Species, Healthy Rivers and Healthy People

By Dr Mark Graham

I reflect on my childhood experience when I would visit a stream next to our home to fetch water for my mother. I would drink water straight from the stream. Playing among the arrowroot leaves I tried in vain to pick up the strands of frogs' eggs, believing they were beads. But every time I put my little fingers under them they would break. Later I saw thousands of tadpoles: black, energetic and wriggling through the clear water against the background of the brown earth. This is the world I inherited from my parents. Today, over 50 years later, the stream has dried up, women walk long distances for water which is not always clean, and children will never know what they have lost. The challenge is to restore the home of the tadpoles and give back to our children a world of beauty and wonder. Excerpt from the Nobel Peace Prize acceptance speech by Wangari Maathai, green activist, farmer, politician. (10 December 2004).

These words reflect a profound wisdom and wonder about the natural world, innately recognised by most children, but which is rapidly fading as we pursue an increasingly fast and material lifestyle. Many a child will have relished messing about in boats or in water, somehow, a pastime immortalised by Kenneth Grahame in *Wind in the Willows*: '...there is nothing – absolutely nothing – half so much worth doing as simply messing about in boats...'

Sadly, however, more and more of our water resources are fast becoming polluted and are disappearing due to the demands placed on them by the modern world. This clearly limits the opportunity for kids to simply 'mess about in rivers'. These missed opportunities further distance us as a society from the source of life's most vital natural resource: water! If we are to honour the late Wangari Maathai and 'restore the home of the tadpoles and give back to our children a world of beauty and wonder', something needs to be done about ensuring that these simple, but valuable, opportunities are available to all children.

Work started by aquatic ecologists in the 1980s by people like Mark Chutter and others, looked at taking the naturally occurring insect fauna or 'nunus' present in our rivers and using them as indicators of the health or condition of these systems – in much the same way as canaries were used by miners to see if the air in a mine was safe or would kill them. Only now, the concern is with the 'health' of the river and, ultimately, the availability of this resource as a source of 'clean' water.

Helathy Rivers - miniSASS training day

If the community of species of organisms in the river were showing signs of stress or strain, they could be used as indicators of pollution. This was not rocket science, the earliest civilisations were looking for and using such indicators of the 'health' of a river as a sign of its fitness for use. So, a river with dead fish floating on its surface would have been less attractive, or indicative of 'dirty water' compared with one with a myriad of fish and other organisms living in it. And all of this is indigenous or local knowledge, in the absence of expensive and sophisticated laboratories. More recently, many readers may have heard of the mass deaths of crocodiles within the Kruger Park – another rather extreme indication of an unhealthy river system.

What was found over the years was that South Africa had reasonably easily recognisable river fauna and that some elements were more sensitive to pollution than others. This spectrum of approximately 90+ aquatic invertebrate families could then be sampled in a standardised manner and used on a regular basis as an indicator of the health of the river system. Thus was born the South African Scoring System (SASS) to measure river health. This has been through various refinements and iterations over the years, so that we now have the scientifically robust SASS version 5 method (Dickens and Graham) widely used by many aquatic ecologists across the country and, indeed, throughout Africa. This method has been developed in accordance with ISO 17025 standards, and the Department of Water Affairs has a system of accreditation to ensure data emerging from this technique is credible.

The downside of the SASS5 technique is that it is still fairly onerous in terms of learning all the identifying characteristics and distinctions between the 90+ families that make up the technique. To address this issue, and to develop a tool more suited to the layman, school groups and the environmental education community, the SASS5 technique has been simplified and reduced in complexity to produce the **mini-Stream Assessment Scoring System** (or **miniSASS**) tool. This has recently been updated with the support of the Water Research Commission, the Wildlife and Environment Society of South Africa and GroundTruth Consulting.

The complexity of the 90+ families of aquatic invertebrates has been reduced to 13 groups of organisms, and sampling can be undertaken by anyone or groups with an interest in their local water resource. A simple pond net (or old wire coat hanger, shaped into a square and covered with a stocking or sewn mosquito netting), white tray or ice-cream tub, a printed A5 data sheet and identification guide completes the 'kit' and this is all one needs to get started.

One of the key strengths of the miniSASS technique is that the results it produces are very similar to the full SASS technique. This allows the miniSASS tool to act as a 'red flag' indicator of the condition of rivers, identifying hot spots and, where further, more detailed follow-up or investigation of the condition or water quality of a river is required. With the possibility of any interested groups of 'citizen scientists' starting to monitor their rivers comes a huge window of opportunity to transform how we look at and manage our water resources in the future.

A recent investigation looking at the positioning of all schools within South Africa shows that, not surprisingly, most major rivers in the country have a host of schools in close proximity. If all the schools in the country were to simply monitor a river within a 5km radius of themselves, 80% of the approximately 17 700 kilometres of river in South Africa could be covered by this monitoring network of cells.

Healthy Rivers - GroundTruth miniSASS kit

Added to this, the school curriculum has to cover various aspects of environmental or life science studies (including human effects on the environment, pollution, etc.) at various stages and with varying levels of sophistication. The miniSASS tool provides an ideal opportunity of integrating this teaching requirement (meeting the needs of the curriculum) with schools adopting a river within

As the general public, we can play a part in making a difference to managing freshwater resources in a community. miniSASS has the potential to be a powerful 'red flag' indicator for the identification of aquatic pollution sources. By using miniSASS we can actively take an interest and management in the health of freshwater bodies in our community.
Your interest and knowledge can be enhanced by adopting a local river in your community and monitoring it over time, identifying sources of pollution and taking local action to make a difference. You could also encourage more members of the community to take positive action towards monitoring and conserving water.

Download copies of miniSASS
www.minisass.org
www.groundtruth.co.za

Additional resources
www.wrc.org.za
www.wessa.org.za
www.dwa.gov.za

Send your results to results@minisass.org
to contribute to a developing picture of river quality in South Africa.
For queries or comments email info@minisass.org
miniSASS is also available from Share-Net
www.sharenet.org.za PO Box 394, Howick, 3290. Tel (033) 3303931

River safety: take special care in polluted waters. Beware of dangerous animals (crocs/hippos!) and fast flowing waters. Wear protective gear when necessary and wash your hands regularly with soap and clean water wherever possible!!

Key words for further reading/resources:
macroinvertebrates, benthic, water quality, conservation, biodiversity, water quality, river health, aquatic pollution.

Glossary

Biomonitoring: the monitoring of biodiversity using biological organisms
Biodiversity: diversity within species, between species and of ecosystems
Conservation: the maintenance of environmental quality and functioning
Ecosystem: a complete community of living organisms and the nonliving materials of their surroundings.
Sedentary: inactive, motionless, not moving

SITE INFORMATION TABLE		
Date (dd/mm/yr):		
Collectors name:		
River name:		
Site description:		
GPS co-ordinate:	S	E
Comments / notes		

Co-ordinates as lat/long (e.g. 29°30'25" S / 30°45'10" E) **OR** as decimal degrees (e.g. 29.50694°S/30.75277°E)

Scoring
1. On the table below, circle the sensitivity scores of the identified insects.
2. Add up all of the sensitivity scores.
3. Divide the total of the sensitivity score by the number of groups identified.
4. The result is the average **score**, which can be interpreted below.

GROUPS	SENSITIVITY SCORE
Flat worms	3
Worms	2
Leeches	2
Crabs or shrimps	6
Stoneflies	17
Minnow mayflies	5
Other mayflies	11
Damselflies	4
Dragonflies	6
Bugs or beetles	5
Caddisflies (cased & uncased)	9
True flies	2
Snails	4
TOTAL SCORE	
NUMBER OF GROUPS	
AVERAGE SCORE	

Average Score = Total Score ÷ Number of groups

Interpretation of the miniSASS score: Although an ideal sample site has rocky, sandy, and vegetation habitats, not all habitats are always present at a site. If your river does not have rocky habitats use the **sandy type** category above to interpret your scores.

Ecological category (Condition)	River category	
	Sandy Type	Rocky Type
Unmodified (NATURAL condition)	> 6.9	> 7.9
Largely natural/few modifications (GOOD condition)	5.8 to 6.9	6.8 to 7.9
Moderately modified (FAIR condition)	4.9 to 5.8	6.1 to 6.8
Largely modified (POOR condition)	4.3 to 4.9	5.1 to 6.1
Seriously/critically modified (VERY POOR condition)	< 4.3	< 5.1

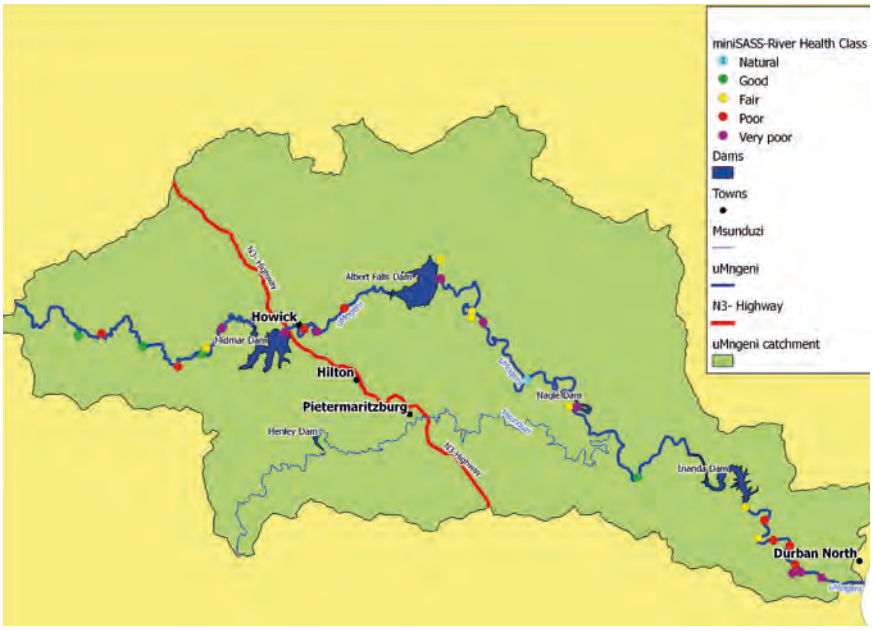
Healthy Rivers - miniSASS score sheet

close proximity and becoming 'monitoring cells' –telling the story of how healthy their 'stretch' of river is. The collective network of monitoring cells has the added advantage of building a national picture of the health of our rivers, empowering local communities to identify pollution sources, and educating the next generation of consumers and polluters about the effects of their various actions on water resources.

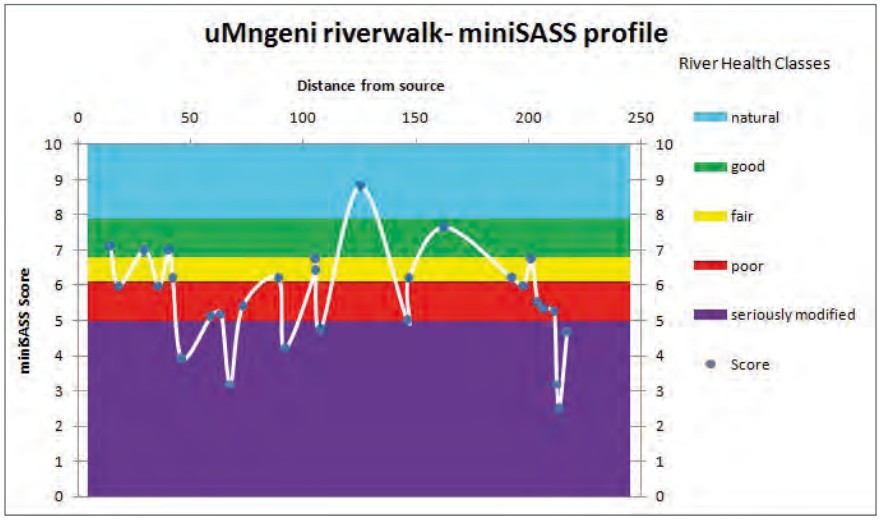
There are already many schools operating through the Eco-Schools programme that have adopted miniSASS as a tool. Added to this are various other local conservation and environmental groups that have begun to undertake miniSASS assessments (e.g. the Duzi uMngeni Conservation Trust (DUCT), Kloof ConservancyKZN, Waverly Hills Wines - Southern Cape).

In March 2012, the first miniSASS training day took place at the WESSA's UmgeniValley in Howick. The event was held collaboratively by WESSA, GroundTruth and the Water Research Commission (who very generously sponsored the event) to promote awareness of the miniSASS tool and its potential application across South Africa and even further afield. The event was extremely well supported with over 60 participants from eight countries attending. Members of the ORASECOM (Orange-Senqu River Commission) and RCE (Regional Centres of Expertise) teams took part, with Dr Abel Atiti of the UNU-IAS (United Nations University – Institute of Advanced Studies) describing the RCE network and linking the miniSASS tool to education for sustainable development.

In May 2012 the DUCT group finished an inaugural month-long 'source-to-sea' uMngeni River Walk. At various stages along this walk they undertook miniSASS assessments, often in conjunction with local schools, to determine the health of the river. Their results highlighted the generally healthy state of the river in its upper reaches, and its decline around urbanised settlements (Howick and Durban) or below major dams (Nagle and Inanda) along the river's course. This was citizen science at its best: a group of volunteers, with no formal training in aquatic sciences, undertaking a source-to-sea assessment of the state of the uMngeni River. There are already plans to add the walk along the uMsunduze River to this picture in August/September 2012.



miniSASS survey of uMngeni River



Healthy Rivers - miniSASS-PROFILE5

This snapshot on the health of this system could easily be replicated annually and/or along ALL rivers in the country. This act of monitoring and highlighting the problems and issues affecting our river resources has received considerable publicity and has the potential to make significant changes to how we have traditionally viewed (or not, as the case may be…) our rivers.

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For information on additional resources or activities, visit the following:

- Environmental education resources and support *www.wessa.co.za*
- The miniSASS tool, assistance with training and/ or supply of simple sample equipment email *info@ groundtruth.co.za* or visit *www.groundtruth.co.za*
- Information on the activities of the DusiuMgeni Conservation Trust (DUCT) and the uMngeni River Walk, visit *www.duct.org.za*