

## Challenge to the Forum Speakers, Panelists and Audience

I am now entering my 24<sup>th</sup> year on the Environmental Management Commission (EMC). Most of those years I've served as Vice Chair but more critically as Chair of the Water Quality Committee (WQC). So now that you, the speakers, have your presentations completed, what I'm going to do is challenge you. I'm going to show you why you've done all this work because I'm going to show you the kind of ignorance that we have as we try to do the state's business.

I'll start by saying we all figure there are some linkages here. We put nutrients in. From those inputs we get algal growth including phytoplankton. This phytoplankton is eaten by herbivores of the aquatic world and the nutrients move up to the fish and so forth. All that sounds great! So what's wrong with nutrients? Well, we've learned that there can be too much of a good thing. It is possible that we can put too many nutrients in so that we've got this continuum that goes from oligotrophic, that doesn't have any, to hypereutrophic, which has so much it is dying. And how do you get there? What's the deal? So you can put too much in and that may stress the ability of the herbivores to eat the phytoplankton that grow on those nutrients. Therefore, the excess phytoplankton sit around, fall to the bottom, decompose, and use up the oxygen. When the oxygen isn't there, more animals die, the fish die, the thing stinks, and we don't exactly have a functioning aquatic ecosystem anymore.

That's our general view as we sit on the EMC's WQC as to what's going on. But there are a whole bunch of interesting issues here. At what point does this system tip over into something that is so eutrophic where it is no longer good to add nutrients? Because you see in the original story that you add a little nutrient and you'll get some more fish out of it. What could be better? Well at some point we tip over into a condition where we have too many nutrients. We would like to know where the tipping point is because we would like to be proactive. Instead of just dealing with 303d lists of trouble stories of disasters and trying to work backwards to restore degraded waters, which traditionally we view as more expensive than doing this in an a prior sort of way, we would like to be protective.

We tried that a couple of years ago. We began in the EMC to try to move to public hearings and to try to get some input. We got a lot of input on this one. The input on this one was "Well you know, it is kind of good idea but you also need to have the science there." We need to know numeric levels of whatever we're measuring and what is going on. What numeric levels are indicators that we are mighty close to that tipping point? Indicators that are good enough at predicting impending serious problems so that the utility rate payers and others who are asked to pay for the burden of what we are doing when trying to maintain high water quality won't complain and will move forward to support proactive measures. We also, of course, have made great modifications in the last decade in the attempt to bring economics into our business.

For the EMC, one of our first big deals was in the Neuse River to try to understand how we could reduce nutrient loading especially nitrogen but not solely because there are co-limitations of both nutrients (N and P) in the system, but we had dealt with phosphorus in a major way with the phosphorus detergent ban back in mid 80s and that had immediate and obvious changes in the phosphorus concentrations in the water. We were trying to repeat that with nitrogen, having recognized all those symptoms of serious eutrophication particularly in the estuary, particularly at the bottom (estuarine) end of the aquatic system where everything ultimately ends up.

What we had to ask was how should our reductions in nitrogen be allocated among the various stakeholders, the various contributors? Our answer to that was largely the following: that we want to be entirely fair and have each group reduce its nitrogen by the same percentage so that to the degree that they contribute to the problem they should help solve the problem. That was the way we did this and we

allocated that equal percentage reduction in loading to point sources, to agriculture, and to other components in the system that were contributors.

Well that's all well and good, but now as we think more from an economic perspective, we could make this a little bit more complex, but we need an awful lot of guidance to do this. For instance, perhaps there are some things that are cheaper to do than others; perhaps there are some things that give us a better payoff for the dollar expended. Shouldn't we allocate our effort with an idea of costs in mind? Then the issue also arises - who pays? What are the stakeholders who pay and who benefits? Which are the stakeholders who benefit? Perhaps we should think about those as we do our business and incorporate that more fundamentally. Then there are issues around, of course, as always, about point sources versus nonpoint sources. We're told by our friends in the municipalities, and I can understand exactly what they are saying, we're told all the time that we pick on them at the EMC level, that the point source is such an easy target given that inputs all come together in one waste treatment plant and there we can spend billions of dollars to upgrade and therefore do our job. Meanwhile perhaps we are not doing enough with the nonpoint sources. So that becomes a big challenge to us, in part because nonpoint source regulation is relatively new but also in part because we have to work out what works and what doesn't.

Then there are more complexities. Okay if we've got this aquatic system, a system where first we have nutrient loading that produces nutrient concentrations that are not static, and therein lies a problem with trying to deal with regulation on the nutrient concentration per se. But then the nutrient concentrations trigger growth of the algae, phytoplankton in particular, which if it is excessive can trigger low dissolved oxygen, which can trigger loss in the invertebrate community and fish community and actual fish kills. We've got all those things which we can conceivably measure to see what's going on. And all those are affected by both point sources and nonpoint sources.

But can nutrients give us a clue as to whether they came from a point source or nonpoint sources? There is a great deal of new science that can be done in that regard. And when we do it we find that there are quite a few differences between rainy periods and drought periods. So think of this for a minute, drought periods are a time when in some waterways a large amount of the flow is made up of discharges. So that's going to reflect a lot of the point sources and what they're doing. At times when it is really rainy, that's when we have a lot of runoff from the land and so that's going to be affected by a lot of the nonpoint sources and so we'll have differences between those periods. Those periods can give a clue as to whether we're doing a better job for point sources or for nonpoint sources.

We would like to expand that further because we think we have good accounting for the nonpoint sources but, as people have studied and looked, they have found that we don't really have good numbers that tell us that we are achieving what we know we've done. We know we've made tremendous reductions in agricultural inputs and those reductions have been very well conceived and are measured at the level of what comes off the field. But we've not really measured well what's going on in the stream, and in the lakes and in the waterways. We need to understand that linkage much better so that we can understand concentrations and how they relate to what the load was as well as to what the nutrient problem is.

Then we have this major challenge of linking discharge into the atmosphere particularly of ammonium from agriculture but also from point sources and how that deposits out on our waterways or on our lands and then is transported into water. That one is a huge challenge that we face. It is a challenge in some sense administratively, legally, and technically, but we really need to solve the technical part and understand that better to make progress.

Then we all worry about the following and that is that the designated uses of our waters are what we are really doing all this for; uses as water supply, recreation, fisheries and aquatic life. Those are the things

that dictate what we are doing. Is there any way of bringing those four more directly into the equation? They are in some sense just assumed.

And we also wonder about the Antidegradation provisions of the Clean Water Act. Those dictate that we can't do things that remove the highest use of waters. We are reasonably comfortable applying that to shellfish waters and shellfishing uses because there is a clear bright line there. When those waters get too many fecal coliform bacteria, then the shellfish get too many and public health is endangered. Then we clearly have not maintained the use of those waters. That clear bright line is not as obvious when it comes to nutrients. I don't mean to say that in a pejorative way, but it's just that we don't typically have people keeling over from various diseases and being rushed to the hospital. That is not there. So we really do have to ask ourselves what about these uses requires us to do what we do? And to what degree do economics dictate the level of our response as we see pollution happening and problems emerging?

So I'm just touching the surface of the kinds of things that bother me every day and bother our WQC as I try to explain something about what's going on. But you can see the levels of my ignorance, which are likely repeated as I say things to WQC, and are the sorts of things that bring you all together to tell us how better to manage our responsibilities and for that I thank you. We all thank you for traveling here and for preparing your technical presentations. Thank you.

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