20	Tr.	0.25	0	0.56	0.25	0.19
		1/29 3/26	1949	6337	0.10	7.72	0.37	0.50	0.06	Tr.	0	0.53	0.20	0.18
		3/26 4/23	1949	16496	0.10	7.90	0.32	0.30	0.06	0.10	0	0.35	0.37	0.18

* The pH meter used during this period gave some erratic results regardless of constant checking. These values are questionable.

Table E.—Record of Individual Samples—Major Idaho Irrigation Waters (Continued)

Lab. No.	Source	Period	Year	Av. Stream Flow (cfs)	ECx10³	pH	Constituents E.p.m. Cations Ca	Mg	Na	K	Anions CO_3	HCO_3	SO_4	Cl
54	Spokane river at Post Falls	4/23 5/31	1949	27565	0.10	7.60	0.38	0.30	0.05	0.10	0	0.35	0.36	0.19
	(continued)	5/31 6/11	1949	14590	0.10	7.40	0.31	0.30	0.05	0.11	0	0.34	0.38	0.15
		6/11 7/9	1949	1963	0.10	7.20*	0.38	0.15	0.06	0.10	0	0.45	0.20	0.14
		7/9 7/30	1949	932	0.10	7.40*	0.34	0.15	0.08	0.10	0	0.39	0.20	0.10
		7/30 8/22	1949	715	0.10	7.42*	0.28	0.15	0.08	0.10	0	0.38	0.26	0.14
		8/22 9/2	1949	120	0.10	7.00	0.30	0.26	0.05	0.10	0	0.49	0.22	0.14
		9/2 9/17	1949	125	0.10	7.10	0.28	0.26	0.05	0.10	0	0.49	0.22	0.17
		9/17 10/1	1949	253	0.10	7.10	0.29	0.26	0.05	0.10	0	0.49	0.17	0.17
55	Weiser river at Diversion	5/7 5/24	1948		0.10	7.10	0.46	0.33	0.17	0.13	0	0.76	0.10	0.12
		5/24 6/9	1948		0.10	6.90	0.39	0.27	0.12	0.13	0	0.72	0.09	0.12
		6/9 6/23	1948		0.10	7.62	0.47	0.20	0.19	0.22	0	0.87	0.09	0.13
		6/23 7/7	1948		0.10	7.95	0.59	0.26	0.26	0.22	0	1.19	0.11	0.11
		7/7 7/23	1948		0.15	8.00	0.68	0.36	0.36	0.22	0	1.36	0.14	0.14
		7/23 8/9	1948		0.15	7.95	0.70	0.40	0.38	0.22	0	1.33	0.15	0.13
		8/9 8/23	1948		0.10	7.80	0.94	0.80	0.39	0.10	0	1.35	0.27	0.47
		8/23 9/6	1948		0.10	8.20	0.95	0.80	0.35	0.10	0	1.35	0.32	0.47
		9/6 9/20	1948		0.10	8.30	0.89	0.78	0.31	0.10	0	1.35	0.27	0.47
		9/20 10/4	1948		0.10	8.25	0.88	0.80	0.34	0.10	0	1.40	0.28	0.52
		6/8	1949		0.10	7.40*	0.40	0.30	0.15	0.15	0	0.60	0.30	0.14
		6/8 6/22	1949		0.10	7.95*	0.44	0.35	0.23	0.10	0	1.00	0.07	0.15
		6/22 7/6	1949		0.10	8.20*	0.55	0.45	0.40	0.10	0	1.32	0.15	0.17
		7/6 7/22	1949		0.10	7.95*	0.57	0.35	0.38	0.10	0	1.21	0.21	0.13
		7/22 8/8	1949		0.10	8.12*	0.57	0.40	0.38	0.10	0	1.17	0.12	0.17
		8/8 8/24	1949		0.15	7.60	0.67	0.70	0.33	0.10	0	1.35	0.37	0.09
		8/24 9/9	1949		0.15	7.8	0.71	0.80	0.35	0.10	0	1.54	0.32	0.09
		9/9 9/23	1949		0.16	7.8	0.75	0.80	0.37	0.10	0	1.58	0.20	0.10
		9/23 10/10	1949		0.14	7.7	0.76	0.70	0.33	0.10	0	1.63	0.33	0.09

* The pH meter used during this period gave some erratic results regardless of constant checking. These values are questionable.

**Table F.—Record Of Individual Samples
Miscellaneous Idaho Waters**

Lab. No.	Source	Period	Year	ECx10³	pH	Constituents E.p.m. Cations Ca	Mg	Na	K	Anions CO_3	HCO_3	SO_4	Cl
1.	Aberdeen Experiment Station Canal Water	8/15	1949	0.30	8.00*	1.75	0.70	0.54	0.20	0.32	1.94	0.68	0.37
2.	Aberdeen Experiment Station Well	8/15	1949	0.41	8.10*	1.94	1.00	0.83	0.20	0.28	2.27	0.95	0.61
3.	Aberdeen Jackson Well	8/14	1948	1.35	7.95	4.25	4.40	6.52	0.40	0	7.72	4.77	3.07
			1949	2.40	7.40*	6.44	6.20	12.59	0.34	0	7.29	9.15	9.37
		8/15	1949	2.18	8.50*	5.19	5.60	9.85	0.20	0.66	6.29	7.79	4.23
4.	Bastion, Merlin, Well at Malad	6/25	1949	0.72	7.60*	3.44	2.75	1.17	0.20	0	5.28	0.57	1.71
6.	Big Jimmy Creek at Fort Hall	8/19	1948	0.45	8.32	2.33	1.20	1.01	0.38	Tr.	3.08	0.94	0.84
8.	Big Malad Channel flow west of George White barn—Malad	8/16	1949	2.60	7.79*	7.67	5.40	13.89	1.00	0.24	6.67	10.31	11.47
		10/5	1949	2.55	7.50	8.33	6.32	15.77	0.40	0	8.21	12.68	11.70
9.	Big Malad Channel flow at Holbrook Road—Malad	6/13	1949	2.35	7.90*	6.43	5.60	13.10	0.62	0.50	5.75	10.20	9.02
		8/16	1949	2.60	7.72*	7.93	5.40	13.78	1.00	0.28	6.57	11.14	11.03
10.	Big Malad Channel flow east of John Price farmstead—Malad	8/16	1949	2.60	7.67	8.61	5.20	12.77	0.20	0	6.30	7.96	11.85
		10/15	1949	2.80	7.90	9.09	6.46	13.28	0.40	0	7.23	9.03	12.68
11.	Bishop Drain at Emmett	10/6	1948	0.50	8.68	1.48	1.05	3.18	0.10	0.54	4.19	0.54	0.60
17.	Bruneau Hot Springs	8/12	1948	0.25	8.30	0.47	0.10	2.46	0.10	0.40	1.25	0.54	0.42
		10/8	1948	0.30	8.62	0.31	0.70	2.47	0.10	0.56	1.34	0.63	1.05
20.	Clear Creek at Fort Hall	8/19	1948	0.50	8.32	3.17	1.30	1.13	0.23	Tr.	3.75	0.82	0.91
21.	Homedale Town Well	7/15	1949	2.40	7.40*	7.89	2.85	15.20	0.50	0.94	3.73	18.05	4.13
		8/9	1949	1.99	7.52*	6.14	2.62	12.31	0.50	0.60	3.71	13.82	3.44
22.	Homedale Drain	8/9	1949	2.42	8.25*	7.82	3.15	15.78	0.78	0.60	4.47	18.59	4.34
23.	Jones Estate Well at Malad	6/13	1949	0.73	7.53*	3.67	2.50	1.04	0.34	0	5.21	0.83	1.79
24.	Kaes Drain—Twin Falls	6/17 6/29	1949	1.09	8.50*	3.49	3.36	3.24	1.00	0.54	3.37	4.85	2.43
		6/29 7/15	1949	1.01	7.50*	3.09	3.30	3.18	1.00	0.86	3.22	4.62	2.28
		7/15 8/5	1949	1.11	7.48*	4.51	3.50	3.20	1.00	0.68	4.32	4.71	2.22
		8/5 8/22	1949	1.10	8.10	3.41	5.07	3.70	1.00	Tr.	4.43	2.27	4.57
		8/22 9/5	1949	1.15	7.90	3.89	4.99	3.63	1.00	Tr.	5.18	2.23	4.81
		9/5 9/16	1949	1.20	7.70	4.48	4.88	3.72	1.00	Tr.	5.92	2.23	4.73
		9/16 9/28	1949	1.20	7.90	5.30	5.20	3.84	1.00	Tr.	6.41	2.23	4.73

* The pH meter used during this period gave some erratic results regardless of constant checking. These values are questionable.

**Table F.—Record of Individual Samples
Miscellaneous Idaho Waters (Continued)**

Lab. No.	Source	Period	Year	EC x 10^3	pH	Constituents E.p.m. Cations Ca	Mg	Na	K	Anions CO_3	HCO_3	SO_4	Cl
25.	Larsen Bros. Wells—Blackfoot	7/12	1949	0.59	7.40*	3.02	1.25	1.16	0.45	0.62	3.89	1.12	0.69
		8/12	1949	0.59	7.35*	2.86	1.45	1.15	0.25	0.60	3.83	1.17	0.69
		no date	1949	0.60	8.30	3.06	1.70	1.18	0.90	0	4.92	1.06	1.01
26.	Little Malad river at Elkhorn Dam	8/18	1948	0.50	8.30	2.71	1.70	1.00	0.17	0.48	3.37	0.54	1.23
31.	Malad Warm Springs	6/15	1948	2.25	7.59	5.69	2.55	11.59	0.60	0	5.36	2.39	13.45
		8/18	1948	2.10	7.51	5.69	2.85	12.30	0.57	0	5.43	2.41	14.04
		6/13	1949	2.05	7.25*	5.18	3.00	11.81	0.61	0	5.43	2.49	11.97
		8/16	1949	2.05	7.78	5.66	2.45	10.37	0.78	0	5.23	2.28	12.19
		10/5	1949	1.80	7.70	3.95	3.90	11.89	0.50	0	4.31	2.41	13.31
32.	Malad Warm Springs—Roderick Thomas Spring	6/13	1949	2.15	7.22*	5.64	2.55	13.29	0.78	0	5.82	2.53	13.29
33.	Malad Warm Springs—Southwest Spring	6/13	1949	2.15	7.20*	5.39	2.50	12.15	0.70	0	5.53	2.40	12.10
34.	Moore's Creek—Boise River	8/10	1948	0.13	8.00	1.20	0.26	0.23	Tr.	0	1.12	0.32	0.35
36.	Neely Warm Springs near American Falls	8/12	1949	0.72	7.08*	2.24	1.15	2.70	0.35	0.60	2.70	0.50	3.09
37.	Norwood Springs at Emmett, Payette return flow	8/9	1948	0.73	7.60	2.23	0.73	4.86	0.10	0	5.26	1.63	0.86
		12/23	1948	0.93	8.70	2.52	1.20	6.53	0.25	1.08	5.13	2.90	1.48
		8/9	1949	0.75	7.19*	2.75	0.95	4.14	0.20	0.90	5.10	1.49	0.53
		9/15	1949	0.90	8.40	2.19	1.00	6.61	0.10	0.20	5.68	2.65	1.19
39.	Payette river—South Fork	10/12	1949	0.10	7.70	0.53	0.35	0.20	0.13	0	0.70	0.39	0.21
40.	Payette river—North Fork	10/12	1949	0.10	7.60	0.40	0.50	0.25	0.10	0	0.75	0.32	0.11
44.	Pevlar Drain—Emmett	10/6	1948	0.78	8.51	2.70	1.10	4.63	0.60	0	6.17	1.82	1.15
48.	Sharps Coulee—Snake river return flow—Twin Falls	8/9 8/22	1948	0.40	8.40	2.24	1.15	0.68	0.33	0.32	2.72	0.81	0.70
49.	Snake river return flow seeps—Twin Falls	8/9 8/22	1948	1.30	7.90	4.97	3.35	5.03	0.34	Tr.	6.12	5.37	2.44
		8/9 8/22	1948	0.95	8.10	3.73	2.45	3.29	0.34	Tr.	4.86	3.40	1.71
55.	Spring Creek at Fort Hall	8/19	1948	0.48	8.28	2.93	1.20	1.00	0.40	Tr.	3.66	0.86	0.74
56.	Valley Plunge Artesian Well at Bruneau	6/8	1949	0.30	8.05*	0.50	Tr.	2.22	0.25	0.26	1.70	0.65	0.35

* The pH meter used during this period gave some erratic results regardless of constant checking. These values are questionable.

Table F.—Record of Individual Samples
Miscellaneous Idaho Waters (Continued)

Lab. No.	Source	Period	Year	$ECx10^3$	pH	Constituents E.p.m. Cations				Anions			
						Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl
57.	Walker Springs at Emmett—Payette return flow	4/17	1949	1.00	7.20	2.55	0.75	6.97	0.13	0	9.00	0.87	0.71
		9/15	1949	0.80	8.30	2.46	1.00	5.99	0.10	0.26	6.56	1.76	0.91
59.	Williams, J. E., Well at Blackfoot	8/13	1949	0.52	7.78*	2.83	1.40	1.16	0.20	0	4.00	0.89	0.71
		7/12	1949	0.51	7.78*	3.05	1.40	1.23	0.20	0	4.00	0.93	0.71
60.	Williams, Les, Wells at Blackfoot	8/13	1949	0.55	7.77*	3.12	1.40	1.17	0.20	0	3.97	0.97	0.82
			1949	0.50	7.77*	2.52	1.52	1.20	0.20	0	3.55	0.96	0.80
61.	Williams, J., Ditch at Samaria	6/13	1949	1.30	7.80*	6.35	4.05	3.36	0.40	0	5.43	4.13	4.05
		8/16	1949	1.30	7.39*	6.16	3.75	3.22	0.35	0	5.05	4.05	4.21
		10/5	1949	2.05	7.40	9.24	6.20	6.03	0.30	0	6.20	7.42	8.87
62.	Williams, J., Spring at Samaria	6/13	1949	1.40	7.50*	6.68	4.05	3.38	0.40	0	5.53	4.40	4.07
		8/16	1949	1.21	7.49	5.03	3.25	3.21	0.40	0	4.34	4.25	4.09
		10/5	1949	1.45	8.00	6.19	5.60	3.47	0.30	0	5.86	4.45	4.52

* The pH meter used during this period gave some erratic results regardless of constant checking. These values are questionable.