Freshwater Governance for Sustainable Development
November 2012

mini SASS RIVER HEALTH
Stream Assessment Scoring System
A community river health monitoring tool

40 Years of Excellence
WATER RESEARCH COMMISSION

GroundTruth
Water, Wetlands and Environmental Engineering

WESSA
PEOPLE CARING FOR THE EARTH

ORASECOM

Citizen Science Biomonitoring Tools for Environmental Education and Community Participation in Freshwater Governance

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Wangari Maathai (10 December 2004)

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.

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Some of the problems around water resource governance…….

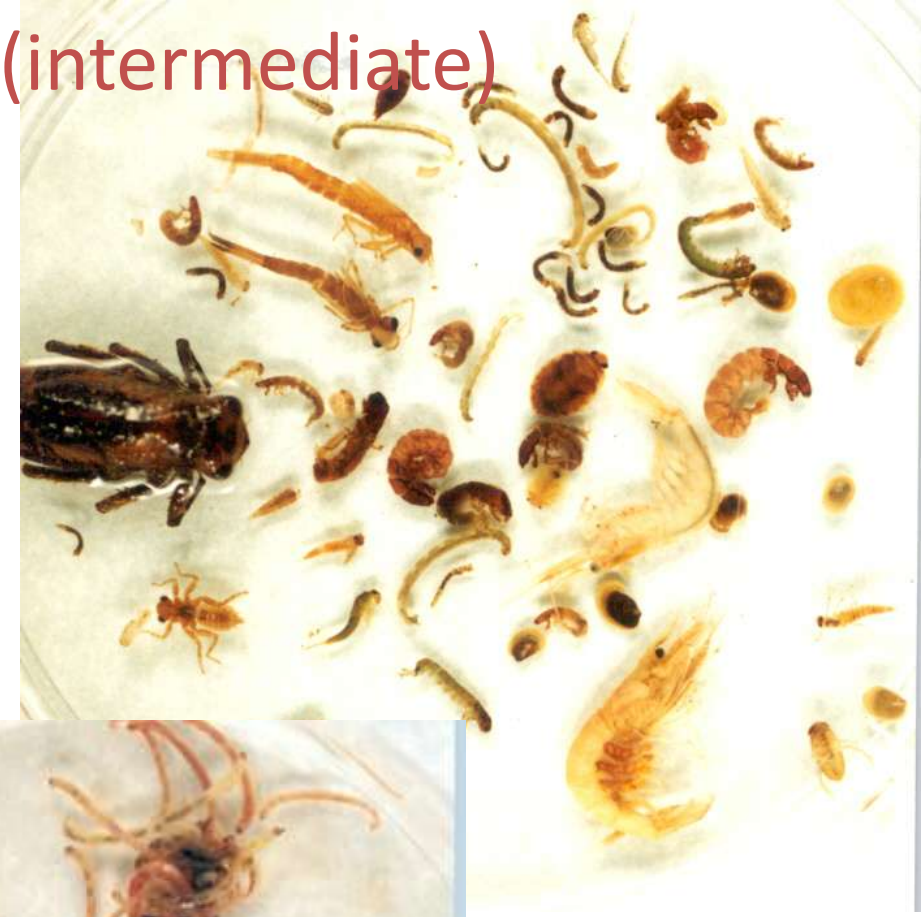
- Community understanding of rights and expectations
  - One of them being "to an environment that is not harmful ……"
- Pollution of freshwater resources
- Lack of flow – and what does this mean..
- Disconnection many of us have between our actions (what we consume) and its impact on the environment.
  - Poor understanding of ecosystem goods and services
- Other than – polluted water or no water
  - What about everything in between?
- The political and social will to tackle these issues
  - "Apparently" most pressing issues are dealt with first
  - The squeaky wheel gets oiled
- Social License to Operate
  - Corporates and government

miniSASS – Stream Assessment Scoring System - Summary

- Aquatic biomonitoring technique
- Derived from the South African Scoring System (SASS)
  - Aquatic biomonitoring with a long pedigree (over 30 years)
  - 90+ aquatic invertebrate taxa – used to derive river health classes
  - Distilled to 13 groups – capable of producing similar data to full SASS technique
- Low cost, low technology, environmental education tool
- Capable of producing “real/useful” bio-monitoring data – **Red** Flag indicator of problems

Good (sensitive taxa)

Fair (intermediate)



Poor (tolerant taxa)

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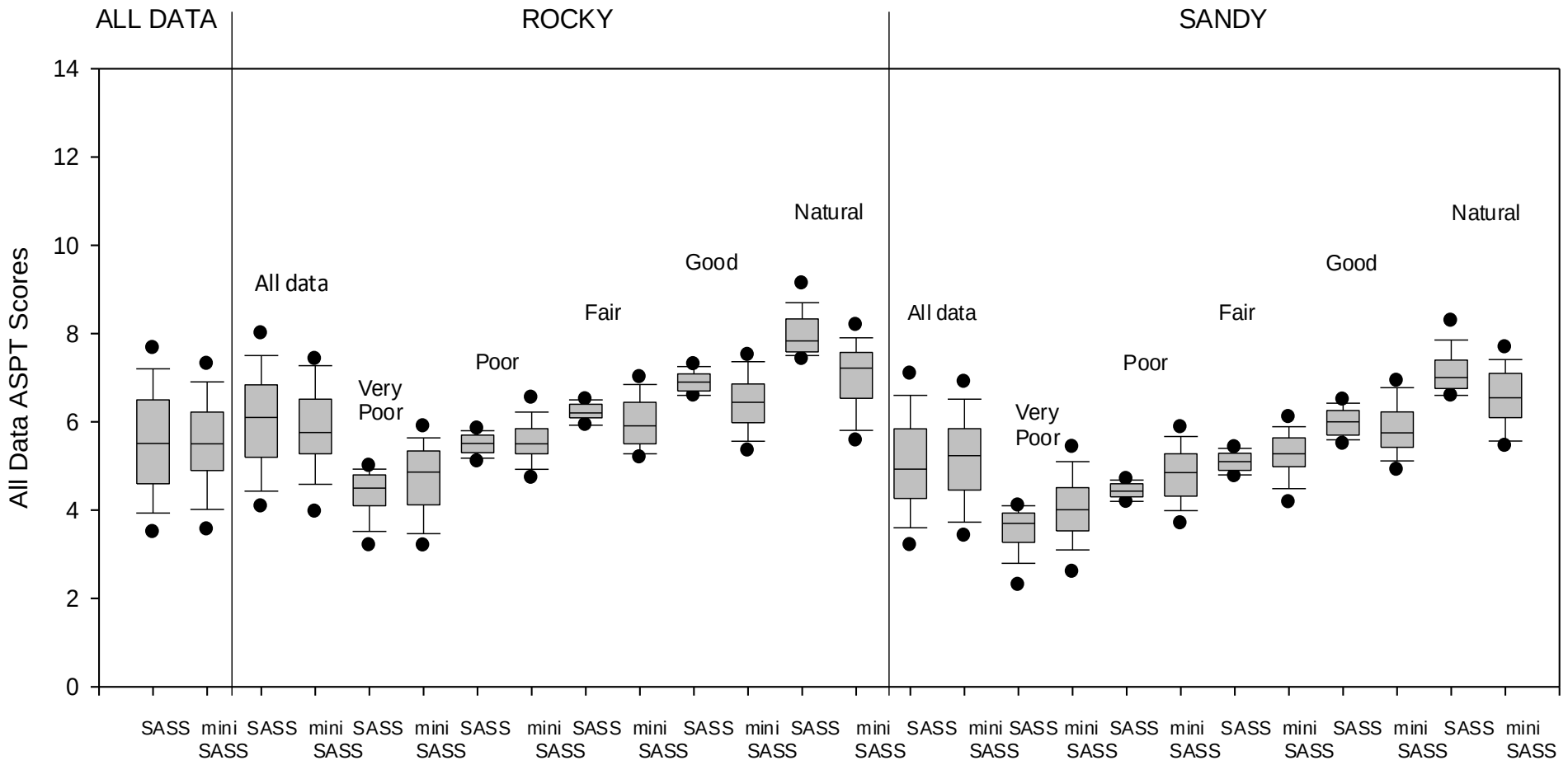
miniSASS – Stream Assessment Scoring System - Summary

- Used for over 10 years by environmental educators and the SA River Health Programme (RHP)

- Skills learnt
  - promote environmental understanding,
  - “contact” with the science/environment,
  - real “useful data” is possible
  - Indications of the state of the health of the river???

miniSASS – Stream Assessment Scoring System - Summary

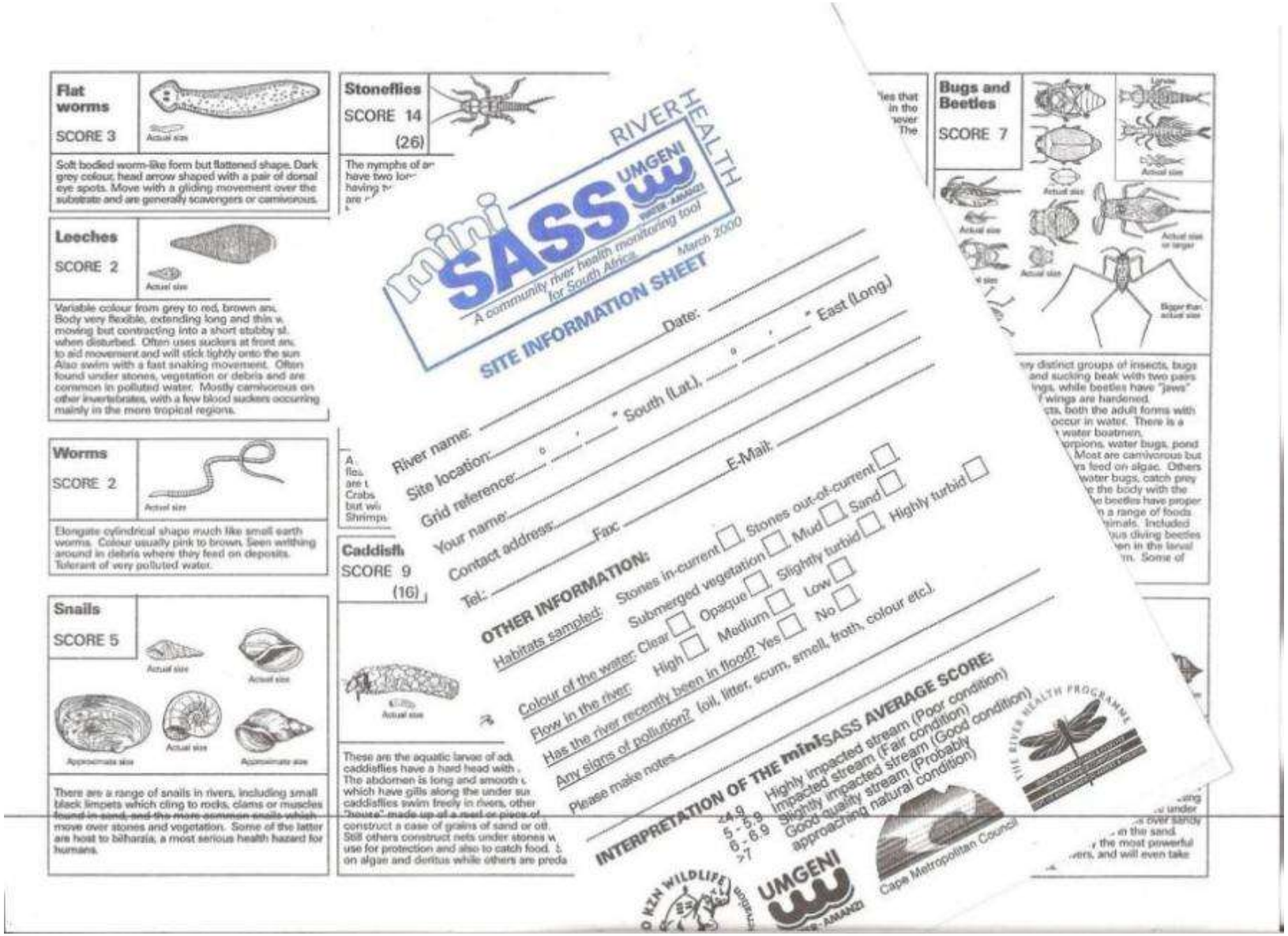


SASS and miniSASS Average Score Per Taxon (ASPT) per River and Ecological Categories

miniSASS – Stream Assessment Scoring System - Summary

	Difference between SASS5 & miniSASS2 Scores per intervals of 1 ASPT	*Frequency*	*Cumulative proportion of total number of records*
Entire dataset	≤ 1	5184	82.9%
(6,254 records)	1.1-2	978	98.5%
	2.1- 3	83	99.9%
	≥ 3	9	100.0%

Development of miniSASS



miniSASS materials

miniSASS
RIVER HEALTH
Stream Assessment Scoring System
A community river health monitoring tool

Version 2.0 **November 2011**

miniSASS can be used to monitor the health of a river and measure the general quality of the water in that river. It uses the composition of macroinvertebrates (small animals) living in rivers and is based on the sensitivity of the various animals to water quality. (note: miniSASS does NOT measure the contamination of the water by bacteria and viruses and thus does not determine if the river water is fit to drink).

Equipment list

- net
- white container / tray / ice-cream box
- pencil
- magnifying glass (optional)
- shoes/gumboots
- Hand wash / soap

How to make your own net

Take any piece of wire, for example an old clothes hanger, and bend it into the shape of a net. Then tie the netting (which can be any porous material) to the wire with a piece of string. And you have a net!

Method

The best sites are those with rocks in moving water. Not all sites have rocks (**rocky type** rivers), but may be largely sandy (**sandy type** rivers).

1. Whilst holding a small net in the current, **disturb** the stones, vegetation, sand etc. with your feet or hands.
2. You can also lift stones out of the current and **pick** insects off gently with your fingers or forceps.
3. Do this for about 5 **minutes** whilst ranging across the river to **different habitats** (biotopes).
4. Rinse the net and turn the contents into a plastic tray and **identify** each group using the identification guide (see insert: you could start with the dichotomous key and then use the identification guide for more information).
5. **Mark** the identified insects off on the identification guide.
6. Fill in the site information and **Add up** the sensitivity scores to determine the average score (see scoring sheet on back page).
7. Remember to **WASH** your hands when done!

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

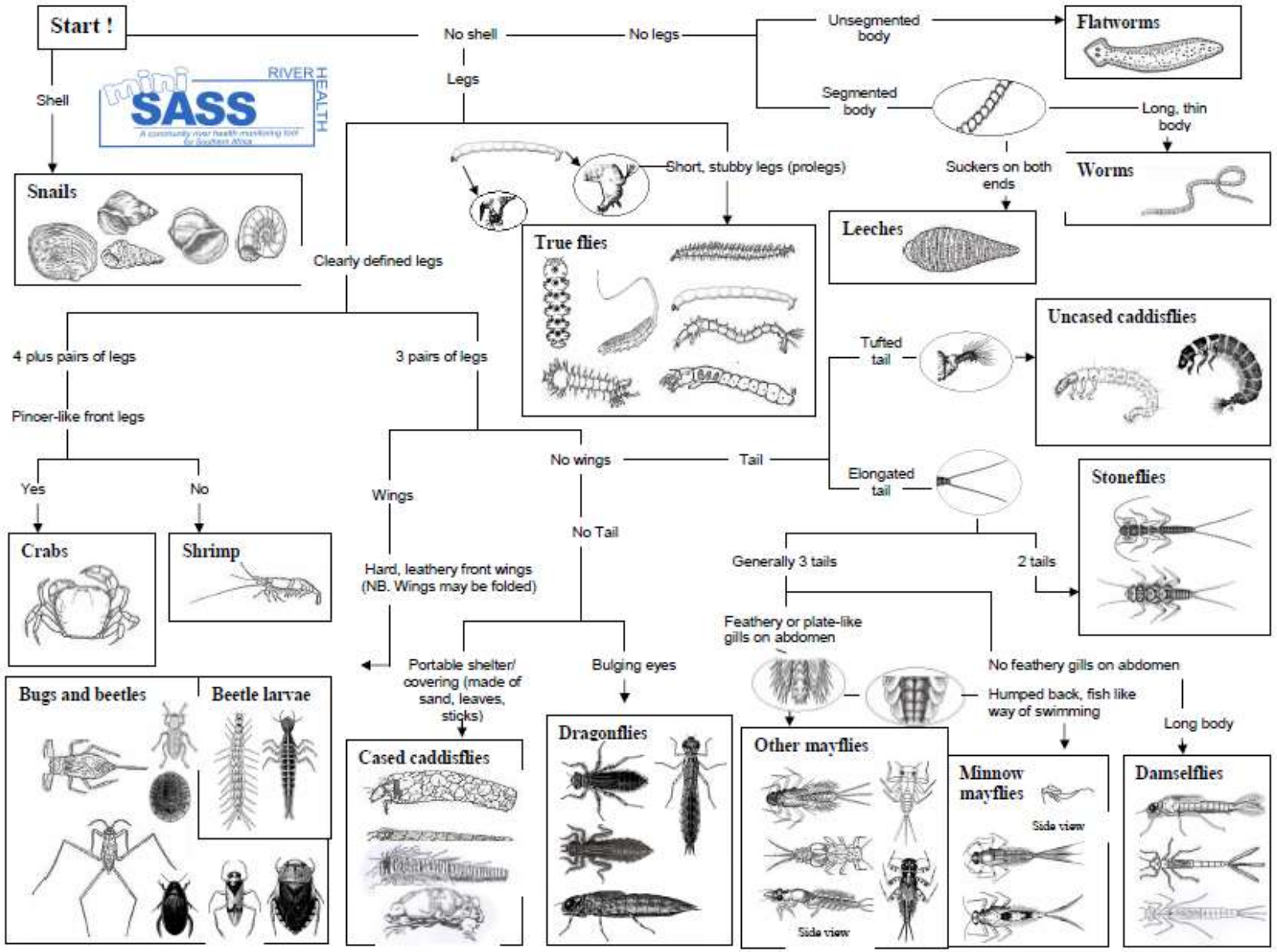
1. On the table below, circle the sensitivity scores of the identified insects.
2. Add up all of the sensitivity scores.
3. Divide the total of the sensitivity score by the number of groups identified.
4. The result is the average **score**, which can be interpreted below.

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

miniSASS field guides



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.

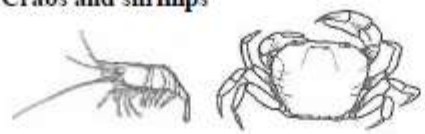
Worms

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

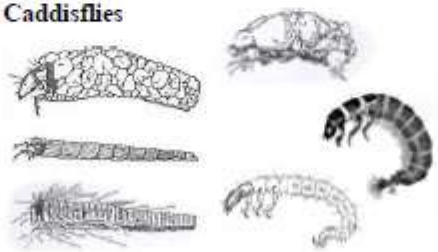


Crabs and shrimp form part of the order Decopoda (ten legs) and have bodies and legs hardened to form a tough shell. They have four or five pairs of legs and eyes that are carried on stalks and are movable. Crabs are scavengers that feed mainly on leaf litter but will feed on animals when given the chance.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

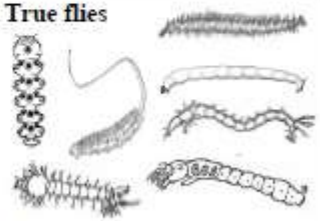
Minnow mayflies

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



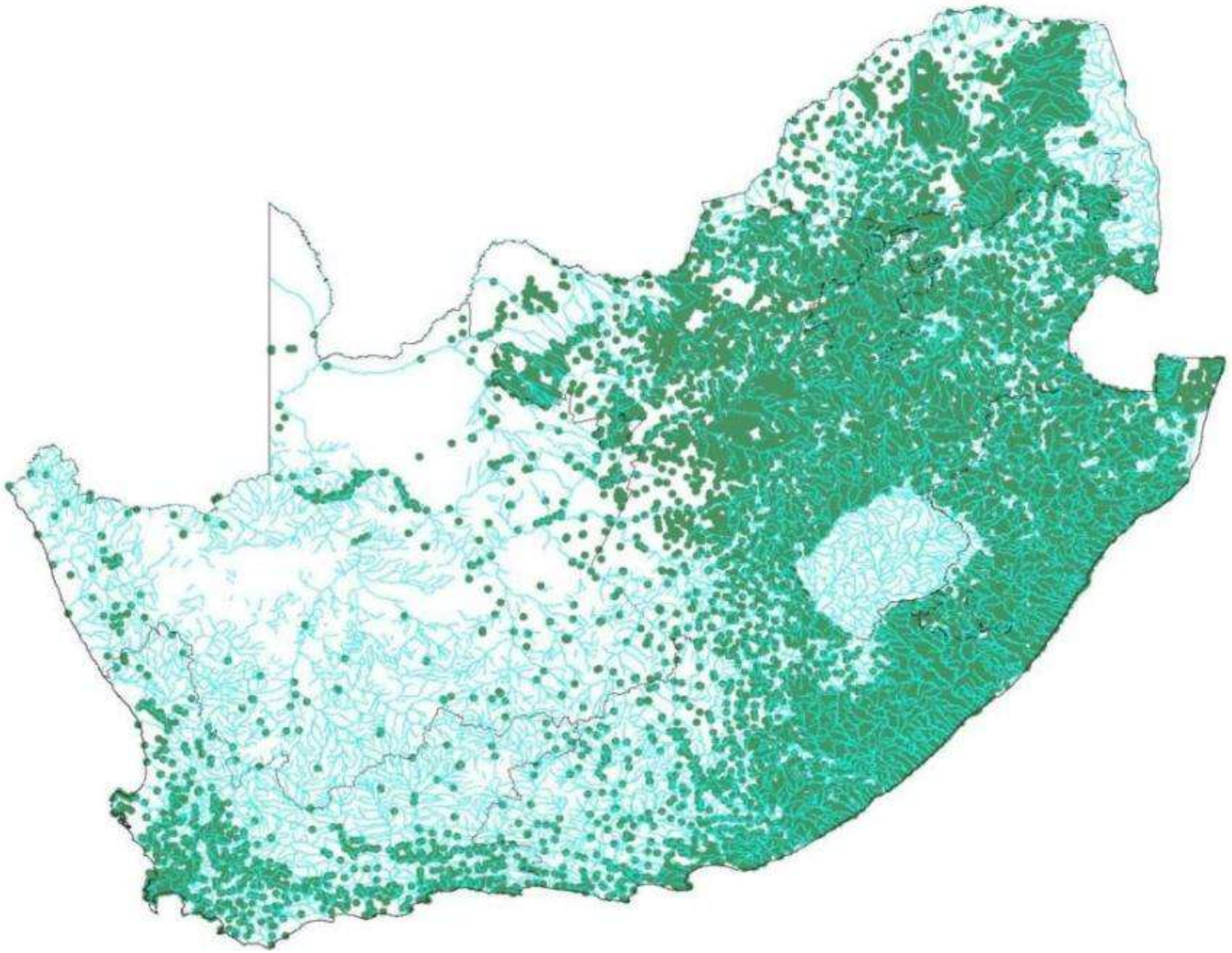
Most fly larvae have a fairly indistinct head but elaborate tail ends. They often have small, soft legs (prolegs), segmented bodies and have the appearance of maggots. Some have bristles/ spines and antennae. True flies live in a variety of habitats including sand, mud and stones in fast flowing water.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

miniSASS – Stream Assessment Scoring System - Summary

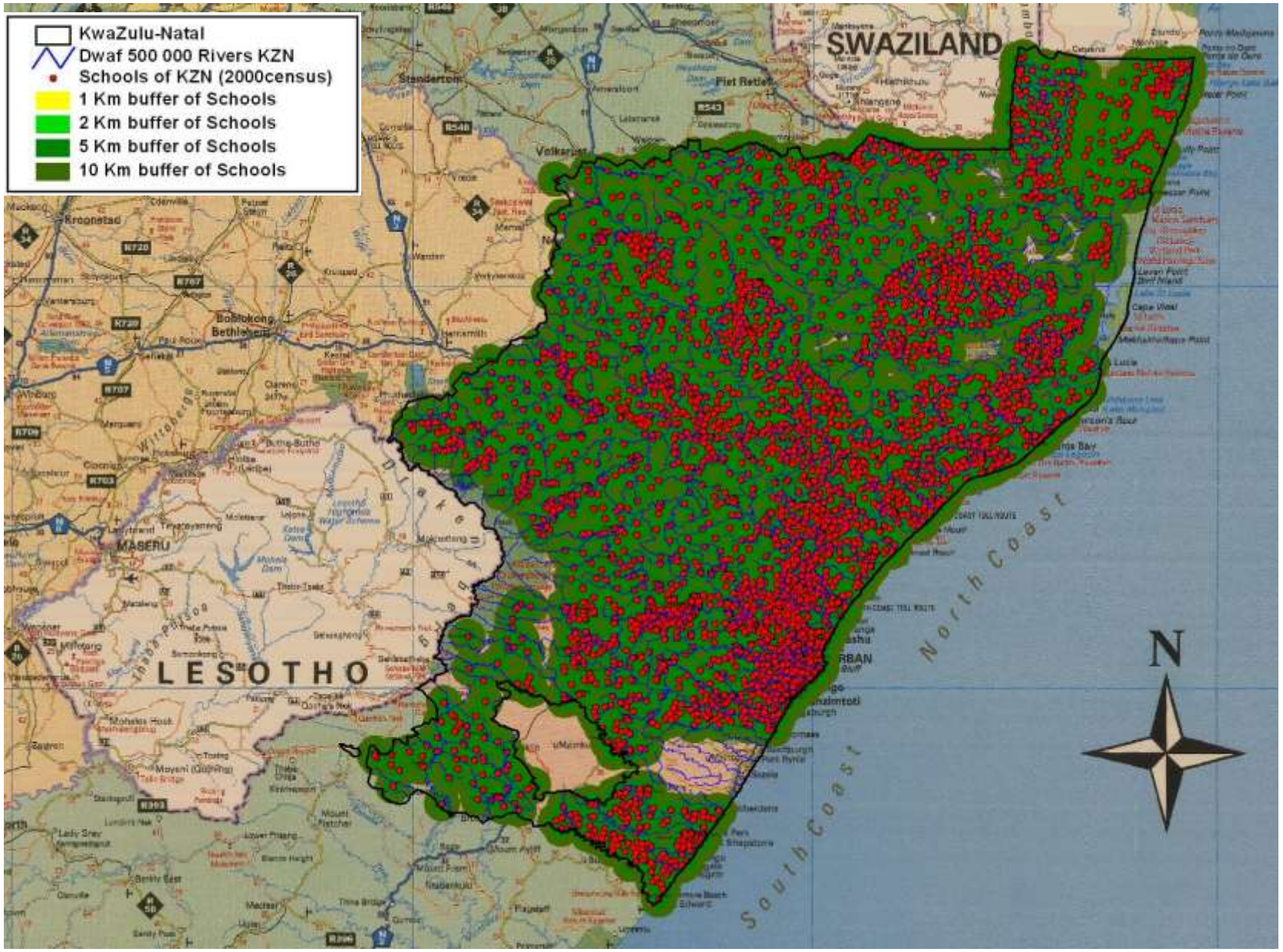
- So……..
- We have the tools to measure and monitor river health at the community level
- Increasing integration of environmental education into the curricula
- Skills learnt
  - promote environmental understanding,
  - “contact” with the science/environment,
  - real “useful data” is possible
  - Indications of the state of the health of the river???

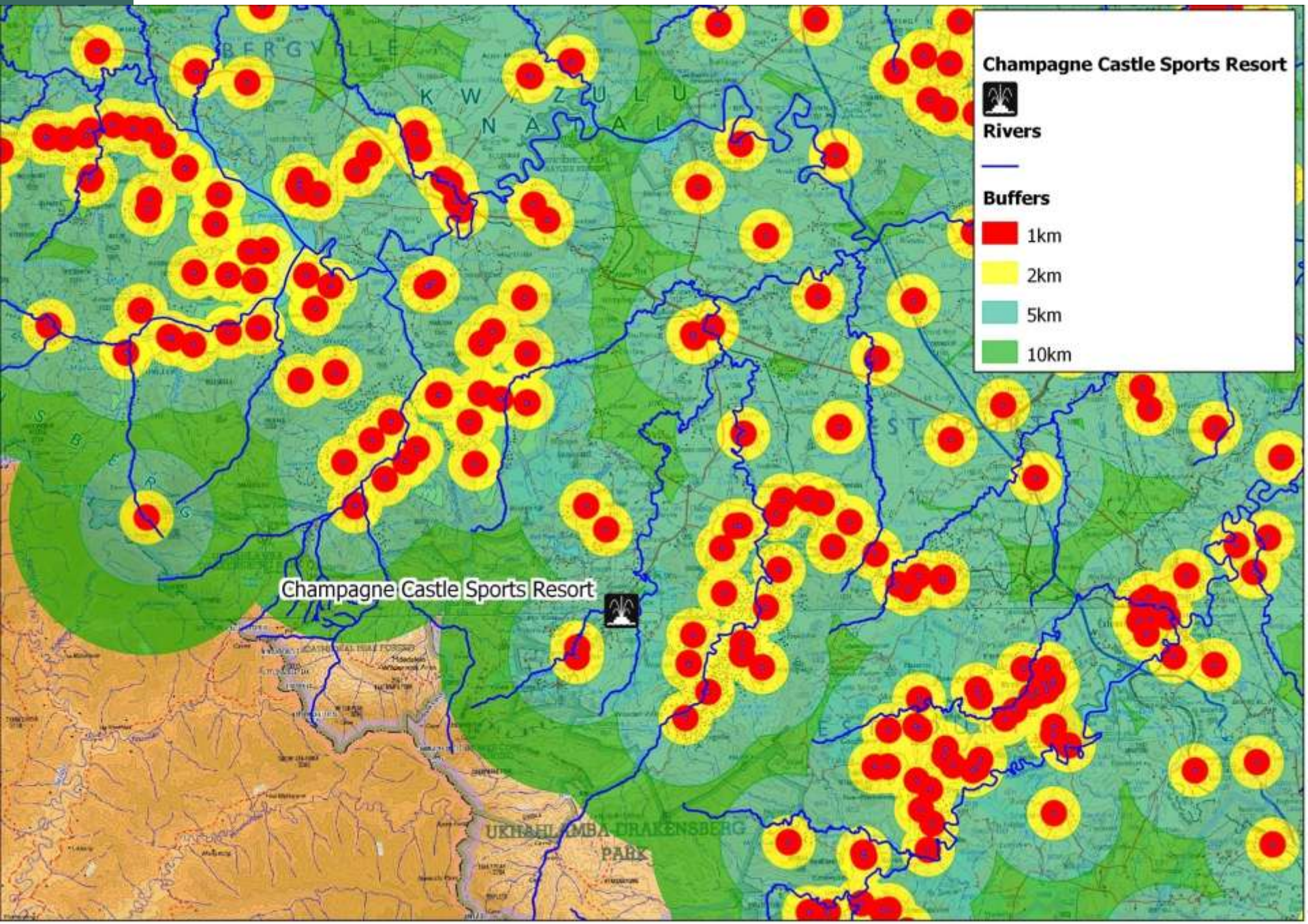
– Where to from here – SO WHAT?

The possibilities…….???
Spatial application and potential in SA

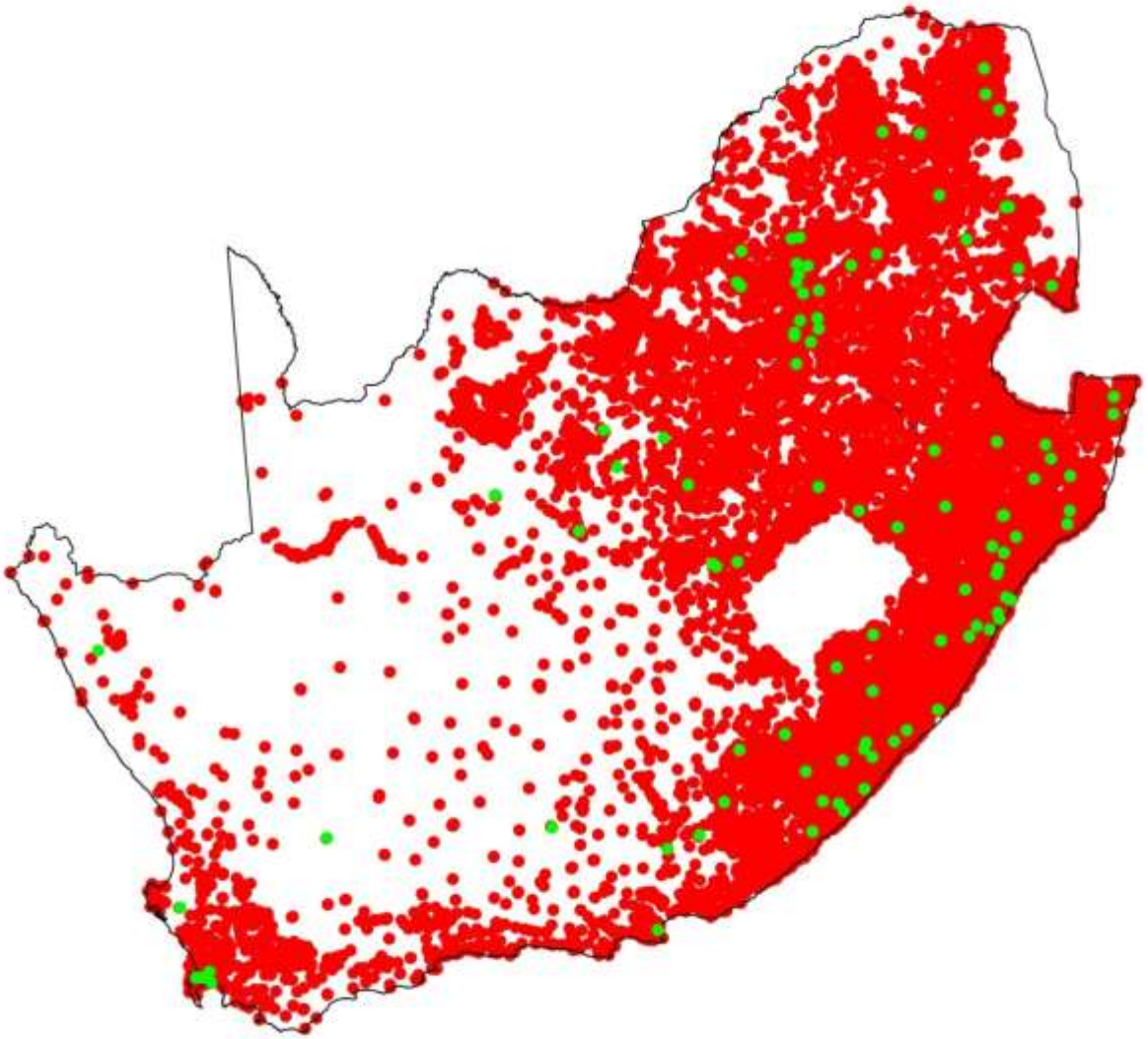


Schools & Rivers KZN

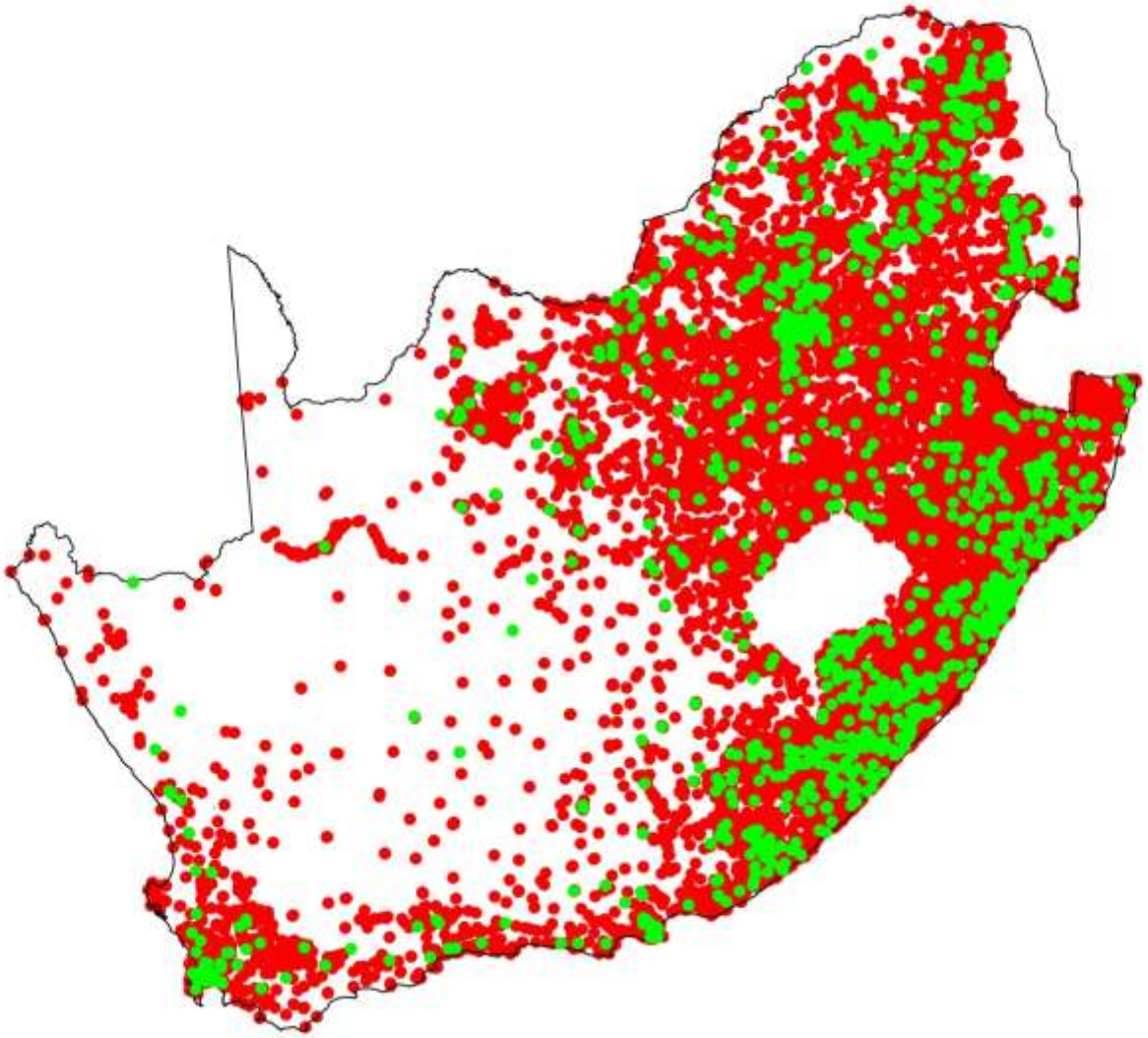



Champagne Castle Sports Resort
Rivers
Buffers
1km
2km
5km
10km
Champagne Castle Sports Resort
KWAZULU NATAL
UKHAHLAMBA DRAKENSBERG PARK

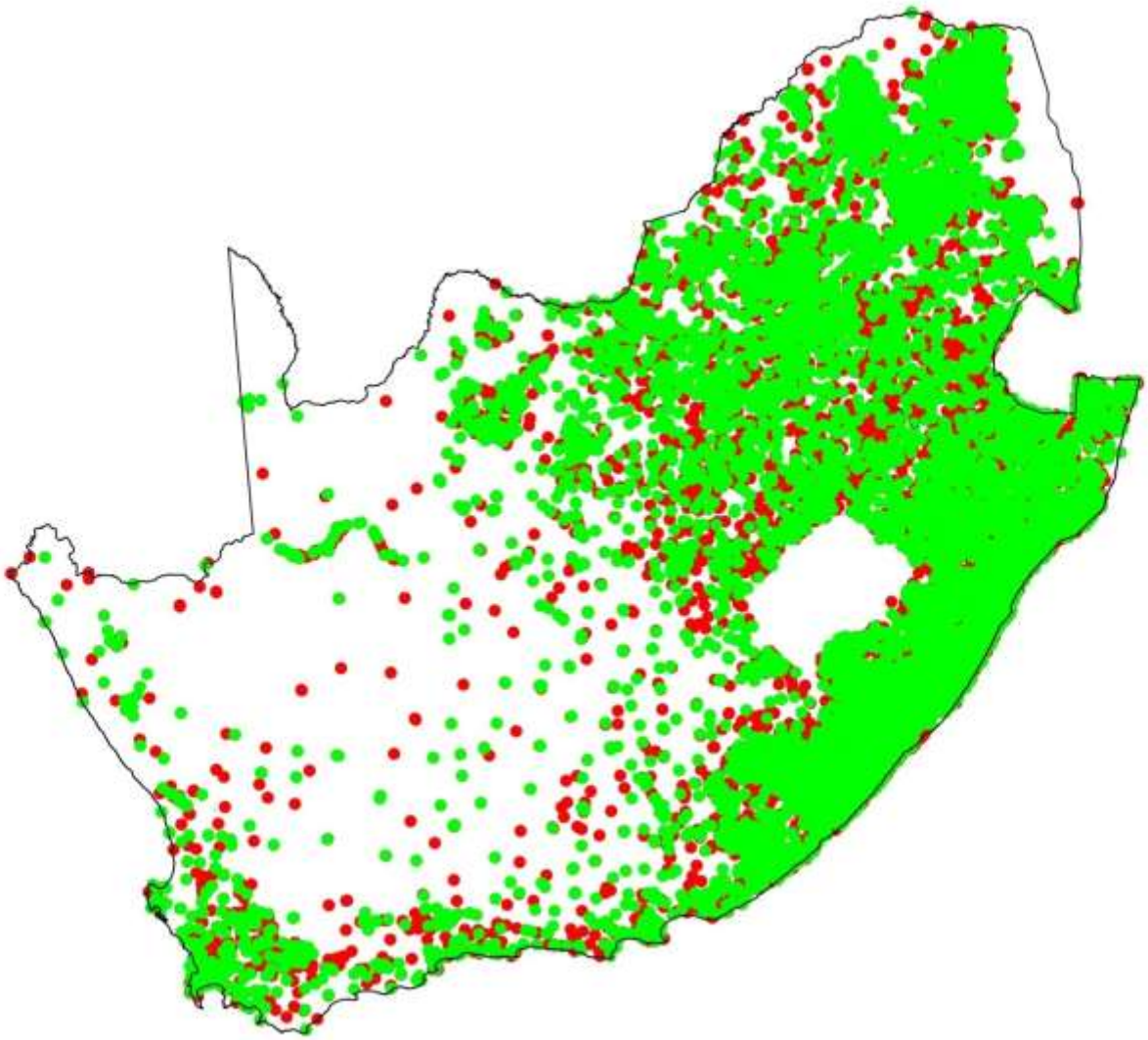
100 schools monitoring



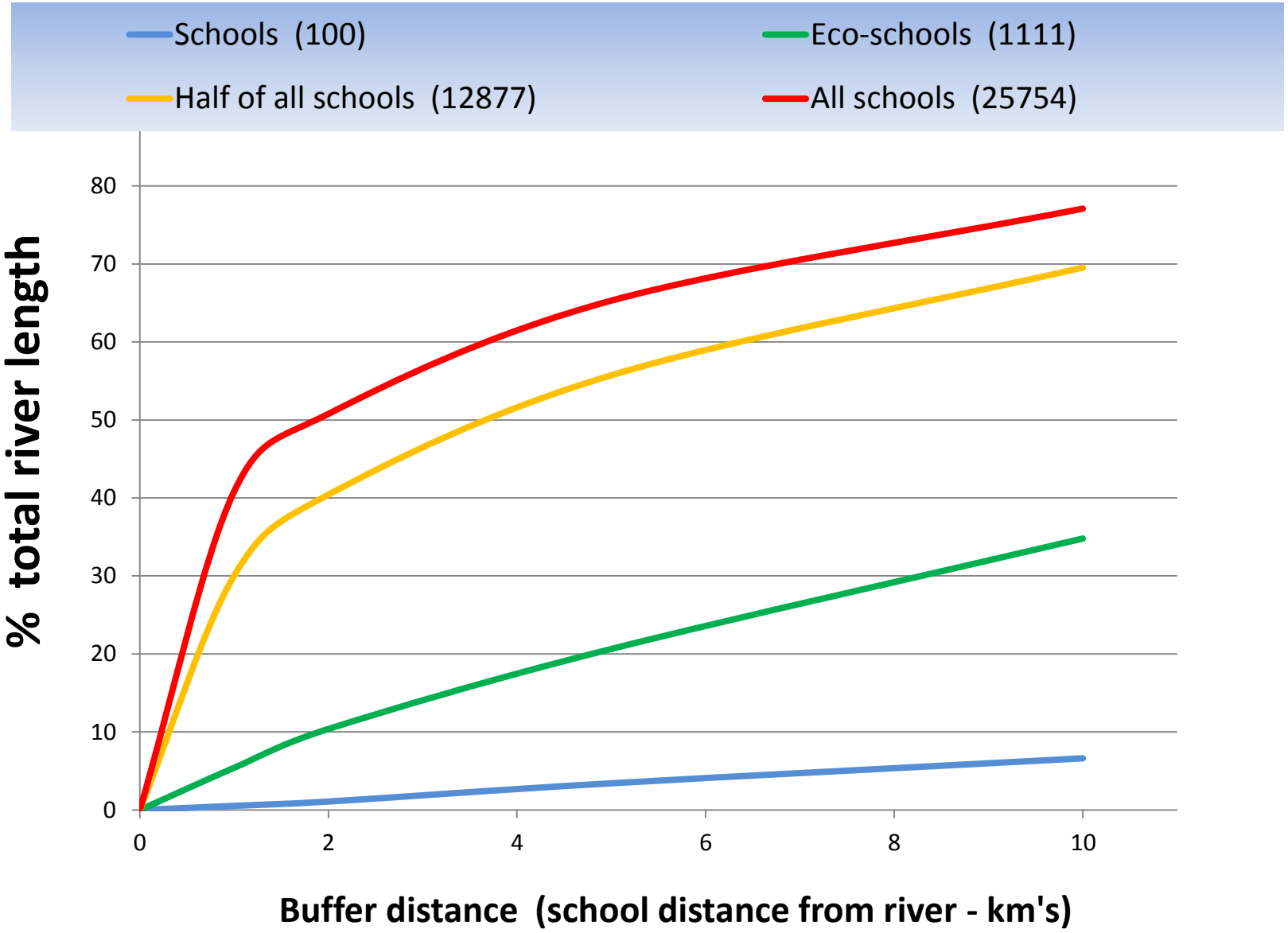
All EcoSchools (approx 1111) monitoring



50% of all SA schools (12877) monitoring



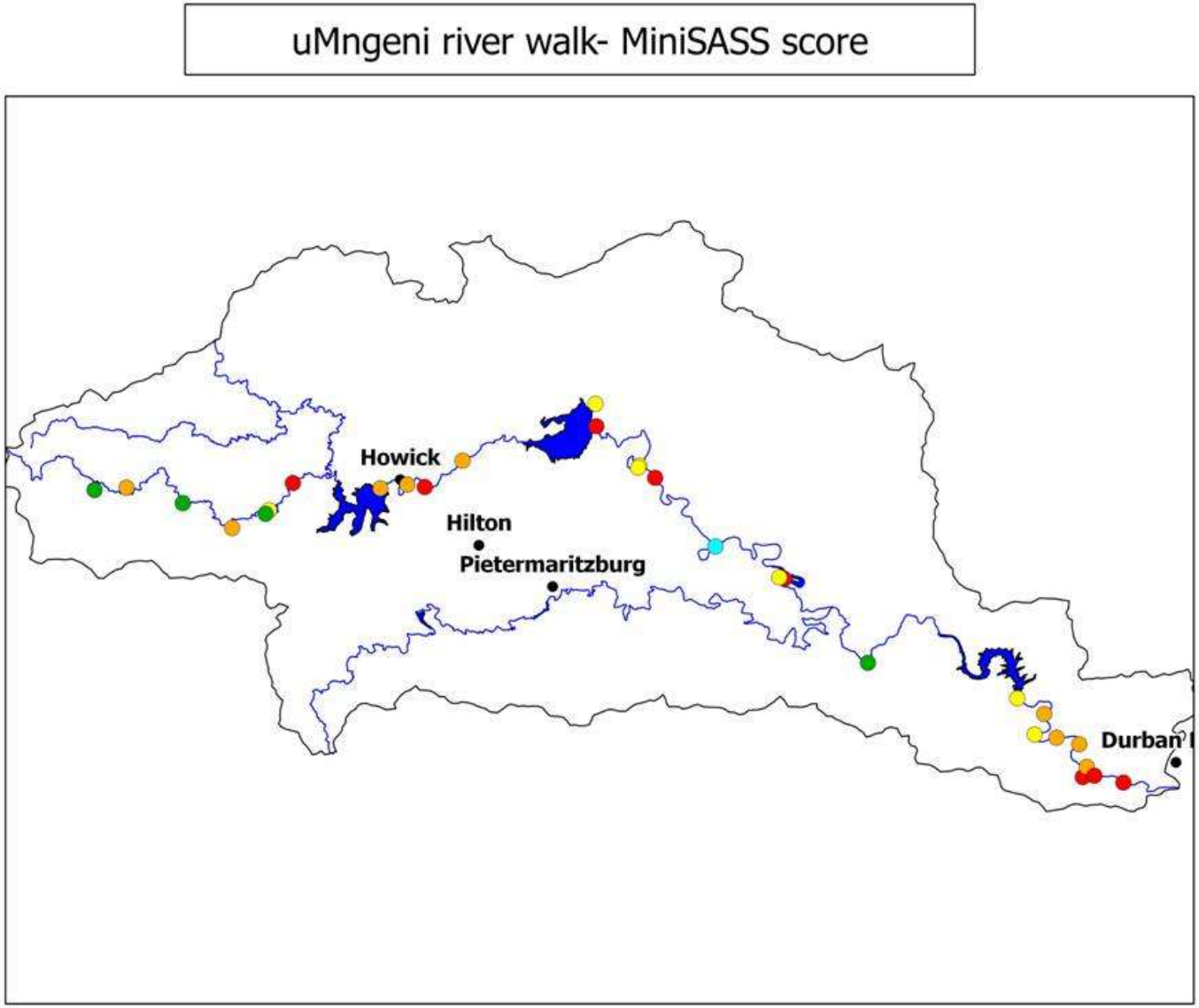
Schools & Rivers proximity analysis



Conclusion

- Cheap, effective tools
- Easy to learn – some of you already trained!
- Has potential to make a real change at the community level
- Eyes & ears on the ground – identifying Water Quality problems – **RED flag** indicator
- Connections made between broader catchment activities and Water Quality
- Community involvement & understanding of Water Quality issues
- The next generation of consumers, river health monitors and potential polluters(!) & next generation of leaders have some understanding of what aquatic ecosystems are all about
- Data platform/capture – the next phase ??
- Useful for monitoring uptake & use of School Box

miniSASS – current application



miniSASS – current application