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Suesan Saucerman
US EPA Region 9 RTAG
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Suesan,

I have reviewed the April 12, 2001 Draft Findings and Recommendations for the EPA Region 9 Nutrient Criteria developed by Tetra Tech (Wortham, *et al.*). I am concerned that anyone would think that there would be a readily discernible relationship between nutrient concentrations in streams and microinvertebrate populations in the streams that could be used to establish reliable chemical specific numeric nutrient criteria. Based on my over 40 years of work in this field, I would not have spent any time on this topic. Nutrient concentrations in streams are highly variable, the growth/biomass of microinvertebrates is not directly dependent on nutrients and also, with respect to phosphorus, much of the phosphorus that is present in streams is in a non-available form and therefore, does not affect beneficial uses. The growth of attached or sessile substances in streams is dependent not only on nutrient concentrations, but also on specific micro flow pattern near the organisms and upstream. Widely different micro flow regimes will affect the utilization of nutrients differently for the same nutrient concentrations. Another important issue, with respect to developing credible nutrient criteria, is that except under extreme conditions, there is no way to translate microinvertebrate populations to nutrient related beneficial uses.

While the OECD eutrophication studies conducted in the 1970s showed, as expected, a relationship between normalized phosphorus loads to waterbodies and phytoplankton, zooplankton and fish biomass, a similar relationship would not necessarily be expected for benthic microinvertebrates in streams. The state of Arizona data shows that there is no relationship between nutrient concentrations in the water column and microinvertebrates in streams. This is exactly what is expected. From my experience, there would only be a relationship in gross cases of pollution or extreme oligotrophy. Under gross pollution, it is likely constituents/factors other than nutrients that are controlling microinvertebrate populations. I would not put any further funds in this area of activity. It will not prove to be useful in developing meaningful nutrient criteria.

I have reviewed the Tetra Tech April 12 outline of a "Long Term Strategy" beginning on page 6. It is my finding that the RTAG Region 9 nutrient criteria project has not yet come to grips with developing meaningful nutrient criteria. The continued emphasis on trying to find un-impacted waterbodies as a basis for developing nutrient criteria is a waste of time and money. It is my recommendation that US EPA Region 9 RTAG group abandon its current approaches and begin to

focus on defining the waterbodies in this region where there are nutrient related water quality problems that are significantly impacting the beneficial uses of the waterbodies. Once these waterbodies are defined, then efforts need to be made to define nutrient loads/concentrations water quality impairment relationships. These relationships then become the basis for establishing the appropriate nutrient load to the waterbody.

Basically, the approach I am advocating is the approach that is being used in the TMDL program, where instead of trying to contrive a critical nutrient concentration, the emphasis is on understanding nutrient impacts. This is what is of interest to the public. The issue is not how much phosphorus is in a waterbody relative to pristine pre-cultural situations in a waterbody's watershed. The issue should be what is the impact of the phosphorus on the beneficial uses of concern to the public and what degree of phosphorus control, if any, is needed to protect, or where degraded, enhance these uses. Basically, there is need to shift from chemical (nutrient) concentration based approaches to chemical (nutrient) impact approaches.

From information made available to me, my criticisms of the US EPA's attempts to develop chemical specific nutrient concentration based criteria for an ecoregion are independently being supported by a number of individuals in state pollution control agencies across the US. Thus far, I have found little or no support by those who have to implement the programs in state pollution control agencies for the US EPA's nutrient criteria development approach. I hope that at least in US EPA RTAG Region 9, a more technically valid appropriate approach can be developed.

It is important to understand that the state and regional water quality control boards do not have the time, resources, personnel and inclination to chase ghosts of nutrient problems that arise out of a comparison between the concentrations of a nutrient in a stream or river being elevated compared to pre-cultural nutrient concentrations. The focus of eutrophication/excessive fertilization management must be devoted to defining appropriate loads/concentrations which significantly impact the beneficial uses of waterbodies. This approach requires a site specific nutrient criteria development approach.

It is extremely important for the RTAG Region 9 and nationally, to understand and appropriately incorporate the fact that nutrient enrichment of waterbodies is not all bad. Nutrient enrichment increases the productivity of a waterbody, and thereby, its value to the public as a recreational resource. There is need to focus on determining the appropriate loads of available forms of nutrients to a waterbody to avoid nutrient caused severe water quality impairment. It is inappropriate and in many cases, contrary to the public's interest, to try to establish chemical specific nutrient criteria concentrations based on pre-cultural conditions that existed in a waterbody's watershed.

An example of the conflict between the beneficial impacts of nutrients and their adverse impacts occurs in the Sacramento San Joaquin River Delta. The fisheries resource managers argue for increasing the nutrient inputs to the Delta to improve fisheries while those who water ski in the Delta would argue for decreased nutrients in an attempt to control water hyacinth development. Any attempt to impose pre-cultural nutrient concentration conditions on the Delta would almost certainly be met with large scale public opposition.

There is sufficient information today to begin to develop appropriate nutrient criteria for lakes and reservoirs largely as a result of the OECD eutrophication studies conducted in the 1970s. The information does not exist in California or elsewhere, to define the relationships between nutrient loads/concentrations in streams and rivers and adverse impacts on the beneficial uses of streams and rivers. The basic problem is that the impacts of nutrients on streams and rivers is poorly understood and is dependent on the public's response to the characteristics of the waterbody. The public's response to increased fertility in waterbodies is highly variable and dependent on a wide variety of non-nutrient related issues. Further, the studies that are done often focus on total phosphorus, which in many streams and rivers is largely unavailable to impact water quality/beneficial uses.

With respect to the Tetra Tech strategy outlined on page 7, I do not understand what Tetra Tech means by, "The RTAG develops specific nutrient criteria development hypotheses for each waterbody type within EPA Region 9 ecoregions." What do they mean by "hypotheses"?

I have significant problems with the Tetra Tech proposed outline on page 7. This appears to be more of the fuzzy thinking that has prevailed in the RTAG Region 9 nutrient criteria development program. I plan to participate in the April 17 conference call. Hopefully, in that conference call a meaningful nutrient criteria development plan can begin to be formulated.

Please contact me if you have questions on these matters.

Fred