

Data Confidence and the future – Waterwatch Victoria’s direction

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Abstract

Over the past 12 months, Waterwatch Victoria’s focus on data confidence has become more strategic in order for community monitoring data to have a place beside professionally collected data in Victoria. A statewide Waterwatch Data Confidence Framework and supporting Guidelines were developed to clearly identify and recognise community data collected for various purposes and with varying scientific rigour. The framework and guidelines have been synthesised regionally through the development of 11 regional Data Confidence Plans, which detail all aspects of regional onground monitoring activities. The development of the DC Plans have seen many regional Waterwatch programs streamlining their monitoring activities and developing consistent procedures and documents for their monitoring activities. The plans have also facilitated greater communication between Waterwatch programs, catchment managers and sponsors, clarified monitors’ expectations, roles and responsibilities, and are providing a vessel for monitoring program continuity during staff and monitor turn over.

The statewide framework, guidelines and regional data confidence plans are the platform that the Waterwatch Victoria program will use to identify and place datasets of known quality onto the Victorian Data Warehouse in 2005. Having statewide community-collected data online and alongside professionally collected data is a significant advancement for Waterwatch and will be a first for Australia.

This paper will outline the Victorian climate that lead to the development of the statewide Data Confidence Framework, guidelines and regional plans. The progressive development of data confidence over the last 6 years will be discussed, as well as the benefits of regionalising data confidence. The future direction and challenges for Waterwatch Victoria are also discussed.

The Waterwatch Program in Victoria

Waterwatch Victoria is part of a national community-based monitoring network with the goal of involving community groups and individuals in the protection and management of waterways. The program raises awareness and understanding about water and catchment health issues to stimulate activities to achieve the vision of “healthy waterways”.

The Waterwatch program started 12 years ago and has since grown to a network of 45 coordinators, involving 15 000 people in monitoring activities and a further 62 000 people in water education and awareness activities in 2004. A range of organisations, including Water Authorities, Catchment Management Boards, non-government organisations and government departments, currently host the program. A major strength of the program is its flexibility to be able to deliver outcomes that satisfy hosting bodies’ requirements, whilst maintaining the broader purpose, core values and objectives of the Waterwatch program.

Water Resource Management in Victoria and the role of Waterwatch.

In 2004, the Victorian government's "Our Water Our Future" policy emerged as the state's key Water Resource Management strategy. The water reform policy identifies six key objectives, amongst which are actions listed in the Victorian River Health Strategy (VRHS). The value and role of community monitoring is clearly articulated in the VRHS, both for its education and capacity building outcomes and its monitoring outcomes. A number of community objectives are proposed in the VRHS, including

- Community monitoring programs such as the Victorian Waterwatch Program will continue to develop tools and training aimed at increasing the value and useability of the data collected by communities.
- Catchment Management Authorities (CMAs) will develop partnerships with regional community monitoring networks to provide additional monitoring to support regional management requirements.
- Data collected through community monitoring programs will also be made available through the Victorian Water Resources Data Warehouse.
- Community training programs will continue to be developed through programs such as Waterwatch and Landcare to provide the community with the skills to participate in monitoring and on ground rehabilitation activities.

This policy platform and increasing emphasis on creditable data led the Waterwatch Victoria program to review its approach to data confidence.

Community monitoring – Meeting expectations

Raising the profile of community monitoring and promoting the use of community data for management and decision making has meant that Waterwatch data is often under the spotlight. Meeting the expectations of community monitors and decision-makers is a major challenge for regional programs. This was clearly evident during the Victorian Waterwatch 2004 review where volunteer monitor's primary concern was for their data to be used for natural resource management decisions (Thompson 2004). However, some decision-makers have questioned the validity of community data, despite pressures from state and federal strategies for regional projects to back up their decisions with data from a range of sources.

Most governmental derived data in Victoria comes from the collective efforts of the Victorian Water Quality Monitoring Network (VWQMN). In 2004 the VWQMN captured data of known value at over 148 sites throughout Victoria. Paralleling VWQMN monitoring efforts in 2004 was Waterwatch, where more than 750 community groups captured information at over 1400 sites. Participatory statistics like this create an obvious opportunity for community data to compliment professionally collected data on a catchment wide scale, especially when community data is collected consistently and of a known quality.

Data Confidence and Waterwatch (1998 – 2004)

The Waterwatch Victoria program has invested considerable time and effort over the last 5 years to highlight the strengths of Waterwatch data. Waterwatch aims to identify the quality of community data, increase the transparency of Waterwatch monitoring activities, and provide greater access to Waterwatch data. The time series below highlights major advancements in data confidence over the last 7 years.

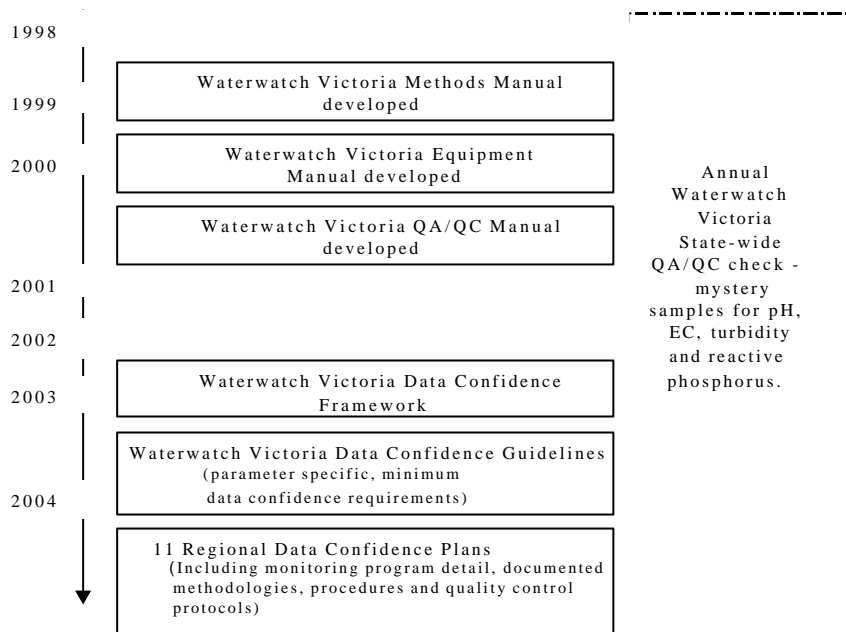


Figure 1: Waterwatch and Data confidence processes for the last 7 years between 1998 and 2004.

1998 - 2002

In 1998 quality assurance measures were introduced into the Victorian Waterwatch program. Waterwatch Victoria developed three resources to encourage standardised monitoring methods, appropriate selection of equipment, and the use of Quality Controls.

Also in 1998, Waterwatch Victoria through Water Ecoscience developed a QA/QC process through the use of a series of 'Mystery solutions', stable solutions of known chemical make-up designed to audit regional and catchment programs. This system allowed coordinators across the state to assess the competencies and equipment reliability of results.

This significant step heralded a new chapter in Waterwatch Victoria's quality assurance processes. Since 1998, six yearly audits have been conducted, with physico-chemical (electrical conductivity, pH, turbidity and reactive phosphorus) and biological parameters (macro invertebrate order and family identifications) tested. This evolving activity has empowered the coordinator network to make better decisions about equipment choices and monitoring methodologies, the amount of training required to monitor consistently and accurately, and also refines monitoring strategies and plans. As a result of this self-appraisal mechanism, the Waterwatch program has seen steady improvement in the level of compliance with quality limits since 2004, despite staff and monitor turnover. Results from two years are compared, note that there is a significant increase in compliancy between 1998 and 2004.

Table 1: Percentage compliance of 4 physico-chemical tests for 1998 and 2004. Results taken from Waterwatch Victoria's annual audit program.

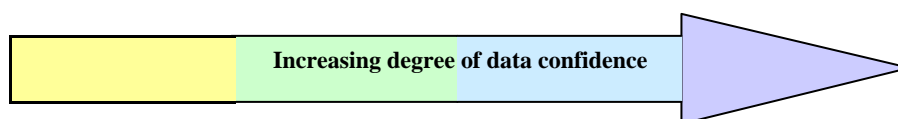
Audit parameters	1998	2004
Electrical conductivity	62	86
Turbidity	80	79
Reactive phosphorus	21	72
pH	55	89

2002 - 2004

Whilst the QA/QC mystery solution activity has been very successful in highlighting overall data confidence across the state, it does not necessarily reflect the varied monitoring objectives and/or desired rigour of regional Waterwatch programs at the operational, day-to-day level. Recognising that current and potential data users would benefit from understanding the range of monitoring objectives (and associated data quality) at both the regional and state-wide scale, Waterwatch Victoria has developed a state-wide data confidence framework (Refer to table 2).

Table 2: Waterwatch Victoria's Draft Quality Assurance and Quality Control framework for the implementation of a Quality assurance and Quality control program in the Regions.

Waterwatch Victoria Data Confidence Framework Physical-Chemical Water Quality Monitoring				
Data Confidence (DC) Standards	Standard 1	Standard 2	Standard 3	Standard 4
Monitoring Purpose	Education and Awareness	Education focus with data collection 'spin-offs'	Data collection focus with educational 'spin-offs'	Data collection
Recommended equipment	Type, Range, Resolution and Accuracy			
Standard Methods	Calibration, sampling/measurement, Quality Control mechanisms, Record Keeping			
Competencies	Coordinator and Monitor competencies			
Regional Performance Evaluation	Regional accuracy/precision checks (eg. mystery samples, parallel testing)			
State-wide Performance Evaluation	State-wide performance evaluation/accuracy checks (eg. QA/QC week mystery sample event)			
Monitoring Frequency	Random	Once a year (eg. Snapshots) to quarterly	Quarterly (minimum)	Monthly (minimum)
Database	Spreadsheet and/or local Waterwatch database Waterwatch Victoria Snapshot Database (EC, turbidity only)		Regional Waterwatch Database Victorian Data Warehouse (late 2004)	



Challenges to develop Waterwatch Victoria's data confidence framework meant that an extensive consultation process needed to be in place. Both regional Waterwatch programs and

the States water quality monitoring and assessment committee (SWQMAC) were engaged to ensure that both community engagement and technical merits were in focus. The framework acknowledges that both volunteers and partners become involved in Waterwatch for different reasons, and with different expectations, resulting in a tiered approach to data confidence. Four tiers or standards for data confidence allows for both the educationally aspired or data focused group to be represented whilst conducting monitoring activities.

In addition to the data confidence framework as shown in Table 2, specific data confidence guidelines have been developed for individual water quality parameters, the Waterwatch Victoria Data Confidence Guidelines. These parameter-specific guidelines were developed to identify minimum data confidence requirements for the four standards identified in the state-wide framework. The guidelines have been generated from an awareness of the range of monitoring equipment used within the Waterwatch network for different monitoring purposes, and also minimum requirements for producing and demonstrating data of known quality.

The state-wide framework and guidelines have been adopted regionally and interpreted into a regional context through the development of Regional Data Confidence Plans. The plans define and describe all aspects of a region's Waterwatch monitoring program, including standard operating procedures and QA/QC checks (where appropriate). Data users interested in knowing more specific information about the quality and validity of regional Waterwatch data sets are encouraged to view regional Waterwatch Data Confidence Plans.

The plans have a dual purpose. Firstly, the plans encourage informed decision making about the quality of Waterwatch data by openly and transparently detailing specifics about regional monitoring programs. Secondly, the detail within the Data Confidence plans will help to maintaining continuity, and momentum, of regional programs during the turnover of staff and/or monitors.

Regional Data Confidence Plans – the Wimmera experience

Brad Hollis, Wimmera Regional Waterwatch Coordinator.

Background:

Volunteer community groups have been collecting valuable water quality data in the Wimmera region for the past ten years as part of the Wimmera Community Waterwatch (WCW) Program. Quite often, the data collected within this extensive network is the only data available for particular sites. The contribution of this information to regional natural resource management frameworks, in filling spatial data gaps and in supporting other monitoring efforts shouldn't be understated. It is therefore imperative that our water quality monitoring techniques are well documented and that the data collected within this network is of a known and credible standard.

The Data Confidence Plan pledges to breakdown the misnomers that community collected data is contentious and is of little scientific value. The Wimmera Community Waterwatch Program currently has 115 registered community groups, monitoring 913 environmentally significant sites, boasting more than 5650 historical data sets. These are impressive numbers that should be used to further “value-add” to the region’s information base.

In 2004, Landscape and Social Research Pty Ltd conducted an extensive Review and Evaluation of Wimmera Community Waterwatch. Key recommendations and issues from this Review then formed the foundations for the WCW Strategic Plan (2004-07). This Strategic Plan places a high priority on community water quality monitoring activities and reaffirms the importance of developing a Data Confidence Plan for current and potential data users.

The Need:

Through the management of all regional Waterwatch programs, there comes a time when you have to make some fairly important decisions on the efforts of volunteers in collecting water quality data.

Is your Waterwatch monitoring carried out simply to facilitate education? Or is it something that you want to take more seriously and have a dedicated network of volunteers collecting meaningful and important water quality data at environmentally significant sites, to a known and reliable standard, which external organisations are going to want to access?

The wide distribution of Waterwatch volunteers means that data that they collect at remote locations is quite often the only data available for that particular site. The potential significance of this data therefore is quite substantial to a whole range of external data users. The importance of collecting this data to a known and reliable standard, to ensure the credibility of the information to external users is paramount.

There have always been scientific stigmas surrounding the validity of community collected data. It is therefore essential, if you would like the efforts of your volunteer water quality monitors to retain any sort of credibility, to formally document, through the development of a Data Confidence Plan (or similar), every aspect of the monitoring activities of your volunteers.

The Process:

The nature of this document means that you really can’t afford to leave any stone unturned. Every aspect of your monitoring program, from equipment used, to training, collection and sampling techniques will need to be thoroughly documented. There’s no hiding that this can be a fairly drawn out and tedious process, but the potential benefits far outweigh the process of developing the necessary frameworks for documenting data confidence.

The importance of establishing any sort of credibility will revolve around your ability to be honest about what is really happening locally, on the ground, within your network of volunteer monitors. In a perfect world, we would have all of our monitors collecting data to the same very high standard. They would all be submitting weekly data sheets, and their spatial distribution would mean that every one of their sites would be highly significant environmentally, and that the entire catchment would have an even coverage of sites and monitors. Realistically, this is very difficult (if not unrealistic) to achieve.

The benefits:

I've touched on the benefits earlier, but the appeal of external organisations in using data which is credible, spatial, and plentiful is dramatically increased through the documentation of a Data Confidence Plan.

Organisations wanting to broadly use community collected data are going to want to be reassured of its scientific integrity. The Data Confidence Plan helps achieve this. Through their nature, some academics and scientists are going to want to undermine the credibility of volunteer data, and instinctively look for any holes in your monitoring efforts. If your Data Confidence Plan completely documents your monitoring program, there will be no opportunities for the sceptics to find these information "holes".

In terms of broadening the appeal of your Waterwatch Program, in addition to the many educational stakeholders that would be attracted to your line of work, there are many more organisations that would be interested in your monitoring efforts. The potential to build new partnerships (including financial sponsors) with a range of external organisations will be increased. Your Waterwatch Program should also be more financially secure through the adoption of a Data Confidence Plan; as National, State, and local investors will want to support your efforts from both a monitoring and educational perspective.

Waterwatch Victoria - Where to from here?

The primary outcome from the regional Data Confidence Plans is to have community data accepted by the environmental management community and increase its use in decision making processes. An important factor in this is making community data more accessible to current and potential data users, for initial perusal as well as use. Significant effort has gone into improving the data management resources used by the Waterwatch program. These steps will facilitate the merging of high quality Waterwatch data alongside professionally collected water resource monitoring data on the Victorian Data Warehouse (www.vicwaterdata.net). It is anticipated that this merging process will be under way by early 2005. This merge is generating much interest from data users, with the Data Warehouse already receiving enquiries about when Waterwatch data will be online.

Once all 11 regional data confidence plans are developed, the next challenge for the statewide program will be the development of a monitoring and evaluation framework that will allow us to evaluate how successful the data confidence plans have been. This could be a measure of how well the plans realistically reflect what is being practiced on the ground, and/or a

measure of whether the higher emphasis on data confidence is in fact producing good quality data. This framework is in its early infancy and will likely come to life in late 2005/2006.

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