

## ALUM - A brief, incomplete, review.

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After my article titled *Alum - myth or miracle*, I received several responses. Most of them asked me to forward any other information if and when I got it. Some folks did send in some pretty interesting items though, and I now feel that a revisitation is in order. I also received my EPA manual titled "Design Manual - Phosphorous Removal" in the mail.

So anyway, I learned some pretty interesting things that I thought were really worth sharing. The first thing I learned is that this technique has been around for longer than I'd thought. Some northern lakes had been treated in the seventies to control sedimentary sources of phosphorous (P).

The EPA manual primarily addresses the use of Alum in wastewater treatment plants (WWTP) but does give some insight into how the stuff works. Probably the most important thing is that the results are largely unpredictable. The big challenge in using Alum is in getting the dosage correct. There are side effects listed in the manual as well as several other papers. The manual says that sludge does not release P, even under anaerobic conditions. I thought this was good. We must remember though that this data was based on sludge in a WWTP. Other studies done in lakes seems to support this, until the wind blows. Long Lake was treated for sedimentary P (Welch, E.B. et. al., 1982). The floc was unevenly distributed and P was still getting into the water column.

That brings up another aspect of Alum. Is the use for sedimentary P control or for storm water load control? Both techniques are practiced with, again, varying results.

A couple more little problems that don't seem to be answered are that the Alum itself (wet or dry) is considered a hazardous and corrosive material; if the pH falls below 6 at any time, the alum changes to elemental aluminum and is highly toxic (check your lake sediment pH next time you are out); and the floc tends to accumulate other things as well as P - e.g. PAH's and heavy metals (USEPA Manual). Of course, having the contaminants in the sediment may well be better than having them in the water.

One other thing. According to the EPA Lake and Reservoir Restoration Guidance Manual, it apparently only works in hard water, well buffered lakes.

The last item raised was the effect on the benthos. No one sent in anything on this topic. One person sent in a letter stating that they were "not able to locate information on long-term lake impacts of alum." There was one citation of a paper by Jellerson (1982). The citation states that the work showed no adverse effect on the benthos. I haven't been able to locate the paper.

So where are we now? Or maybe I should ask where I am now. A lot of what I've read is relevant to special cases or WWTP's and there are still some holes in the information. So far there is, however, one unarguable fact: Alum strips P out of the water. Translation: it works in what it is intended to do. The questions virtually all center around the real, suspected, or imagined side effects.

I can only conclude that we need more studies. If anyone is surprised by that, you haven't been paying attention.

#### Added Reading

Dooris, P.M., V. Ley, and D.F Martin, 1982. Laboratory experiments as an aid to lake restoration decisionmaking. Water Resources Bulletin, August 1992, p 599-603.

Harper, H.H., 1991. Restoration of Lake DOT using an improved Alum storm water treatment process. Water Resources Forum, ASCE, Water Resources Technical Group, East Central Branch - Florida Section.

Harper, H.H., 1994. Evaluation of a direct methodology for estimating phosphorous inactivation requirements in lake sediments. Florida Lake Management Society Symposium, 1994.

Jellerson, D.B. 1982. Impacts of Alum sludge on Lake sediment phosphorous release and benthic communities. Masters thesis, University of Central Florida, Orlando, Florida.

USEPA, 1987. Design Manual. Phosphorous Removal. EPA/625/1-87/001. (There are several references worth reading in this manual's bibliography)

USEPA, 1990. The Lake and Reservoir Restoration Guidance Manual, Second edition, USEPA 440/4-90-006, August 1990.

Welch, E.B. et.al., Alum control of internal phosphorous loading in a shallow lake. Water Resources Bulletin, 1982.

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