Waterwatch ALT Accreditation Program

Prepared by **The Waterbug Company Pty Ltd**

The Waterbug Company Pty Ltd for consideration by Waterwatch Victoria

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Contents

Introduction

Waterwatch Victoria currently uses QAQC procedures that allow the physico-chemical data (water quality data) collected by its members to be assessed for its quality. This ensures that the various roles of Waterwatch - such as education and environmental monitoring - can be carried out without compromising either the utility, simplicity, or credibility of the data collected.

A State Data Confidence Framework and Guidelines have been established for water quality, and the purpose of this document is to outline a series of methods that will bring the collection of freshwater invertebrate data based on Agreed Level Taxonomy (ALT) into a comparable state. The QAQC methods in place for water quality are initiated at the state level, but enacted at a mix of state and regional levels. For example, the Corrangamite CMA has its own program that mirrors the overarching state plan. Eventually, various parts of the ALT training program and ALT QAQC program, will be distributable in a similar way. This is likely to occur as individual regional co-ordinators become more familiar with the method.

Currently Waterwatch data on freshwater invertebrates is considered to be of inconsistent value. Some volunteers and coordinators are quite clearly capable of identifying invertebrates to the level of Family (as considered necessary for most freshwater assessment methods), but many lack either the training or the equipment (dissecting microscopes) to do so. Assessments of efficacy[*] assume Family level identification and result in a varied pass rate that is difficult to attribute specifically to either training or a lack of appropriate equipment. QA processes for the ALT method will be simpler to interpret as the method does not require specialised equipment and so pass rates are directly attributable linked to the increasing abilities of the operators being assessed and the efficacy of the training provided. The three main tools for QAQC outlined in this document are: Training, Assessment (and accreditation), and Backup. The first part of the document deals with these generally, while the second part of the document steps through the process of sampling outlining where each of the QAQC components fits.

Training

While any QAQC program is ultimately about testing whether the data collected is consistent enough for various uses, often the potential errors and inconsistencies that will undermine it can be traced directly to flaws in methods or the way they have been taught. The following document details training objectives as an intrinsic part of the ALT QAQC program. If the training can be completed to varying degrees, the different grades possible, and the types of data they are associated with are detailed. Some of the simpler training objective (such as knowing about the seasonal timing of a sampling event) won't need testing, but care should be taken that they are addressed in the training.

There are assumptions inherent to training invertebrate identification that need to be acknowledged. While most physico-chemical water quality assessment methods can be taught quite simply, and repeatable methods can be established and tested objectively, the identification of invertebrates is a complex task that cannot be completed consistently without experience, regardless of the quality of the methods being used and the equipment at hand. As a result,

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[*] Waterwatch Victoria QAQC Week 2010 Report On State-Wide Results For Physicochemical Parameters And Macroinvertebrates, August 2010 prepared by Instream Solutions.

invertebrate identification needs to be taught in much the same way that people are taught to dive or drive a car. It is assumed that people **will not** be instantly able to identify invertebrates. They will need to complete a minimum number of sites or samples, and become familiar with the identification tools and the animals involved. Different operators will have different abilities, will learn at different speeds and the system proposed in this document allows on-going training, and acknowledges that different grades of accomplishment will yield data of different standards. Operators that are especially conscientious can be rewarded in the proposed system, by achieving/ maintaining ranks in much the same way that martial arts belts are awarded. This will hopefully foster a culture of friendly competition (that already exists) and allow recognition of those operators who have amassed considerable knowledge over the course of their Waterwatch involvement.

Assessment

Waterwatch recognises different minimum data confidence standards for a range of monitoring purposes. The standards are separated by differences in equipment used and the quantity of the QAQC/training required of the operators. For example the turbidity measurements for standard 2 can be taken with a turbidity tube, while standards 3 and 4 require more complicated equipment.

The four standards used for water quality are :

- standard 1 (education),
- standard 2 (education/data collection),
- standard 3 (data collation/education) and
- standard 4 (data collation).

Waterbug data is either usable for monitoring or it isn't. As a result, the collection of stream invertebrate data could be considered to fit into three standards. For comparability with the existing standards we simply consider the middle category a composite of standards 2 and 3. The standards are assumed to be hierarchical, so standard 2/3 is of sufficient rigour for education purposes should they be desired, and standard 4 can be supply data for all purposes.

- standard 1 (education),
- standard 2/3 (data collection),
- standard 4 (data collation).

These standards of data are different to the grades described in the following section (the main purpose of which are to break up training into manageable and attainable portions), but an operator that has achieved the Green grade (for example) can be considered to supply data of standard 2/3.

The standard 1 (education) can be considered equivalent to data collected by operators with Yellow or Orange grade accreditation. The data collection standards (2 and 3) are roughly equivalent to data collected by the green, blue or black grade operators, or brown grade operators providing they restrict their assessments to sites that are known to support the depauperate fauna they have been trained to identify, and they report any extra taxa they encounter (The Brown Belt, page 8 for more detail). Green level is the minimum required for an operator to supply useable data for monitoring purposes. Operators that are going to collate data from other operators, need to be trained sufficiently to spot anomalies in the data, this level of competence equates with the experience associated with the blue or black grades of the ALT grading system.

The ALT grade accreditation system

The ALT grade accreditation system uses multiple increments so that there are stages that can be attained by operators while they are still learning but before they are considered sufficiently trained to contribute to ongoing waterwatch data sets. The main purpose of these increments is to make the learning process rewarding and less daunting, and to partition the training into acquirable portions. The ALT minimum requirements acknowledge the difficulty of the subject matter and the fact that it will take time to learn.

Each grade has a set of pre-requisites, and this allows the qualifications to be built upon over time, and ensures that the basic skills have been acquired early on in the training schedule. This also means that the basic competencies listed for yellow are assumed for all subsequent grades. If these competencies are likely to need maintenance they are mentioned under the relevant tables.

All grades need to be re-accredited once every two years if the operator is contributing to a waterwatch data set. Re-accreditation can be done with minimum testing as listed beneath each table in the section titled "Maintenance".

Initially, a small excel-based table will be used to manage records of operators' training, eventually, this will need to migrate to the DSE owned database, and be linked to current records for each of the various Waterwatch volunteers/co-ordinators.

In the following tables, percentages and minimum requirements refer to pass rates calculated using **AT LEAST** 20 specimens. The specimens also have to be from different ALT taxonomic groups (ie they can't be 20 different species that all key out as "Family Dytiscidae, various genera (mixed diving beetles)"). If the testing includes extra points from pickles or photos, these need to be submitted in the same 6 month period as the original testing.

yellow   No pre-requisites.

Competencies	Minimum Standard Required
ability to collect habitat data	all habitats over 10% present - check and correct if needed
sampling technique	check and correct if needed
picking technique - rinsing	check and correct if needed
picking technique - efficiency	80%of the taxa. No common animals can be missed.
correct key use	check and correct if needed
identification - lumping	no lumping of abundant taxa (2 instances of lumped rare taxa is OK) check and correct if needed
identification - splitting	check and correct if needed
safety standards	coordinator assessed compliance with Safety standards[†]

Maintenance: Safety standards assessed by coordinator.

[†] http://www.waterwatch.org.au/publications/safety.html (NEED TO CHECK IF CURRENT)

brown Pre-requisite: prior completion of yellow

Competencies	Minimum Standard Required
can Identify a depauperate fauna	100% of simulated sample OR
can Identify a depauperate fauna	100% of pickles from 2 ongoing sites OR
can Identify a depauperate fauna	100% verified by green or greater coordinator in the field

Maintenance: Safety standards assessed by coordinator.

orange Pre-requisite: prior completion of yellow

Competencies	Minimum Standard Required
ability to decide on damaged or immature animals (no ID attempted)	check and correct if needed
E/P/T ID	separate Ephemeroptera, Plecoptera and Trichoptera with 80% accuracy
identification - ID correctly	60% of test taxa (min 20 taxa)
accurate to ORDER level	80% of test taxa (min 20 taxa)

Maintenance: Safety standards assessed by coordinator.

green Pre-requisites: prior completion of orange and a minimum of 1 year of experience sampling more than 2 sites

Competencies	Minimum Standard Required
identification - ID correctly	90% of test taxa (min 20 taxa)
accurate to ORDER level	by eye and without literature

Maintenance: Safety standards assessed by coordinator and re-accredited once every two years

blue Pre-requisite: prior completion of green

Competencies	Minimum Standard Required
identification - ID correctly	100% of test taxa (min 20 taxa)

Maintenance: Safety standards assessed by coordinator.

black Pre-requisites: prior completion of blue and attained blue and maintained blue/green for 3 consecutive assessments

Maintenance: Safety standards assessed by coordinator.

Each of these grades is awarded following a combination of formal assessment (run annually or as required alongside training, or as part of the Waterwatch Conference) combined with a number of pre-requisites. Prerequisites and test history need to be logged, pickles and photos can be used to supplement test scores but cannot account for more than half of the test animals :

- Number of sites sampled (like the RACV careful driver rewards badges or dive logs)
- Attendance at training sessions and scores
- Documented history of photos and pickles (see page 10)

The results from ALT QAQC sessions that grade operators provide two sets of information. In the first instance, they assess the overall abilities of each of the operators, but when this data set is considered as a whole, especially across multiple years. it reflects the efficacy of the training program. Waterwatch Victoria will hopefully be able to establish a set of goals -best expressed as the number of operators trained to a sufficient grade to provide Data collection standard bug sampling and identification - and then assess the training program for its ability to reach these training objectives.

The buddy system for data confidence

In most instances operators will be sampling in pairs at the very least (for safety reasons). This allows the teams of waterwatchers to be mixed up so that people with less training can be paired with more experienced operators. This allows the data generated by the sampling to be considered as though it was processed by the more experienced operator, and allows the less experienced operator to gain experience while still contributing to site assessment data in ways they wouldn't be able to alone or paired with operators of the same experience level. There is already a strong culture of guidance and teaching within the Waterwatch community, so this is already effectively in place and will simply need formalising.

The Brown Belt (Urban Ninjas)

In many urban areas the fauna involved in samples can be depauperate and consist of organisms that are quite simple to identify. In these instances, less experienced operators are able to identify the animals involved with greater consistency than they would at more diverse sites, so their data can be considered comparable to that of the more experienced operators. Considering operators with the brown belt to be capable of producing consistent data allows more data to be collected at these sites with greater ease. The brown belt accreditation is focussed on distinguishing the difference between the limited numbers of taxa at impacted sites. It is awarded under the proviso that the operator will either be assisted, or that if they find animals that are outside their experience they will either photograph, or pickle them as described on page 10. The presence of animals outside the training nullifies the data for use at higher confidence levels as the operators aren't trained to distinguish the types of animals involved. This also flags the site as requiring an operator with higher ranking for the next sampling event, . Sites areas that brown belts can operate in are to be decided on prior to sampling by Waterwatch co-ordinators and should include an appraisal of existing invertebrate data from the area.

Training / Assessment Criteria

The following sections detail the sampling process with reference to the various training objectives and associated assessment criteria. It is ordered as a sample would be taken to demonstrate the different stages where QAQC procedures fit within the process.

Site Selection

Two basic questions cover the main issues that can undermine a dataset at the site selection stage:

Is the site you are visiting the same as last year?

Is the season relevant?

The first question is important as it can influence the habitats (discussed in the next section) that are available for sampling. Continuity in staff, photo points and previous years habitat data can minimise the errors involved in site selection .

Waterwatch has traditionally sampled invertebrates for site assessments in either Spring or Autumn. This should continue, as all the available data against which Waterwatch data can be compared follows a similar sampling regime.

Habitat Data

Habitat data provides a coarse assessment of habitat or biotope diversity at the site. It also allows comparisons between dissimilar sites to be avoided. So for example, a rocky site would not be expected to have the same waterbugs as one dominated by sand and silt and plants. Storing habitat data alongside the waterbug data is an important part of the ALT methodology.

The ALT habitat sheets provide a standard set of habitat types for which a percentage cover is estimated The assessment should describe the composite sample that was taken from the site, and the site should reflect what is available at the site.. Limiting the habitats that can be described allows sites to be compared. Limiting the description of coverage to 10% units makes this part of the field assessment less time consuming and better reflects the degree of accuracy possible. Habitat data should be accompanied by photos of the site, especially if it is likely to be revisited.

Sampling

Sampling equipment and sampling methods need to be in line with those described in the ALT method manual. These can be checked in the basic field method assessment. Eventually a field equipment checklist might be a useful tool as small items such as specimen vials (which allow operators to examine specimens more closely) could be easily forgotten.

Bad weather / high water / drought conditions can effect a sample, so notes about these conditions need to be made on the Site habitat sheets.

Sampling technique needs to be assessed in the field. The operators being assessed need to bring the waders and nets and sampling equipment that they currently use to sample sites, and this allows it to be assessed as well.

Picking

As with sampling, the ALT method should be followed. This part of sampling can be assessed quite readily. Experience can pay a large part in how successfully operators can find waterbugs in a sample, and then how consistently they can separate them into groups. These two facets of the pick are assessed in the basic assessment, and a score (%successful compared to an assessors attempt at the same sample) can be assigned.

Waterbug Identification

Identification errors are complicated and are addressed mainly by the training program. The success of this program is assessed by testing waterwatchers as described in The ALT grade accreditation system on page 5. Mostly, these assessments allow the grading of operator ability, and tell us when people have developed sufficient consistency to be contributing to ongoing data sets, but when the scores for all waterwatchers are considered collectively, it can be considered a reasonable assessment of the training program/ materials themselves.

The basic assessment will offer two options to participants, a standard assessment using the invertebrates found at the field site where the assessment is being held, and a simulated impacted sample for those wishing to be assessed for the Brown belt (see page 8).

While the main method of assessment is based in the field, participants can bring along pickles (see page 10) which they have already identified, and have their assessment completed using these animals. This allows the operators to be assessed on animals that they are familiar with from sites that they are likely to continue sampling.

Data entry/ Database maintenance

The data entry and database maintenance QAQC are dealt with by existing measures. Eventually changes may be needed to incorporate ALT training logs. These will be maintained by database administrators/coordinators in the same way as water quality accreditation is currently managed.

Additional resources

Photos

Most digital cameras have reasonable macro functions these days, as do most of the smart phones. As a rule, a reasonable bug photo needs to let the bug take up about a third of the frame at least ...and be in focus.

Waterbug Face on Facebook is a facebook page to which you can submit photos of waterbugs that you are struggling to identify, or you would like confirmation on. Other users of the page (other Waterwatch people and the broader community) will help you if they can, and if they don't set you right, the page is moderated/serviced by The Waterbug Company for free, so we'll correct any inaccuracies or post an answer if possible. Hopefully this site will make the ID process a bit less daunting as you can get feedback on the problem bugs in your samples within a day or so.

Pickles

The Waterbug Company is also happy to confirm/check your identifications of bugs if you are comfortable pickling the waterbug in question and either bringing it along to an assessment or training day, or posting it to us if you follow the directions below.

Each specimen container should hold a single animal (preferably a good example). If you have lots of similar animals that you think are the same (but are unsure) pack them individually even if they have the same names on their separate labels. This allows us to correct them individually if they do turn out to be different. Specimens should be placed in small, plastic, screw-top, liquid-tight containers and preserved in 70% or stronger ethanol or methanol. Read the MSDS before handling this preservative and keep it away from naked flames at all times. There are important minimum labelling requirements for samples to be checked. Each specimen needs a small paper label with the following information written on it in pencil (pen will dissolve in the ethanol/methanol):

- ID (as far as you can)
- Location
- Date
- Your Name

An associated (coded) photo of the animal alive so you can remember it can help you next time you are looking at it alive in a tray somewhere. The animals will lose colour (and movement) once preserved.

To post pickled bugs:

Samples need to be in liquid-tight plastic containers (like the wee sample containers you can get from the chemist). Specimens are:

- preserved in vials with no more than 30 mL of alcohol or an alcohol solution;
- the vials are then placed in a plastic bag that is then heat–sealed
- the bagged specimens are then placed inside a another plastic bag with absorbent material, then heat sealed
- the finished bag is then placed in a strong outer packaging with suitable cushioning material (a padded envelope)
- the total quantity of flammable liquid per outer packaging must not exceed 1 L
- the completed package is marked "scientific research specimens, not restricted Special Provision A180 applies".

More detail can be found at:
http://www.casa.gov.au/scripts/nc.dll?WCMS:STANDARD::pc=PC_100324

Send Pickles to the address below, but contact me (John Gooderham -) before you send them so I know they are coming.

Address: The Waterbug Company Pty Ltd, 47 Pottery Rd, Lenah Valley, Tasmania, 7008.

Phone: 0447893519   Email: flatworm@ozemail.com.au

If there is a lot of interest in this we might be able to provide vials and packaging at assessment or training events so that people don't have to find all the materials themselves.