Update on Selenium Projects at Tilden and Empire Mines

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Purpose Statement:

Cliffs Natural Resources' Michigan Operations Tilden and Empire Mines move over 60 million tons of rock annually in order to produce approximately 12 million tons of iron pellets. This large scale operation generates significant environmental interest. This newsletter will focus on selenium.

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DNRE Releases Results of 2009 Study

By: DNRE Staff

In 2009, Department of Natural Resources and Environment (DNRE) staff collected fish in the vicinity of Empire and Tilden Mines to determine the geographic extent of elevated selenium levels in fish tissue. In addition, the DNRE collected water and sediment samples in the vicinity of inactive mines and measured temperatures and dissolved oxygen levels in Goose Lake.

Selenium levels in fish collected in 2009 were similar to those collected in 2008. Although Michigan does not have an aquatic life protection criterion for fish tissue, fish collected near the Tilden and Empire Mines generally exceeded the proposed Environmental Protection Agency (EPA) selenium criteria, indicating potential adverse impacts on aquatic life. Water samples and most sediment samples near the inactive Republic (Marquette County) and Groveland (Dickinson County) Mines either had undetectable or low selenium concentrations, indicating that selenium is not a significant environmental issue at these mines. Dissolved

oxygen levels measured in Goose Lake were higher in 2009 than those measured in previous years, probably due to the cool summer temperatures.

Those wishing to view the entire report may find it at: http://www.michigan.gov/documents/deq/wrd-report-2009selenium_329360_7.pdf

Measuring and Reducing Selenium

By: Cliffs Natural Resources Staff

Efforts by Cliffs Natural Resources (CNR) to reduce the amount of selenium that enters the waters surrounding the Empire Mine and Tilden Mine are underway. These efforts are part of a comprehensive site program to investigate and, as appropriate, address selenium in waters that have the potential to leave the mining area. Investigation results will be used to prioritize activities to address selenium concentrations in waters at the mine site. One project already scheduled for the summer of 2010 is expected to reduce selenium in discharges by more than ten percent.

A “mass loading model” has been developed through the initial steps of the site investigation. The mass loading model catalogs how water leaves the mines and interfaces with surrounding waters. At locations along the water courses, water is sampled for selenium concentration and a flow measurement is taken. Combining the long-term averages for selenium concentration and flow yields an estimate of the mass of selenium that could be passing through a sampling location annually.

Mass loading accounts for how much selenium from all sources is available in an ecosystem. This is an important way to examine the system because it chronicles the mass potentially available for the many environmental pathways that selenium can follow, such as accumulation in sediments, accumulation in fish, or volatilization to the atmosphere. The mass loading also establishes a baseline that can be used to measure improvements and set targets for mass reductions.

Early analysis revealed an opportunity at Empire Mine to reduce the selenium entering Warner Creek. A small seep was found at the base of a road that follows a historic rock stockpile. The selenium concentration and water flow rate from the seep were used to calculate the mass of selenium passing through the sampling location annually. Based on the information from the mass loading model to date, more than ten percent of the selenium that leaves Empire Mine and Tilden Mine combined, originates from this location. Design work is nearly complete for the 2010 construction of a pumping station that will direct the water into the ore processing water distribution system instead of Warner Creek.

Updated Consumption Advisory for Goose Lake Fish

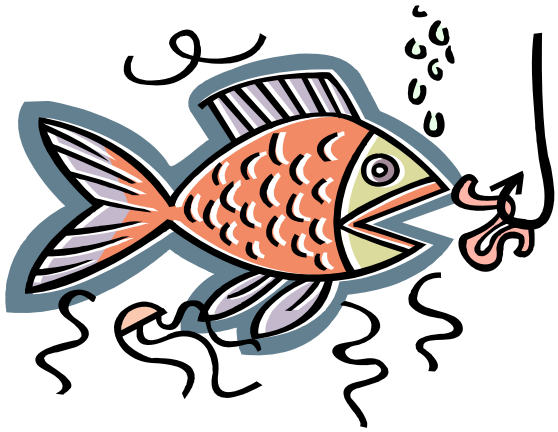
By: DNRE Staff

The Michigan Department of Community Health (MDCH) has issued an updated fish consumption advisory for Goose Lake (Marquette County). The Department of Natural Resources and Environment (DNRE) collected and analyzed fillets from northern pike and white sucker for a standard suite of chlorinated organic chemicals, mercury, and selenium. Polychlorinated biphenyls (PCBs), mercury, and selenium fillet concentrations were compared with chemical-specific health protective fish consumption screening values. Based on this MDCH evaluation, an updated fish consumption advisory was issued for Goose Lake for the concentration of selenium in fish fillets. The MDCH advises the public to eat no more than 12 meals per year (average of one meal per month) of white sucker or northern pike from Goose Lake. Goose Lake receives runoff from the Empire rock stockpiles.

The DNRE also collected and analyzed fish fillet samples from Schweitzer Reservoir, which receives wastewater discharge from the Empire Mine tailings basins. The selenium levels in these fillets do not warrant any consumption advisories. Analysis of fish from other locations to determine whether additional advisories are appropriate is being considered.

In general, all fish consumption advisories in Michigan, regardless of location, address the concern of repeated consumption of contaminated fish fillets over many years (i.e. chronic exposure). The MDCH does not expect the consumption of a single fish meal containing any contaminant listed in the fish consumption advisory will pose a health hazard requiring immediate medical treatment. The chronic concern is that repeated consumption of contaminated fish will result in elevated contaminant levels in people's blood. Some people who are sensitive to the negative effects of a particular chemical may experience an illness they would not have otherwise acquired due to prolonged consumption of contaminated fish.

Therefore, the MDCH recommends that all people who eat fish from Michigan waters, including the Great Lakes, check the Michigan Fish Advisory before making your catch your dinner. For details on the Michigan Fish Advisory, go to www.michigan.gov/eatsafefish or call 1-800-648-6942.



Cliffs Natural Resources Conducts Reproductive Studies on Birds

By: Cliffs Natural Resources' Michigan Operations

As part of the ongoing selenium studies at Michigan Operations, Cliffs Natural Resources has placed nest boxes to evaluate the hatching success of birds that nest in the area. Although selenium is an essential nutrient for all life, abundant concentrations of this element have been associated with decreased hatching success for birds. The Cliffs study will assess whether or not selenium concentrations in water bodies adjacent to and downstream of the Michigan Operations are affecting the hatching success of bird eggs relative to two reference areas that have background concentrations of selenium.

Two groups of birds are being studied. One group is the cavity-nesting waterfowl, which can be attracted to nest boxes where the nests can be monitored. The bird species that are using the Cliffs waterfowl nest boxes include: wood ducks (2 nests); hooded mergansers (1 nest); and an American kestrel (1 nest). The ducks are relatively large birds that use aquatic food sources, are readily attracted to nest boxes, lay large clutches (8 to 15) of eggs and those eggs yield ample tissue mass for chemical analyses. The kestrel is a guest that will be monitored, but no samples for selenium analysis are planned.

The second group of birds being studied is the passerines, or perching birds that use small nest boxes. Passerines are smaller than waterfowl, and also have smaller foraging ranges; by example, tree swallows have a forage radius of approximately 100 meters, while wood ducks have a forage radius of approximately 700 meters. The passerines that are using the Cliffs nest boxes include: tree swallows (3 nests), eastern bluebirds (4 nests), house wrens (2 nests), and black-capped chickadees (6 nests). The smaller forage range means the passerines will spend more time feeding in close proximity to the nest boxes than waterfowl, and will obtain much of their food during nesting by eating insects that live in the stream as juveniles, then emerge and fly as adults. In addition to monitoring the nests for success, Cliffs is also collecting adult (flying) aquatic insects, which are the food source preferred by breeding passerines, at the nest box locations, for selenium content analysis.

Cliffs has used well-established procedures for nest box placement and nest monitoring. Birds migrate into the area in early spring and feed heavily on local food sources to replenish energy that was used to fly here, and to obtain enough nutrition to produce eggs. The insects and crustaceans that live in local streams, ponds and wetlands are important sources of proteins for egg production, and most of selenium exposure is through food items. Cliffs has placed next boxes near water bodies to ensure the study uses realistic exposures. Nests are being monitored for occupation, egg-laying and incubation. Following the onset of

incubation, eggs are being counted and one to two eggs will be collected under a permit for selenium analysis. Nests will be monitored through fledging to determine success. Eggs that are abandoned, or do not hatch can be salvaged under permit and will be inspected for developmental abnormalities and selenium content analysis. To date, Cliffs has collected a total of 39 bird eggs.

(Wood duck eggs in a waterfowl nest box)

(Passerine boxes are monitored several times a week)

Goose Lake TMDL for Phosphorus

By: DNRE Staff

There has been public interest in water quality problems in Goose Lake that are not related to selenium. This is a follow up to an article on Goose Lake in the last newsletter.

Section 303(d) of the federal clean Water Act and the United States Environmental Protection Agency's Water Quality Planning and Management Regulations require states to develop Total Maximum Daily Loads (TMDLs) for water bodies that are not meeting water quality standards. The TMDLs provide states a basis for determining the pollutant reductions necessary to restore and maintain the quality of their water resources. The Department of Natural Resources and Environment (DNRE) has developed a draft TMDL for phosphorus loading to Goose Lake to achieve water quality standards.

A history of nuisance algae blooms, fish kills, low dissolved oxygen levels and odor problems led to the determination that Goose Lake is not meeting water quality standards. The DNRE has conducted studies and has determined that the majority of the phosphorus in Goose Lake is released from lake sediments during the summer months. Phosphorus in Goose Lake sediments was enriched by raw sewage discharges from the City of Negaunee. While these discharges ended in 1953, when a wastewater treatment plant was constructed and the discharge was directed to another watershed, the sediments continue to contribute phosphorus to Goose Lake.

The draft TMDL for Goose Lake can be viewed at http://www.michigan.gov/deq/0,1607,7-135-3313_3686_3728---,00.html. The public is welcome to make comments on the draft TMDL during the public notice period, which ends on August 13, 2010. The DNRE calendar (link below) includes contact information and how to submit comments on the draft TMDL. http://www.michigan.gov/deq/0,1607,7-135-3308_3325---,00.html. To access the information first click on the link above and then click on the August 2, 2010, DNRE Environmental Calendar. Once you have opened the calendar, the information can be found on page 6 under the August 13, 2010, heading "Deadline Extended for Public Comment on the Draft Goose Lake Phosphorus Total Maximum Daily Load (TMDL)."

(Goose Lake Outlet)

This newsletter was developed and distributed by the Michigan Department of Natural Resources and Environment with cooperation from Cliffs Natural Resources. It is intended to assist the public with information on the activities in and around the Empire and Tilden mines. If you have any questions, suggestions or would like to be added to the electronic mailing list, please contact Steve Casey by e-mail at caseys@michigan.gov.