Flambeau River Monitoring at the Flambeau Mine: Sediments

A Summary of the Parejko Sediment Report [1]
Provided by Wisconsin Resources Protection Council –June 2009

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. The present summary outlines his findings with regard to FMC's river sediment 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 Sediments: Five major points emerge from Dr. Parejko's Sediment Report:

1. Inadequate design and implementation of FMC's river monitoring program makes it hard to conclude whether or not the Flambeau Mine has or has not impacted sediments in the Flambeau River. As Parejko states:

   Inadequate baseline data and [too few samples], combined with changing sampling procedures make it very difficult to draw any conclusions regarding the presence or absence of a mining-related effect on the sediment of the Flambeau River.[2]

   Parejko elaborates: ***Sampling and reporting issues exist not only with regard to the baseline sediment studies conducted by FMC (1988), but the follow-up studies conducted to assess potential mine impacts (1991-2008). The most significant issues of concern regarding FMC's … sediment studies fall into the following categories: (1) Insufficient baseline data; (2) Changes in sampling location; (3) Inconsistency in sampling methodology; and (4) Insufficient replication [i.e., too few samples].***[3]

   Parejko also points out how some of the FMC data that might ordinarily qualify as "baseline" cannot be used as such [Note: FMC began to bulldoze and clear the mine site of vegetation in 1991; blasting and ore production commenced in 1993]:

   The company's erosion control system … washed out at three different control points in early September 1991 after a rainfall of 5.2 inches over several days. … Wisconsin DNR officials issued a report confirming that "water laden with fine sediments" had entered the Flambeu River after the erosion control system failed and that "existing sediment basins and bail dikes did not provide nearly enough retention time to settle out clay size particles." As a result, the mine project had already impacted the Flambeau River prior to the 1992 sediment study, invalidating use of that data as a true baseline.[3]

   Parejko concludes: ***… there is no reliable background data on sediment metal concentrations. Therefore, it is not possible to compare pre-mining with mining or post-mining levels, a critically important if not the primary purpose of the monitoring.***[4]

2. Despite FMC's poor study design, Parejko's review of the data still suggests that the Flambeau Mine might be having an impact on the Flambeau River. While the results are not catastrophic, they appear to be real and, according to Parejko, warrant further monitoring. As he states:

Sediment copper concentrations appear to be higher downstream than upstream … In addition [crayfish and walleye] copper concentrations were found to be significantly higher downstream than upstream, suggesting a possible mine effect. … Continued monitoring of the river sediments and its biota are necessary to determine … whether the trend of somewhat higher downstream copper concentrations in sediment continues.[5]

3. Parejko also challenges FMC's assessment of its own data by quoting from the company's 2006 sediment report. He states the following:

   In its 2006 sediment report … FMC's consultants state that **"Data from the years of sediment analysis indicate that, in general, no increase or decrease in parameter concentration in sediments is occurring. Moreover, downstream samples continue to compare favorably with upstream sediment samples indicating no impacts due to mine activities during the closure time window."**[6]

   But Parejko adds: ***Because of lack of baseline information, and [various] sampling issues … and also when considering the results of statistical analyses [of the FMC data], which show in some cases significantly higher downstream than upstream metal concentrations in sediment, the statement from the [FMC] 2006 sediment report that there is*** **"no increase or decrease in parameter concentration in sediments … [and that] downstream samples continue to compare favorably with upstream samples"** ***is questionable. It is also certainly not possible, especially given the limitations of the monitoring outlined above, to state with any reasonable certainty whether there has or has not been impacts due to mine activities.***[6]

4. Parejko also comments on the results obtained from a sediment sampling site immediately downstream of where a small tributary (known as Stream C) enters the river. The significance of Stream C, dubbed "Churchill Creek" by members of WRPC, is that it conveys contaminated surface water runoff from the mine site to the Flambeau River (see Chambers & Zamzow report for information on Stream C). Parejko states the following:

   FMC was asked to expand its sediment monitoring in 2008 to include [two locations in Stream C and a site immediately below the Stream C outlet to the Flambeau River] because of some evidence Stream C might be carrying potential toxic levels of some substances into the Flambeau River. … While it is very difficult to draw conclusions from one year's sampling without replication, sediments … in Stream C do show very high copper concentrations compared with those found in Flambeau River sediments at any other time or place in the FMC study. … The reported value [for zinc] is also notably higher than those found at the Flambeau River sampling sites.[7]

   Parejko continues: ***[Copper and zinc] levels measured at the new Flambeau River sediment sampling site [immediately below the Stream C outlet] are also … among the highest encountered by FMC in the bed of the Flambeau River during the entire study period (1991-2008).***[8]

5. Parejko concludes his report with a comprehensive list of recommendations for how to improve FMC's monitoring program at the Flambeau Mine site, and how to design better monitoring programs in the future.

Summary: Parejko provides the following summary of his findings:

Inadequate baseline data and [too few samples], combined with changing sampling procedures make it very difficult to draw any conclusions regarding the presence or absence of a mining-related effect on the sediment of the Flambeau River. The combined observation of statistically significant increased copper concentrations in crayfish (whole-body specimens), walleye (liver tissue) and sediment (when 2008 downstream copper measurements are included) downstream from the mine site raises the possibility of a causal relationship. Unusually high copper and zinc concentrations in a sampling site within the bed of … Stream C indicate a possible entrance-point for some potential toxins into the Flambeau River. In hindsight, having additional historic data from Stream C and the Flambeau River would prove very useful.[2]

References:

1. Flambeau River Monitoring at the Flambeau Mine, Rusk County, Wisconsin: 1. Flambeau River Sediments – 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. 24 3. ibid, p. 8 4. ibid, p. 17 5. ibid, p. 18-19 6. ibid, p. 19 7. ibid, pp. 19-20
8. ibid, p. 20