NO. 8

PRELIMINARY FINDINGS OF THE JOINT STUDY PROGRAM OF WATER QUALITY CONDITIONS ON THE LOWER SNAKE RIVER

January 1964

STATE OF IDAHO
DEPARTMENT OF HEALTH

STATE OF WASHINGTON
POLLUTION CONTROL COMMISSION

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INTRODUCTION

The imminent construction of impoundments along the Lower Snake River have increased the concern for future water quality maintenance. When completed, a series of ~~four~~ dams will alter the character of the river from a flowing stream to that of slack-water from the mouth of the river to the Lewiston-Clarkston Area, 140 miles upstream. Not only will the total assimulative capacity of the river for waste loadings be diminished but localized problems resulting from decreased immediate dilution of the treated wastes will have to be solved.

In addition to these anticipated problems of the near future, existing water quality is becoming marginal in an aesthetic sense to the increasing numbers of recreational water users, and in a physical sense to downstream irrigators. For these reasons and the need for wastewater treatment improvements in the Lewiston-Clarkston Area, a program for the joint study of existing water quality conditions and future management needs has been undertaken by the States of Idaho and Washington. ~~The first~~ phase of the study program has been completed ~~and the~~ preliminary findings are presented in this report.

JOINT STUDY PROGRAM

Objectives

In recognition of anticipated future problems of water quality maintenance attending the conversion of the Lower Snake River into a series of slack-water pools, and to clear up the wastewater treatment deficiencies which presently exist, planning meetings were held at Lewiston by the Idaho Department of Health and the Washington Pollution Control Commission during the winter of 1962-1963. In these meetings the mutual desire for coordinated water quality management found expression in the following program objectives:

1. To initiate an immediate program for the correction of existing problems associated with food processing and wood pulping wastes.
2. To inventory existing and potential water uses and waste sources.
3. To establish common water quality objectives.
4. To determine the hydrological, physical, chemical and biological characteristics of the common receiving waters.
5. To gather basic data for the prediction of future wastewater treatment requirements necessary to the prevention of water quality impairment.
6. To determine future wastewater treatment requirements necessitated by authorized impoundments.
7. To delineate water quality problems and to establish programs for corrective measures.
8. To establish a water quality monitoring program to serve as a basis for evaluating present and future problems.

Water Quality Survey Scope

Reconnaissance work indicated that to adequately measure the effect of the Lewiston-Clarkston Area on the chemical and biological water

quality, a long section of the river would have to be investigated. The section selected for study extends from the Ice Harbor Dam at river-mile 10 to above the confluence with the Salmon River nearly 180 miles upstream. The Salmon River is the last major tributary for another 160 river miles. A total of 14 sampling stations were located along the study section including the mouths of the three major tributaries.

Survey Sampling Stations

Following are descriptions of the water quality and biological sampling stations used in this study. The water sampling stations are noted on the study area map in the back of this report.

Water Quality Stations

Station	Stream	River-mile	Location
1	Snake	192 est.	Above the Salmon River
2	Salmon	53 est.	At White Bird, Idaho
3	Snake	178 est.	Above Grande Ronde River
4	Grand Ronde	-	Near Confluence
5	Snake	168 est.	Below Grande Ronde
6	Snake	143.6	Below Asotin, Washington
7	Snake	139.6	At Interstate Bridge
8	Snake	135.1	Near Clarkston Golf Course
9	Clearwater	-	At mouth
10	Clearwater	12 est.	At Spalding, Idaho
11	Snake	124 est.	10 miles above Wawawai, Wash.
12	Snake	83.1	At Central Ferry, Wash.
13	Snake	49.4	At Ayer, Washington
14	Snake	10.0	At Ice Harbor Dam

Biological Stations

Station	Stream	River-mile	Location
1	Clearwater	1	Below highway bridge
2 & 3	Snake	198 est.	At Pittsburg Landing, Idaho
4	Salmon	36 est.	Below White Bird Creek
5	Clearwater	12 est.	At Spalding, Idaho
6	Grande Ronde	-	Near confluence
7	Snake	146.5	Above Asotin, Washington
8	Snake	147 est.	Above Asotin, Washington
9 & 10	Snake	130 est.	Below Clarkston, Washington

Methods & Progress

Existing water quality monitoring stations are maintained at four locations along the Lower Snake River as parts of both state and federal basic data collection networks. To augment these data, the special surveys of this joint study were designed for conduct during each of three significant hydraulic conditions of the river. The first of these is the July-August period representing conditions of low flow and warm water temperatures. The second phase is for the springtime condition following a period of low flow and prior to the flushing action of flood stage. This second phase should most closely resemble conditions of water quality that might be expected after the stream is converted to slack-water. The third phase is to depict conditions during the maximum runoff of May and June.

In addition to the normal water quality parameters special attention is being given to the bottom organisms. Living in the stream, the aquatic organisms tend to integrate water quality conditions that have been in effect over a period of time and are less susceptible than water samples to the indication of atypical conditions.

The unique feature of the biological portion of the survey is the employment of identical media for organism growth at each of the sampling stations. This is accomplished by setting wire cubes containing one cubic foot of selected gravel sizes and placing them in the stream, one at each station, for one month periods, after which they are retrieved and the organisms counted and identified.

The first of the three surveys was conducted during late July and early August, 1963, and the second and third phases are scheduled for the spring and May-June, 1964 respectively.

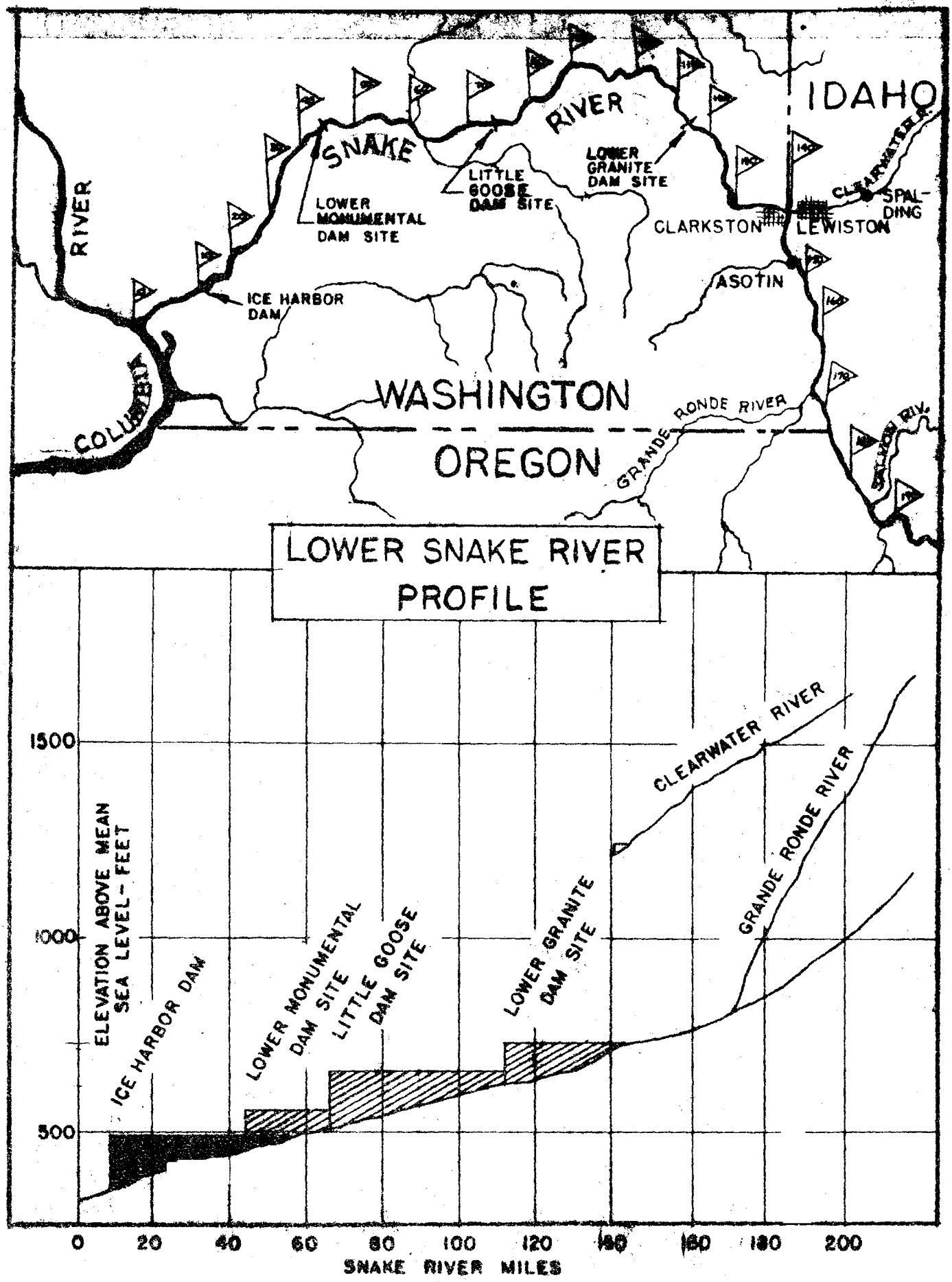
AREA DESCRIPTION, POPULATION & ECONOMY

The lower 190 miles of the Snake River below its confluence with the Salmon River are defined as the Lower Snake River for purposes of this study. Both the Salmon and the Snake Rivers lie in deep narrow canyons cut through the surrounding high plateau country. From this confluence, the Snake River continues northward down a series of rapids past the mouth of the Grande Ronde River at river-mile 169. The river and canyon character continue the same to river-mile 151 where the canyon widens slightly. From this point downstream to its junction with the Clearwater River in the Lewiston-Clarkston Area, the canyon widens into a deep valley. At its confluence with the Clearwater River, the Snake River changes its northerly course along the Idaho-Washington border and flows to the west through the narrowing valley. At river-mile 130, the Snake River turns to the north and again enters a narrow and deep canyon cut through the surrounding plateau approximately 1,000 feet above the canyon floor. The river then follows a semi-circular course to the Columbia River as the canyon walls gradually diminish in height.

Between Wawawai at river-mile 111 and Central Ferry at river-mile 83, occasional widening of the canyon bottom permits the cultivation of limited farm lands. Another small farming area is located at the mouth of the Tucannon River at river-mile 62. The rest of this stretch of river is characterized by a series of pools and rapids lined by narrow sandy beaches and steep canyon walls.

The forests which dominate the high plateaus bordering the upper reaches of the study area give way to the rich "Palouse Country" wheat lands downstream from Lewiston and Clarkston. The wheat lands in turn, merge into the semi-arid grazing and sagebrush lands near the river mouth.

FIG. 1


IDAHO
SNAKE
RIVER
LOWER GRANITE DAM SITE
LITTLE GOOSE DAM SITE
LOWER MONUMENTAL DAM SITE
CLARKSTON
LEWISTON
SPALDING
ASOTIN
ICE HARBOR DAM
COLUMBIA RIVER
WASHINGTON
OREGON
GRANDE RONDE RIVER
LOWER SNAKE RIVER PROFILE
ELEVATION ABOVE MEAN SEA LEVEL - FEET
1500
1000
500
CLEARWATER RIVER
GRANDE RONDE RIVER
ICE HARBOR DAM
LOWER MONUMENTAL DAM SITE
LITTLE GOOSE DAM SITE
LOWER GRANITE DAM SITE
0
20
40
60
80
100
120
140
160
180
200
SNAKE RIVER MILES

Population

The area outside the urban centers of Lewiston, Clarkston, Asotin and Spalding are very sparsely populated. Of the 31,000 or so inhabitants of the Lewiston-Clarkston Metropolitan Area, 18,000 reside in Lewiston and Lewiston Orchards, 6,220 reside in Clarkston and the populations of Asotin and Spalding are 745 and 200 respectively.

Economy

The economy of the area is supported primarily by the forest products and food processing industries with agricultural production playing a limited role. Potlatch Forests, Inc., the largest employer, produces lumber, wood pulp, paper and fuel products. The Smith Frozen Foods Company processes peas and the Seabrook Farms Company processes both peas and potatoes. The two meat packing plants, Bristol Packing Company and Meats, Inc., complete the industrial community.

WATER USES

To a greater or lesser degree, all water uses are presently being made of the Snake and Clearwater Rivers in the Lewiston-Clarkston vicinity.

Water Supply

The City of Lewiston derives much of its water supply from the Clearwater River. The City of Clarkston auxiliary water supply is obtained from a pumping station located on the Snake River.

Recreation

Water recreational pursuits of swimming, boating and skiing are very popular during the warm summer months along the municipal beaches and along the sandy shores in the canyon downstream.

Fishery

The Snake River system supports an important fishery in both the anadromus and resident species. The Clearwater, Grande Ronde and Salmon Rivers are particularly noteworthy for their excellent spawning grounds for migratory fish. The runs of Steelhead are famous. Up to 22,000 fish are caught by sportsmen during the 4-month season. Sturgeon and Bass are important resident species.

Irrigation

The irrigation usage of the Lower Snake River waters is presently limited to small acreages adjacent to the river. Considerable acreages near the mouth of the river now involving uneconomical lifts are contained in the proposed Eureka Flats Project to be supplied by the reduced pumping lifts possible due to river impoundments.

Power

The small power drop near the mouth of the Clearwater River and the 230,000 kilowatt facility at the Ice Harbor Dam represent only the beginning of the power development under construction on the Lower Snake

River.

Navigation

Navigation on the river system is presently limited to log transport, small boats and short season for barge traffic to and from the Columbia River. The dams now under construction will provide slack-water navigation from the ocean to Lewiston with minimum depths of 18 feet for year round barge traffic.

WATER QUALITY INFLUENCES

In addition to the wastewater discharges in the Lewiston-Clarkston Area, the Lower Snake River water quality is subject to the influences of impoundment, relulation and residual effects from upstream origination combined with those from natural causes.

Impoundments

The principal influences of impoundment are generally adverse to water temperature and dissolved oxygen concentrations. The latter being primarily related to deep reservoirs where stratification prevents circulation to replenish oxygen depletions resulting from the decomposition of natural or discharged organic matter. While the effect on downstream temperature is dependent on the characteristics of the reservoir, studies of existing reservoirs have indicated water temperature increases on the order of 1.85° F/million acre-feet of storage, or on a surface area basis, of 0.88° F/10,000 acres of water surface. Predicted temperatures in the Lower Snake River on completion of the proposed dams are expected to average above 75° F. during the month of August.

Regulation

Severe regulation of river flows to meet diurnal power peaking demands enhance detrimental temperature increases, hinder recreational water-front development, and in the extreme case has caused the loss of aquatic organisms including incubating fish eggs. Both the Snake and the Clearwater rivers are heavily regulated as is shown by their hydrographs in figure 2. Below the diversion dam, near the mouth of the Clearwater River, very nearly the entire flow is frequently diverted during periods of low flow. More drastic regulation is anticipated in the future as nuclear power assumes the base load and hydro-electric projects are converted into peaking plants.

Natural Runoff & Upstream Residual Effects

These two influences are considered together in the assessment of water quality entering the study area. It is not known what their relative contributions are but combined, their influence has a masking effect on the impact of the wastewater discharges in the Lewiston-Clarkston area.

Wastewater Discharges

The wastewater discharges originating in the Lewiston-Clarkston area are the only domestic or industrial discharges of significance in the lower 352 miles of the Snake River.

The sewered communities of Asotin, Clarkston & Lewiston provide modern sewage treatment for their domestic wastes. The unsewered community of Spalding relies on individual systems of septic tanks and drainfields for disposal of sanitary wastes. Under the present hydraulic conditions of the river, the existing sewage treatment plants are considered satisfactory.

Individual industrial waste discharges are made by the Bristol Packing Company, Meats, Inc., Seabrook Farms Company and Potlatch Forests, Inc. The wastes from Smith Frozen Foods Company are treated at the Lewiston sewage treatment plant.

Both the Bristol Packing Company and Meats, Inc. provide the equivalent of primary treatment for their wastewaters prior to discharge. Fine mesh screens and air-flotation units are employed for the removal of paunch manure and fats. Both companies installed blood cookers which were later abandoned as too troublesome and expensive to operate. Alternate methods involving lagoons for land disposal are being considered by the companies as a means of complete treatment for all of their wastewaters.

The Seabrook Farms Company lacks adequate treatment facilities. Immediate needs are fine screening and sanitary wastes separation for discharge to the municipal sewer.

Potlatch Forests, Inc. provides in-plant control to reduce product losses and has installed settling ponds for further solids removal. These facilities are not sufficient to prevent the undesirable losses of fibre and cooking liquors to the watercourse. Further corrections at this plant and the Seabrook Farms Company are recognized in the joint study objectives and have been the target of stepped-up negotiations by the Idaho Health Department.

Following in Table 1 is a summation of the wastewater sources in the Lewiston-Clarkston area.

Table 1

Wastewater Discharges - Lewiston-Clarkston-Asotin

	5-day Biochemical Oxygen Demand		
Municipal	Lbs/day	% of sub-total	% of total
Lewiston	950 (1)	49.5	1.09
Clarkston	620 (2)	32.3	0.71
Asotin	350 (3)	18.2	0.40
Sub-total	1,920	100	2.20
Industrial			
Potlatch Forests, Inc.	73,600 (4)	86.0	84.18
Seabrook Farms Co.	9,000 (5)	10.5	10.29
Bristol Packing Co.	1,670 (6)	1.9	1.91
Meats, Inc.	1,240 (6)	1.4	1.42
Sub-total	85,510	100.0	97.80
Total	87,430		100.00

(1) From sewage treatment plant records
(2) 4-hour composited sample during maximum load period
(3) 4-hour composite sample during maximum load period-value appears excessively high probably due to sharp loading peak of 2 or 3 times 24-hour average
(4) From monthly mill reports
(5) Estimated from production
(6) Estimated from grab sample analysis

FUTURE WASTEWATER TREATMENT

As mentioned earlier, one of the major questions to be answered relates to how the proposed river changes will affect the existing facilities and what additional treatment will be required to maintain water quality. The answers to the latter are the object of the joint study. At this time, however, it does appear that the treatment will have to be up-graded from primary to intermediate or even secondary depending on the efficiencies that can be developed for effluent diffusion and immediate dilution.

The municipalities of Asotin and Clarkston have each retained consulting engineers to study the impact on their respective sewerage systems and to recommend necessary modifications. The Briston Packing Company and Meats, Incorporated are considering lagooning methods to both up-grade their industrial waste treatment and to correct the present unsatisfactory practice of discharging blood to the waterway.

FIRST PHASE SURVEY RESULTS

As mentioned previously the first water quality survey phase of the three part investigation has been completed. The data obtained are presented in the tables that follow. While their full evaluation must await the data collection of the second and third phases, the findings are summarized below.

Dissolved Oxygen

The minimum percentage of saturation was 92% corresponding to 8.4 mg/l at station located at river-mile 143.6 and between the Town of Asotin and the City of Clarkston.

Nutrients

Descending concentrations are noted from the maximum values of; 35.9 mg/l Sulfate, 0.070 mg/l Ortho Phosphate, and 0.60 mg/l Nitrate-Nitrogen at river mile 192 above the Salmon River, to the minimum concentrations of; 18.4 mg/l Sulfate, and nonmeasureable amounts of Ortho Phosphate and Nitrate-Nitrogen at river-mile 10. The nutrient values are shown graphically in figure 3.

Biochemical Oxygen Demand

The data indicate a general pattern of decreasing concentrations with progression downstream. An exception is an increase of 0.5 mg/l (1.3 to 1.8 mg/l) immediately downstream from the Lewiston-Clarkston Area.

Biological

The greatest volume of organisms was recovered from the stations at river-mile 198, approximately 12 miles above the confluence with the Salmon River. The percentage of abundance of trichopterans (Hydropsychidae) decreased between the upstream stations and the downstream station at river-mile 130, about 10 miles downstream from Clarkston. In this same

68-mile reach of river the percentage abundance of ephemeropterans (Heptageniidae) increased as did the number of families present. The greatest biological difference occured on the Clearwater River between Spalding and the confluence with the Snake River, 12 miles downstream. The number of organisms obtained from the mouth of the Clearwater River was very much less than the number obtained at Spalding.

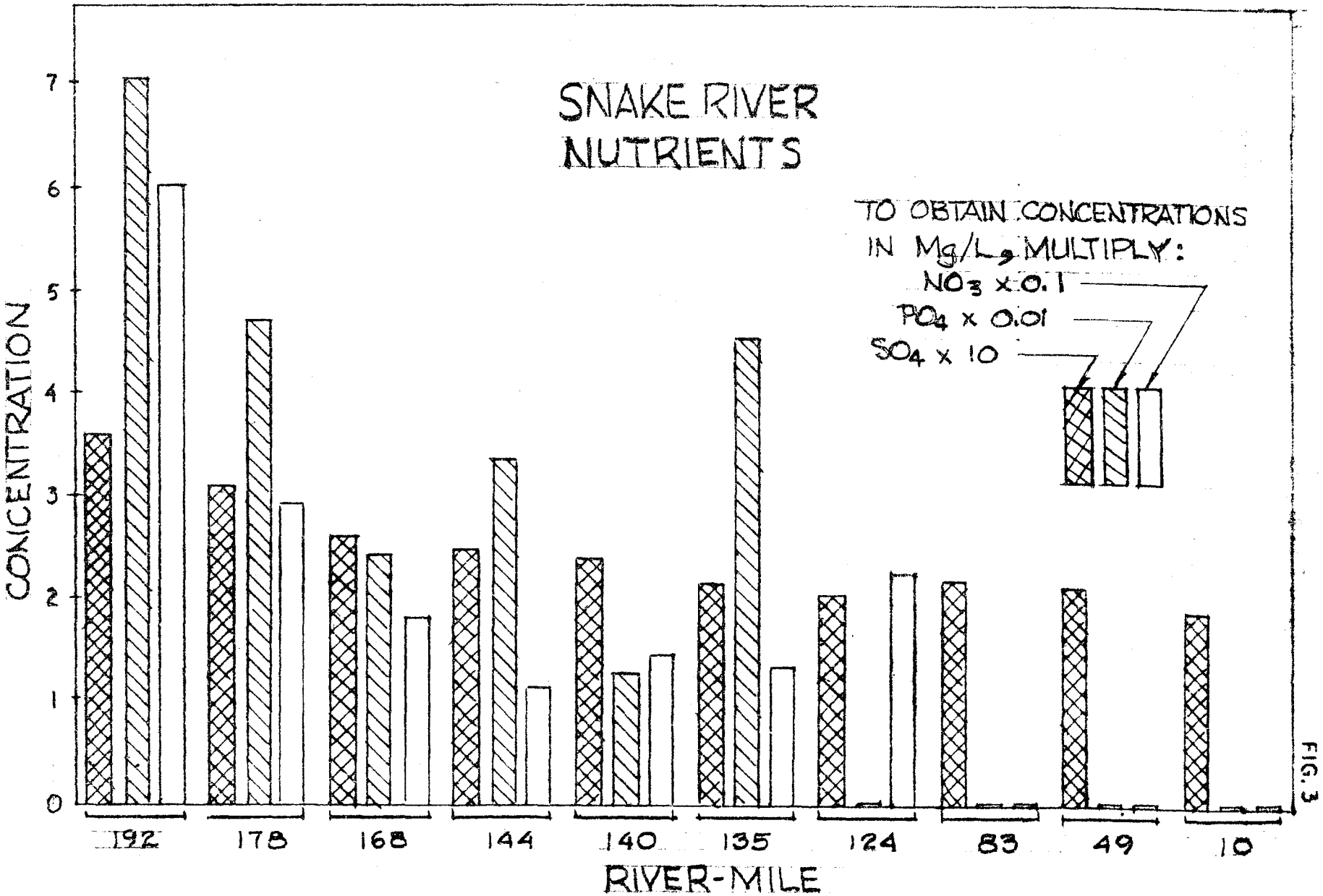

SNAKE RIVER
NUTRIENTS
TO OBTAIN CONCENTRATIONS
IN Mg/L, MULTIPLY:
NO3 x 0.1
PO4 x 0.01
SO4 x 10
CONCENTRATION
0
1
2
3
4
5
6
7
192
178
168
144
140
135
124
83
49
10
RIVER-MILE

FIG. 3

TABLE 2

LOWER SNAKE RIVER WATER QUALITY, JULY 30-AUGUST 1, 1963

Station	1 Snake River Above Salmon	2 Salmon R. At White Bird	3 Snake Riv. Below Salmon	4 Grande Ronde Near Mouth	5 Snake Riv. Below Gr. Rd.	6 Snake Riv. Below Asotin	7 Snake R. At Interstate Bridge
River-mile	192	53	178	0	168	143.6	139.6
Date	7-30-63	7-30-63	7-30-63	7-30-63	7-30-63	7-30-63	7-31-63
Flow-cfs	11,810*	7,960	19,770*	748	20,520*	20,520	20,520
Time	11:35	11:30	11:30	11:20	10:15	9:00	9:00
Temp. °C.	20.5	19.6	20.5	20.4	20.6	20.2	19.9
pH	8.4	8.1	8.4	8.4	8.6	7.9	8.3
Turbidity	9	0	10	9	15	10	--
MPN/100 ml	21	49	8	15	49	11	94
Diss. Solids	260	110	260	170	210	230	240
D.O.	8.9	9.1	9.1	9.4	9.1	8.4	8.8
C.O.D.	14	11	13	13	10	36	16
B.O.D. 5-day	1.2	0.1	1.1	0.6	1.33	1.33	1.36
B.O.D. 20-day	--	-	-	-	2.45	3.05	2.40
Sulfate	35.95	0.99	30.51	0.22	25.78	24.35	23.85
Ortho PO_4	0.070	0.00	0.047	0.019	0.024	0.033	0.012
Total PO_4	1.80	0.95	1.95	0.30	1.35	1.20	1.25
Nitrate-N	0.60	0.00	0.29	0.01	0.18	0.11	0.14
Alkalinity	116	60	128	70	84	80	83
Calcium	26.3	18.5	24.0	20.1	23.1	21.6	23.4
Magnesium	20.6	13.6	16.5	12.9	15.8	13.4	14.9
Chloride	3	1	7	1	6	9	7
Sodium	24.2	8.5	28.4	9.6	10.5	10.6	18.9
Potassium	6.4	1.4	8.6	2.1	2.0	1.9	4.5
ABS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tannin-Lignin	0.4	0.3	0.5	0.4	0.5	0.3	0.3

TABLE 2 (Continued)

Station	8N Snake R. Below Clrkstn	8M Snake R. Below Clrkstn	8S Snake R. Below Clrkstn	9 Clearwater At Mouth	10 Clearwater At Spalding	11 Snake R. Above Wawawai
River-mile	135.1	135.1	135.1	1	12	124
Date	7-31-63	7-31-63	7-31-63	7-31-63	7-31-63	8-1-63
Flow-cfs	24,000	24,000	24,000	4,580*	4,580	23,900
Time	--	--	--	09:15	--	--
Temp. °C.	20.4	20.2	20.1	20.8	20.9	--
pH	8.4	8.4	8.4	7.4	7.4	--
Turbidity	--	20	20	10	0	--
MPN/100 ml	800	800	1,300	4,900	130	--
Diss. Solids	--	220	230	< 75	< 75	170
D.O.	8.7	8.8	9.1	8.7	8.5	8.9
C.O.D.	--	13	--	15	12	12
B.O.D. 5-day	--	--	--	1.20	0.65	0.46
B.O.D. 20-day	--	--	--	1.53	1.03	1.04
Sulfate	--	--	--	--	0.15	20.03
Ortho PO_4	--	--	--	0.003	--	--
Total PO_4	--	1.15	1.40	0.25	0.20	0.11
Nitrate-N	--	--	--	0.03	0.07	0.22
Alkalinity	--	76	86	20	16	70
Calcium	--	19.5	25.9	5.6	4.4	14.4
Magnesium	--	12.5	17.3	3.8	2.7	4.3
Chloride	--	10	10	2	1	10
Sodium	--	15.6	16.6	1.6	1.4	16.7
Potassium	--	3.0	2.4	1.1	1.1	4.2
ASB	--	0.0	0.0	0.0	0.0	0.0
Tannin-Lignin	--	0.5	0.4	0.4	0.3	0.4

TABLE 2 (Continued)

Station	12 Snake River At Central Fy.	13 Snake River At Ayer	14 Snake River At Ice Harbor	8 Snake Riv. Composite Below Clarkston
River-mile	83.1	49.4	10.0	135.1
Date	8-1-63	8-1-63*	8-1-63*	
Flow-cfs	23,900	23,900*	23,900*	
Time	--	--	--	
Temp. °C.	--	--	--	
pH	--	--	--	
Turbidity	--	--	--	
MPN/100 ml	--	--	--	
Diss. Solids	190	180	160	
D.O.	9.0	9.0	9.6	
C.O.D.	16	50	9	
B.O.D. 5-day	1.47	0.98	0.67	1.85
B.O.D. 20-day	2.74	1.89	1.13	2.84
Sulfate	21.38	21.15	18.36	21.33
Ortho PO_4	0.004	--	--	0.045
Total PO_4	0.14	0.13	0.11	--
Nitrate-N	0.01	0.01	0.00	0.13
Alkalinity	78	74	76	
Calcium	16.8	16.8	16.8	
Magnesium	4.8	4.8	4.8	
Chloride	6	15	16	
Sodium	17.5	16.7	15.1	
Potassium	4.8	3.4	3.2	
ABS	0.0	0.0	0.0	
Tannin-Lignin	0.4	0.4	0.3	

TABLE 3

LOWER SNAKE RIVER WATER QUALITY, NOVEMBER 25, 1963**

Station	Snake River Above Asotin	Snake River At Interstate Bridge	Clearwater R. At Spalding	Clearwater R. At Mouth	Snake R. At Clrkstn G.C. South Side
River-mile	150	139.6	12	1	131.5
Flow-cfs	20,040	20,040	4,160	4,160*	20,040
Time	13:40	13:10	15:30	12:50	12:15
Temp. °C.	10	10	--	5	10
pH	8.1	8.1	--	6.7	7.9
Turbidity	0	5	--	--	9
MPN/100 ml	79	172	1,600	< 2,000	330
Total Solids	280	264	26	56	--
Susp. Solids	10	9	6	6	--
D.O.	10.9	11.1	--	12.0	11.3
C.O.D.	12	10	7.	9	--
B.O.D. 5-day	1.4	1.6	0.9	1.1	--
Sulfate	59	60	1.8	4.2	--
Ortho PO_4	0.22	0.22	0.09	0.07	--
Nitrate-N	0.85	0.80	0.80	1.45	--
Alkalinity	130	134	20	22	--
Calcium	27.2	28.0	4.0	4.8	--
Magnesium	10.5	9.5	1.0	1.0	--
Chloride	21	19	3	3	--
Sodium	33	33	5	4	--
Hardness	110	108	14	16	--
Iron	0.02	0.02	0.11	0.13	--

TABLE 3 (Continued)

Station	Snake R. At Clrkstn G.C. Composite //	Snake R. At Clrkstn G.C. North Side	Snake R. Below Interstate Br.	Snake R. At Gage Station Midstream	Snake River Downstream
River-mile	131.5	131.5	137	132.5	128
Flow-cfs	20,040	20,040	20,040	20,040	20,040
Time	12:17	12:20	12:00	11:40	11:10
Temp. °C.	9.5	9	9	9	9
pH	--	7.8	7.9	7.9	7.8
Turbidity	--	10	15	15	15
MPN/100 ml	--	330	1,300	700	1,300
Total Solids	240	--	246	272	222
Susp. Solids	16	--	8	10	10
D.O.	--	11.4	11.3	11.3	11.1
C.O.D.	14	--	12	14	14
B.O.D. 5-day	1.4	--	1.6	1.4	1.7
Sulfate	53	--	55	54	58
Ortho PO_4	0.20	--	0.18	0.20	0.22
Nitrate-N	1.60	--	0.85	1.85	1.75
Alkalinity	116	--	118	126	116
Calcium	23.2	--	23.2	24.3	23.1
Magnesium	6.5	--	8.4	9.6	8.1
Chloride	19	--	19	23	18
Sodium	30	--	31	30	31
Hardness	84	--	92	101	90
Iron	0.04	--	0.04	0.04	0.04

Manganese was undetectable at all stations
Ammonia as N was less than 0.1 ppm. at all stations

***State of Idaho Department of Health Follow-up Survey
* Estimated
// Composite of north and south side samples

Table 4

SUMMARY OF BOTTOM FAUNA

Approximate Percentage of Abundance

Station	1*	2	3	4**	5	6	7	8	9	10
Trichoptera	X	90	90	X	2	60	60	80	60	20
Ephemeroptera	X	7	5	X	20	20	10	10	30	20
Diptera	X	3	5	X	40	15	30	10	10	60
Plecoptera	X	0	0	-	35	5	0	0	0	0
Insect Families Present	6	5	5	9	6	10	6	6	9	10

* Abundance estimates were not made because only a few organisms were found.
"X" indicates the families present
** Screen sample

BIOLOGICAL OBSERVATIONS

Station 1

Description: In the Clearwater River approximately 1-mile above its confluence with the Snake River, approximately 300 yards below the highway bridge on the north side of the river.

Remarks: The cage was placed in the Clearwater River on July 15, 1963 and removed on August 19, 1963. Percentage estimates were not made due to the fact that only a few organisms were found. There was considerable silt and debris contained in the sample. The cage was located in a riffle in relatively fast water. The consistency of the bottom varied from gravel to heavy rubble.

Station 2

Description: In the Snake River at Pittsburg Landing in Idaho on the east side of the river.

Remarks: The cage was placed in the Snake River on July 16, 1963 and removed on August 20, 1963. The cage was heavily infested with bottom organisms, predominantly Hydropsychid Caddisfly larvae. There

was also a heavy growth of green algae Cladophora on the cage. Aside from the heavy Cladophora growth the sample was very clean. The cage was located in a riffle in fast moving water. The bottom consisted largely of rocks from 6 inch to 1 foot in diameter.

Station 3

Description: In the Snake River at Pittsburg Landing in Idaho on the east side of the river upstream from cage number 2.

Remarks: The cage was placed in the Snake River on July 16, 1963 and removed on August 20, 1963. The cage was similar to cage number 2 with Hydropsychidae predominating. The cage was again very clean with a heavy growth of Cladophora. The riffle conditions were physically the same as for cage number 2.

Station 4

Description: In the Salmon River downstream from the mouth of White Bird Creek on the south side of the river.

Remarks: The cage was placed in the Salmon River on July 16, 1963 and removed on August 20, 1963. At the time this cage was removed it was completely exposed. Therefore, a sample was taken in the vicinity of the cage using a piece of window screen.

Station 5

Description: In the Clearwater River near Spalding, Idaho, 1/8 mile upstream from U. S. Highway 95 bridge at small powerline crossing on the north side of the river.

Remarks: The cage was placed in the Clearwater River on July 16, 1963 and removed on August 22, 1963. The cage was 60% exposed at the time it was removed, however, the sample was clean as far as silt and debris were concerned. The cage was located in a riffle in rather swift water. The bottom consisted of rubble and rocks approximately 1-foot in

diameter.

Station 6

Description: In the Grande Ronde River approximately ¼ mile upstream from its confluence with the Snake River, on the north side of the river.

Remarks: The cage was placed on July 17, 1963 and removed on August 22, 1963. The cage was clean with very little silt and debris. It was located in a riffle in rapid moving water with the bottom consisting primarily of gravel and heavy rubble.

Station 7

Description: In the Snake River just above Asotin, Washington on the east side of the river.

Remarks: The cage was placed in the Snake River on July 17, 1963 and removed on August 21, 1963. The sample was very silty and located in relatively slack water. At the time of removal the cage was 50% exposed.

Station 8

Description: In the Snake River approximately 1-mile above the City of Asotin, Washington on the west side of the river.

Remarks: The cage was placed in the Snake River on July 17, 1963 and removed on August 22, 1963. It was located in fast water and the sample was fairly clean with little silt and debris. At the time of removal the cage was 70% exposed.

Station 9

Description: In the Snake River approximately 12-miles west of Clarkston, Washington on the east side of the river.

Remarks: The cage was placed in the Snake River on July 17, 1963 and removed on August 21, 1963. It was located in rather swift water

and the rocks in and around the cage were covered with considerable silt at the time it was removed.

Station 10

Description: In the Snake River approximately 100 yards upstream from cage number 9 on the east side of the river.

Remarks: The cage was placed in the Snake River on July 17, 1963 and removed on August 21, 1963. At the time it was removed the cage was 50% exposed and heavily silted. It was located in swift water among large rocks 1 to 2-feet in diameter.

SUMMARY AND CONCLUSIONS

From the previous water quality information and from the data available to date from the current study program, the serious impairment of present water quality conditions cannot be substantiated. This is not to deny that undiscovered problems may exist. Should they exist however, it is felt that their significance would be that of predicting trends leading to problems rather than being problems in themselves as they are not of sufficient magnitude to herald their existance to the investigator or the water user.

In recognition of the need for further study, a joint program was inaugurated by the States of Idaho and Washington to explore the fundamental facts and from these develop a basic and coordinated plan of water quality management on an area-wide basis. Of major concern is the changing character of the receiving water anticipated in the near future on completion of the additional impoundments by the Lower Monumental, Little Goose and Lower Granite dams between the Lewiston-Clarkston Area and the mouth of the Snake River. These dams will complete the navigational slack-water begun by the construction of the Ice Harbor Dam located near the river mouth, to Lewiston, 140 miles upstream.

While the survey investigations are incomplete the findings indicate that chemically and biologically the present water quality conditions are generally satisfactory. Physically, water temperatures are in excess of desirable limits for trout fishery during the summer months, and on occasion fiberous materials have caused the plugging of small irrigation pumps in the vicinity of Wawawai, approximately 20 miles downstream from the Lewiston-Clarkston Area. Esthetically, sporatic occurrences of perceptible color and odor give cause for complaint by downstream recreationalists. Bacteriologically, the inconsistency of the survey results