

Flambeau River Monitoring at the Flambeau Mine: Walleye

A Summary of the Parejko Walleye Report¹

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Flambeau Mining Company (FMC), a subsidiary of Kennecott Minerals of Salt Lake City, Utah constructed an open pit copper sulfide mine on the banks of the Flambeau River near Ladysmith, Wisconsin in the mid 1990s. The river formed the western boundary of the project area, and the pit itself was constructed to within 150 feet of the river. The Flambeau Mine was operational for four years. It ceased production in 1997 and has since been partially reclaimed.

Between 1991 and 2008, FMC carried out a series of studies to determine if the Flambeau Mine might be impacting the Flambeau River ecosystem. River sediment, crayfish and walleye were tested upstream and downstream of the mine site for metal content. In addition, surveys were done to track the kinds of insects, worms, leeches and clams (macroinvertebrates) living along the river bottom.

Dr. Ken Parejko, Professor Emeritus, Department of Biology, University of Wisconsin-Stout, did an independent analysis of FMC's river monitoring data for the Wisconsin Resources Protection Council (WRPC). He generated four separate reports dealing with the company's sediment, macroinvertebrate, crayfish and walleye studies. This summary outlines his findings with regard to FMC's walleye study; separate summaries are provided for his other reports. To view any or all of the Parejko reports in their entirety, please go to the WRPC web page: www.wrpc.net.

FLAMBEAU RIVER WALLEYE: Three major points emerge from Dr. Parejko's Walleye Report:

1. While FMC was required to monitor walleye in the Flambeau River as a condition for receiving its mine permit, the studies performed by the company between 1991 and 2008 were flawed. As Parejko explains:

*Adequate baseline data for the present study is lacking. According to [the 1989 Environmental Impact Report for the Flambeau project], only two walleye specimens were collected for background analysis ... Two fish cannot be considered representative of the general walleye population in the Flambeau River upstream and downstream from the mine site. To establish reliable baseline conditions, several years of background monitoring data involving larger sample sizes should have been gathered.*² Parejko adds: *Metal analysis performed on the two walleye specimens [both of which were apparently caught downstream from the mine site] did not include aluminum, iron or manganese, three metals present in measureable quantities in walleye collected in later studies.*²

Parejko also questions the sampling site locations selected by FMC for its Flambeau River walleye study. He states: *The upstream sampling site selected for the walleye study, effective 1991, was the Ladysmith Flowage, located about 3.8 miles upstream from the mine site. The downstream sampling site at Thornapple Dam is about 7.6 miles downstream from the project area. Fish collected as far upstream and downstream as this are subject to environmental variability which may readily not be related to the mining activity.*²

Perhaps the most important study design flaw discussed by Parejko is what he calls FMC's "lack of in-year replication."³ In other words, there were too few walleye samples tested in any given year to draw meaningful conclusions, from a statistical viewpoint, for that year's data. He explains that FMC collected 9 walleye on an annual basis at each of the two sampling sites in the river and removed their livers for metal analysis. However, the livers from each site were not tested individually; rather, they were "composited" (i.e., combined into a single sample) for analysis.⁴ Instead of 18 liver samples being tested (9 from each site), that meant only two samples (an upstream composite and a downstream composite) were tested each year. Parejko explains: *The theory behind compositing is that the concentration in a composite of fish [e.g., 9 walleye livers blended into a single sample] is roughly equal to the mean for those fish had individual samples been analyzed. Compositing is often done to save money.*³ The problem with composite samples, however, as Parejko points out, is that: *"the variation in [metal concentrations in the] walleye livers among individual fish is not known."*³ In the case of the FMC study, this, in turn, *"limited the ability to do statistical analyses and draw meaningful conclusions regarding the level of potential risk to walleye."*²

2. FMC's data indicates that there was an increase in copper levels in Flambeau River walleye subsequent to mining, with downstream concentrations being significantly higher than upstream concentrations.

Despite FMC's poor study design, Parejko's review of the data still suggests that the Flambeau Mine did have and may be continuing to have an impact on walleye in the Flambeau River. He explains: *Based on visual inspections of the data, it*

appears that prior to the commencement of ore production at the Flambeau Mine in 1993, copper concentrations in liver samples from walleye caught upstream from the mine site were higher than in downstream fish. A similar view was expressed by FMC's consultant in its 1996 fish sampling report. ... This trend, however, appeared to reverse during the operational phase of the Flambeau Mine, when higher copper levels began to be measured in downstream fish. This shift, first detected in walleye tested in 1996, prompted FMC's consultant to repeat the copper test done on the 1996 liver samples in an effort to confirm the results.

... the increased copper levels between 1995 and 1996 were indeed confirmed. From 1995 to 1996 walleye liver copper concentrations upstream from the mine increased on the order of 2 to 3-fold. Downstream, however that increase was on the order of 11 to 12-fold. ... Upon reviewing this and related data, FMC's consultant suggested in its 1996 fish sampling report that the 1996 copper results "be flagged as suspicious and that monitoring data for the 1997 field season be used to evaluate possible trends and/or further explain the 1996 data set." In 1997 the upstream composite liver sample registered a copper level of 33 mg/kg, and the downstream sample registered 45 mg/kg – both similar to the 1996 results.⁵

When reviewing the above results, FMC's consultant drew what Parejko describes as a questionable conclusion. He explains: In light of the data presented above, one is naturally led to question the ... conclusion [drawn by FMC's consultant in its 1997 fish sampling report submitted to the Wisconsin Department of Natural Resources] that "None of these data sets show other than consistent copper or other metals concentrations in the ecosystem for the time period of 1991 to 1997." And while the observed trends in metal concentrations do not prove causation, neither do the data provide support for FMC's further statement that "...the operation of the mine has had no impact on the concentrations of metals which are observed in the liver of walleye."⁶

Parejko summarizes the walleye data collected by FMC and submitted to the Wisconsin DNR as follows: All walleye liver studies conducted between 1996 and 2006 showed higher copper concentrations in the livers of downstream fish compared to upstream fish. ... Copper concentrations increased in both crayfish and walleye tissue compared to pre-mining levels beginning in the mid-1990s. The increase was more noticeable in walleye compared to crayfish. This is not surprising, since the walleye are likely eating some crayfish. ... [As of 2006] concentrations of copper in walleye liver tissue appear to be moving downward, but in 2008 were still approximately nine times the 1991 "baseline" level in downstream fish (13 mg/kg vs. 1.5 mg/kg) and three and a half times the "baseline" in upstream fish (21 mg/kg vs. 6.0 mg/kg). The 2007-2008 results also, for the first time in more than ten years, provide downstream walleye liver copper concentrations which are less than those upstream. The sampling which will be done over the next few years will help determine whether this declining trend is real or not.⁷

3. FMC's conclusion of "no impact" of the Flambeau Mine on walleye in the Flambeau River is not warranted.

Parejko challenges FMC's assessment of its own data by quoting from the company's 2006 annual report. He states the following: While the wide variation and differing patterns of metal concentrations in walleye liver ... suggests that other environmental factors in the river other than those connected with mining had an important influence on these values, the data presented and the lack of replication make it impossible to conclude that FMC's activities had no effect on metal concentrations in walleye. Therefore the conclusion FMC drew in their 2006 annual report that "Based on review of the data, it is concluded that the operation of the mine, including the time window when reclamation and habitat restoration activities are being conducted, has had no impact on the concentrations of metals which are observed in the liver or tissue of walleye" is not warranted.⁸

SUMMARY: Parejko provides the following summary of his findings:

Based on both visual inspection of the data and statistical analyses, there appears to have been an increase in walleye liver copper concentrations subsequent to mining, with downstream concentrations being significantly higher than upstream concentrations. This suggests a possible mining effect. The same can be said for crayfish whole-body specimens, as discussed in a separate report, although the elevation in copper levels appeared to be less pronounced in crayfish. ... Suggested improvements in monitoring procedures would allow making stronger inferences about the effects of mining activity, if any, on walleye metal loads.⁹

References:

1. Flambeau River Monitoring at the Flambeau Mine, Rusk County, Wisconsin: 4. Walleye – Analysis. Comments and Recommendations. Ken Parejko, Ph.D., Professor Emeritus, University of Wisconsin-Stout, April 10, 2009. To view the complete report, go to www.wrpc.net
2. ibid, p. 3
3. ibid, p. 4
4. ibid, p. 2
5. ibid, p. 9-10
6. ibid, pp. 10-11
7. ibid, p. 11, 12, 13
8. ibid, p. 13
9. ibid, p. 16