

Pond Ammonia Levels and Cycling

Will a pond's biological filter cycle with too few fish?

By Stephen M. Meyer

Q. Last summer I built a 3,000-gallon liner pond in my backyard. I constructed a very large biological filter for the pond (I used large gravel for the media) and put three koi — each about 12 inches — into the pond in September.

My problem is ammonia. A week or two after I put the fish in the backyard pond ammonia readings went to 0.25 parts per million (ppm) and they have not gone back down. I called a local pond "expert" who told me that the problem was that I had too few fish! Wow, was I shocked. He explained that because I had such a small fish load there was not enough ammonia to get my large biological filter working. So the ammonia built up. He said the best thing to do would be to buy about 12 more fish — they would produce enough ammonia to feed the filter and then everything would be fine.

Having read your column in the past I thought I was doing the right thing by having only a few fish. But, now I am afraid I won't be able keep my filter running properly. Please help.

A. I wish I could say this was the first time I had heard this nonsense, but it is not. Believe it or not, there really are some folks out there who fervently believe that too small a fish load prevents the biological filter from detoxifying ammonia, which in turn leads to higher ammonia levels in a backyard pond than if there were more fish. This is "voodoo fishkeeping" at its finest.

Let's consider this. A biofilter is nothing more than a convenient place for nitrifying bacteria to hang out. The only special design feature of a biological filter is that it tries to cram as much surface area for bacteria to attach to into as small a space as possible while still allowing water to pass through freely.

Controlled laboratory experiments do indeed show that, given the room, the density of nitrifying bacteria is directly related to the concentration of ammonia in the water — all else being equal. So, higher concentrations mean more bacteria. The converse is also true: lower concentrations result in reduced bacterial colonization.

But, these bacteria are always in water. They live on pond walls, on plants and even float freely in the water. If there is any ammonia in the water, these bacteria are available and in numbers commensurate with the ammonia load. If there was not enough ammonia in the water to stimulate bacterial nitrification, the concentrations would be so low they would be irrelevant to the fish and unmeasurable by your test kit.

So let's keep our facts straight: The amount of ammonia produced by fish does not determine the capacity or effectiveness of a biological filter. It is the steady-state (long-term) operational capacity of a biological filter that determines the maximum ammonia load in a recirculating water fishpond.

Plunking more fish into the backyard pond is a guaranteed way to kill off your fish by ammonia poisoning. The reason your filter does not appear to be working has nothing to do with the fish load. It is not working yet because you set it up as the weather was turning colder (nighttime temperatures in the 50s and below), which means it will take about 60 or more days to finally operate at stable capacity. Poor water conditions, such as high acidity (low pH — around 6), high organic content, high chlorine content and poor oxygen levels will also inhibit rapid and effective establishment of nitrifying bacteria colonies.

Also, check that the water flow through the filter is not channeling along a narrow path that prevents circulation through the gravel. Channeling creates a situation that is similar to having no biological filter at all.

Frankly, if you add some plants to your backyard pond and keep the fish load right where it is you will not need a biological filter at all. The nitrifying bacteria on the pond walls and the plants will take care of everything. In fact, I'll bet that you will never get measurable ammonia readings again.

Keep in mind that the goal of pondkeeping is to cultivate fish, not nitrifying bacteria. Beware of backyard pond experts who tell you that you need more fish to make your biological filter work properly — in the next breath they will offer to sell you some of their fish!