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MONTANA FISH AND GAME DEPARTMENT

FISHERIES DIVISION

SUMMARY OF FISH-KILLS OCCURRING IN MONTANA DURING RECENT YEARS

Robert C. Averett
Pollution Control Biologist
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RATTLESNAKE CREEK

Two fish-kills have been reported in Rattlesnake Creek. This stream, the lower portion of which is located within the City of Missoula, Montana, is the city water supply stream. The lower one mile of Rattlesnake Creek flows through a city park, under the main highway and then into the Clark Fork River. Mean flow is about 30 cfs (cubic feet per second). Less than one mile above the mouth of Rattlesnake Creek the Missoula Brewing Company has a waste effluent that enters the stream. The volume of this waste effluent has been estimated at less than 1 cfs.

Details of the two fish-kills in Rattlesnake Creek are as follows:

1956

On November 6, 1956, a University of Montana Instructor informed Mr. Arthur N. Whitney, District Fish Manager at Missoula, that dead fish were observed in Rattlesnake Creek below the brewery waste effluent. Mr. Whitney, accompanied by the above instructor and several students, investigated the stream in the area where the dead fish were reported. The first dead fish (sculpins) were noticed about 50 feet below the Northern Pacific Railway Bridge (below the brewery waste effluent). About 100 feet downstream from here dead trout and whitefish were observed.

The waste effluent of the Missoula Brewing Company enters Rattlesnake Creek about 50 feet above the Northern Pacific Railway Bridge. Whitney reported that this effluent was clear on November 7, and was 70 degrees Fahrenheit at 2:00 P.M. He described the effluent as smelling like wood pulp, and said it contained some paper fragments, but very little soap. A light oil slick was present on the surface of Rattlesnake Creek just below the effluent. This slick continued downstream for a short distance. Soap fragments were found at the junction of the stream and the brewery effluent. Paper fragments were observed downstream from the effluent as far as 200 yards.

Whitney concluded that the fish-kill was due either to something being dumped off the Northern Pacific Railway Bridge or from something abnormal being released from the brewery. He contacted officials from both the railway and the brewery. Both officials stated that to the best of their knowledge nothing unusual had been dumped or released into Rattlesnake Creek.

Chemical data collected by Whitney on November 8 showed that both dissolved oxygen and alkalinity(phenolphthalein and methyl purple) were within the limits deemed safe for fish life. The pH of the brewery effluent was slightly greater than 9.6; the pH of Rattlesnake Creek just above this effluent was slightly less than 6.8. About 50 feet

below the railway bridge the pH was also slightly less than 6.8. At this time the temperature of Rattlesnake Creek above the effluent was 40°F., and the brewery effluent was 78°F.

Whitney concludes his report by saying "It appears to me that this is one of those things that everyone is sorry about, but for which the cause can never be determined". However, the 1958 fish-kill on Rattlesnake Creek gives some insight on the possibility of a highly caustic waste being released into the stream from the brewery effluent.

1958

On August 21, 1958, an unidentified person reported to the Missoula office of the Montana Fish and Game Department that he had observed some dead fish in Rattlesnake Creek. This kill was investigated by Arthur N. Whitney, District Fish Manager at Missoula. Whitney found large numbers of dead fish in the lower one-quarter mile of Rattlesnake Creek. The most upstream point where dead fish were found was at the waste effluent of the Missoula Brewing Company. However, most of the dead fish were found from the mouth of Rattlesnake Creek upstream to where the brewery effluent first distributes itself across the width of the stream.

Whitney placed trout, suckers, and cottus, captured in Rattlesnake Creek with an electric shocker, in live-cars. These live-cars were placed in the stream above and below the brewery effluent. On August 23, the first day the live-cars were checked, all trout and one cottus in the live-cars placed below the brewery effluent were dead. Water temperature in Rattlesnake Creek was 55°F. at this time. During the rest of the live-car checking period (through August 27) no other mortalities were noted.

Whitney reported the following types and numbers of dead fish were counted when the kill was first reported on August 21, 1958: 32 rainbow trout; 2 brown trout; 17 cutthroat trout; 28 coarse-scaled suckers; 26 whitefish; 27 cottus; and 184 unidentified small fish. The trout ranged from 4 to 10 inches in length. He estimated the flow in Rattlesnake Creek as less than 20 cfs, and the brewery effluent at less than 0.5 cfs. The creek water above the effluent was 58°F. and the brewery effluent was 94°F. The stream temperature at its mouth was 62°F. Whitney noted that the brewery effluent contained some paper fibers, and had caused a slime growth in the stream below its point of entry.

On August 22, Whitney met with a brewery official and discussed the release of brewery waste material into Rattlesnake Creek. Briefly, the following information was revealed by the brewery official.

1. Most of the brewery waste goes into the main city sewer line. That waste which is released into Rattlesnake Creek is from the bottling plant. This waste normally consists of the following:

   a) Rinse water from the bottle washers.
   b) Water from the pasteurizer.
   c) Periodic washing of the bottling plant floor.
   d) Periodic cleaning of the caustic tank on the bottle washing machine. (Note: This no doubt explains the high pH recorded by Whitney during the 1956 fish-kill, and could have indeed caused the kill).

2. The above activities all result from normal plant operations.

3. The pump that raises the caustic solution to the main bottle washing tank has a pressure release valve directly over the floor drain. Should this

pump be started when the valve is open a two-inch stream of strong alkaline solution would enter the Rattlesnake Creek sewer effluent.

Employees of the brewery were questioned as to whether or not this had happened. They assured Whitney that it had not.

No definite conclusions were reached as to what caused this fish-kill. However, it seems likely that a caustic solution from the brewery was released into Rattlesnake Creek and thus caused the kill.

CLARK FORK RIVER

Since July of 1958 the Clark Fork River has been the victim of two fish-kills. One kill was the result of pulp mill waste material being released directly into the river, and the other was a result of mine-mill waste (heavy metals).

The first kill occurred about 17 miles below the City of Missoula, Montana. At this point on the river a pulp mill waste effluent enters. The second kill, although it was difficult to determine the magnitude, occurred from the community of Warm Springs Montana to about 10 miles below Missoula, Montana.

Details of the two fish-kills in the Clark Fork River are as follows:

1958 - Pulp Mill Waste Material

On July 31, 1958, anglers informed the Missoula Office of the Montana Fish and Game Department that there were dead and dying fish in the Clark Fork River about 30 miles below the City of Missoula.

An investigation of the river on this date showed that a great many fish were dead or dying in the river below the Waldorf Paper Products Company Mill effluent. Fish species observed were trout, whitefish, suckers, squawfish, and red-sided shiners. Dead fish were observed floating over almost every riffle examined below the pulp mill effluent. Several days later combined aerial and ground counts revealed at least 33 concentrations of dead fish from the pulp mill effluent to the mouth of Fish Creek - a distance of 47 miles below Missoula. Three of these dead fish concentrations contained 112, 116 and 121 dead fish.

The State Fish Pathologist, Mr. Jack Bailey, examined moribund fish collected during the kill. He concluded that death was due to a toxic substance.

On August 6, 1958 hatchery rainbow trout of two size classes were placed in metal and wooden-framed, bobbinet-covered live-cars. These live-cars were placed above the Missoula sewage effluent, below the Missoula sewage effluent and below the pulp mill effluent. A total of seven live-cars were placed at various locations in the river. On this date (August 6) the pulp mill effluent was running comparatively clear and its usual soapy or foamy characteristic was not apparent. During the early morning hours of August 8, the pulp mill effluent again resumed its foamy, soapy characteristic and its usual black color. During the next 24 hours the pulp mill discharge gradually cleared of the dark color and the soapy appearance. But, after about 3 to 4 hours of exposure to the black liquor and soap the fish in the live-car located one-half mile below the pulp mill effluent became moribund. By noon on August 9, all of the fish in this live-car were dead. In the live-car located one and one-half miles downstream

from the effluent, 25 percent of the fish were dead. Sometime, during August 9, the flow of pulp mill waste material to the Clark Fork River was discontinued.

Dissolved oxygen analysis of the river water taken during the fish die-off revealed that the fish did not die of suffocation.. Fish in live-cars located above Missoula, below the Missoula sewage outfall, and on the opposite side of the river just below the pulp mill effluent remained alive and exhibited normal reactions throughout the fish-kill period.

Percussion sampling on the Clark Fork River after the fish-kill showed game fish present above the pulp mill effluent; however, no game fish were collected by this method in two stations sampled below the mill effluent. During mid-July (before the fish-kill) bottom fauna samples taken below the mill effluent showed a noticeable decline in the clean water organism groups, as compared to samples taken during the previous summer.

During mid-August the Waldorf Paper Products Company began constructing waste lagoons. Since this time all waste material from the mill has been held in these lagoons, and no waste has directly entered the river. A carpet of sewage slime (Sphaerotilus spp.) which was quite apparent on the river's substrate when the waste material was being released directly into the river, has since disappeared. Bottom fauna samples indicate that the clean water organisms are now well represented below the waste effluent area. Percussion sampling during the summer of 1959 showed that game fish were present in at least one station below the effluent where none were taken during the 1958 sampling.

1959-1960 - Mine-mill Waste Material (Heavy Metals)

On December 1, 1959 an anonymous phone call was received by the secretary at the Missoula Office of the Montana Fish and Game Department. The person calling stated that he had observed dead trout and whitefish in the Clark Fork River about 20 miles upstream from Missoula, Montana. On December 2, 1959, Tom Smith, Fishery Biologist, inspected the area of the river where the dead fish were reported to have been seen. He collected the following dead fish: 13 whitefish, 2 suckers, 1 squawfish, and one red-sided shiner. In addition, he collected two moribund whitefish. Smith reported that the river water was a dirty straw-yellow color and had a temperature of 32°F. Smith investigated the river at eight locations, from 30 miles above Missoula to 10 miles below Missoula. He observed several other dead fish.

It is perhaps well to mention here that the Anaconda Company has a large copper mining and processing operation on the headwaters of the Clark Fork River at Butte and Anaconda, Montana. The company releases its mine-mill waste into the upper reaches of the Clark Fork River. Just above the town of Warm Springs the company maintains a series of settling ponds. Lime may be applied at various places along the river above these settling ponds to raise the pH above the acid scale and to precipitate the iron waste from the river water. Also, according to Montana's Stream Classification Law the Clark Fork River from its headwaters to the lower end of these settling ponds is exempt from classification, and the river can be used for industrial wastes. From below the Warm Springs settling ponds to the mouth of the Little Blackfoot River the Clark Fork River is permanently classified for industrial use. From the Little Blackfoot River downstream to the mouth of Flint Creek it is classified for industrial use until 1969. From the mouth of Flint Creek to Milltown Dam (located seven miles above Missoula, Montana) the Clark Fork River is classified for industrial use until 1964.

From below Milltown Dam to the Montana-Idaho border the Clark Fork is classified for drinking water (with treatment), recreation (swimming, boating, etc.) aquatic life (fish, waterfowl, etc.) and agricultural and industrial waste. After 1969 the Clark Fork River from the mouth of the Little Blackfoot River downstream to Milltown Dam will

also be classified for fish and other aquatic life. Thus, at the present time, any deleterious substance released into the Clark Fork River, and allowed to flow down the river to Milltown Dam is lawful according to Montana's Stream Classification Law.

On December 2, 1959, the author examined the Clark Fork River from below the Warm Springs settling ponds to 10 miles below Missoula. Water samples and pH readings were taken. No dead fish were observed at this time. This was possibly due to the straw-yellow color of the river which greatly limited visibility through the water. The water samples taken at this time showed the river to be carrying 20.00 ppm (parts per million) iron just below the Warm Springs settling ponds; 2.80 ppm where Smith collected the dead fish; and 0.50 ppm at the station 10 miles below Missoula. The pH at these stations was 5.2, 7.3 and 6.8 respectively. A dissolved oxygen analysis taken about 35 miles below the Warm Springs settling ponds showed 13 ppm dissolved oxygen in the river at 1:00 P.M.

The fish collected by Smith were sent to the State Fish Pathologist for examination. He stated that they could have died from a toxicant such as heavy metals, as the gills were covered with a heavy mucus and silt. He could not give a definite statement on why the fish died because he was unable to observe them during the process of dying.

... During late December, 1959, another fish-kill on the Clark Fork River was investigated in the vicinity of Missoula, Montana. At this time water samples showed 5.6 ppm. iron in the river below Milltown Dam - this is in the section of the river classified for fish or other aquatic life.

It is suspected that both fish-kills occurring in December were due to high iron concentrations being intermittently released into the river by the Anaconda Copper Company. Mining personnel of the Anaconda Company were on strike during the months of August through February (1959-1960), and lime was not regularly placed in the upper river to percipitate the iron.

During February, 1960, Arthur N. Whitney, District Fish Manager at Missoula, reported to me that the Clark Fork River above Milltown Dam was flowing a deep red color. During early March water samples were collected along various points of the river between the Warm Springs settling ponds downstream to Missoula. At this time the red coloration in the water was not noticeable below Milltown Dam. An analysis of these water samples showed that the river contained 110 ppm iron just below the Warm Springs settling ponds, and 1.1 ppm between Milltown Dam and Missoula.

During mid-March 1960 the red-colored water began flowing over Milltown Dam. Water samples collected at this time, about three miles below Milltown Dam, showed the iron content of the river to be 6.8 ppm. At this time live-cars containing hatchery rainbow trout were placed in three localities of the river from about three miles above Milltown Dam to 10 miles below Missoula. One live-car was placed in upper Rattlesnake Creek to serve as a control. In the live-car placed above Milltown Dam three of the fish died withing 23 hours, and the remaining died within 67 hours. In the live-car placed about 3 miles below Milltown Dam (water classified for fish life) all six of the fish were dead within 67 hours. On all moribund and dead fish examined, the gills were covered with a clotty mucus containing strings and globules of a reddish-orange precipitate. Fish placed in the control station live-car (Rattlesnake Creek) remained normal and active throughout this period.

Subsequently a meeting was held with mining company officials concerning this waste material being released into the Clark Fork River. The mining company once again began putting lime into the river above the Warm Springs settling ponds and installed a permanent pH meter. As a result the Clark Fork River returned to its normal color and chemical composition.

Because of the turbid color of the water during this mine-mill pollution episode it was impossible to determine the extent of the damage to the fishery resource. Bottom fauna samples taken three miles above Milltown Dam showed that about 95 percent of the immature insects collected were dead. Below Missoula about 5 percent were dead. Several dace were noticed in distress at the station 10 miles below Missoula. During early April, 1960, anglers reported that fishing was exceptionally good below Milltown Dam, and almost all anglers were making good catches. Several anglers who had fished this area for many years stated that they had never seen the fishing so good. This was undoubtedly due to the lack of natural food for the fish.

Because it was felt that the fish population in the Clark Fork River above Milltown Dam has been drastically reduced, the Montana Fish and Game Commission ordered this section of the river (from Milltown Dam upstream to the mouth of the Little Blackfoot River) closed to all fishing until further notice.