18. MONITORING PROGRAMME AND SAMPLING FREQUENCIES

18.1 SELECTION OF BIOMONITORING INDICES FOR YOUR MONITORING PROGRAMME

There are currently seven RHP indices. Each of these indices is designed to measure a particular aspect of the health of the aquatic ecosystem, such as the invertebrates, fish, habitat, riparian vegetation and the geomorphological condition of the river channel (Table 18.1). Therefore, each RHP index has its own requirements regarding training, equipment application and frequency.

The selection of which RHP indices for the pilot phase of your programme will depend on your basic RHP objectives, budget, level of training and capacity and available resources. It is recommended that you start off with something manageable during the pilot phase (such as SASS4 and IHAS) and introduce some of the other indices as your programme develops from the pilot to the full implementation phase.

Table 18.1. RHP Biomonitoring indices.

Index	Brief description
Primary	
South African Scoring System (SASS4)	Monitoring of freshwater invertebrate communities, both diversity and abundance
Invertebrate Habitat Assessment System (IHAS)	Assessing the condition and availability of invertebrate habitats of the site being sampled
Secondary	
Fish Assemblage Integrity Index (FAII)	Monitoring of the composition of fish communities
Riparian Vegetation Index (RVI)	Monitoring of ecological condition of plant communities in and alongside the river
Tertiary	
Index of Habitat Integrity (IHI)	Aerial assessment of the overall condition of the river and catchment with respect to habitat availability and diversity, as well as surrounding land-use
Geomorphological Index (GI)	Assessing the physical condition of the river channel's morphology (prototype only)
Hydrological Index (HI)	Assessing the hydrological (FLOW) conditions of the river (prototype only)

18.1.1 Developmental status of the RHP Indices

Each of the above indices has undergone varying degrees of research and development for South African conditions. The most widely used biomonitoring index is the SASS, which has been in development since 1990 and version four (SASS4) has been in use since 1995. Version five (SASS5) is due for release.

IHAS has been in development for some time and is the descendant of forerunners such as the Habitat Assessment Matrix (HAM) and Habitat Quality Index (HQI). It can be applied with confidence along with SASS in all regions of South Africa.

The FAII has also been in development for several years and the current index's precursor was known as the Fish Community Integrity Index (FCII). The FAII has been applied successfully for rivers in the north-eastern parts of South Africa. Further testing and verification is required for other regions.

The IHI has also been tested in various regions in South Africa over a number of years. It can be applied with confidence at this stage.

The RVI is relatively new to the family of RHP indices. The initial RVI prototype has been tested successfully for some of the rivers of the Lowveld of Mpumalanga, but further testing and verification is still required for other regions of South Africa.

Only initial prototypes have been developed for the GI and HI at this stage. Testing and verification of these is still required.

For more information on the RHP indices, please consult the relevant literature.

18.1.2 Biomonitoring Protocols

NAEBP Reports Nos 6 and 8 explain a number of Biomonitoring Protocols (BP), which are proposed as different levels of biomonitoring using different RHP indices (Table 18.2). These range from BP 1 to 5 with a corresponding increase in the number and combination of indices.

Table 18.2. The range of Biomonitoring Protocols and associated indices.

Biomonitoring Protocol	Combination of Indices
BP1	SASS4 + IHAS
BP2	SASS4 + IHAS + FAII
BP3	SASS4 + IHAS + FAII + RVI
BP4	SASS4 + IHAS + FAII + RVI + IHI/HI
BP5	SASS4 + IHAS + FAII + RVI + IHI +HI + GI

The full implementation phase requires both a diversification in the number of catchments being monitored as well as the number of RHP indices being used. The progression from pilot to full implementation will probably be gradual and BP1-5 provides a useful means of assessing your programme's development for a particular catchment.

NOTE:
The combinations of indices in the aforementioned BP's are by no means compulsory as there is no prescribed recipe for which BP is best suited to which situation. The selection of the appropriate BP for your RHP largely depends on budget, time constraints, level of expertise and training and other logistical considerations.

18.2 MONITORING FREQUENCY

The RHP has been designed for the monitoring of long-term environmental trends in a practical and achievable way, even when resources are limited. As aquatic fauna and flora provide a long-term reflection of prevailing water quality and ecological conditions, biomonitoring demands less frequent sampling than chemical monitoring. This is one of the main advantages of biomonitoring and the RHP, particularly from a cost and logistical perspective.

NAEBP report no 8 proposes a biomonitoring frequency table for the RHP (Table 18.3). It is suggested that your RHP follows this, where possible. Both SASS and IHAS, should be conducted more frequently than the other indices. The reason for this is that invertebrates have a much shorter life span than fish or plants and hence are more responsive to changes in ecological conditions. Fortunately, these two indices are also the easiest and most rapid of the indices to perform!

Table 18.3. The application of biomonitoring indices and suggested monitoring frequencies.

Index	Monitoring frequency
South African Scoring System (SASS)	2-3 times per year - to be done with IHAS
Invertebrate Habitat Assessment System (IHAS)	2-3 times per year - to be done in conjunction with SASS
Fish Assemblage Integrity Index (FAII)	Every 2-3 years - to be done with RVI
Riparian Vegetation Index (RVI)	Every 2-3 years - to be done with FAII
Index of Habitat Integrity (IHI)	Every three to five years
Geomorphological Index (GI)	Initially once - to be repeated after major flood events which significantly alter the river channel
Hydrological Index (HI)	N/A

It is proposed that SASS and IHAS be conducted during the dry season, at the end of the dry season and at the end of the wet season. Ultimately though, the best monitoring times to perform these indices will largely be governed by local conditions.

Other factors which may affect your monitoring frequencies:

- **$** The biogeographical region in which you are launching the programme may play a role in determining your monitoring times during the year. For example, many of the larger rivers in Mpumalanga are flowing too strongly to sample effectively during the wet summer months. However, the opposite seasonal effect may occur for rivers in the Western Cape where peak river flows generally occur in July to September.
- **$** Apart from hindering monitoring activities, major floods can wash away habitat as well as much of the resident invertebrate communities. These will need some time to recover.
- **$** Certain activities and developments in the river catchment may also influence your monitoring routine, as with major pollution spills.

NOTE:
The recommended monitoring frequencies of SASS and the FAII may not co-incide with the length of the lifecycles of some of the organisms which these indices are striving to monitor. For example, the recolonisation of a site by aquatic invertebrates after a major catastrophic pollution spill can take as little as six and eight weeks.

It is suggested that if a major pollution spill has occurred in one of your RHP catchments, SASS, IHAS and FAII be conducted as soon as possible at the affected sites. If possible, both SASS and IHAS should be repeated two months later at these sites and the FAII six months later. Such ecological recovery biomonitoring may also be a component of a special monitoring programme separate from your RHP.