

Case study



Ambient (routine) monitoring

Community water quality monitoring for the Maroochy River

Background

This case study focuses on community-based waterway monitoring undertaken by Maroochy Waterwatch from 2003 to 2004. Monitoring was undertaken by community volunteers, financial support was provided by Maroochy Shire Council, and technical support was provided by the Environmental Protection Agency and the then Department of Natural Resources and Mines (now Natural Resources and Water).

The Maroochy River catchment covers the eastern area of the Maroochy Shire, which is located approximately 100 kilometres (km) north of Brisbane. The Maroochy River drains a natural basin covering an area of approximately 400 square kilometres (km²), and is one of very few river systems in Queensland to be contained entirely within the one local council boundary. Over the past 20 years, the area has experienced a high rate of residential growth, with the population now exceeding 136 000.

In recent times, several water quality issues have been identified in the area including:

- urban stormwater run-off from unprotected building sites, gardens and roads
- unvegetated and eroding water courses
- rural run-off from agriculture and grazing land
- water from sewage treatment plants.

Project objectives

Project objectives, developed in response to the identified water quality issues, were to:

- collect sufficient data in order to provide a general characterisation of water quality
- determine the specific cause of variations in water quality away from the norms
- identify priority areas to address in order to improve the water quality of the Maroochy catchment.

Study design

The study was conducted throughout the Maroochy River catchment from January 2003 to June 2004. A key component of the project was community involvement, with close to 100 volunteers contributing to the data collection. The catchment was divided into 11 subcatchments, with over 140 sampling sites spread throughout the area. The sites were chosen based on their:

- representativeness of variation in the catchment
- strategic location
- custodial connection to members of the community
- accessibility.



Level one physico-chemical tests (including pH, conductivity and salinity, dissolved oxygen, turbidity and temperature) were conducted by volunteers on a monthly basis. A minimal amount of training in conducting tests was required to produce quality data. Additional macro-invertebrate and nutrient monitoring was conducted at a number of sampling sites, which provided data on ecosystem processes to complement the interpretation of tests.

Monitoring methods

Level one physio-chemical tests were carried out by Waterwatch volunteers using Horiba U-10 multi-probe water analysers. Each volunteer was trained in using the Horiba probe. Readings were taken either directly from the water body if depth allowed, or from a carefully collected bucket sample representative of the water body. Readings were taken at approximately the same time each day. Data was recorded on record sheets that circulated with sampling kits as well as on the volunteer's personal record sheet.



Personal records were used to detect any inconsistencies with the monitoring instruments, to act as a data back-up and for verification once the data was centrally collated and reported. All test kits were cleaned and calibrated weekly by the coordinator. Volunteers were alerted to problems with instruments through the monthly newsletter.

Macro-invertebrate samples were taken as biological indicators of the Maroochy River catchment from ten sites within the five major subcatchments. Sites were selected to represent the range of different land uses—including agricultural, commercial and residential—along waterways. An insect net was used to sample four habitat types—edge, riffle, pond and riparian vegetation—within each site.

The macro-invertebrates caught were transferred into separate sorting trays and their classification was aided by the use of identification sheets and reference books. Total taxa richness (TR) and pollution sensitivity index (PSI) was calculated for each site. Further explanation of methodologies used can be found in the monitoring report.

To ensure data confidence, quality control checks (shadow testing) were undertaken with the Environmental Protection Agency at a number of sites on an annual basis.

Data management

Blank data sheets were compiled in separate folders for each water testing equipment unit. All folders and units were labelled for consistency. As the kit circulated, each volunteer added their completed data sheets to the envelope. During weekly and monthly calibration by the program coordinator, the completed forms were removed from the folder, arranged in chronological sequence and placed in the office folder for all raw data.

Once a month, raw data was entered into a Microsoft Excel spreadsheet. The data was then checked for any obvious outliers by the coordinator. A pivot table with the number of times collected, maximum and minimum was then used to find discrepancies and these were rectified. Ten random spot checks of data records were also undertaken to check for accuracy and validity. Values were identified as outliers if they were outside the 'normal' range—between maximums and minimums—from previous years' monitoring.

The data was then graphed and any further discrepancies identified and rectified. Also at this point in time, the calibration logs were entered into the computer in a similar fashion. Data was deleted if it lay outside the pre-determined tolerable error range or was found to be from malfunctioning equipment.

Once all the accuracy and validity checks had been undertaken, notes were made on data sheets to indicate why any data was changed or deleted in the spreadsheet. The data sheets were then

returned to the office folder for storage. The spreadsheet was resaved under a different name to indicate that data had been checked and verified. At the end of the reporting period, the monthly datasets were combined into a single spreadsheet for statistical analysis, graphing and data interpretation.

Data interpretation

Data interpretation in this project was aided by tools such as:

- modified box and whisker plots illustrating the maximum, minimum and median results of the physio-chemical parameters recorded at each subcatchment for
 - pH
 - turbidity
 - dissolved oxygen
 - temperature
 - salinity
- Histograms showing
 - change in the pollution sensitivity index over the four seasons of the study for each habitat (edge, riffle, pond, vegetation) at selected catchments
 - macro-invertebrate taxa richness for sites within the Maroochy catchment
 - macro-invertebrate pollution sensitivity index for sites within the Maroochy Catchment.
 - a map of the Maroochy River Catchment area showing monitoring sites, subcatchment boundaries, waterways and urban areas
- Tables showing
 - macro-invertebrates sampled at each habitat (edge, riffle, pond, vegetation) at selected sites
 - the pollution sensitivity index and taxa richness rating at selected sites
 - cumulative scores and ratings for pollution sensitivity index and taxa richness
 - site codes and descriptions of sites
 - rainfall and temperature data for the region.

The data collected at each site was only compared to that collected at other sites within the same subcatchment. This enabled an individual assessment of each subcatchment to be made.

Reporting

The monitoring results and associated information were collated into a report, *Community water quality monitoring report for the Maroochy River, January 2003 to June 2004*, which was distributed to a wide range of stakeholders.

To access the report, which includes full details of the monitoring methodologies and actual monitoring results, see the Maroochy Catchment Centre website <www.maroochycatchmentcentre.org.au>.

References

Fawns, C, Todd, A, Nash, V & Chapman, S (comps) 2004, *Community water quality monitoring report for the Maroochy River January 2003 to June 2004*, Maroochy Waterwatch Inc, Nambour, Queensland, viewed 3 January 2007, <<http://www.maroochycatchmentcentre.org.au/web%20pdf/WaterQuality%20Monitoring%20Report%202003%202004%20Final.pdf>>.