Water Quality Status Report No. 4

REPORT ON POLLUTION PROBLEMS IN ROCK CREEK
Cassia and Twin Falls Counties, Idaho
1959

May, 1960

IDAHO DEPARTMENT OF HEALTH
Engineering and Sanitation Section

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REPORT ON POLLUTION PROBLEMS IN ROCK CREEK

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IDAHO DEPARTMENT OF HEALTH
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Report on Pollution Problems in Rock Creek

Introduction

The purpose of this report is to show the results of our investigation concerning the pollution problem in Rock Creek.

Three separate studies were made at four-month intervals to obtain a complete yearly picture of the problem. The surveys were made in April, August and December of 1959. During each study, a series of samples were taken at strategic points along the creek from above Twin Falls to where it empties into the Snake River. (See Figure 1.) Samples were also collected in the Snake River above the point where Rock Creek empties into the river and during the December survey, several samples were collected in the river below Rock Creek. These samples were taken for chemical, bacteriological, and biological analyses. Also, the various industries and municipalities along Rock Creek 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 and M.D. Alsager, public health engineers, and R. P. Olson, public health biologist. The laboratory work was done by personnel in the Boise laboratory of the State Department of Health and the South Central District Health Department laboratory in Twin Falls.

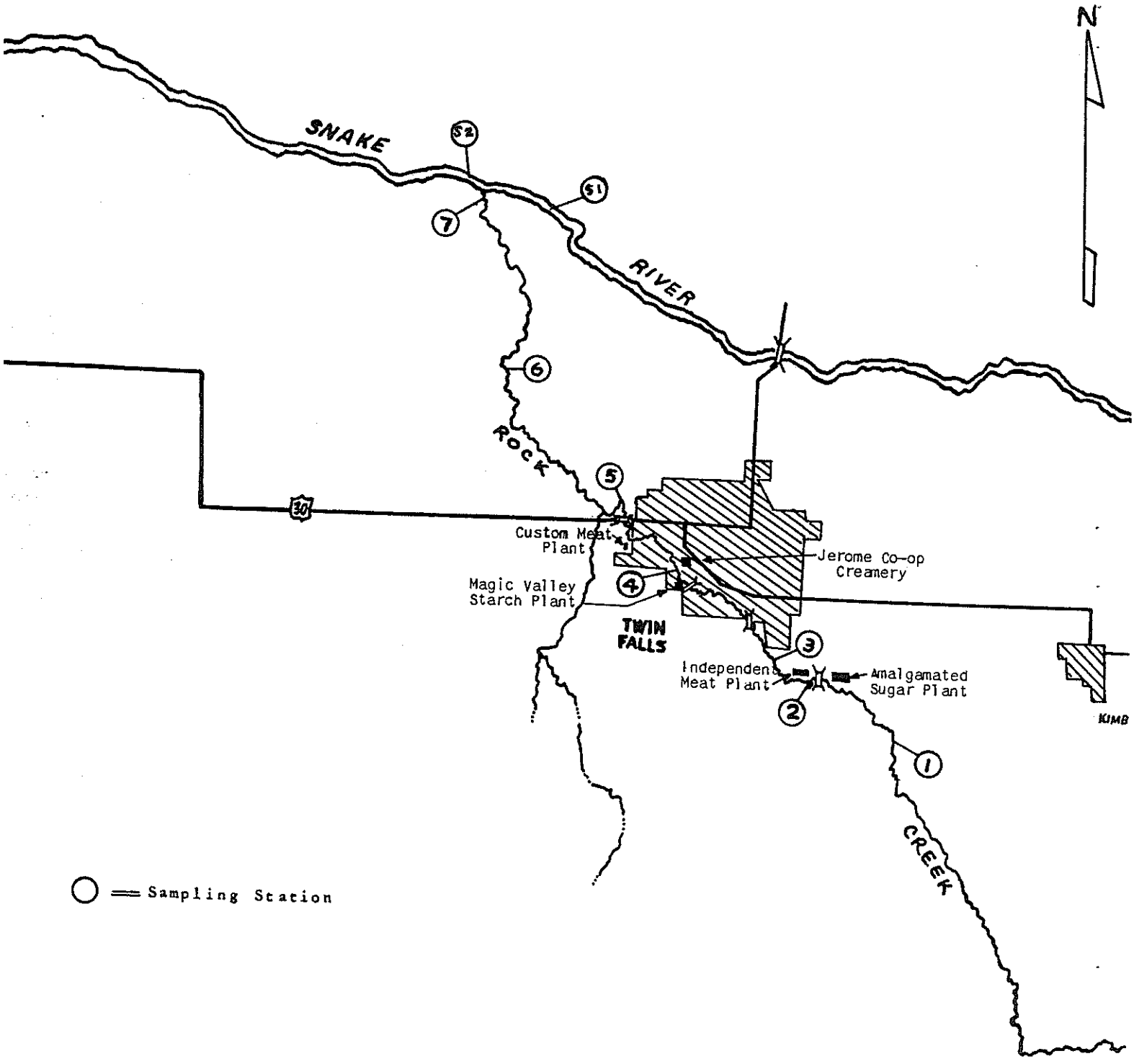
Rock Creek is located in Cassia and Twin Falls Counties in South-Central Idaho. It has its origin in west-central Cassia County near the Twin Falls County line. Above the City of Twin Falls the stream flows in a canyon through wasteland and some farmland. The creek flows on the south

ROCK CREEK
STREAM POLLUTION STUDY

TWIN FALLS COUNTY, IDAHO

Engineering Section

Idaho Department of Health



and west sides of Twin Falls and the area below Twin Falls is all under-diversified cultivation. The stream is also used by the City of Twin Falls and industries in and near the city as a carrier for their wastes. The good velocity of the stream aids in its recovery and keeps the pollution problem from being even more pronounced.

Waste Loading to the Stream

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

Amalgamated Sugar Company

The Amalgamated Sugar Company has a beet sugar factory southeast of Twin Falls. The plant processes approximately 3,700 tons of sugar beets per day for a campaign of about 110 days. The plant operates 24 hours a day with about 80 employees on each shift. About 6,000 gallons of fresh water per minute are used in the plant.

A brief description of the operation of the sugar beet factory is as follows: The whole beets are first washed thoroughly in a continuous washer; next they are sliced into small pieces; the sugar is extracted in a continuous diffuser and purified with carbon dioxide and milk of lime. The sugar solution is then filtered, evaporated, and crystallized under vacuum. The sugar crystals are separated from the molasses by centrifugal action and are dried for packaging. The waste water from the beet washer is discharged directly to Rock Creek. The spent lime slurry is discharged to a settling pond which overflows to Rock Creek. Water is added to the spent beets (pulp) in order to give it a consistency which can be pumped. This pulp is pumped and passed over vibrating screens. The screened pulp

is discharged into a huge wooden storage pit where it is stored until farmers acquire it for livestock feed. The screen water is discharged to Rock Creek. The storage pit has floor drains which empty into the creek. Thus most of the water that was used for diluting the pulp enters Rock Creek after it has partially leached the pulp of its nutrients.

The resultant molasses separated by the centrifuge is further processed to obtain additional sugar and by-product recovery. The waste from this process is the spent lime slurry which is also discharged to the settling pond.

The effluent from three of the septic tanks which treat domestic sewage from the plant is discharged to the lime settling pond. The effluent from the septic tank which serves the main portion of the plant is discharged directly to Rock Creek.

Independent Meat Company

The Independent Meat Packing Company plant is located about one mile below the beet sugar factory. This plant is located next to the stream with stockyards immediately adjacent to the creek. Approximately 150 head of cattle and 300 hogs are processed each week. Blood, wash water and domestic sewage from the plant is discharged directly to the creek without any treatment. Paunch washings are discharged to a small settling tank with the overflow directed to the creek.

Magic Valley Processing Company

The Magic Valley Processing Company is a potato starch plant located on the south side of Rock Creek in Twin Falls. The plant can process approximately 200 tons of potatoes per day; however, raw potatoes are not processed every day. The plant is operated between the months of September

and April. The principal wastes from this process are the wash and flume water and the protein water resulting from the centrifuge action. Approximately 500 gallons of fresh water are used per minute. The quantity of protein water has been estimated at 50 to 100 gallons per minute, the remaining 400 to 450 gallons per minute wastes being wash and flume water. Solid wastes, including some raw potatoes, and other refuse removed from trucks transporting potatoes to the plant are disposed over the side of the canyon.

Jerome Cooperative Creamery

The Jerome Cooperative Creamery has a plant located on the north side of Rock Creek in Twin Falls. This plant processes approximately 128,000 pounds of milk per day into cheese products. About 90 per cent of the milk results in whey. About 50 per cent of the whey is being transported to their drying plant in Jerome.* The remaining whey, vat and floor washings and domestic sewage from the plant are discharged to Rock Creek without treatment.

Custom Packing Company

The Custom Packing Company is located on the south side of Rock Creek and on the west side of Twin Falls. Approximately 30 hogs and 7 head of cattle are slaughtered each week. Slaughtering is done one day a week. The paunch manure, blood, wash water and toilet wastes are discharged without treatment to a small creek which flows into Rock Creek several hundred feet from the plant.

City of Twin Falls

The City of Twin Falls, which has a population of about 22,000, discharges sewage from the city collection system to Rock Creek without treatment. This sewage is discharged to the creek through seven separate sewer

* Information from Mr. Stevens, plant foreman, January 28, 1960

outfalls. A majority of the sewage is discharged through two outfall sewers located west of the hospital. The hospital also has a separate outfall sewer line. The remaining four outfall sewers serve smaller areas, on either side of Rock Creek. Waste water from the city water filtration plant is also discharged to Rock Creek through an outfall sewer on the south side of the creek. These are wastes resulting from the backwashing of the filters.

Table I

Rock Creek Stream Survey
1959

Organic Waste Load Discharged to Rock Creek

Contributor	Type and Amount of Waste and/or Product	Est. Lb. BOD/day in Raw Wastes	Type of Treatment	Est. Lb. BOD/day Treated Wastes	Population Equivalent
Amalgamated Sugar Company	Flume and wash water, pulp silo drainage, lime cake slurry, domestic sewage (240 employees) 3,700 tons of beets/day	105,340* 40	Lime slurry lagoon Septic tanks	79,810 28	469,450
Independent Meat Company	Blood, wash water, and paunch manure. Domestic sewage (50 employees) 142,500 lb. cattle & 75,000 lb. hogs/week	641* 9	none none	641 9	3,825
Magic Valley Processing Company	Wash, flume and protein water 200 tons potatoes per day	5,078	none	5,078	29,900
Jerome Cooperative Creamery	Whey, vat and floor washings, domestic sewage (60 employees) 128,000 lb/milk/day	2,330* 10	none none	2,330 10	13,760
Custom Packing Company	Blood, paunch manure, wash water. 14,150 lb/hogs & cattle/week	40*	none	40	235
City of Twin Falls	22,000 people plus small industrial load	4,250	none	4,250	25,000
Totals				92,196	542,170

Physical Observations

The general appearance of Rock Creek above the Amalgamated Sugar Company did change somewhat throughout the year. During the April and August surveys, the water was quite turbid with considerable silt. During the December survey, the water was quite clear. The turbidity during the summer months would be due to the irrigation runoff carrying silt into the creek. The stream at this point has a rocky bottom with large boulders. There was a considerable amount of silt in places on the bottom and banks of the stream. The velocity of the stream is very rapid in its entire distance, ranging between two and five feet per second. This rapid flow does not permit the silt to settle out rapidly, consequently the stream remains turbid for considerable distances below points where irrigation runoff enters the creek.

While the sugar plant was in operation, the water at Station 2 contained considerable amounts of floating solids and foam. This condition would be due to waste water from the washing of the sugar beets and the beet pulp passing through the screens. There was also sludge along the banks of the creek. Conditions at Station 3 were much the same as at Station 2 except for larger sludge banks. Sludge banks up to 1½ feet deep were noted in places. This would be due to organic material from the sugar plant and from the Independent Meat Company which had settled out and decomposed.

At Station 4, the water was further discolored by the wastes from the Jerome Cooperative Creamery. There was also a large amount of foam on the water due to the wastes from the Magic Valley Processing Company. Here again there were sludge banks one to two feet deep.

At Station 5, sludge banks were still prevalent with a considerable amount of organic and sewage solids floating in the stream. There was a

definite sewage odor in this area. These conditions would be due to the presence of the untreated domestic sewage in the stream as the City of Twin Falls main outfall sewers discharge to the creek about 1/4 mile above Station 5.

Observations at Station 6, which is about 4 miles below Twin Falls, also showed effects of gross pollution as evidenced by thick sludge banks, slime growths, floating organic solids, turbid water and an odor of septic sewage.

Physical observations were also made on the Snake River above and below the entrance of Rock Creek. Sludge banks, murky water, septic sewage odor and murky appearance characterized conditions in the Snake River below Rock Creek. Such conditions were not found above the entrance of Rock Creek. During the summer there were also considerable numbers of flies along the river bank below the creek. Carp and other trash fish were also observed in the river below the creek, while numerous trout were observed breaking water in pools above the Rock Creek entrance. During the December survey, observations were made from a boat from the Rock Creek entrance to about six miles below. The river in this entire stretch was characterized by deep sludge deposits, and turbid and murky water. Near the entrance of Rock Creek the sludge deposits were characterized by partially decomposed sugar beet pulp and other organic material. Further decomposition of the sludge was evident further down the river. Gas evolving from the water indicating anaerobic decomposition of the sludge in the river was noted for a distance of at least three miles below Rock Creek. The river in the area from Rock Creek to about six miles below is about 300 feet in width with an average depth of about eight feet. The velocity in the river is much less than that in Rock Creek, so the river is acting as a settling basin for the wastes discharged by the industries and the City of Twin Falls.

Physical, Chemical and Biochemical Analytical Results

Water samples were collected at each of the various sampling stations during the survey. These samples were analyzed in our laboratory in Boise. A summary of the physical, chemical and biochemical data from these samples is shown in tables in this report. (See Tables II through IV.)

Physical

The total solids at Station R-1, above any waste outlets, was practically the same for all the surveys. The total solids showed a definite increase below each of the industrial waste outlets and the main city sewer outlets. The rise below the sugar plant during the December survey was very pronounced, increasing from 554 parts per million to 1536 parts per million. The suspended solids increased from 42 parts per million to 844 parts per million. The total and suspended solids also showed a definite increase in the Snake River below the entrance of Rock Creek.

Chemical

The dissolved oxygen (D.O.) in the stream at Station R-1 was at or near the saturation point during each survey. The saturation point varies indirectly with the temperature of the water and for Rock Creek, it will vary from 9 to 13 parts per million D. O.

The dissolved oxygen in per cent saturation for all three surveys showed a steady decrease from the point where the first wastes are discharged to the creek to a point several miles below the Twin Falls outfall sewer which is the last waste discharged to the creek. Had the velocity of the water in the creek been less, thus reducing the reaeration rate and allowing more solids to settle out, the decrease in oxygen would have been more pronounced and more severe septic conditions would have prevailed.

The pH of the stream samples were slightly higher during the August survey, indicating greater alkalinity, than during the April and December surveys. This would be accounted for by the fact that much of the flow in the creek during the summer is irrigation return flow.

The phosphate content of the water showed a sharp increase below the Twin Falls sewer outlets. This would be due to the household detergents present in the city sewer.

Biochemical

The amount of dissolved oxygen required for satisfactory oxidation of organic material, such as domestic sewage and industrial wastes, is called the biochemical oxygen demand or B.O.D. This is, therefore, a very important test in determining the degree of organic pollution in a stream. The quantity of B.O.D. is also used to determine the population equivalent of wastes. (See Table I).

The results of the tests for the 5-day B.O.D. at the various stations at different times of the year very clearly show the effects of the wastes discharged to Rock Creek (See Figure 2).

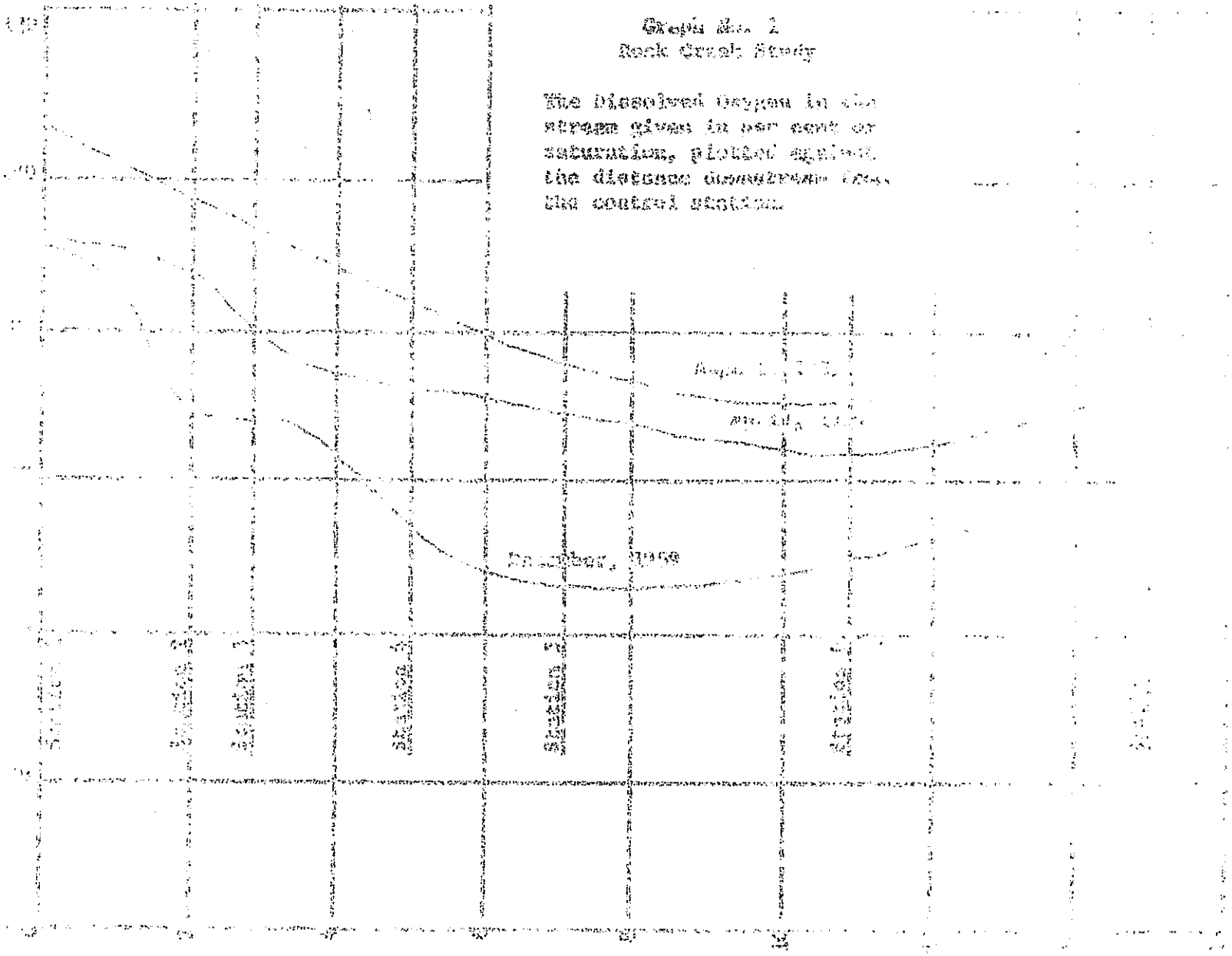
The 5-day B.O.D. at Station 1 was very low during all sampling periods.

At Station 2, the 5-day B.O.D. was relatively low, 5.8 parts per million, during the April and August surveys but showed a sharp rise to 550 parts per million in December. This would be due to the wastes discharged by the sugar factory.

The 5-day B.O.D. at Station 4, which is below the Jerome Cooperative Creamery and the Magic Valley Processing Company outlets, also showed a sharp rise from 30 to 109 parts per million during the April survey.

At Station 5, below the main sewer outlets for the City of Twin Falls, there was also a sharp rise in the 5-day B.O.D. This was the most noticeable during the August survey when the larger industries were not in operation.

During the December survey, samples were collected in the Snake River above and below Rock Creek. These samples showed the effects of the wastes discharged to Rock Creek as evidenced by an increase in the 5-day B.O.D. from 1.5 to 33.0 parts per million.


Graph No. 1
Rock Creek Study
The Dissolved Oxygen in the stream given in per cent of saturation, plotted against the distance downstream from the control station.
Miles Downstream from Control Station (Mile 0)

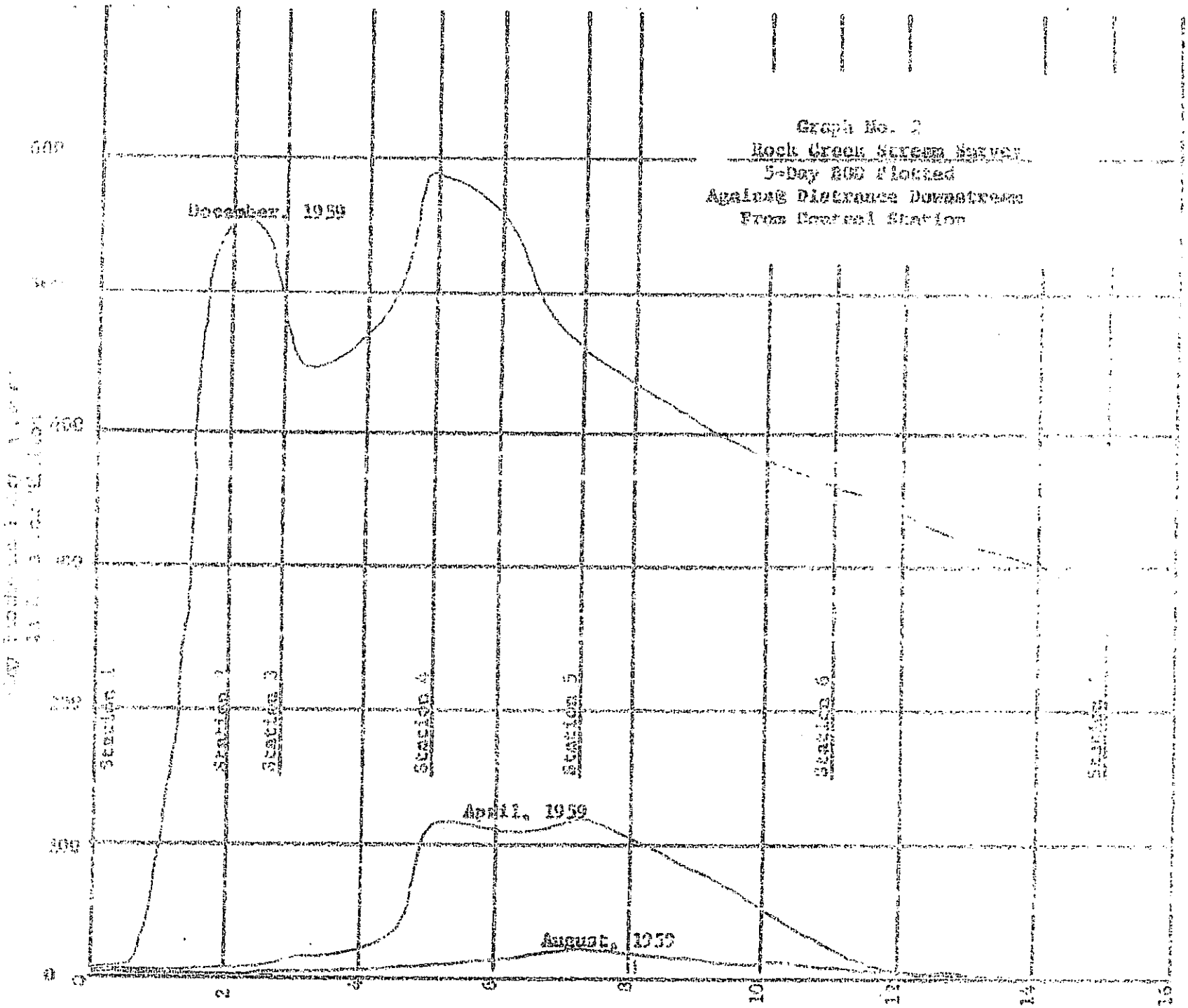

Graph No. 2
Rock Creek Stream Survey
5-Day BOD Plotted
Against Distance Downstream
From Control Station
December, 1959
April, 1959
August, 1959
Station 1
Station 2
Station 3
Station 4
Station 5
Station 6
Station 7
300
200
100
0
1
2
3
4
5
6
7
Distance Downstream from Control Station (Miles)

Table II

Rock Creek Stream Survey

Results of Analytical Determinations
April 21, 22, 1959

Stations	R-1	R-2	R-3	R-3.5	R-4	R-5	R-6	S-1	S-2
Temperature °F	50	50	48	49	50	54	60	55	60
pH	7.6	7.2	7.2	7.3	7.3	7.2	7.5	7.3	7.4
D.O.	10.4	10.0	9.4	7.5	8.4	7.4	6.4	12	9.3
B.O.D.	4.0	5.8	8.8	30	109	117	26	3.7	2.0
Total Solids	454	500		660	756	834		504	600
Suspended Solids	1	29		152	68	124		50	280
Phosphates	0.07			0.009	x0.5	0.4		0.02	0.54
Nitrates	0.4			0.38	1.0	0.9		1.3	1.9
Hardness	236					312		232	244
Alkalinity	102					200		112	106

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Table III

Results of Analytical Determinations
August 17, 18, 1959

Stations	R-1	R-2	R-3	R-4	R-5	R-7	S-1	S-2
Temperature °F	67	66	65	65	64	59	65	62
pH	7.6	7.6	7.6	7.6	7.6	7.6	7.4	7.8
D.O.	9.9	9.2	8.9	8.0	7.2	8.7	9.6	8.3
B.O.D.	1.3	1.3	4.8	5.2	20	3.6	2.0	1.5
Total Solids	576	602	602	616	678	626	458	528
Suspended Solids	52			72	77	234	40	136
Phosphates	0.07	0.11	0.18	0.14	0.5	0.4	0.05	0.16
Nitrates	0.65	1.0	1.1	1.2	0.2	1.5	1.2	1.4
Hardness	292					342	260	280
Alkalinity	201					238	190	230
Syndets						0.09	<01	<01

Table IV

Rock Creek Stream Survey

Results of Analytical Determinations
December 8, 9, 10, 1959

Stations	R-1	R-2	R-3	R-3.5	R-4	R-5	S-1	S-2	S-3*
Temperature °F	34	46	51		50	50	41		43
pH	7.6	7.2	7.2	7.4	7.4	7.2			
D.O.	12.9	8.3	7.7		6.2	5.3	11.1		11.1
B.O.D.	2	550	440	500	590	465	1.5	33	10
Total Solids	554	1536	1440		1260	1246	418		428
Suspended Solids	42	844	680		496	430	5		14
Phosphates	0.0	0.0	0.0		0.0	1.22	0.14		0.10
Nitrates	0.8						0.8		1.1
Hardness	300					252	246		258

*Snake River 1½ miles downstream from mouth of Rock Creek

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). The coliform group of organisms are indicators of domestic sewage pollution. These samples were analyzed at the South Central District Health Department laboratory in Twin Falls.

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 reproduce. 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 in December at Station R-1 was 2,400 organisms per 100 milliliters. In August the coliform count was 7,900 per 100 milliliters at the same station. This higher count in August could be due to irrigation runoff water which may contain some cattle yard and possibly septic tank drainage.

The coliform count rose steadily as the creek flowed through the City of Twin Falls and reached a maximum at Station R-5, which is below the main outfall sewer. The coliform count at this station in August was 2,400,000 organisms per 100 milliliters, and in December the count was 220,000,000 organisms per 100 milliliters. The higher count in December would be due to the large amount of organic wastes present in the water which promotes the growth of the coliform organisms present in untreated domestic sewage.

The rise in coliform counts during the August survey would be due to untreated domestic sewage from the Independent Meat Company, and the untreated domestic sewage from the city's outfall sewers which discharge to the creek at various points along the canyon.

Samples collected from the Snake River during the December survey showed a coliform count of 920 organisms per 100 milliliter at Station S-1, which is above Rock Creek, and 430,000 organisms per 100 milliliter at Station S-2, which is below Rock Creek. This clearly demonstrates the fact that untreated wastes discharged to Rock Creek degrade the water in the Snake River.

These high coliform counts present a definite health hazard to anyone who comes in contact with this water. This may happen to persons fishing in the stream or to anyone fishing or swimming in the Snake River below the entrance of Rock Creek. Pets that come in contact with the water could also transmit micro-organisms to humans.

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Table V

Rock Creek Stream Survey

Results of Bacteriological Analyses

Station	August, 1959	December, 1959
R-1	7,900	2,400
R-2	4,000	700,000
R-3	92,000	35,000,000
R-4	920,000	160,000,000
R-5	2,400,000	220,000,000
R-7	2,400,000	
S-1		920
S-2		430,000
S-3		230,000

Biological Aspects

Indications of pollution in a stream can be determined by studying the various organisms that are present on the bottom of the stream. These organisms are, for the most part, quite susceptible to the effects of various pollutants, depending on the volume of the pollutants and the amount of flow of the receiving water. The value of using bottom organisms as indicators is that they reflect the longer term effects of pollution as compared to a given water sample which only indicates the condition of the stream at the moment the sample is taken. (The life span or developmental cycle of aquatic organisms represents a much longer period of time.) Therefore, under certain circumstances, intermittent pollution may not be detected by water sampling but may be observed by studying the bottom organisms.

Survival of aquatic organisms depends on many environmental conditions and the physical makeup of the animal in reacting to these conditions. An animal may live and thrive in clean water at the right temperature, with the proper amount of sunlight, plenty of dissolved oxygen, sufficient food, with no toxic chemicals or excess silt present, not too many predators, without too much organic material present and other factors that the animal may need or have to cope with to survive. A different species may be able to withstand or be tolerant of a wider range of these factors and may actually thrive under polluted conditions and be unable to exist, or at least to thrive, in clean water. There are many gradients between these two extremes.

Wherever a stream is polluted with a type and quantity of pollutant that is detrimental to organisms living on the bottom of the stream, it can readily be observed by obtaining bottom samples above and below the

points where the pollutant is discharged into the stream. Two distinct effects are produced when pollution, that is destructive to organisms living on the bottom of the stream, is present.

1. Polluted water contains fewer kinds of organisms than clean water. In other words, there is less variety.
2. Polluted water is apt to contain large numbers of the few kinds of organisms present. Gross pollution, on the other hand, may be responsible for producing a biological desert.

Good indicators of pollution are those organisms very sensitive to pollutants and those organisms very tolerant to pollution. The organisms between these two extremes cannot be relied upon until much more information is known about them and their ecology.

Samples of bottom organisms were taken in Rock Creek and the Snake River. These samples were collected with a double-handled, 16-mesh screen, 3 feet by 4 feet, an Eckman Dredge or simply collected from the bottom of rocks in the stream. Samples were taken in August and December of 1959 at the same time other samples of water were taken. Table VI is a list of the pollution-tolerant and pollution-intolerant organisms found in this survey.

An indication of what is happening in the stream can best be shown as in Table VII. On examining this table, it is quite evident that pollution effects are present at Stations 2, 3, and 4, and at the sampling stations in the Snake River below the outfall of Rock Creek. Three factors have considerable influence on the presence of bottom organisms in Rock Creek. These are: (1) the amount of water for dilution of wastes, (2) the variation in the amount of wastes discharged and (3) the rapid flow of the stream. At Stations 2, 3, and 4, which are below the discharge points

for various wastes, there is a difference between the August and December surveys. In December there is less dilution water along with more organic waste than in August since the Amalgamated Sugar Plant and the Magic Valley Processing Company discharge very little waste during the summer months. Wastes discharged during the previous operating season are, nevertheless, showing some effects despite rapid flows and more dilution during the summer. At Station 7, which is in Rock Creek about one mile above the outfall into the Snake River, there is some pollution effect. In the Snake River below the entrance of Rock Creek, samples of the bottom were taken at ½, 1, 1½, 2, 3, 4, 5 and 5½ miles down stream. Beet pulp was obtained at the ½-, 1-, 1½- and 2-mile sampling points. From the 2-mile point to the 4-mile point, various stages of decomposition were found with a black sludge. The first bottom organisms found were taken at the 5-mile sampling point. Stream pollution effects of the wastes discharged into Rock Creek are indicated in the Snake River as well as in Rock Creek, according to this survey.

In addition to the bottom organism survey, it should be pointed out that Norway rats are living along Rock Creek. They are fed by the various organic wastes discharged into the stream and along the banks. Municipal, industrial, household wastes and some animal feeds are the source of food supply for these animals. For this reason, there is a direct relation between the presence of these animals and the polluted stream.

Table VI

Rock Creek Stream Survey

Pollution-Tolerant and Pollution-Intolerant
Organisms Found in Rock Creek and the Snake River
August and December, 1959

Organisms found that are known to be pollution tolerant:*

1. Segmented worms of the class Oligochaeta.
2. Leeches of the class Hirudinea
3. Snails of the class Gastropoda.
4. Bloodworms of the family Tendipedidae.

Organisms found that are known to be pollution intolerant:*

1. Dragonflies of the order Odonata.
2. Green and brown midges of the family Tendipedidae.
3. Caddisflies of the order Trichoptera.
4. Flatworms of the order Tricladida.
5. Mayflies of the order Ephemeroptera.
6. Sideswimmers of the order Amphipoda.
7. Clams of the order Pelecypoda.

* Those organisms that are intermediate with regard to pollution effects are not listed.

Table VII

Rock Creek Stream Survey

Biological Comparison of Seven Stations
August and December, 1959

Station Number	(1959) Date	Number of Different Organisms Found	Number Pollution Tolerant	Number Pollution Intolerant	Intermediate	* Showing clean water effect + Showing polluted water effects -
1	August 17	13	3	5	5	+
	December 9	9	1	5	3	+
2	August 17	4	2	2	0	+ -
	December 9	1	0	0	1	-
3	August 17	6	2	3	1	+
	December 8	2	2	0	0	-
4	August 17	6	3	3	0	+ -
	December 8	0	0	0	0	-
7	August 17	6	3	3	0	+ -
Snake River Approx. 2 miles above Rock Creek	August 18	7	2	4	1	+
	December 8	7	2	4	1	+
Snake River 5 miles below Rock Creek	December 10	3	2	0	1	-
Snake River 5½ miles below Rock Creek	December 10	3	2	0	1	-

* This is simply a matter of rating the station on the basis of the predominant type of organisms found.

Conclusions

The following conclusions are drawn from observations at various Rock Creek and Snake River sampling stations at different seasons, from evaluations of wastes being discharged to the stream and from analytical results of samples taken:

1. Conditions definitely showed the effects of wastes being discharged to Rock Creek. The physical, chemical, biochemical, biological and bacteriological examinations of samples collected at Station R-1 showed a water relatively free of organic pollution. During the summer the wastes discharged by the Independent Meat Company, the City of Twin Falls and the Jerome Cooperative Creamery definitely degraded the stream. This was evidenced by an increase in the 5-day B.O.D. content, a tremendous increase in the coliform bacteria count and the appearance of blood from the packing plants, milk solids from the creamery and domestic sewage solids below the city outfall sewers in the stream.

   During the fall, winter and spring, the wastes from the Amalgamated Sugar Company and the Magic Valley Processing Company further degrade the stream as evidenced by an extremely high increase in the 5-day B.O.D., total solids and coliform bacteria content. The wastes discharged to Rock Creek not only degrade the water in Rock Creek but cause a definite degrading of the water in the Snake River. This is shown by a high 5-day B.O.D. and coliform bacteria content and large sludge deposits in the Snake River.

2. The main problems created by the discharge of the various untreated and partially treated wastes to Rock Creek are as follows:

   a. A health hazard is created by the discharge of raw sewage from the City of Twin Falls, the meat plants and the partially treated domestic sewage from the sugar factory. This health hazard is also present in the Snake River below Rock Creek. This section of the river is used extensively for recreational purposes, fishing and hunting, and could be developed to an even greater extent such as swimming, water skiing, etc., were the water of better bacteriological quality.

   b. The wastes discharged to the creek interfere with the propagation of fish in both Rock Creek and the Snake River. Raw sewage and industrial wastes create an environment in the stream which is not favorable for the growth of biological organisms which provide the necessary food supply for game fish. The stream bed in the Snake River was found during the December survey to be a desert for the larger aquatic organisms for a distance of at least four miles below Rock Creek.

   c. The wastes discharged to the creek 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.

d. The deterioration in quality of water used for livestock watering.

e. The asthetic problem created by odors resulting from the decomposition of solids in the domestic and industrial wastes and the sludge banks which form along the banks of the stream.

f. The wastes discharged to Rock Creek have an effect on domestic water use of the Snake River. The addition of wastes in the quantity and strength as discharged to Rock Creek promote algae and slime growths in the Snake River which in turn cause difficulties in the treatment of water for domestic use. The high coliform bacteria counts in the water discharged to the Snake River also make the water more difficult to treat for domestic use.

g. The wastes discharged to Rock Creek add to the fly-breeding problem.

Recommendations

Amalgamated Sugar Company

1. An overall program for treating the different wastes should be carried out. The most feasible way to accomplish this would be to separate the individual wastes and treat them separately. The program for treatment of these wastes should include the following items:

   a. Effective removal of the settleable and floatable solids and a material reduction in the dissolved solids content of the pulp waste. Installation of pulp driers with mechanical conveyance of the pulp from the diffusers to the driers would reduce the quantity of waste water to be treated. This would have an added benefit in that the nuisance condition created by the odor from pulp storage and transportation would be eliminated.

   b. There should be effective removal of settleable and floatable solids from flume and wash water.

   c. The possibility of reducing the quantity of water used for transporting the lime waste and/or increasing the capacity of the lime settling pond, in order to materially reduce or eliminate overflow from the pond, should be considered.

   d. All domestic sewage should be given effective primary treatment and adequate disinfection before discharge to Rock Creek.

Independent Meat 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. The remaining industrial plant waste water should be given effective settling for grease and solids removal before discharge to Rock Creek.
4. The toilet wastes and other domestic sewage should be given effective primary treatment and disposed in an underground absorption system or should be adequately chlorinated before discharge into the creek.

City of Twin Falls

1. All of the raw sewage presently being discharged through the several city sewer outfalls should be intercepted and sewage treatment facilities constructed which will adequately treat the sewage before discharge to the Snake River.
2. Consideration should be given to the installation of a settling basin to remove the settleable solids from the filter backwash water discharged from the water filtration plant.
3. Adequate settling of the waste water from the potato washing plants should be provided before discharge to the city sewerage system. Periodical inspection should be made of these units to insure proper operation.