Water Quality Status Report No. 7

REPORT OF POLLUTION PROBLEMS IN THE BOISE RIVER
Ada and Canyon Counties, Idaho
1959 – 1962

April 1962

State of Idaho
Department of Health
Engineering and Sanitation Division

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INTRODUCTION

The purpose of this report is to show the results of our investigation concerning the pollution problem in the Boise River and to establish a basis for waste treatment facilities necessary to obtain a water quality suitable for beneficial use.

Separate studies were made in August of 1959, in January of 1960, in January of 1961 and in February of 1962. During each study, a series of samples were taken at strategic points from above Boise to Notus. (See Figure 1.) These samples were taken for chemical, bacteriological, and biological analyses. Also, the various industries and municipalities along the Boise River and tributary streams were contacted to determine the volume and strength of wastes being discharged into the stream.

The stream pollution study was made by H. G. Formo, Chief, Water Pollution Control Section, R. P. Olson, Public Health Biologist, and M. D. Alsager, Public Health Engineer. The laboratory work was done by personnel in the Boise laboratory of the State Department of Health.

The portion of the Boise River studied is that portion below Lucky Peak Reservoir located in Ada and Canyon Counties in Southwestern Idaho. There are wide variations in flow in the river, varying from a low of 2 cubic feet per second during the winter months measured at the Capitol Boulevard Gaging Station in Boise, to a high of several thousand cubic feet per second during the irrigation season. The flow in the river in the portion studied is in part controlled at the dam for Lucky Peak Reservoir. During the last few years, the lower than average precipitation in the Boise River drainage area has created successively longer periods of no discharge at the Lucky Peak Reservoir during the nonirrigation season in order that water may be conserved for irrigation use.

Figure 2.

Description of Location of
Sampling Stations on Boise River

B-5	Highway Bridge across Boise River at Notus, Idaho
B-6	500 Yards below Junction of Indian Creek and Boise River
B-7	500 Yards below the Caldwell Sewage Treatment Plant Outfall to the Boise River
B-8	At Old Highway Bridge across Boise River North of Caldwell below Mason Creek
B-9	Below Middleton between Willow Creek and Mason Creek
B-10	Highway Bridge across Boise River at Middleton, Idaho
B-11	Highway Bridge across Boise River at Star, Idaho
B-12	Highway Bridge across Boise River on Linder Road
B-13	1/2 Mile below Highway Bridge at Eagle, Idaho.
B-14	Highway Bridge across Boise River at Eagle, Idaho
B-15	Highway Bridge across Boise River at Strawberry Glenn
B-16	500 Yards below Boise Sewage Treatment Plant
B-17	500 Yards above Boise Sewage Treatment Plant
B-18	1/2 Mile below Fairview Avenue Bridge in Boise
B-19	Broadway Avenue Highway Bridge in Boise
B-20	Barber Road Bridge about 3 miles above Boise

Below the City of Boise the flow does increase during the nonirrigation season due to the various drain ditches and tributary streams which discharge to the river, so that flows in the river below would be greater than those recorded at the Boise Gaging Station. During the irrigation season, there are numerous diversions to canals so that flows below Boise would not necessarily be greater than those measured at the Boise Gaging Station. A tabulation of flows in the Boise River at Boise and Notus is shown in Table I.

In addition to its use as an irrigation supply, a fishing stream, a waterfowl refuge, source of sand and gravel from the river bed, the Boise River and its tributary streams are used as a waste carrier for numerous industries and domestic sewerage systems. Also, numerous individual septic tank overflows and feed lot drains are directed to the river and tributary streams.

WASTE LOADING TO THE STREAM

Other than the pollution load placed upon the stream by irrigation runoff and stockyard drainage, the individual contributors who discharge wastes to the stream are listed as follows:

City of Boise

The river receives the treated effluent from the City of Boise's sewage treatment plant which is located at the west end of the City. The plant provides complete treatment which involves primary settling and secondary treatment consisting of activated sludge and chlorination of the effluent. A high degree of treatment is provided before discharge to the river.

Custom Packing Plant

This packing plant is located in Garden City across the river and a short distance downstream from the Boise sewage treatment plant. The waste water is piped to the Garden City sewerage system. However, they do maintain an overflow to the river and in case of stoppage in the city sewer system, the wastes can be directed to the river.

Table I
Flows in Boise River at Boise and Notus*
October 1955 - September 1961
Monthly Mean in Cubic Feet Per Second

	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
At Boise Gaging Station												
1955	166	13.9	16.6	450	3,330	6,098	4,954	5,322	3,629	1,326	986	599
1956	196	15.7	11.1	7.4	112	3,949	5,149	5,990	3,457	1,341	1,064	588
1957	397	88	75	72	658	3,122	3,641	5,869	3,479	1,205	1,062	666
1958	246	134	15.1	7.04	26.5	14.7	1,097	1,210	1,236	1,210	973	418
1959	76.6	61.5	60.9	44.3	72.8	81.3	2,233	2,364	1,656	1,201	980	766
1960	263	27	10	6.0	7.65	12.3	705	1,177	1,094	958	766	554
1961	80	12.6	22	6	21	27						
At Notus Gaging Station												
1955	680	691	645	1,034	3,769	6,305	4,225	4,670	2,970	365	350	460
1956	871	761	618	523	888	4,722	5,473	5,740	2,603	343	301	483
1957	1,109	767	707	631	1,434	3,754	3,650	4,902	3,012	320	380	637
1958	788	844	621	527	514	431	274	749	250	253	494	798
1959	786	705	614	602	700	633	1,756	1,911	680	244	472	567
1960	743	752	632	536	521	470	196	113	140	93.9	62.3	302

*Information from U. S. Department of Interior, Geological Survey, Water Resources Division.

Garden City

A drain ditch tributary to the river receives the treated effluent from Garden City's sewage treatment plant. The plant has provisions for complete treatment which involves primary settling and secondary treatment consisting of a trickling filter and chlorination of the effluent. The volumetric loading due to ground water infiltration is so great that at times some of the raw sewage is bypassed directly to the drain ditch.

Swift and Company

The Swift and Company meat packing plant is located about one mile below the Boise sewage treatment plant. This is one of the larger meat packing plants in the State. The wastes from this plant which are discharged to the river without treatment consist of wash water from the kill floor, and other processing rooms and the plant's domestic sewage. The blood from the kill floor is collected and dried separately. The paunch manure is collected and disposed of onto the land.

Liberty Meat Packing Company

The Liberty Meat Packing Company is located a short distance north of Eagle. The wastes from this plant which are discharged to a drain ditch tributary to the river without treatment are blood from the kill floor, wash water from the kill floor and other processing rooms, and the overflow from the septic tank which is used for disposal of the plant's domestic sewage. The paunch manure is collected and disposed of onto the land.

Ideal Meat Packing Company

The Ideal Meat Packing Company is located on the Boise River near Eagle. Although it was reported at the time of the survey that no slaughtering had been done for the last few months, they have no provisions for treatment of the wastes before discharge to the Boise River.

Boise Valley Meat Packing Company

The Boise Valley Meat Packing Company is located on the Boise River near Eagle. The wastes from this plant which are discharged direct to the river without treatment are blood from the kill floor, paunch manure and wash water from the kill floor and other processing rooms.

Eagle and Star

Eagle and Star are two unincorporated communities located a short distance from the river. Although neither area has a community sewerage collection system, each community has a number of individual sewers, each of which serve several homes and business places. Some of these sewers discharge to septic tanks with the overflow going to drain ditches tributary to the river.

Middleton

Middleton is an incorporated village and does have a sewerage collection system. The sewage is discharged to a settling tank and is chlorinated before flowing into a drain ditch which flows into Willow Creek which is tributary to the river. The settling tank is not provided with sludge collection facilities and as a result very little treatment is provided before discharge to Willow Creek.

Amalgamated Sugar Company

The Amalgamated Sugar Company is located near Nampa and a portion of the wastes are discharged to Mason Creek which enters the Boise River above Caldwell. The portion of the wastes discharged to Mason Creek consist of press water from the pulp presses and pulp silo drainage. Improvements are being made at the plant to eliminate pulp silo drainage and to recycle a portion of the press water back through the process so as to extract additional amounts of sugar. A larger portion of the waste load is discharged to Indian Creek which is covered in another report.

City of Caldwell

The river receives the treated effluent from the City of Caldwell's modern sewage treatment plant. The plant provides complete treatment which involves primary settling and secondary treatment consisting of trickling filters and chlorination of the effluent. In summer, the volume to be treated increases greatly because of infiltration of ground water. Hydraulic overloading reduces the effectiveness of sewage treatment facilities and also results in a more costly operation.

J. R. Simplot Company

The J. R. Simplot Company has a food processing plant located about two miles west of Caldwell on Highway 19. This is one of the larger potato processing plants in the state. Waste water resulting from the processing of potatoes is discharged to a series of settling ponds located adjacent to the Boise River. The overflow from the ponds is discharged to the river. In order to reduce the slime growths in the irrigation canals, provisions have been made for intermittent discharge of the overflow to the river. Although the ponds remove a major portion of the settleable material in the waste flow, the overflow has a high dissolved organic content which contributes a major organic pollution load to the river.

Village of Notus

The Village of Notus is an incorporated village and does not have a community wide sewage collection system. However, there are a number of individual sewers which each serve several homes and business places. Some of these sewers discharge to septic tanks with the overflow going to a drain ditch tributary to the river. The village maintains three of these systems.

J. C. Palumbo Company

The Palumbo Company potato warehouse is located at Notus adjacent to the river. Potatoes are washed, sorted and packaged at this warehouse. The wash water is

discharged to the river. Potato wash water does contain a large amount of silt and some organic material which both contribute to the pollution load to the river.

Parma Farm Labor Camp

The Parma Farm Labor Camp which operates during the summer months has a sewage disposal system which discharges to a drain ditch. The sewage is first passed through a septic tank and chlorinated. This is not adequate treatment.

City of Parma

The City of Parma has a sewage collection system which discharges to a drain ditch without any treatment. This drain ditch more or less runs parallel with the Boise River and enters the Snake River a short distance below the mouth of the Boise River.

Miscellaneous

There is a considerable amount of drainage from various stockyards and feed lots along the tributary streams and river, especially during rainy periods. This presents a bacteriological as well as an organic loading problem. There are also individual domestic sewage systems in the rural areas which discharge wastes to the drain ditches and river which add to the health hazard.

The discharge of wash water to the river from sand and gravel operations without adequate settling facilities create siltation and turbidity problems in the stream.

The drain which discharges to the river in Julia Davis Park, just below the Broadway Bridge, contains a considerable amount of silt and settleable material during certain times of the year. This condition was evident during the 1961 and 1962 surveys.

Dead animals which are deposited in the stream not only create a nuisance condition but present a health hazard as well.

PHYSICAL OBSERVATIONS

The Boise River is a typical mountain stream characterized by a rocky and gravel bottom and numerous riffle areas. This holds true except in stretches of the river below points where excessive pollution is discharged. In these areas the rocks are coated with slime and in areas of low velocity where solids can settle out there are sludge blankets on the bottom of the stream. This is especially true below meat packing and food processing plants which contribute high organic waste loads. During times when there is little dilution water available in the stream, effects of meat packing wastes are more visible. These include floating grease and meat scraps and discoloration due to blood wastes. These conditions are especially pronounced at the stations below Swift and Company and Boise Valley Packing Company outlets. During the period when the food processing plants are operating, there are areas of excessive slime growths in the stream below the plant outlets. This is especially a problem in the river below the point where Mason Creek enters the river, below the point where Indian Creek enters the river and at Notus.

The drain ditches and streams which are tributary to the river do influence the appearance of the stream by increasing the turbidity due to silt and other suspended material which is carried into the river. Also gravel washing operations which have not provided settling facilities add to this problem.

PHYSICAL, CHEMICAL AND BIOCHEMICAL ANALYTICAL RESULTS

During the study, water samples were collected at a series of permanent sampling stations as shown in Figure 1. These samples were taken each year by following a standard procedure and were handled with analytical care. A summary of the results from these samples is shown in Tables II through V.

Physical

The samples collected during the four surveys showed consistent results at the various stations when comparing the amount of suspended and total solids in the

Table II
Boise River Survey
Results of Analytical Determinations
August 11-13, 1959

Station	B-5	B-6	B-7	B-8	B-9	B-10	B-13	B-14	B-15	B-16	B-20
Temperature °F (Water)	71	70	71		65	65	68	68	66	67	61
pH	7.3	7.6	7.6	7.6	7.3	7.3	7.3	7.5	7.2	7.1	6.8
Dissolved Oxygen (ppm)	9.6	9.6	9.8	9.2	8.8	9.3	10.3	10.4	9.7	9.2	9.1
DO % Saturation	108%	107%	110%	103%	93%	98%	111%	112%	103%	99%	91%
5-Day BOD (ppm)	2.9	5.5	4.9	2.9	1.2	2.5	2.1	3.3	2.7	3.0	1.2
Total Solids (ppm)	572	570		220	229	162		62	70	33	46
Suspended Solids (ppm)	33	27									
Hardness (ppm)	142	146		120	84	84		40	34	34	32
Alkalinity (ppm)	162	168		142	98	98		42	42	41	34
Sodium (ppm)	72	54		38							5
Magnesium (ppm)	12	12.6		11.2							2
Calcium (ppm)	38	38		30							9.6
Phosphates (ppm)	0.36	0.56		0.36	0.16	0.22		0.04	0.07	0.25	0.07
Nitrates (ppm)	0,45	0.75		0.4	0.15	0.2		0.1	0.45	0.1	0.15
Syndets (ppm)		0.12								0.11	0.0

Table III

Boise River Survey
Results of Analytical Determinations
January 12-14, 1960

Station	B-5	B-6	B-8	B-9	B-10	B-13	B-15	B-16	B-19
Temperature °F (Water)	43	44	41	33	39	36	41	41	34
pH	7.5	7.4		7.6		7.6	7.2		
Dissolved Oxygen (ppm)	5.2	7.1	11.3	13.0	13.8	12.8	12.6	13.7	12.7
DO % Saturation	42%	58%	88%	90%	105%	93%	98%	107%	89%
5-Day BOD (ppm)	31.0	16.5	16.8	5.0	3.6	14.0	26.0	5.1	2.1
Total Solids (ppm)	558	622	409	258	270	198	248	228	130
Suspended Solids (ppm)	104	150	84	22	28	42	44	38	36
Hardness (ppm)	186	220	158	120	124	56	94	76	52
Alkalinity (ppm)	194	204	162	134	138	72	92	62	54
Sodium (ppm)	73	75	49	33	34	23	31	29	10
Phosphates (ppm)	.93	1.00	.61	.34	.54	1.50	2.5	1.1	.09
Nitrates (ppm)	1.3	1.4	1.9	1.2	1.3	2.9	2.9	3.8	0.5
Syndets (ppm)	.1	.16	.14	.12	.16	.2	.35	.5	.1

Table IV

Boise River Survey
Results of Analytical Determinations
January 12, 1961

Station	B-5	B-6	B-8	B-11	B-15	B-16	B-17	B-19	B-19-D*
Temperature °F (Water)	43	48	43	43	47	43	40	37	
pH	7.2	7.2	7.2	7.2	7.2	7.3	7.2	7.0	
Dissolved Oxygen (ppm)	9.1	7.9	12	15	10.6	14.2	12.9	12.5	
DO % Saturation	73%	68%	96%	120%	90%	113%	100%	92%	
5-Day BOD (ppm)	10.5	7.9	13.2	4.4	18	6.2	4.4	3.6	
Total Solids (ppm)	534	574	454	264	292	254	248	192	2752
Suspended Solids (ppm)	86	106	118	38	42	38	22	52	2508
Hardness (ppm)	210		180			140			
Alkalinity (ppm)	244					142			
Phosphates (ppm)	.99		.41			.93			
Nitrates (ppm)	1.2		1.2			1.1		.2	
Sodium (ppm)	74		54			25		16	
Syndets (ppm)	.07		.1			.15		.04	

* Drain to Boise River below Broadway Bridge

Table V

Boise River Survey
Results of Analytical Determinations
February 20, 1962

Station	B-5	B-6	B-8	B-10	B-12	B-15	B-16	B-19
Temperature °F (Water)	47	51			51	42	46	42
pH	7.5	7.8	7.5	7.8	7.5	7.2	7.3	7.3
Dissolved Oxygen (ppm)	6.6	8.2	10.1	12.6	10.7	10		13.6
DO % Saturation	48%	73%	90%	113%	95%	79%		107%
Total Solids (ppm)	520	646	222	358	294			
Suspended Solids (ppm)	122	110	130	110	60			
Phosphates (ppm)	.76	.81	.77	.76	1.8	2.5	3.1	.13
Nitrates (ppm)	1.25	1.95	1.45	1.35	.78	.75	.4	.3
Syndets (ppm)	19	.16	.16	.23	.39	.47	.69	.1
Turbidity (ppm)	32	30	28	31	30	33	20	20
Hardness (ppm)	178	228	148	128	98	94	80	62

stream. All four surveys show a dramatic increase in these solids from above Boise to Notus. Both the total solids and suspended solids help to indicate the degree of pollution. The total solids increased from less than 200 parts per million (ppm) above Boise to about 550 ppm at Notus. This increase was steady in a downstream direction except for two peaks which were due to the wastes discharged by Swift and Company at Boise and by the organic waste load discharged into the river from Indian Creek. The increase in suspended solids, which primarily indicates organic material, follows the same pattern as total solids. Some of this increase in total solids is due to natural leaching of the soil by water which enters the river from drain ditches. The rest of total solids and suspended solids are contributed by various organic industries.

Chemical

The chemical analyses also indicate a general degradation of stream from Boise to its junction with the Snake. The synthetic detergents determination (syndets) gives an indication of the amount of domestic sewage being discharged to the stream. The phosphates and nitrates have no real significance but help to show the effect of soild leaching and domestic sewage upon the stream.

The dissolved oxygen (DO) determination is one of the most important used in stream pollution studies as the amount of DO present in a stream indicates the effect that a waste is having upon that stream. The amount of DO present in the Boise River varied considerably from station to station during each survey. Most fish and aquatic organisms require at least 4.0 ppm DO to live. The trout species requires over 6.0 ppm. Most streams will become septic when the DO concentration drops below 2.5 ppm. Streams receiving heavy organic waste loads may occasionally show a relatively high DO level and still have septic conditions prevailing in the settled sludge which blankets the bottom of the stream. During each survey the DO above Boise in the river was near the maximum. Below the Boise sewage treatment

plant the stream was super saturated with oxygen. However, below Swift's Meat Company the DO was only 79 percent of saturation due to the oxygen demand of the organic wastes. Between Strawberry Glenn and Middleton the dissolved oxygen concentration began to gradually increase to the saturation point again. Then due to the tremendous waste loads entering the river from Mason Creek and Indian Creek, the river once again experienced a depletion in DO. The lowest DO being 5.2 ppm or only 42 percent of saturation at Notus. Below Notus the river gradually regains oxygen but enters the Snake River in a highly unstable condition. If it were not for the fact that the stream has a good reaeration rate due to its velocity and numerous riffles, it undoubtedly would be septic along much of its course during the winter months.

Biochemical

The amount of dissolved oxygen required for satisfactory oxidation of organic material, such as domestic sewage and industrial wastes, is called biochemical oxygen demand or BOD. This is, therefore, a very important index in determining the degree of organic pollution in a stream. As shown in Tables II through V, the BOD at the various stations normally increased as the DO decreased. Again the lowest BOD's were found in the area above Boise and the higher ones were prevalent in those stretches of the river receiving organic waste loads. The highest BOD recorded during the study was at the Notus Bridge in January of 1960 which showed a demand of 31 ppm.

BACTERIOLOGICAL EXAMINATION RESULTS

In addition to other water samples, special samples were collected at the various stations for bacteriological examination for the MPN (most probable number) of coliform organisms per 100 milliliters of sample (See Table VI). The coliform group of organisms are indicators of domestic sewage pollution.

Table VI

Boise River Survey
Results of Bacteriological Analysis

Station	Aug. 11-13, 1959 Membrane Filter Per 100 ml.	Jan. 12-14, 1960 Membrane Filter Per 100 ml.	Jan. 12-14, 1960 MPN Per 100 ml.	Jan. 12, 1961 MPN Per 100 ml.	Feb. 20, 1962 Membrane Filter Per 100 ml.
B-5	3,300	240,000	460,000	150,000	63,100
B-6	11,000	200,000	240,000	110,000	9,900
B-7	7,000	45,000	> 110,000		
B-8	1,500	50,000	> 11,000	110,000	4,500
B-9		1,300	4,600		
B-10		600	> 1,100	1,100	17,000
B-12					1,100
B-13		8,400	< 11,000		
B-15		2,000	11,000	24,000	10,300
B-16			46,000	1,500	11,000
B-19		200	460	< 1,100	6,500

From a health standpoint, the bacteriological contamination of a stream is the most serious problem. However, the overloading of a stream with organic wastes many times increases the health hazard involved. The principal way is by furnishing the bacteria nutrients with which they can continue to live and produce. The bacteriological count in a stream increases tremendously in a relatively short distance if there is enough organic waste in the stream and if the temperature of the water is not low.

The coliform count in the sample collected at Station B-19 (Broadway Bridge in Boise) varied from a low of 200 per 100 milliliters in January of 1960 to a high of 6,500 per 100 milliliters in February of 1962. The results of the 1962 samples do show indications of sewage contamination. With the extremely low flow in the river, it would take only a small amount of sewage contamination to produce this coliform count. Except for the stretch of river between Middleton and Caldwell, the coliform counts were progressively higher, reaching a maximum of 460,000 per 100 milliliters at Station B-5 (Bridge at Notus) in January, 1960. The reason for the lower counts between Middleton and Caldwell is that the amount of pollution entering the river in this area is not as great and this is a relatively long distance so that there is an opportunity for some purification. The coliform count in August, 1959, at Notus was 3,300 per 100 milliliters which is considerably lower than the winter samples. This would be due to the higher flows during the summer affording greater dilution and the fact that the food processing plants were not in operation at this time of the year.

These high coliform counts present a definite health hazard to anyone who comes in contact with this water. Perhaps an even greater hazard is along the drain ditches and creeks which are tributary to the river. Many of these ditches which carry raw sewage or inadequately treated sewage have very little dilution water and many of them run through residential areas where children and pets have

easy access to the contaminated water. This is especially a problem in the communities of Eagle, Star, Notus and Parma.

BIOLOGICAL ASPECTS

Surveys were made of the Boise River at three different seasons, spring, summer and winter, to determine the extent of animal life at the various stations by examining the river bottom. These surveys were made in March of 1959, August of 1959, January of 1960 and February of 1962. This examination was done with the use of a double-handled, 16-mesh screen, three feet by four feet and/or an Eckman dredge.

The ability of aquatic animals to survive depends on their physical makeup in reacting and adapting to their environment. This ability is quite varied with all the different animals. The introduction of a pollutant into a stream alters the environment of the bottom living organisms at approximately the site of introduction to some point further downstream. What effect this pollutant has on the organisms depends on the physical make up of the organism, the chemical composition, temperature, physical structure, volume, and toxicity of the pollutant and the conditions of the stream receiving the pollutant. How far these effects extend downstream depends on many of the conditions mentioned. The items listed should not be considered a complete list but examples of the principal factors involved.

When organisms are able to adapt to polluted water, we think of these organisms as being pollution tolerant. If the organisms are sensitive to pollution in that they cannot adapt to the polluted environment, we term them as being pollution intolerant. As would be expected, there exists a whole range of animal species from pollution tolerant to pollution intolerant forms. Those with extreme reactions to pollution or clean water are the best indicators of pollution. In other words, one organism may thrive under polluted conditions but cannot withstand clean water, while another organism thrives in clean water and is rapidly eliminated or reduced by polluted water.

It is known that insects belonging to the orders Trichoptera (caddisflies), Ephemeroptera (mayflies) and Plecoptera (stoneflies) are pollution intolerant organisms, especially in relation to organic enrichment and/or oxygen depletion.

Figure 3 shows the average number of caddisflies, stoneflies and mayflies found during the four surveys. On the basis of these organisms, pollution effects were most pronounced at Stations 5, 6, 7, 8, 9, 15 and 16 at one or more seasons of the year. During the January 1960 survey, five or less of these bottom organisms were found per sample at Stations 6, 7, 8, 9 and 16 while more than 270 specimens were found at Stations 13 and 19.

It should be noted that an attempt was made in August of 1959 to establish a biological sampling station below the Ridenbaugh Canal diversion in the Boise River. No bottom organisms of any kind were collected in several screen samples. There is no organic enrichment of the stream above this point but the stream bed in the sampling area was dry during the previous winter and early spring. There was also a considerable amount of sand being shifted along the bottom by the stream flow at the time of the survey. These two factors could have a definite correlation with the fact of no organisms being found at this point.

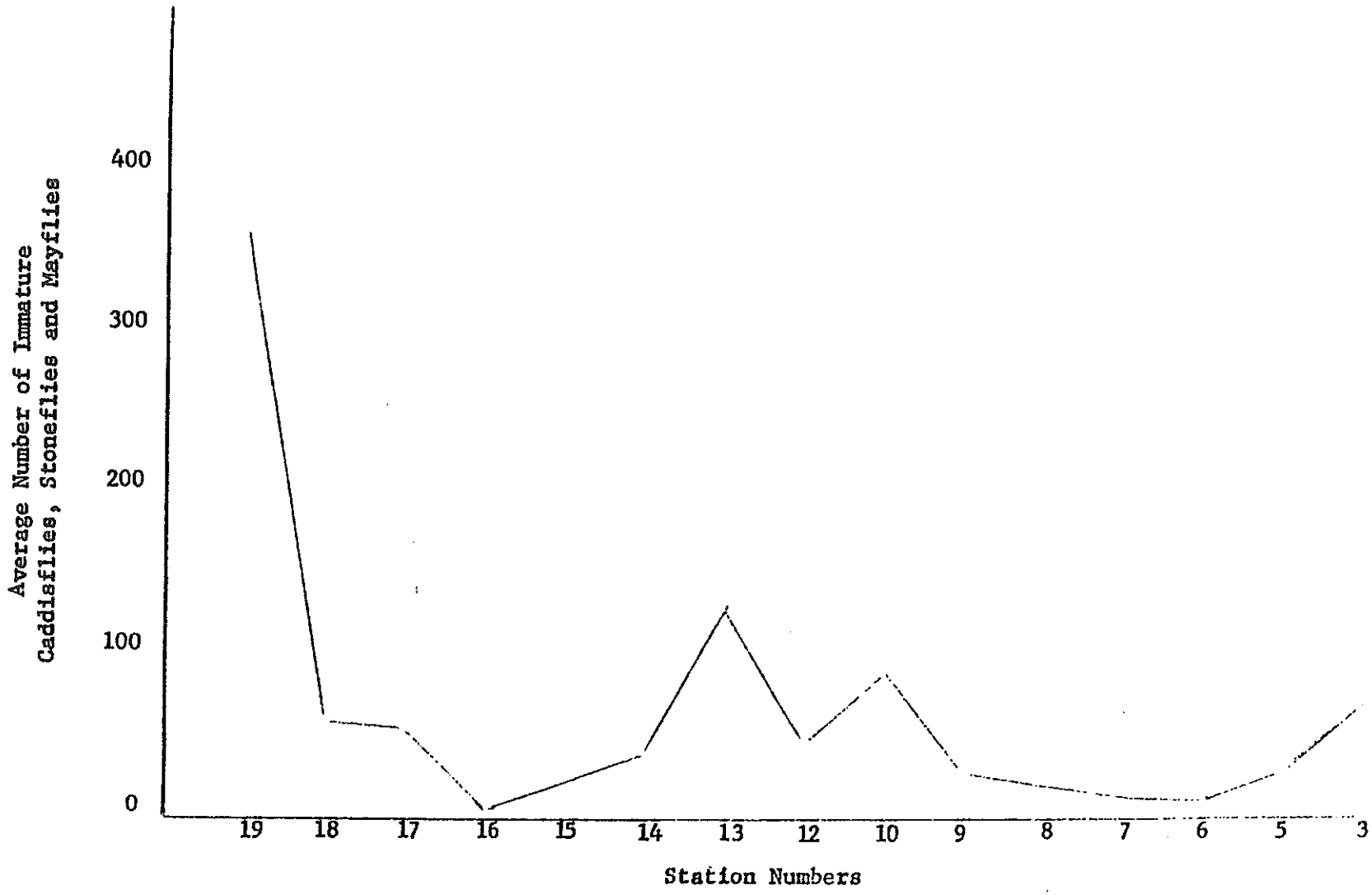
The Boise River has excellent reaeration characteristics which permits rapid assimilation of wastes and development of bottom living organisms of the pollution intolerant types. In this survey only the most severe pollution problems are indicated from these organisms.

During the March 1959 survey no evidence of Norway rats was observed, while on the February 1962 survey rat evidence was found at three separate sites. These were below the Swift and Company packing plant, under the old highway bridge at Caldwell and near the highway bridge at Notus. These three sites are areas of heavy pollution with organic waste. Certain types of pollutants serve as a food supply for these rodents. The fact that these filthy, potential disease carriers

Figure 3

Boise River Survey

Average Number of Immature Caddisflies, Stoneflies and Mayflies Taken During Surveys in March 1959, August 1959, January 1960 and February 1962



are able to thrive on the organic material discharged to the river is in itself sufficient reason for eliminating the discharge of these materials to the stream. Unless these sources of food are eliminated, the rat population will increase.

CONCLUSIONS

The following conclusions are drawn from observations at various Boise River sampling stations at different sampling times from evaluation of wastes being discharged to the stream and from analytical results of samples taken:

1. Conditions definitely showed the detrimental effects of wastes being discharged to the Boise River. The physical, chemical, biochemical, biological and bacteriological examination of samples collected at Station B-19 (Broadway Bridge) showed a water relatively free of organic pollution. During the winter months when flows in the stream are generally low and the food processing plants are in operation, the pollution problems are more pronounced. Areas where the stream is degraded by pollution, the greatest are at Station B-15 (Strawberry Glenn), Station B-13 (below Eagle), Station B-8 (below Mason Creek), Station B-6 (below Indian Creek) and Station B-5 (at Notus). Stream degradation at these points is evidenced by increases in the 5-day BOD, total solids and coliform bacteria content. Also, sludge banks, floating slimes and grease characterized conditions at these stations.
2. The main problems created by the discharge of the various untreated and partially treated wastes to the Boise River are as follows:
   a. The health hazard that is created by the discharge of raw and partially treated domestic sewage from communities, industries and individual homes which either discharge their wastes directly to the Boise River or to tributary streams. Many of the tributary drain ditches which carry raw or inadequately treated sewage have very little dilution water and many of them run through residential areas which presents an even greater problem.

This is especially a problem in the communities of Eagle, Star, Notus and Parma.

b. The wastes discharged to the stream form sludge blankets and slimes which interfere with the propagation of fish and wildlife. Sludge blankets and silt blankets from gravel washing operations smother out aquatic organisms which are necessary for fish.

c. Since water from the Boise River is used extensively for irrigation purposes, the wastes discharged to the stream create a health hazard and cause nuisance conditions in irrigation use.

d. The low flows which prevail during certain times of the year make it necessary that a higher degree of treatment be provided than is conventionally used if all beneficial uses of the stream are to be utilized. The low flows will also tend to discourage industrial development of the type which would have an organic waste load in certain areas of the river. The low flows also interefere with the development of the river as a fishing stream.

e. The wastes discharged to the river encourage rat propagation in the area. The wastes provide food for the rats and, since they already have an adequate water supply and harborage, an ideal habitat is created. Solid wastes allowed to accumulate along the banks of the creek add to this problem.

f. Dead animals deposited into the river not only create a nuisance condition but present a health hazard as well.

g. Although a study was not made on the effects that pesticides and weedicides would have on the water quality in this survey, this should be done.

RECOMMENDATIONS

Recommendations for abatement of pollution in the Boise River should be considered as divided into two major categories: (1) Those referring to major sources of pollution for which specific recommendations are outlined, and (2) general recommendations covering miscellaneous and in most cases individually less significant sources of pollution. Collectively, however, these individual and smaller sources of pollution are of a great deal of significance and no abatement program can be successful unless a mechanism is set up for their control. Effecting clean-up of the Boise River should be a major concern of the communities and other persons who work or reside in the vicinity of the Boise River. Since these same communities and individuals are the source of pollution, it is difficult to bring about corrections without an agressive and positive program being carried out by local, county and municipal governments. These governments, including sewer districts, could contribute a great deal toward pollution abatement by constructive planning and guidance aimed at encouraging community sewage collection systems in those urban areas, or potentially urban, not now served by public sewers. In addition, the communities involved should develop a program of positive control on the installation of individual sewage disposal systems, including the adoption of design and construction standards and a mandatory inspection of such facilities.

One important factor that must be given consideration in the provision of satisfactory quality of the river is the flow volume that can be relied upon for adequate dilution of highly treated wastes. In order to achieve maximum, multiple, beneficial use of the Boise River, including the support of fish and other wildlife, sufficient water should be provided to maintain flows adequate for these purposes. No attempt is made at this time to establish a definite minimum flow recommendation. It has been suggested that satisfactory conditions could be maintained in the river if the flows did not fall below the 100 cubic feet per second range.

City of Boise

1. Individual septic tanks which discharge to the Boise River and ditches tributary to the river should be eliminated. A feasible solution would be extension of sewers to serve those areas on the fringe of the city and bench sewer systems.
2. Adequate settling facilities should be provided for gravel washing operations which discharge to the Boise River and drains tributary to the river.

Custom Packing Plant

1. The emergency overflow which allows wastes to be discharged to the river should be disconnected from the system.

Garden City

1. An effective program for reducing the infiltration of seepage water into the city sewers should be carried out. This will eliminate bypassing of raw sewage to the drain ditch and provide more effective treatment of the sewage.
2. The effluent from the sewage treatment plant should be piped to the river.

Swift and Company

1. There should be effective treatment of the wash water and other liquid wastes to reduce the 5-day biochemical oxygen demand by approximately 90 percent or equivalent to primary and secondary treatment with chlorination of the effluent.
2. Similar treatment should be provided for the plant's domestic sewage.

Liberty Meat Packing Company

1. Blood from the kill floor should be collected and disposed in a sanitary manner.
2. There should be treatment which is equivalent to primary and secondary treatment with chlorination of the final effluent of the wash water and other liquid wastes.
3. Similar treatment or disposal of the septic tank overflow by means of a drain field should be provided for the plant's domestic sewage.

Ideal Meat Packing Company

1. If this plant is to be operated, then adequate waste treatment facilities will be necessary. These treatment facilities should include:
   a. Blood from the kill floor should be collected and disposed in a sanitary manner.
   b. Paunch manure should also be collected separately and disposed in a sanitary manner.
   c. There should be treatment which is equivalent to primary and secondary treatment with chlorination of the final effluent of the wash water and other liquid wastes.
   d. Similar treatment or disposal by means of a septic tank and a drain field should be provided for the plant's domestic sewage.

Boise Valley Meat Packing Company

1. Blood from the kill floor should be collected and disposed in a sanitary manner.
2. Paunch manure should also be collected separately and disposed in a sanitary manner.
3. There should be treatment which is equivalent to primary and secondary treatment with chlorination of the final effluent of the wash water and other liquid wastes.
4. Similar treatment or disposal by means of a septic tank and a drain field should be provided for the plant's domestic sewage.

Eagle and Star

1. Sewage collection systems should be installed for the communities of Eagle and Star.
2. Sewage treatment facilities should be provided for these collection systems which will be equivalent to primary and secondary treatment with chlorination

of the final effluent. Treatment by means of stabilization ponds would also be considered satisfactory treatment.

Middleton

1. Additional treatment should be provided for the sewage before discharge to the drain ditch. Treatment by means of stabilization ponds would also be considered satisfactory treatment.

Amalgamated Sugar Company

1. Improvements should be made to eliminate the pulp silo drainage and to reduce the amount of pulp press water discharged to Mason Creek.

City of Caldwell

1. An effective program for reducing the infiltration of seepage water into the city sewers should be carried out.

J. R. Simplot Company

1. The equivalent of primary and secondary treatment should be provided for the plant's industrial wastes before discharge to the river.
2. Similar treatment with chlorination of the final effluent will be necessary for any domestic sewage before discharge to the river. Treatment by means of stabilization ponds would also be satisfactory.

Village of Notus

1. An adequate community sewage collection system should be installed.
2. Sewage treatment facilities should be provided for this collection system. The treatment provided should be equivalent to primary and secondary treatment with chlorination of the final effluent. Treatment by means of stabilization ponds would also be considered satisfactory treatment.

J. C. Palumbo Company

1. Adequate treatment facilities should be provided for the potato wash water before discharge to the river.

2. Any domestic sewage should be disposed of by means of a septic tank and drain field.

Parma Farm Labor Camp

1. Additional treatment should be provided for the domestic sewage so that the treatment will be equivalent to primary and secondary treatment and chlorination or stabilization ponds.

City of Parma

1. Adequate sewage treatment facilities should be provided. The treatment provided should be equivalent to primary and secondary treatment with chlorination of the final effluent or treatment by means of stabilization ponds.

Miscellaneous

While making surveys of conditions in the river and in the determination of major pollution sources, it was noted that there are numerous sources of pollution which are not specifically identified in this report. These include many individual septic tank or household sewer installations which are allowed to discharge directly to the ground surface or a ditch or stream tributary to the river. The keeping of livestock in large concentrations adjacent to drain ditches or streams can contribute materially to pollution of the river, particularly in that phase of pollution related to bacterial contamination. Dead animals have been reported in the stream adjacent to some of these livestock concentrations. The State Department of Health does not have a sufficiently large staff to investigate and eliminate these more or less minor miscellaneous sources of pollution. It appears that the only mechanism for an orderly elimination of these miscellaneous sources is through programs developed by local governments and carried on in cooperation with the State's program.