

WASHINGTON STATE DEPARTMENT OF ECOLOGY  
ENVIRONMENTAL INVESTIGATIONS AND LABORATORY SERVICES

June 19, 1989

TO: Bob Newman

THROUGH: Greg Pelletier *GP*

FROM: Jory Oppenheimer *JO*

SUBJECT: Lake Sawyer Fishkill

A fishkill of approximately 1,000 fish, largely perch, was reported in Lake Sawyer during the weekend of May 13 and 14. The fishkill appeared to be localized and restricted to the southwestern end of the lake. In response to this fishkill, a team from the Surface Water Investigations Section (SWIS) of Ecology investigated the cause of the fishkill on the afternoon of May 15 and the morning of May 16. The cause of the fishkill was not identified. Based on the collected data, however, a number of potential causes or sources should be disregarded.

Levels of un-ionized ammonia originating from the Black Diamond wastewater treatment plant does not appear to have killed the fish. The criteria for un-ionized ammonia levels varies with temperature and pH, but it is recommended that un-ionized ammonia levels (un-ionized ammonia is only a portion of total ammonia) not exceed 20 ug/L. Total ammonia levels in eight surface samples, collected by Metro personnel in response to the fishkill in the southwest portion of the lake, ranged between levels below detection (1 ug/L) and 21 ug/L. Based on data collected two weeks earlier (which had similar pH and temperatures) and data collected on May 15 and 16, un-ionized ammonia formed about one to six percent of the total ammonia concentrations. Therefore, the highest un-ionized ammonia concentrations were at about 10 times lower than the suggested chronic (4-day) criterion, and 100 times lower than the acute (1-day) criterion. As a result, it seems unlikely that un-ionized ammonia levels reached either chronic or acutely toxic concentrations in Lake Sawyer.

Anoxic conditions, which can result in fishkills, did not occur in Lake Sawyer during May. This conclusion is based on oxygen profiles recorded on the Monday following the fishkill, and surface concentrations observed on Tuesday morning (when oxygen levels should be at their daily lowest). DO concentrations between the surface and five meters ranged between 11 and 12 mg/L on Monday afternoon. Concentrations below five meters ranged between 4 and 7 mg/l. Additionally, oxygen profiles taken at the five in-lake stations on May 2 and May 22 showed that the lake remained oxygenated throughout May. Therefore, the upper layer of the lake had sufficient DO concentrations for fish, as is typical in mesotrophic lakes. DO levels in Rock Creek at the lake shore (RCLS)

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varied between 4 and 6 mg/l, but DO on the lake side of the culvert at RCLS, did not have levels below 10 mg/L. In addition, perch are tolerant of low DO concentrations.

Another possible cause of the fishkill that probably should be disregarded is metal contamination. Samples collected for copper and zinc in RCLS and in the lake showed levels for both metals below detection limits (2 ug/L), and well below aquatic life criteria for these metals.

Because the fishkill was localized in the shallow southwestern portion of the lake, a possible cause of the fishkill was an illegal discharge of an unpermitted chemical near the shoreline. However, there is no direct evidence to support this theory. The usual causes of fishkills in most lakes, low dissolved oxygen and/or high un-ionized ammonia, does not appear to explain the event observed in Lake Sawyer.

GP/JO:pb

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