

2022 Water Quality Assessment for Stream C (WBIC 4000013)

Ashley Beranek
June 2021



Surface water quality data for 2016 – 2018 was received from the Flambeau Mining Company of copper, zinc, and hardness (mg/L CaCO₃) at two sites in Stream C, Site SW-C1 near Copper Park Lane and Site SW-C9, an upstream site near State Highway 27 (Figure 1). This 2022 assessment is based on samples taken from October 2016 to November 2018 and totals 15 samples. The assessment for site SW-C1 duplicates the 2020 findings; the SW-C9 site assessment listing decisions are new to the 2022 cycle. Prior to the 2022 cycle the upstream portion of Stream C was not drawn in the state’s hydrolayer.

To determine if Stream C was still impaired for zinc and copper the formula for Acute Aquatic Toxicity Criteria (ATC) in Wisconsin’s [NR 105](#) Table 2 was used.

$$ATC = e^{(V * (\ln(\text{Hardness})) + \ln(ACI))}$$

Values for V and ln ACI are provided in NR 105 Table 2. Hardness values were provided in the sample data. In order to use the ATC formula hardness values for zinc need to be greater than or equal to 12 mg/l CaCO₃ and for copper greater than or equal to 13 mg/l CaCO₃. All 15 samples at site SW-C1 had sufficiently high water hardness, but at site SW-C9 several samples had water hardness lower than required. A site is considered impaired if it exceeds the criteria more than once every 3 years (WisCALM 2022).

This assessment shows high levels of copper, consistently exceeding criteria (Figure 2), and zinc exceeding twice in 2018 (Figure 3), in the upstream portion of Stream C (SW-C9). **With this new information the upstream reach of Stream C is proposed for placement on the state’s Impaired Waters List for zinc and copper causing acute aquatic toxicity.**



Figure 1. Map of the upstream portion of Stream C. North of Copper Park Lane the stream is intermittent. Samples were collected on days when water flowed. Map adapted from Flambeau Mining Company report.

Table 1. Number of water quality criteria exceedances for Copper and Zinc at a Stream C site and an upstream site (2016 – 2018). Site SW-C9 had fewer than 15 samples that met water hardness requirements for criteria comparison.

Site	Copper Exceedances	Zinc Exceedances	Impairment Status
Stream C (SW-C1)	14/15	0/15	Retain Copper listing Retain Zinc attainment
Upstream Site (SW-C9)	6/6	2/8	List Copper List Zinc

Figure 2. Concentration of copper in surface water of Stream C from 2012 – 2018 compared against the Aquatic Toxicity Criteria (ATC) at site SW-C9. A visible exceedance of water quality can be seen when the solid black line is above the red dashed line. For all samples copper concentrations exceeded the ATC.

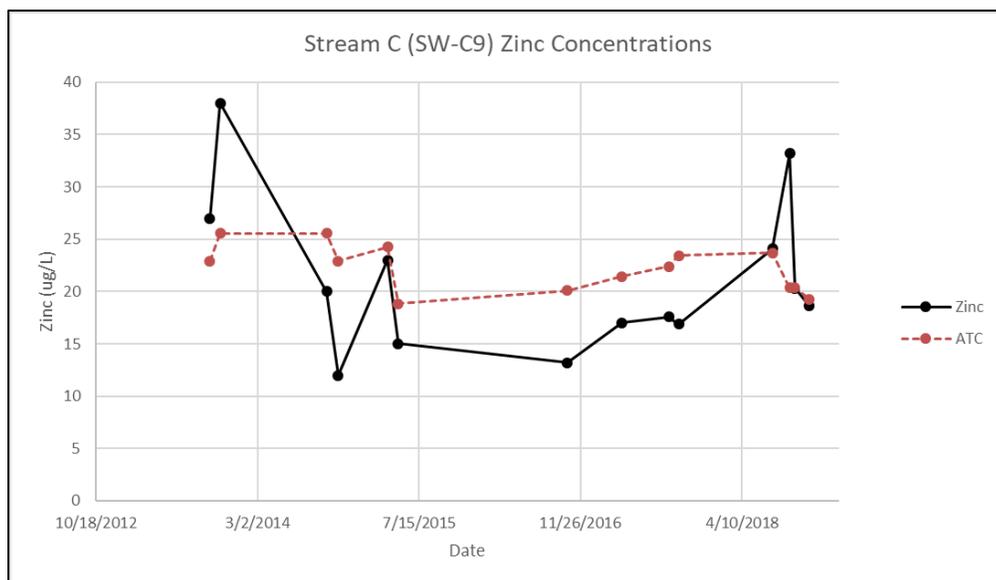
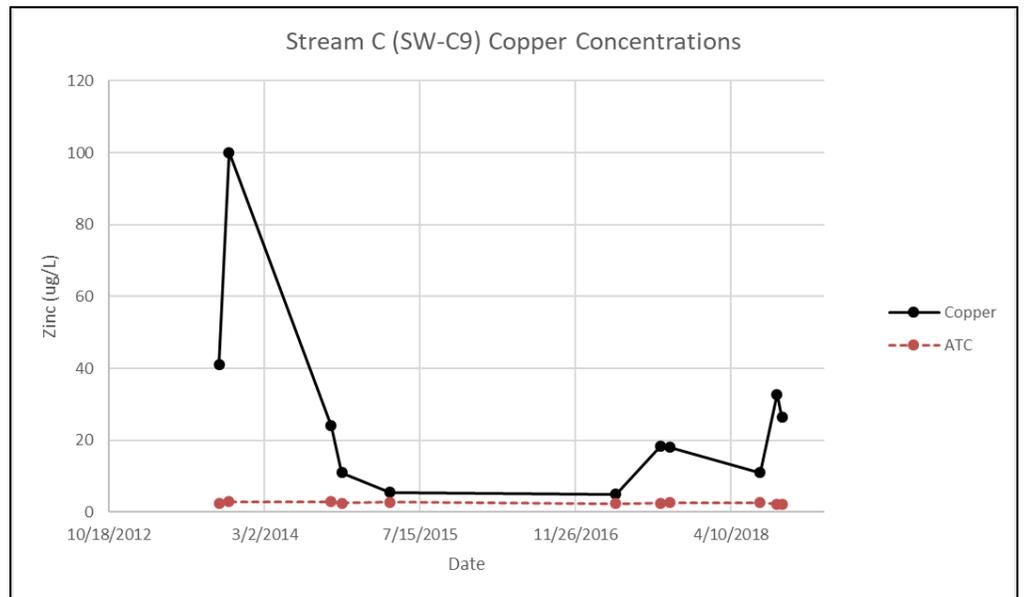


Figure 3. Concentration of zinc in surface water of Stream C from 2012 – 2018 compared against the Aquatic Toxicity Criteria (ATC) at site SW-C9. A visible exceedance of water quality can be seen when the solid black line is above the red dashed line.