"Amongst the many things I learnt, as a president of our country, was the centrality of water in the social, political and economic affairs of the country, continent and indeed the world. I am, therefore, a totally committed water person" – Nelson Mandela

- Desperate residents have resorted to drawing water from unsafe sources.
- It has been three weeks since the taps ran dry, raising concerns that this crisis could lead to an outbreak of water-borne diseases.

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Citizen Science tools in river health and catchment management

Information from presentations by: Jim Taylor, Kerry Rowlands & many other contributors, Mark Graham, Bonani Madikizela & Michelle Browne, Mark Dent

WESSA's Mission

To implement high impact environmental and conservation projects which promote public participation in caring for the Earth

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Water programme

Vision:

To work together in using SA's water resources wisely thus securing safe, adequate and fair water supply to realise our current and future aspirations towards a common good and healthy life support systems.

Aim:

To improve the quality, availability and distribution of water resources in order to enhance the goods and services that they provide.

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Focus on water issues in:

- Catchment areas
- River and estuarine systems
- Human settlements
- SADC transboundary areas

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Tools

To help us understand and engage with catchment issues

- miniSASS, website & App for smart phones
- Velocity plank
- Clarity Tube
- Secchi disc
- Rivers & Nutrient load mapping
- Flickr – stories of change
- Social Media

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Monitoring

Issue	What?	So?
Turbidity	The suspended material - large amounts of e.g. silt, algae, microorganisms, plant fibres, ...	Block light to aquatic plants Smother aquatic organisms Carries contaminants e.g. mercury, bacteria

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Monitoring

Issue	What?	So?
Temperature	Measure of how warm water is	Metabolic rates of most stream organisms are controlled by temperature Warm water holds less dissolved oxygen Higher temperatures can dissolve more minerals from the rocks
		Aquatic species all have a preferred range Some organisms can only survive within a very limited range Too far above or below this preferred range, the number of individuals of the species decreases until finally there are none
pH	Measure of the acidic or basic (alkaline) nature	Pollution may cause a long-term increase in pH Determines the solubility and biological availability of chemical constituents e.g. nutrients

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Assess/monitor: miniSASS

Mini Stream Assessment Scoring System (miniSASS) – 13 groups of invertebrates out of the 90+ of SASS5

- It's easy to use (and can be applied after a 2 hr training)
- It is free to use
- Minimal apparatus (a reference sheet and cup)
- The data is visible on a Google Earth platform
- The data supports decision making in sustainable water resource management

2013
Concept won an award from the United Nations University as a global Flagship Innovation Project.
Won the Water Research Commission's *Community Empowerment Award*

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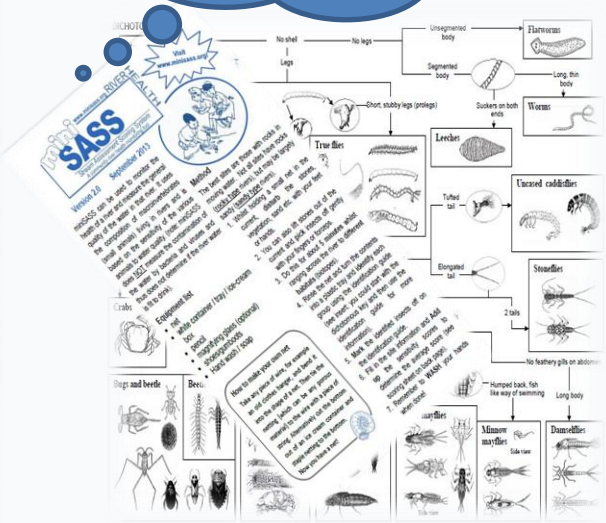
Get Started!!!

1

Did you know, - field guides can be downloaded from the website!



2

Collect a sample!!!

miniSASS Check List

- [x] Net/Sieve
- [x] Life Jacket
- [x] Ice Cream Container / White Tray
- [x] Gumboots/Waders/Wellingtons
- [x] Cap/Hat/Sunscreen
- [x] Soap/Handwash

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What do we see?

Good (sensitive taxa)

Fair (intermediate)

Poor (tolerant taxa)

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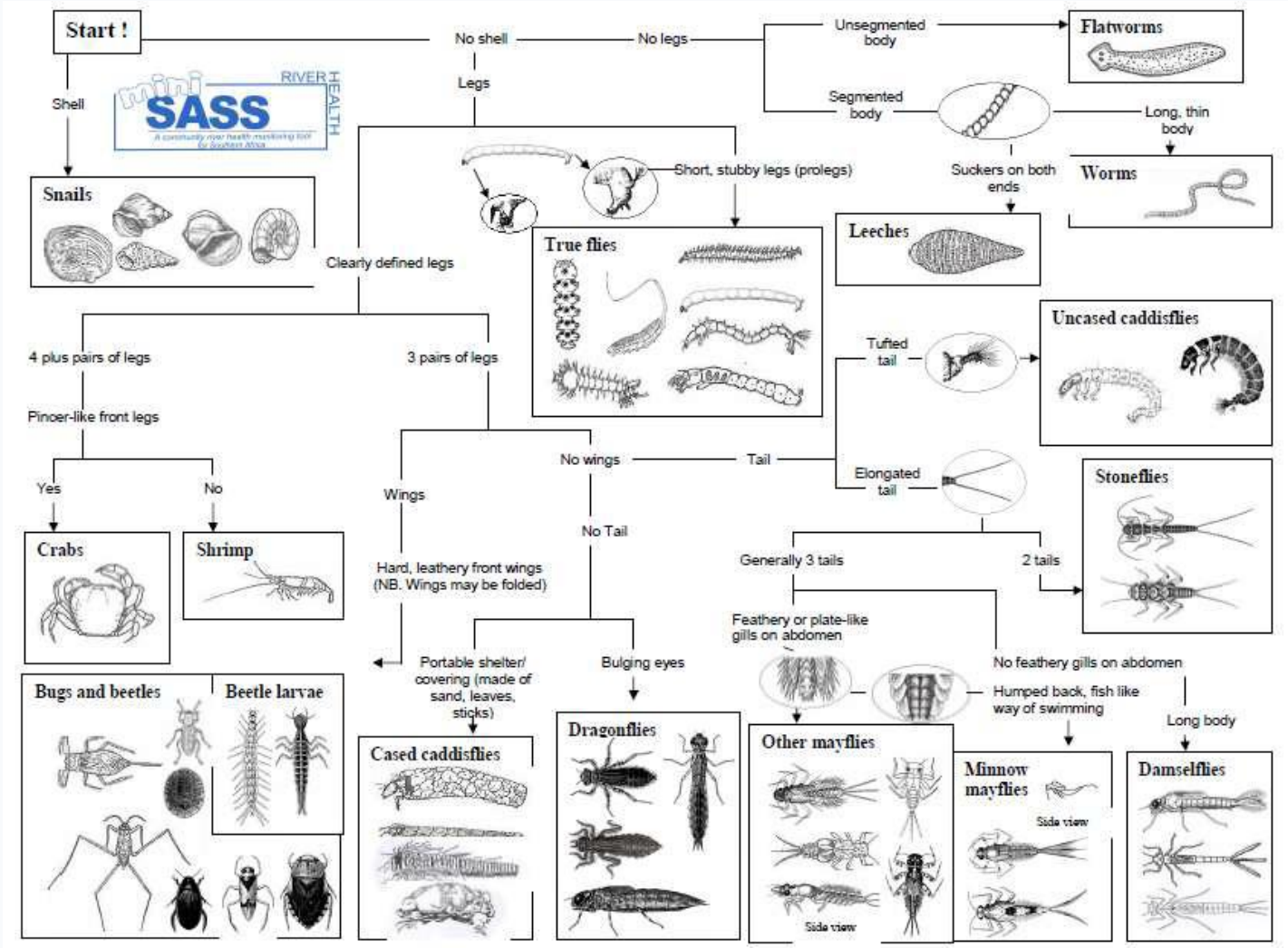
miniSASS field guides



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miniSASS field guides

Flat worms

Flat worms are characterised by their flattened shape and soft bodied, worm-like form. They have an arrow-shaped head with two dorsal eyespots and are generally mottled or dark grey in colour. Flatworms move with a gliding action and are generally scavengers or carnivores.

Leeches

Leeches are segmented organisms that have very flexible bodies. When moving they expand to become long and thin, and then contract to become short and stubby. They have suckers on both ends of the body that are used for feeding and locomotion. Leeches are variable in colour, from grey, to red-brown and black. They swim with a fast, snaking movement and are found under stones, vegetation and debris.

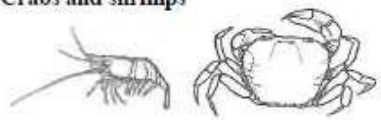
Worms

Worms are long and segmented and have a cylindrical shape much like small earth worms. Their colouring is usually pink to brown. They are usually seen writhing around in debris digesting the substrate they fed on.

Snails

Snails are molluscs with hard shells that vary in size, shape and colour. Habitats vary, with some snails such as limpets clinging to rocks, whereas clams and muscles are found in sand. The more common snails move over stones and vegetation. Some snails are host to bilharzia, a serious health hazard for humans.

Crabs and shrimps

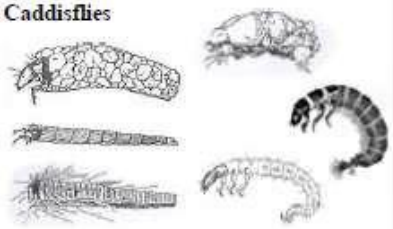


Crabs and shrimp form part of the order Decopoda (ten legs) and have bodies and legs hardened to form a tough shell. They have four or five pairs of legs and eyes that are carried on stalks and are movable. Crabs are scavengers that feed mainly on leaf litter but will feed on animals when given the chance. Shrimps are mostly scavengers or deposit feeders.

Stoneflies

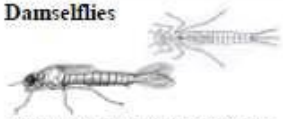
The nymphs of adult stone flies usually have two long tails and three pairs of legs each having two claws at the tip. A characteristic feature of stonefly nymphs are the tufts of gills on the side of the body as well as gills between the two tails. Wing pads on the thorax are often dark and obvious. Some species run across the substrate very efficiently and are potent predators on other invertebrates. Other species are smaller and feed on plant material. Most live in well oxygenated, clean water.

Caddisflies



The aquatic larvae of adult caddisflies have a hard head with three pairs of legs which are attached to an elongated, soft body. Finger-like gills on the abdomen and anal appendages can be seen with the naked eye. Some caddisflies construct portable shelters/cases from sand grains, bits of vegetation and/or silk that are glued together to form a characteristic case shape. Most of the case-building types cannot swim whereas the case-less type swim freely across the substrate. Some feed on algae and detritus whereas others are predators.

Damselflies



Damselflies have elongated bodies with generally three broad tails/gills on the tip of the abdomen. Damselflies are carnivorous and have a 'mask' over the lower part of the face which hinges out to reveal a pair of pincers with which they catch their prey. They are often to be found in vegetation growing on the edge of rivers.

Dragonflies

Dragonflies are robust creatures that are stout and have a large head and protruding eyes. Some have short legs whilst others have long legs. They do not have tails, but swim using 'jet propulsion' by forcefully ejecting water from the abdomen. Dragonfly nymphs are usually the largest organisms found in a sample and are the most powerful invertebrate predators in the water.

Bugs and Beetles

Bugs can be defined as having a piercing and sucking beak for mouthparts, and two pairs of membranous wings. Beetles on the other hand have 'jaws' and outer wings that are hardened to protect the inner wings. Some bugs and beetles are well adapted to swimming, such as water boatmen, backswimmers, pond skaters and water striders. Most bugs and beetles are carnivorous, but some feed on algae.

Mayflies

Mayfly nymphs vary greatly in shape and size and live only for a day or two. In this time they will never feed and live to mate and lay eggs in the water. Mayflies fly close to rivers and lakes, usually swarming in the early evenings.

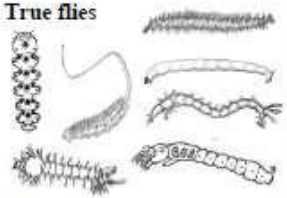
Minnow mayflies

These mayflies have a narrow head and a small, slender, but not flattened body. They have leaf shaped gills on both sides of the abdomen and two but more commonly three tails, depending on the species.

Other mayflies

Other mayflies are characterised by an elongated body, large head, well-developed mouthparts and stout legs. They live in a variety of habitats including burrowing in mud, crawling amongst decaying leaves, and scurrying over stones in fast flowing currents.

True flies



Most fly larvae have a fairly indistinct head but elaborate tail ends. They often have small, soft legs (prolegs), segmented bodies and have the appearance of maggots. Some have bristles/ spines and antennae. True flies live in a variety of habitats including sand, mud and stones in fast flowing water. They can either be carnivorous or filter feeders.

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3 Identify and score the bugs!!

4 What is your miniSASS score?

SITE INFORMATION TABLE		Date (dd/mm/yr):
River name:		Collectors name:
Site name:		School/organisation:
GPS co-ordinate Lat:	Long:	Comments/notes: e.g. weather, impacts,
Site description: e.g. downstream of industry		alien plants, level of flow etc
pH:	Water temp: Dissolved oxygen:	Water clarity/turbidity: see clarity tube at www.minisass.org

GPS co-ordinates as degrees, minutes, seconds (e.g. 29°50'25" S / 30°45'10" E) OR as decimal degrees (e.g. 29.50694°S/30.75277°E). If you don't have a GPS, register to upload your results at www.minisass.org , find your site on the map, click to upload your result and it saves the co-ordinates for you!

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	29
NUMBER OF GROUPS	4
AVERAGE SCORE	7.3
Average Score = Total Score ÷ Number of groups	

Scoring

1. On this table 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 into an ecological category below.

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

For more information or to put your results on the miniSASS map visit the website www.minisass.org!

THIS CITY WORKS FOR YOU

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5 Is your river natural, fair or very poor?

	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

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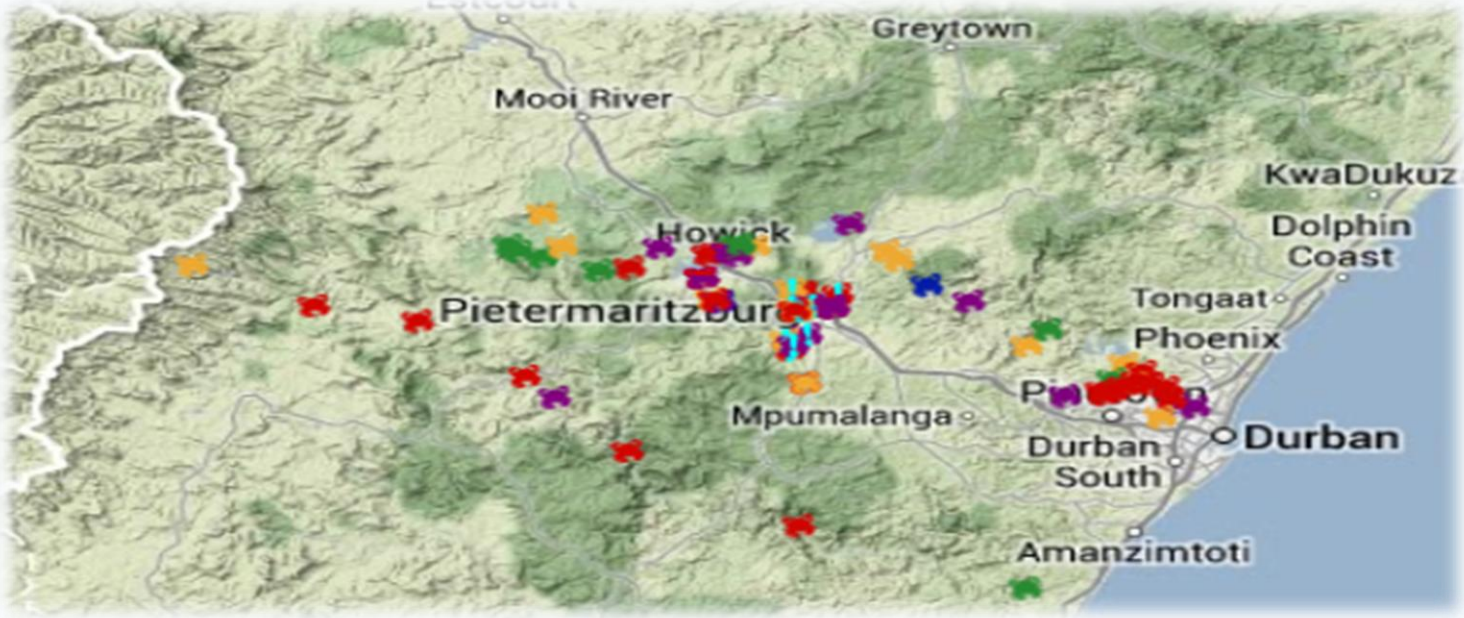
Reporting: Upload Data on ww.minisass.org



Each miniSASS observation that is uploaded appears on the Google Earth Map as a coloured crab icon that correlates to the Ecological Category of the river. With the Ecological Category based on the bugs found, the coloured icons quickly tell us the health of the various rivers and streams!

miniSASS cell phone app to be launched early 2015 so you can upload miniSASS observation while in the field!!!

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www.minisass.org

RIVER HEALTH

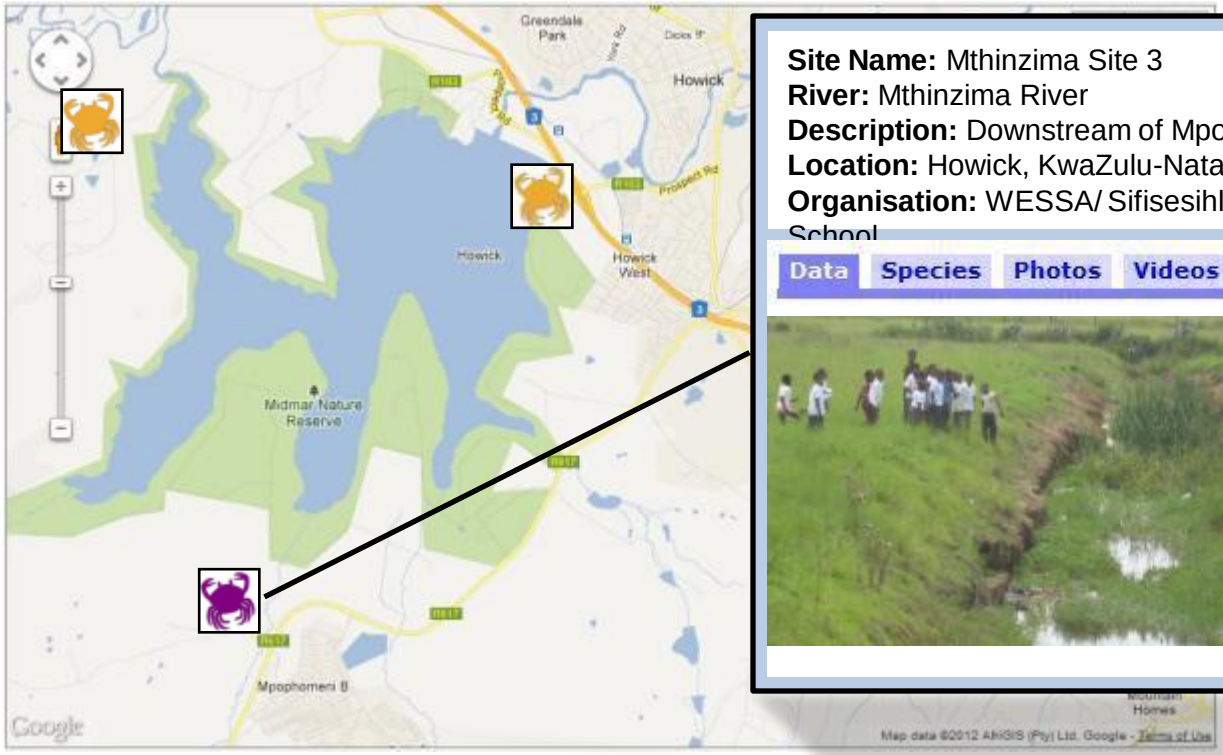
miniSASS

Stream Assessment Scoring System

A community river health monitoring tool

: Search

View site results - photos



Site Name: Mthinzima Site 3
River: Mthinzima River
Description: Downstream of Mpophomeni
Location: Howick, KwaZulu-Natal, RSA
Organisation: WESSA/ Sifisesihle Primary School

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Data | Species | Photos | Videos | Comments | History

THE RIVER HEALTH PROGRAMME

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CITY OF CAPE TOWN | ISIXEKO SASEKAPA | STAD KAAPSTAD
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GroundTruth
Water, Wetlands and Environmental Engineering

UMGENI WATER · AMANZI

EZEMVELO KZN WILDLIFE

WATER RESEARCH COMMISSION

EARTH

miniSASS users

Wide group!

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'With miniSASS I became a scientist for the day at the Modderfontein river' Deputy Minister – DWAS (Pam Tshwete) July 2014

"It helped me to know how to test water quality and understand very well about the importance of keeping the environment clean. I will test for myself and change the way that I was living", Inkosi N.C Molefe.

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Application

- Changes and potential pollution sources (+ solutions).
  - identification of pollution hot spots as miniSASS results provide a "red" flag indicator on river health conditions.
- Reasons for the changes in river health over space and time
  - based on the land uses and other activities that can be observed on the interactive Google Earth/satellite maps, supplemented by local knowledge
- Communities – can use information and knowledge to illustrate the condition of their rivers, and investigate pollution sources
- Land users (eg farmers, industries) - can monitor impacts of their activities on the surrounding river environment
- Trends - the more data the better for communities, authorities

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Challenges

- Verification of data
- Requires internet to upload results
- Some costs
  - Training champions
  - Tools and means eg airtime
- So what?
  - Hand print– follow up? actions on website eg river clean ups, alerting authorities/responsible people

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Conclusion

- Community involvement & understanding of water quality issues
- Has potential to make a real change at the community level
- Eyes & ears on the ground – identifying water quality problems

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