24 October 2019

Hon David Parker
Minister for the Environment
Ministry for the Environment
PO Box 10362
Wellington 6143

Dear Minister Parker

Re: Draft National Policy Statement for Freshwater Management

I wish to confine my comments primarily to Tables 13 and 14 (Appendix 2B) of the Consultation Draft.

Introduction

I have spent the past 44 years as a freshwater macroinvertebrate ecologist, initially studying at the University of Canterbury, then working in a water management agency (Taranaki Catchment Commission: 1981-1986), undertaking research and consulting projects (Cawthron Institute: 1986 – 2007), and as an environmental consultant specialising in macroinvertebrate biomonitoring (Stark Environmental Limited: July 2007 to date).

While at the Taranaki Catchment Commission I developed a preliminary version of the Macroinvertebrate Community Index (MCI), subsequently refined via a secondment to the Water Quality Centre (Hamilton) in 1984 (Stark 1985). While at Cawthron Institute, I undertook further research to characterise the performance of the MCI and developed alternate versions (e.g., SQMCI, QMCI, and versions for soft-bottomed (SB) streams (Stark 1993, 1998, Stark & Maxted 2007a). I was the lead author of the manual that describes sampling, sample processing, and quality control methods for macroinvertebrate biomonitoring in wadeable streams (Stark et al. 2001), and, together with John Maxted, prepared a user guide for the MCI (Stark & Maxted 2007b).

In 2002 I was awarded a New Zealand Science and Technology Medal for my “significant contribution to the use of invertebrates and community indices for the assessment of water quality and river health in New Zealand.”

In New Zealand, biological monitoring of river health using macroinvertebrates started to become more widespread in the 1980’s. Done well, there is no more cost-effective way to
get an overview of river health as macroinvertebrate integrate the effects of pollution etc. in a way that can be missed by discrete water samples. It is critical that macroinvertebrate biomonitoring remains part of the range of tools available to water managers in future.

As a freshwater ecological consultant my aim has always been to apply existing scientific knowledge as cost-effectively as possible. Most of my research involved the development or improvement of methods for monitoring river health. In recent years, however, I have become increasingly concerned about the way it is proposed to include macroinvertebrate biomonitoring in the NPS-FM. I wrote to Hon Nick Smith prior to the last election and then to you (as Ministers for the Environment) afterwards and a meeting was arranged with MfE in April 2018 where I was able to express my concerns. These related primarily to a plea for more cost-effective monitoring and the need for important updates to the protocols manual. I felt that my concerns were listened to and was assured I would be kept ‘in the loop’. Since then .... nothing.

**Monitoring should be cost-effective**

I am extremely concerned that the methods proposed in the consultative draft for macroinvertebrate biomonitoring are quantitative, which, in my view is a waste of time and money. NIWA has advocated consistently that all macroinvertebrate biomonitoring data should be quantitative. I believe that this is motivated by self-interest (i.e., ratepayer-funded data collection that NIWA can ‘use’ for free) rather than the needs of the water management industry. Some scientists, who do not have experience working as water managers, or are keen to see the results of their research applied, no doubt support this recommendation. It seems to me that MfE would rather listen to the views of NIWA and research scientists than those macroinvertebrate ecologists that have experience undertaking biomonitoring and processing samples. You need only look at the composition of some of MfE’s technical advisory groups to see that experienced aquatic ecologists who work at the coal face (as consultants or for councils) are under-represented. I know several ecologists working in councils or as consultants who agree with my views.

The key question ‘we’ need to answer is “Do we want to spend even more time and money on monitoring than we do at present OR do we want to work towards improving river health?” The answer, I’d think is rather obvious, but the methods proposed in Tables 13 and 14 will result in increased complexity and cost of monitoring leaving less time and resources for effecting improvements. Monitoring, alone, does nothing other than document state (and permit trends to be examined when temporal data have been collected).

Recently, as river health has become a priority issue, there has been an increase in macroinvertebrate biomonitoring sample collection that is threatening to out-strip the capacity to process the samples. We (at SEL) have had potential clients call in desperation
asking if we can process samples for them, when other providers have said they’re too busy (as we are too!). This included one of our main competitors! Clearly, there is a problem when your main competitor is asking if you can process samples for them. If the measures outlined in Tables 13 and 14 become mandatory, this capacity crisis will worsen. It takes many years to become proficient processing samples, so, in the short term, we can expect delays in getting samples processed and (possibly) a decrease in data quality as new players (including fresh and inexperienced graduates seeing an opportunity) come onboard in an attempt to meet the demand.

In my view, State of the Environment (SoE) biomonitoring should be as cost-effective as possible. It is paid for by ratepayers who face increasing rates costs that they can do very little about. The MCI is a well-proven index of river health that was validated initially by Quinn & Hickey (1990) and subsequently by others (see asterisked references and Appendix 2 in Stark & Maxted 2007). The MCI, in one form or another, has been used for monitoring river health in NZ for more than 30 years.

I strongly suggest that macroinvertebrate SoE monitoring macroinvertebrate samples should be collected using D-nets and processed quickly to provide a LIST of the different macroinvertebrate taxa present. This is all that is needed for calculating the MCI (& taxon richness and %EPT richness) — three indices that provide measures of river health that are sufficient to identify rivers that are in excellent, good, fair, or poor condition. Processing samples in this way could reduce processing costs by half or two-thirds. This could enable more sites to be sampled (i.e., improved coverage within the region) and/or could free up time and money for remedial action.

It has been stated (e.g., Clapcott et al. 2017), that the MCI is not diagnostic — i.e., it is difficult to determine from, say, a low MCI value what the cause of poor river health is. My response to that is that it is sufficient that the MCI identifies sites/rivers where there are problems. We do not need diagnostic indices in order to monitor river health and identify areas of concern. A site visit, photographs of the riverbed and banks, knowledge of land-use in the catchment, and results from water quality monitoring should be more than enough to identify what the problems are and, therefore, what might be done to remediate. Diagnostic indices, that can be interpreted by scientists or managers who never leave the office are not essential in order to monitor river health and decide what measures are needed to improve problem areas. Biomonitoring is NOT research — it is research-backed — but above all it should be cost-effective. In my view increasing the cost and complexity of routine biomonitoring will not result in improved river health in New Zealand.
Comments on Table 13

The main problem I have with Table 13 is the requirement that sample processing must be quantitative (i.e., 200 fixed count or full counts). I do not believe that quantitative macroinvertebrate data are needed for SoE monitoring, so there should be provision here for processing of samples to yield coded abundances (as some councils currently do) or, better yet, presence-absence data.

The second problem is that ONE table of attribute bands will NEVER be applicable to all wadeable streams and rivers throughout New Zealand. There will be streams or rivers in pristine condition that do not meet the requirements for the A attribute band. The lower reaches of many of our rivers are likely to be well below the A band and it would be unreasonable to expect them to achieve it post-remediation. At best, different tables would be required for different parts of New Zealand, different stream or river types, or for different REC (River Environment Classification) classes. Alternatively, the attributes could be defined in terms of percentage reductions from reference condition.

Another problem with bands is that sites can flip from one band to another – even when the current state is expressed as a 5-year rolling average.

I do support the use of rolling averages (rather than relying on single index values with their inherent ‘error’) but I prefer trends testing (e.g., Stark & Fowles 2006) for interpreting the results of routine biomonitoring results. This addresses the key question “Is river health improving, declining, or staying the same?” Any system requiring classification into quality classes or attribute bands is inevitably going to have a degree of arbitrariness and subjectivity.

Traditionally, the MCI and variants have been interpreted according to criteria provided by Stark & Maxted (2007b), whereby sites can be assigned to quality classes (Excellent, Good, Fair, Poor). Excellent required MCI to be 120 or more (QMCI 6.0 or more) and Poor was less than 80 (QMCI <4.0). The Attribute bands (A – D) in Table 13 are analogous to the quality classes, but all have been increased by 10 MCI units (or 0.5 QMCI units. This appears to be a consequence of analyses undertaken by Clapcott et al. (2017) (p.113-114) but given the long history of use of the ‘traditional’ interpretation, I question the need for change. The ‘new’ criteria will result in the assignment of many sites to lower attribute bands.

Comments on Table 14

Calculation of ASPM scores also requires quantitative macroinvertebrate data, which (as discussed above) I consider an unnecessary expense for SoE biomonitoring.

The ASPM is a multimetric index, is more complex than is needed, and is highly correlated with its component sub-metrics (such as the MCI).
I understand that calculation of the MCI, QMCI, and ASPM will be required and a site will be assigned to an attribute band based on which of these three indices has the lowest 5-year rolling mean. I think this is unnecessarily complex. The MCI alone is capable of identifying more than enough sites in need of improvement to keep water managers busy for many years, if not decades, to come!

Conclusions and recommendations

- Macroinvertebrate SoE monitoring should be based on samples collected using a D-net and processed to obtain a list of the taxa present with identifications as required for calculating the MCI. Quantitative data should not be required.

- The MCI is a well-proven index that has the potential to be used much more cost-effectively than it has been in the past to document river health. In my view, we should spend less on monitoring (by doing it more cost-effectively) and more on improving river health.

- Most Councils already know which rivers need improvement – why require even more complex and expensive monitoring to tell us what we already know?

- An increase in macroinvertebrate sample collection within the last year has put the relatively few quality providers of sample processing services under pressure. This problem is likely to increase with consequences for data quality unless sample processing is made more cost-effective. It is simply ridiculous to have to spend all day counting everything in a single sample in order to generate an MCI value, when you will be QC-checked (having never failed a QC check since the protocols were introduced). It is not an efficient use of time or rate-payers’ money.

- Use some common sense for a change and apply the KISS principle.

Literature Cited


Quinn JM, Hickey CW. 1990. Characterisation and classification of benthic invertebrate communities in 88 New Zealand rivers in relation to


