



14 June 2012

The Use of “Iron Concentrate” in Lakes

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What is the impact of Using “Iron Concentrate” on Plants and Fish ?

An abstract published at the NALMS (North American Lake Management Society) Oct. 2011 meeting concluded that: “Given the minimal adverse effects of iron amendment on aquatic invertebrates, the use of ferric chloride may be a suitable remediation technique for eutrophic lakes.” Fish consume invertebrates and the conclusion in this abstract is that the invertebrates are minimally affected by iron.

What is “Iron Concentrate” and are there any impurities ?

The Iron the RLIA will add to Rush Lake is neither pure Taconite nor Taconite tailings. RLIA uses only “magnetite iron ore concentrate” (Iron particles) which has been separated from taconite by magnetic extraction and is: 91% iron oxide (65% iron), ~6 % silica, trace amounts of CaO, and trace amounts of metals. The RLIA used two different chemical labs to test these Iron particles and both Labs determined that the trace metals were less than the SQT standards set by EPA6020 for trace metal contamination.

Could the Iron Particles Damage Herons ?

Hérons generally feed in shallow water: generally 1.5 feet or less. The Iron particles deposited by the RLIA are in waters that range from 4 to 12 feet, have been deposited some distance from Crane Island, and it is unlikely that the herons are exposed to the added Iron particles. It should also be noted that the Iron particles being used are smaller than grains of sand so it is unlikely they will cause any negative effects on fish or fowl.

What is the RLIA Purpose for Using Iron Concentrate ?

Rush Lake was added to the list of “impaired” lakes in 2008 and the “impairment” is a result of Phosphorus entering from the watershed for the past 100+ years. The contribution from the Rush Lake watershed has been reduced to less than 10% so the Phosphorus currently in Rush Lake is characterized as due to “internal loading” (i.e. in the sediment).

The purpose of the RLIA experiments is to test both the feasibility and dose dependence of using small Iron particles to sequester Phosphorus in Rush Lake. These experiments have been coordinated with both the DNR and MPCA during the past 5 years and both agencies are well informed as to what will be learned from these experiments.

Is Using Iron to Sequester Phosphorus a New Technology ?

The benefit of using of Iron to sequester Phosphorus in lakes has been extensively reported, in many countries around the world, for at least the last 25 years. What makes Iron so attractive for sequestering Phosphorus is that Iron is naturally available in all lakes so adding small amounts of Iron, with fresh surfaces, is not adding a foreign material.

Where Else Has Iron Been Used in MN ?

Since 1986, Iron has been used in a St. Paul drinking-water lake (Vadnais) to remove Phosphorus and clarify the water. ["Phosphorus Inactivation by Iron in the SPWU Supply System", William W. Walker Jr., prepared for Board of Water Commissioners, City of St. Paul, Minnesota, April 1986.]. This fact alone suggests that any negative impact on fish, plants, and humans is negligible, if present at all.

The University of Minnesota also recently implemented a new method for removing Phosphorus from Storm Water that employs Iron particles imbedded in a berm. That phosphorus removal chemical concept is exactly the same as that the RLIA is proposing to use in Rush Lake to sequester Phosphorus in the lake sediments.

How Much Iron Will Be Added to Each Acre in Rush Lake ?

A 3-acre block will receive 1,000, 3,000, or 5,000 pounds/acre. The thickness of the layer of Iron Particles the RLIA will deposit will be substantially less than 1/32 inch in thickness, even at the proposed RLIA maximum of 5,000 lbs/acre (assuming that the Iron particles are spread uniformly on the lake sediment}. These deposited Iron particles settle to the lake sediment in less than a minute because of their relatively high density.

How Were the Iron Test Areas Chosen for Rush Lake ?

There is a strong correlation between the Iron / Phosphorus ratio and the extent in which the Phosphorus has been sequestered by Iron in lake sediments. 50 sediment samples were collected on Rush Lake in

2000 and the locations chosen to use Iron to sequester Phosphorus were those for which the desired Iron/Phosphorus ratio were much lower than others.

What Are the Future Plans for Iron Experiments on Rush Lake ?

A high management priority for the MPCA should be to establish a University based research program to determine the optimum chemical parameters required to produce effective Phosphorus sequestration using Iron. Such a research program would determine the amounts of Iron that are most effective for Phosphorus binding for different redox conditions. Such a Laboratory-based research program would complement ongoing in situ field experiments that are testing the effectiveness of using Iron in an integrated lake environment.

What Were the Results of the MPCA Hearing on May 22, 2012 ?

The MPCA Citizens Board voted 6-1 to DENY the need for an EAW for RLIA to deposit Iron particles on the 9 acres that the MPCA approved on Nov. 15, 2011. That decision also supported the conclusion of the MPCA technical staff that the communication between the RLIA and MPCA has been sufficient to keep them well informed on the details of the experiments proposed by the RLIA.