Webinar #2: Environmental Impacts in the Lake Superior Basin

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EEM Program Overview

- MMER requires all metal mines to conduct Environmental Effects Monitoring (EEM)
- EEM program is a cyclical receiving-environment monitoring program
- 2 to 6 year phases, based on previous studies results
- Fish survey, benthic invertebrate community survey, receiving water quality, sediment quality, sublethal toxicity testing
- a number of monitoring and interpretation phases necessary
Industry Overview in the Lake Superior Basin

- 6 mines where EEM studies are required.
- Number of gold mines in Ontario is expected to increase.
- Preliminary findings on the next few slides.
- Interpret results with caution, the studies need to be repeated and refined to confirm the initial results.
Fish Survey

- 2 studies showed lighter male gonads and 1 study showed heavier male gonads
- 2 studies showed heavier female gonads and 2 studies showed lighter female gonads
- No effects were shown for liver size.
- 2 studies showed greater condition and 2 studies showed lower condition for both male and female fish
- 1 study showed lower male age
- 1 study showed higher female age
- 2 studies showed higher growth and 2 studies showed lower growth for both male and female fish
- 1 study showed higher fecundity and 1 study showed lower fecundity
- 3 studies showed larger egg sizes
Benthic Invertebrate Community Survey

- Abundance lower for 1 study, greater for 1 study
- Taxa Richness lower for 3 studies
- Simpson’s Evenness lower for 1 study
- Bray-Curtis Index higher for 2 studies
- 3 dominant benthic invertebrate community response patterns include: a no-effect response, a stimulatory eutrophication response and an inhibitory metal toxicity response
- Eutrophication response: increased total invertebrate densities coupled with either increased or decreased taxon richness, depending on the degree of eutrophication
- Toxicity response: reduced total invertebrate density, reduced taxon richness, or reduction in both total invertebrate density and taxon richness
- The most common benthic invertebrate community response to mine effluent is no effects
Challenges

• Differentiating between historical mine impacts and current effluent effects
• Several mines have sediments which are highly contaminated with metals from historical mining practices
• New methods of separating historical mine effects from current mine effluent effects should be a research priority
Future Monitoring

• Each mine has only one set of data, representing one moment in time
• Far too early to make any broad conclusions
• Results must be confirmed in at the very least, one more EEM study
• Expect EEM studies to be better in the future
• Mines and their consultants become more familiar with the program and with their effluent receiving environments
• Better reference areas selected, better matching of substrates, water depths and velocities
• Power analyses will be conducted and used to determine more appropriate sample sizes which will increase program efficiency
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