

# Guidelines for the KCC Visual Audit (2005)

## Introduction

One of the key activities of the 2005 KCC programme is to conduct visual audits of pollution and invasive alien plants along “adopted” stretches of the upper Kowie River catchment (the “Kowie Ditches”) in Grahamstown. This guideline document is intended to provide information on how these visual audits can be carried out.

The idea is to keep the audits simple, while producing useful information that can help assess the condition of the river sections and their surroundings. It is also useful to look at the sorts of activities happening around the river, and the conditions in the wider area.

Champions and their groups who wish to conduct more detailed audits of water quality are encouraged to do so, and will be provided with the necessary information and equipment.

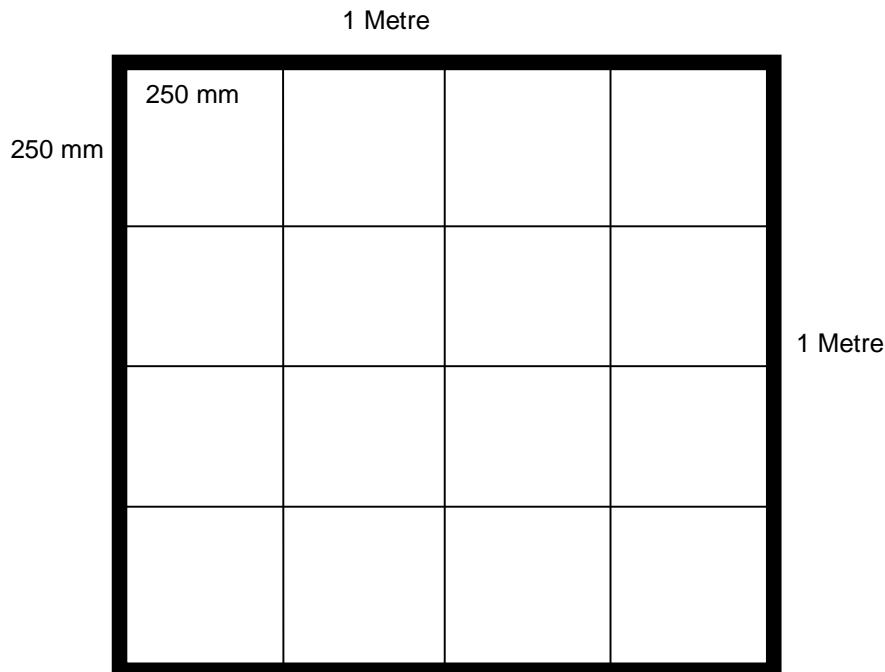
## Section A: Pollution

The focus is on the pollution that can be seen along your stretch. This will include the various types of rubbish or litter that are commonly found in and around the river sections.

### **Equipment needed:**

There is relatively little equipment required for this audit, and this comprises:

- Paper and pens/pencils
- Camera (if available)
- String (marked in 1 metre lengths) or tape measure
- A 1-metre square ‘quadrat’, subdivided into 16 sections (provided by the KCC)



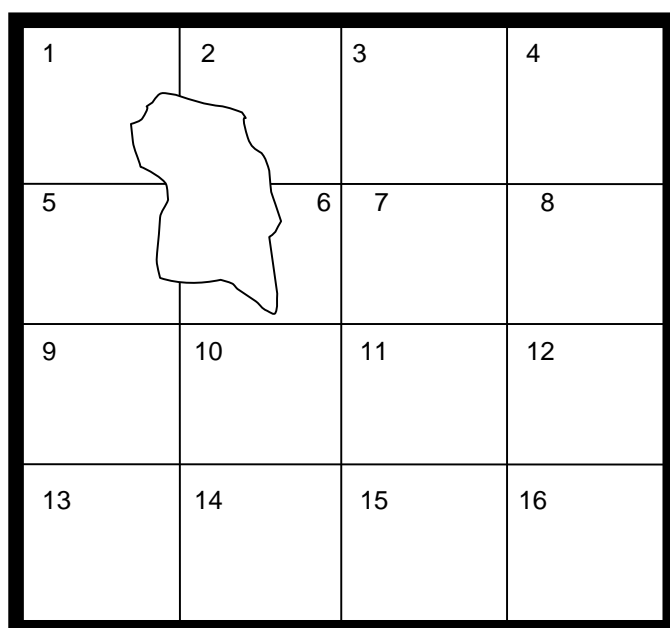
**Figure 1.** Quadrat, with outer wooden frame and inner lengths of fishing line secured to frame.

### Using the 'Quadrat':

The idea of using a Quadrat is to take sample measurements across an area, to help estimate the actual condition. The important thing is that we do not actually choose which bits to sample, but use methods that allow for random sampling. Enough samples have to be taken to provide a reasonably representative picture of the whole area. The two main different methods of sampling an area with a quadrat are:

1. **Taking samples at fixed intervals along a line** – This usually involves using a long tape measure stretched out along the area we wish to sample, and taking samples at every 5 or 10 m along the line (depending on the size of the area). If the area is very big, samples could be taken at regular intervals along a number of parallel lines across the area.
2. **Taking random samples** – This involves literally 'throwing' the quadrat within the area, and taking the sample wherever it happens to land. This is more fun, but take care not to damage the quadrat!

Whatever method you use in this audit, the quadrat will cover an area of ground of 1 square metre (note: quadrats can be different sizes, depending on what they are being used for). By dividing the quadrat into smaller sections, we can make more accurate assessments of what fraction is covered in rubbish. The quadrats we will use will be divided into 16 sections, each representing  $1/16^{\text{th}}$  of the whole. This is to make it easier to make the assessments of the levels of pollution as described above. See figure 2 for example.

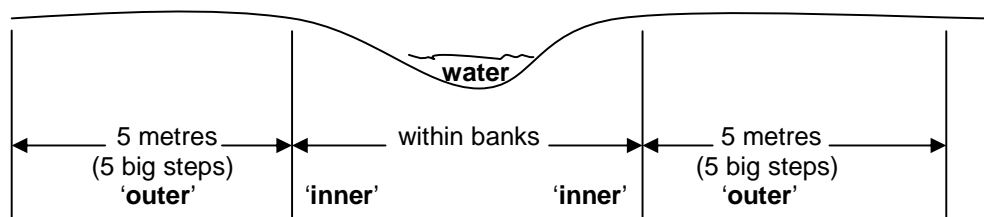


**Figure 2.** Example of measuring litter in a quadrat. This quadrat has only one piece of litter, which is covering parts of sections 1, 2, 5 and 6, but it is not covering any of them completely. Looking at how much of each section it fills, it would seem that it covers probably just over one section in total. This indicates just over  $1/16^{\text{th}}$  covered, and this quadrat on its own would be considered 'quite clean', according to the scale of pollution levels below.

Of course, results from one quadrat do not really tell us anything, so we need to do many more.

### The Scope of the Audit:

The audit should take place along the entire stretch that the group has adopted, and include a five-metre strip outside of the banks ('outer' zone), the area along the banks ('inner' zone), and the water itself, or where it would usually run ('water' zone). See Figure 3.



**Figure 3.** Cross section of a stream / river, showing area to be audited.

**Deciding how polluted the area is:**

This is done by estimating how much of the ground (or water) area is covered with litter/rubbish.

**Table 1.** Assessment of pollution level (scale)

Pollution level		Area covered
1	Clean	No litter/rubbish
2	Quite clean	Not more than 1/16 <sup>th</sup> covered
3	Quite polluted	From 1/16 <sup>th</sup> to 4/16 <sup>th</sup> covered
4	Badly polluted	More than 4/16 <sup>th</sup> covered

**Different kinds of litter/rubbish:**

There are many different kinds of rubbish that can be found in the river catchment. Common ones are:

- Plastic (bags, cling wrap)
- Plastic bottles, etc
- Paper / cardboard
- Foil packets, sweet wrappers
- Polystyrene
- Glass
- Food & drink tins/cans
- Other tins/cans (e.g. paint tins)
- Scrap metal
- Electronic parts
- Cloth/materials (clothes, carpets etc)
- Wood
- Rubber (old tyres etc)
- Building rubble (bricks, tiles, cement etc.)
- Garden waste
- Cut / fallen trees
- Human faeces
- Dog faeces
- Other animal faeces / dung
- Large complex items such as:
  - Old cars
  - Wheels
  - Beds
  - Other furniture
  - Full/split black plastic bags
- Other specific items such as:
  - Condoms
  - Syringes

**Process**

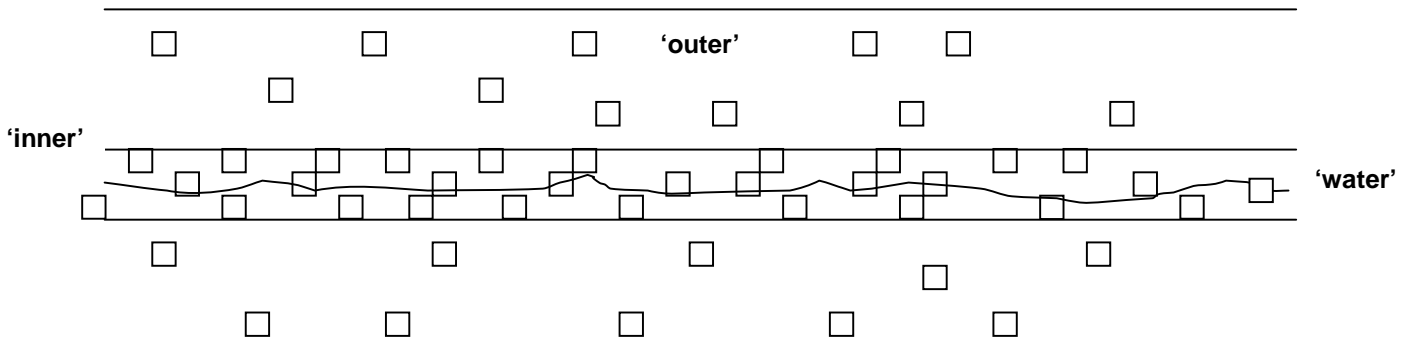
**1. Rough visual assessment of the pollution level of the river and surroundings:**

Ask different members of the group to make their own visual assessment of how polluted they think the area is (using the pollution levels described in Table 1).

It may be easier to look at each different zone ('outer', 'inner' and 'water')) separately. This will also be more useful in helping us work out where the greatest concentration of pollution is.

## 2. Quadrat scores – a more reliable measure of pollution levels:

- **'Outer'**: take 10 samples (either random, or along a line at fixed intervals) in each 5-metre strip outside the stream/river banks.
- **'Inner'**: take 10 samples along each of the banks. Take care when working along steep banks.
- **'Water'**: take 10 samples across the water itself (or where it would run). To take samples across the water, the quadrat will have to be held low over the water (but not touching it) by one person each side of the stream, while a third person records pollution levels.



**Figure 4.** Diagrammatic view of stream / river (from above), showing visual audit zones.

- For each sample:
  - (a) 'score' the estimated number of sections that are filled with the rubbish (see example above). Record these on the Audit Report Sheet (page 2) as the number of 16<sup>th</sup>s (there is a good reason for this!), e.g. 1/16 or 2/16 (*not* 1/8) or 3/16 or 4/16 (*not* 1/4), etc, and
  - (b) record the different kinds of rubbish on a separate sheet (an easy way to count is by making marks in batches of 5: e.g. |||| || = 7).
- You may have 50 different samples (20 from the areas outside the banks, 20 along the bank, and 10 across the stream). For each of these areas ('outer', 'inner', 'water') you can take an average of all the 'scores' for that particular zone.

For example, let's say your 20 scores are:

3/16, 1/16, 4/16, 2/16, 3/16, 1/16, 6/16, 4/16, 2/16, 1/16, 1/16, 3/16, 4/16, 7/16, 2/16, 1/16, 4/16, 3/16, 3/16, 2/16 (your 20 samples).

You need to add together all the 'top lines' (numerators): 3, 1, 4, 2, etc → in this example, we get a total of 57. Then divide your total by the number of samples (20). So, in this example:

$$57 \div 20 = 2.85$$

As 2.85 is close to 3, we would say the average fraction is 3/16. This means our 'area covered' is between 1/16 and 4/16 – according to our pollution scale (table 1, page 3), this is 'quite polluted'.

Now it is easy to see why we keep everything in 16<sup>th</sup>s! The calculations would become too difficult if we changed the bottom lines of the fraction (denominators).

- **Quadrat scores:** Record the number of samples, average score and level of pollution for the 'outer', 'inner' and 'water' zones on page 2 of your Audit Report Sheet.
- **Summary of main types of litter/rubbish found:** From your litter log of the types of rubbish found in all the quadrats, you will be able to identify which are the most common types. On page 2 of your Audit Report Sheet, record the different types in the order of how often they were found in the quadrats. For example: plastic bags (30 quadrats), glass (17 quadrats), paper (12 quadrats) etc.

## **Section B: Invasive Alien Plants (IAPs)**

The focus is on the invasive alien plants that can be seen along your stretch, including the banks and the wider area. This will include 12 kinds that are commonly found in and around the river sections in Grahamstown. The important thing is to get an idea of how natural or disturbed the river or stream is with regard to IAPs.

### **What are IAPs – and why worry?**

A plant that is 'invasive' grows and spreads very quickly, so that it pushes out other vegetation. A plant that is 'alien' comes from another area or country, so when it grows in this area it has no natural pests or diseases to control its growth. Invasive alien plants (IAPs) are thus a big problem:

- IAPs push out natural (indigenous) vegetation and reduce biodiversity
- IAPs upset the natural balance of our local systems
- Many IAPs stop rivers and streams from flowing properly
- IAPs use up water that is needed by local plants, animals and people
- Many IAPs burn easily, and so increase the danger of runaway fires
- Many IAPs are poisonous to humans
- IAPs cause millions of rands of damage in our country.

### **Invasive alien plants, the law, and you!**

By law (Conservation of Agricultural Resources Act No. 43, 1983), you are responsible for controlling any invasive alien plants on the property where you live. There are almost 200 different IAPs, which are divided into three categories:

- **Category I:** It is illegal to have these plants anywhere on your property. They must be removed immediately.
- **Category II:** It is illegal to grow these plants without a permit. They must be removed from urban gardens.
- **Category III:** It is illegal to buy or sell these plants. Existing plants may remain in your garden, but those growing within 50 metres of wetlands or streams/rivers must be removed.

### **Equipment needed for audit:**

There is very little equipment required. All you need is:

- Paper and pens/pencils
- String (marked in 1 metre lengths) or tape measure
- Camera (optional)
- Identification pamphlet (provided): 'The Kowie River catchment in Grahamstown – 12 common invasive alien plants'.

### **Using the identification pamphlet:**

The identification pamphlet is not comprehensive, but focuses on the 12 most common invasive alien plants that you are likely to find in our upper section of the Kowie River catchment in Grahamstown. Each plant description includes:

- the common name of the plant in English and in Xhosa (where possible), e.g. castor oil bush / umhlavuthwa
- the scientific name, in italics in brackets, e.g. (*Ricinus communis*)
- the IAP category
- a line drawing and description of the plant, including texture, smell and side effects (where applicable).
- the types of habitats that the plant usually invades e.g. rivers & streams, sides of roads & disturbed ground.

### Deciding on the level of infestation:

This is done by counting how many invasive alien plants are growing in the river/stream and surrounding area along your adopted stretch.

**Table 2:** Assessment of IAP infestation

Infestation level		Numbers
A	No IAPs	0
B	IAPs present	1 IAP in category III
C	IAPs pose a threat	From 2 to 4 IAPs in category III
D	Dangerous infestation of IAPs	5 or more IAPs in category III and/or any IAPs in category I and II

### Process

#### 1. Making the observations

- Ask two members of the group to hold your tape measure or string from one “outer” bank to the other. Take care when working along steep banks.
- Other members of the group can then identify what IAPs they can see along the length, using the pamphlet of Grahamstown’s 12 common IAPs.
- Record and count the number of each type of IAP, using the IAP log sheet on page 3 of the Audit Report Sheet (an easy way to count is by making marks in batches of 5: e.g. |||| | = 6.)
- If you identify other IAPs that are not listed, you can add these in at the bottom (under ‘other’) of the log sheet.
- Repeat this process approximately five times at evenly spaced intervals along your adopted stretch. You can keep counting (making marks) in the same block for each type of IAP.

#### 2. Working out the level of infestation

- Once you have completed all your observations, record the total number of each type of IAP that you have found in your adopted stretch.
- Record the category of each of the IAPs that you have found.
- Record the level of infestation in your adopted stretch using Table 2 above. For example:
  - 1 syringa (category III) would be infestation level B.
  - 2 syringas (category III) + 2 belhambras (category III) would be infestation level C.
  - 5 syringas (category III) would be infestation level D.
  - 2 syringas (category III) + 1 bugweed (category I) would be infestation level D.

#### Need more information?

- Henderson, L. 2001. *Alien weeds and invasive plants. A complete guide to declared weeds and invaders in South Africa*. PPRI Handbook No. 12, Plant Protection Research Institute, Agricultural Research Council.
- <http://www.ukuvuka.org.za/>
- [http://www.thewaterpage.com/invasive\\_alien.htm](http://www.thewaterpage.com/invasive_alien.htm)
- Working for Water: <http://www-dwaf.pwv.gov.za/wfw> or national toll-free helpline 0800-005.376
- Albany Working for Water: 046-636.1449
- Palmer, T., Berold, R. & Muller, N. 2004. *Environmental Water Quality in Water Resources Management*. Pretoria: Water Research Commission.
- Palmer, T., Berold, R., Muller, N., & Scherman, P. 2002. *Some, For All, Forever. Water Ecosystems and People*. Pretoria: Water Research Commission.

## **Section C: General surroundings**

In order to give a more complete idea of the state of the river or stream, it is useful to include pictures and information about the surrounding area. Record briefly on page 3 of the Audit Report Sheet, and attach any extra information or pictures.

**1. *Make notes on the surrounding area:***

Include information about the types of buildings (houses, shacks, factories, schools etc, if any), or if it is open veld, and the types of activities that are happening (cattle grazing, children playing, house building, etc).

**2. *If possible take photographs:***

Include the river itself, the banks, the 5 metre strips, and the wider area.

**3. *Make drawings of the area:***

Ask some of the group if they are willing to draw their impressions of the area.

## **Section D: Reflections and recommendations**

Now that you and your group have assessed the state of your adopted stretch, it is important to consider what can be done to improve the situation. It is equally important to realise that by taking responsibility for ensuring that these decisions are put into action, you and your group will be empowered and be more effective citizens. Record your ideas on page 4 of the Audit Report Sheet.

**1. *Reflection:***

Ask your group what they think needs to be done along your adopted stretch of river or stream. Make sure they give careful consideration to and discuss all possibilities.

**2. *Make recommendations:***

Make a list of recommendations about what should be done, and what assistance and equipment the group will need in order to do this. (This will be the beginning of your group's 'plan of action' for your stretch).

**3. *Comments:***

It is important that everyone has an opportunity to chat about how they felt about the audit process experience, and share these thoughts with the rest of the group.

## **Conclusion**

**1. *Deliver the Report:***

Take or send the report, and any photographs or drawings, to your main Kowie Catchment Campaign contact person. You may wish to make a copy for your group first.

**2. *Congratulate yourselves!***

You and the group deserve congratulations for doing this really useful work!

**3. *Feedback:***

The KCC education team would like to give their feedback on your efforts. This will take place at the next champions' meeting.

**Thank you for your contribution!**