

Northern Rivers Ecohealth Project

Aquatic Ecosystem Health Monitoring Program for NSW Northern Rivers

M. Osborne¹, Peter Corlis¹, D. Ryder², J. Schmidt³, C.Sbrocci¹

¹ Northern Rivers Catchment Management Authority (NRCMA), NSW

² University of New England (UNE), NSW

³ Office of Environment and Heritage (OEH), NSW

Northern Rivers Catchment Management Authority, Grafton, NSW 2460Email: max.osborne@cma.nws.gov.au

Key Points

- Standardised sampling and analysis across Northern Rivers NSW
- Collaboration between Local, State and Federal Government agencies
- Addressing knowledge gaps for regional environmental reporting
- Repeated on a 3 year cycle to observe change over time
- Catchment-based Technical Assessment and Report Card production

Abstract

A standardised means of collecting, analysing and presenting riverine, coastal and estuarine assessments of ecological condition has been identified as a key need for State and Local Government Agencies who are required to monitor natural resource conditions.

In response an Ecohealth program has been developed that outlines a framework for the development of a catchment-based aquatic ecosystem health monitoring for rivers and estuaries in the Northern Rivers CMA (NRCMA) area with the aim of providing consistency in monitoring and reporting. NRCMA has facilitated bringing together the major NRM stakeholders across Coastal northern NSW to develop, refine, report and promote a standardised aquatic health assessment tool. Ecohealth will assist the preparation of State of Environment Reports, NSW Monitoring Evaluating and Reporting (MER) via State of Catchment Reports, and NRCMA Catchment Action Plan (CAP) reporting. Most importantly Ecohealth provides a unique opportunity for community communication via the production of an aquatic ecosystem Report Card.

The first Ecohealth pilot has just been completed for Bellingen Shire Council with lessons learnt then adopted in the current Coffs Harbour City Council (CHCC) and Port Macquarie Hastings Council (PMHC) pilots. Following the success of the pilot projects, the University of New England (UNE) is currently preparing the Ecohealth Manual to document the methodology so it can be utilised across the Northern Rivers region.

Assessment of several key indicators of aquatic ecosystem health is undertaken including water quality, fish assemblage, macroinvertebrates, riparian vegetation and macrophytes. A trial using zooplankton as an estuarine health indicator is currently being trailed by PMHC.

Ecohealth produces two main products including a comprehensive technical assessment of riverine health report and an easily interpreted report card for use as a communication tool. Data generated by the projects will be centrally stored via a web based NRCMA data portal to assist with reporting processes.

Keywords

Indicators, assessment, ecohealth, report-card, standardised, regional, whole-of-government, catchment, baseline, aquatic

Introduction

The health of aquatic ecosystems is influenced by the way we use and manage our land and water resources and our estuarine and coastal lagoon systems have become the focal point for the cumulative impacts of changed catchment land-use. Aquatic ecosystems as a result generally are now impacted to various extents with changes to habitat condition, and associated biodiversity values. To assist with management, a standardised means of collecting, analysing and presenting riverine, coastal and estuarine assessments of ecological condition has been developed to create a complete picture of waterway health across the region at the catchment scale.

The development of such a program has been identified as a key need for coastal Catchment Management Authorities (CMAs) and Local Councils who are required to monitor natural resource condition and water quality and quantity in these systems. Monitoring indicators of aquatic ecosystem health, such as water quality, riparian vegetation, macroinvertebrates and fish provides a snapshot of waterway condition. When repeated over time this record tells a story of a state of decline or improvement in our catchments as compared to an established baseline.

Ecohealth outlines a framework for the development and implementation of catchment-based aquatic ecosystem health monitoring programs for rivers, estuaries and marine environments in the NRCMA area with the aim of providing consistency in monitoring and reporting into the future.

In 2007, the NRCMA and OEH Coastal and Estuary staff (then DLWC) were asked by local Government Agency representatives to investigate existing ecosystem health monitoring programs to find a program that could be adapted for use in the Northern Rivers region and provide a collaborative standardised way for councils and agencies to sample, evaluate and report on waterway health on a catchment basis. A scoping study was completed in 2006-07, providing guidance for the development of the program (Cavanagh and Udy 2007). The scoping study in effect examined the applicability of the SE Qld Healthy Waterways Ecosystem Health Monitoring Program (Abel *et al* 2005) to the Northern Rivers.

By 2009, the Northern Rivers Ecohealth program was under development and being trialled in the Bellinger – Kalang Catchment by Bellingen Shire Council and partners. With the completion of this first Ecohealth pilot project in 2011,

and lessons learnt adopted in the next two pilot projects in the Port Macquarie Hastings Council (Hastings & Camden Haven catchments) and Coffs Harbour City Council (Coffs Coastal catchments) areas during 2011, the Ecohealth program had now become a marketable entity. The Clarence catchment is the next major area for Ecohealth assessment.

Ecohealth is designed to be efficient, relevant and scientifically rigorous and meet the monitoring, reporting and evaluation needs of government at local, State and Federal levels. The products are designed to be simple and credible and meet the needs of the relevant local council and its community for information and understanding about current aquatic ecosystem health in their catchments.

Sampling is undertaken monthly of ambient conditions over a 12 month period, and the results reflect a snapshot of the average health of the system over that period. In this way Ecohealth provides a measure of the system's resilience to shocks such as large flood events. An Ecohealth assessment is designed to be repeated on a 3 to 4 year cycle.

Government Authorities will use the findings from the reports to better manage aquatic ecosystems as Ecohealth endeavors to:

- Standardise local government and state government monitoring approaches
- Simplify and improve efficiency in existing monitoring and reporting processes
- Improve data quality and usefulness
- Improve reporting ability at a local, state and national level
- Establish baselines for future comparisons
- Enable cross-comparison between catchments
- Provide scientifically-valid assessment of catchment health
- Provide information in an easy to understand format for the community
- Deliver consistently derived data for regional and state reporting purposes
- Centralise data management and interpretation
- Provide catchment-wide reporting
- Standardise triggers for action and targeted management responses
- Enhance community awareness

Products of the Ecohealth program are primarily:

- A comprehensive technical assessment of riverine health.
- An easily interpreted report card for use as a communication tool.

Other products include:

- Health scores generated by Ecohealth are able to be used by local government in State of Environment reporting including Regional State of Environment reporting.
- Ecohealth Posters of the report card can be issued to schools and community groups for environmental education.
- Web based access to all the information and other affiliated reports via a central NRCMA web page such as DPI fishery report, UNE Technical report, State of Catchment reports, catchment soil information, and links to any other relevant reports.

- Data generated by the projects is centrally stored via a web based NRCMA data portal to assist with local, regional, state wide and nationwide reporting processes.

Program Description

Ecohealth attempts to bring together all of the existing monitoring programs of Local Government, State Government and other organisations to create a single, standardised region-wide system where information about the health of our waterways is shared between catchments. This will enable resource managers to better direct environmental management activities, research and investment. It also enhances our ability to report on catchment health to the community.

Ecohealth initially generates a baseline resource condition assessment that can be used into the future to enable comparisons to be made over time. Repeated Ecohealth assessments will fill gaps in knowledge and assist NRM managers in improving, monitoring and direct planning accordingly. The “Whole of Catchment” Ecohealth branding will also assist with monitoring aquatic ecosystems across administrative boundaries.

Assessment of several key indicators is undertaken including; ambient in stream water quality, freshwater fish and macroinvertebrate assemblage, riparian vegetation and river bank condition, and estuarine macrophyte distribution. Also being incorporated into Ecohealth is assessment of estuarine zooplankton populations as a surrogate indicator for estuarine fish assemblage. Research is also continuing on nearshore rocky reefs to develop a system to monitor long term change in the marine environments resulting from changes in estuarine discharge regimes and climate change. This research is part of the Northern Rivers CMA’s Long Term Marine Monitoring program, undertaken in partnership with the National Marine Science Centre (Smith *et al* 2011).

NRCMA have been working in close association with OEH and key LGA representatives to facilitate bringing together the major stakeholders in coastal management of North Coastal NSW to develop, refine, report and promote a standardised aquatic health assessment tool designed to improve NRM and assist with preparation of State of Environment Reports, NSW Monitoring Evaluating and Reporting (via State of Catchment Reports), and with NRCMA Catchment Action Plan reporting.

A Technical Reference Group (TRG) consisting of key specialist representatives from agencies involved in NRM including State MER team leaders is an integral part of the program to ensure that best science is incorporated into the project and to ensure alignment with regional and state programs. The TRG assisted with the development of the template for Report Card production which was modelled off the South East Queensland Ecosystem Health Monitoring Program and other ecosystem report cards currently being produced in NSW.

External Partners

The following are partners involved in Ecohealth to date.

- Local Government (Bellingen Shire Council, Coffs Harbour City Council, Port Macquarie Hastings Council, Clarence Valley Council)

- NSW Office of Environment & Heritage
- NSW Office of Water
- National Parks & Wildlife Service
- NSW Food Authority
- Marine Parks Authority - Solitary Islands Marine Park
- University of New England
- Southern Cross University
- University of New South Wales
- Department of Defence
- Bureau of Meteorology

NRCMA provides administrative, technical, production and financial assistance towards Ecohealth projects. OEH has been providing significant funding assistance to Local Government Agencies as well as providing invaluable technical expertise and experienced on ground field staff.

The NRCMA Ecohealth Team roles include:

- Promoting Ecohealth to LGA's
- Development of new projects
- Aligning project with the RSOE, State MER, SoC and CAP
- Identification of potential funding sources & partnership development
- Assisting with interagency co-operation for baseline riverine resource condition assessments
- Technical advice
- Program planning and delivery
- Liaison with other organisations involved in NRM
- Project and brief development
- Contract management
- Monitoring, evaluation and reporting roles
- Aligning current NRCMA programs to provide mutually beneficial outputs
- Lobbying government agencies to partner and invest in the program.

UNE has been instrumental in the development of the program and is currently contracted to prepare the Northern Rivers Ecohealth Manual to enable the standardised protocol and methodology to be adopted across the Northern Rivers region and possibly elsewhere in NSW. The Ecohealth Manual will prescribe the processes involved in project development, site selection, sampling techniques, guidelines and standards used, implementation, quality control, data base usage instructions, reporting guidelines, and will also including the technique employed to manipulate raw data sets to develop health "scores".

For the Bellinger / Kalang pilot, UNE were contracted to measure water quality parameters, collect water samples, analyse water samples, conduct macroinvertebrate and riparian vegetation assessment as well as write the Ecohealth technical assessment reports which includes generating the health scores that are used in the report cards. To test the capacity of greater involvement of Council staff, the Coffs Coastal and Hastings / Camden Haven pilots, have incorporated a greater involvement of Council and OEH staff in field sampling and water quality analysis, with program coordination by UNE.

OEH and LGA's are the key financiers to the projects however overall level of financial investment by Local Councils can be minimised by in-kind contribution by all associated partners via the provision of on-ground assistance with collection of water samples, measuring water quality parameters and conducting water quality analysis at Council operated laboratories.

NSW DPI Fisheries is contracted to conduct freshwater fish assemblage and estuarine macrophyte assessments including mangrove, saltmarsh and seagrass distribution and have been aligned where possible with the agency's responsibilities under the State MER process.

The Bellinger / Kalang pilot study identified issues such as the need for a cost effective methodology for assessing estuarine health. As a result a trial using zooplankton as an estuarine health indicator is currently being undertaken in the Hastings / Camden Haven Ecohealth project in association with the University of New South Wales with assistance of OEH funding.

The Clarence, Richmond and Macleay catchment projects will require a collaborative approach between councils, state and federal agencies to achieve a "whole of catchment" reporting program and the NRCMA are keen to try to develop, facilitate and support this approach. The NRCMA are currently formalising support from NPWS, Department of Defence, and several New England Tableland Councils who manage land influencing the health of these river systems.

Indicators being assessed

Water quality - pH, temperature, turbidity, nutrients, dissolved oxygen, electrical conductivity (salinity)

Ecosystem Processes: Chlorophyll-a and suspended sediments

Biota: Fish, macroinvertebrates, macrophytes (water plants – seagrass) and riparian vegetation

Land Use Pressures - available local data

Estuarine water quality health indicator: Plankton analysis

Bacteriological: E.coli monitoring

One thing that Ecohealth does not attempt to report on is anthropogenic (human) environmental health issues such as safe water drinking quality, swimming condition, heavy metal pollution or other contamination, virus, water-borne pathogen, safe harvesting of shellfish, although site specific issues are acknowledged for community information.

Products – Technical Reports & Report Card

The Ecohealth report card is designed to inform the community about the health of waterways in their local catchments. It provides quality information in an easy to understand format derived from the technical assessment and associated technical reports. The Report Card is used to provide a regional assessment of

each catchment, and in time will highlight where the health of a waterway is improving and where improved management action may be required.

By providing a Report Card, councils inform the community about current aquatic health, and provide opportunities for people to see how they might become involved to help improve or maintain their favourite parts of the river.

For the Bellinger and Kalang Rivers project, 2 technical reports were produced (Gilligan 2010, Ryder et al 2010). A Report Card was distributed to all ratepayers within the shire (Northern Rivers CMA 2011). A phone survey was also undertaken to get community feedback from the Bellinger and Kalang Rivers report card to gauge community response and interest in aquatic ecosystem management (Jetty Research 2011). This was a valuable process to undertake as it demonstrated that the community were overwhelmingly supportive of Ecohealth and appreciated being informed on riverine health, “76 per cent of respondents who had read the report agreed Council should produce another EcoHealth report in the future”. Bellingen Shire Council will use the results of the recently completed program to identify areas in good condition that need protection, or areas that are in need of restoration activities and support the work they are already undertaking in their River Health Program.

The development of the Ecohealth program has been supported by the NSW government through the OEH (Estuary Management Program) and the NRCMA (Catchment Action NSW). The NRCMA also brings Australian Government investment (Caring for Our Country) to the program. Local councils are also contributing through their staff and existing environmental monitoring budgets. Bellingen Shire Council made an allocation from its Environmental Levy to fund the Bellinger and Kalang Rivers Ecohealth project.

It is difficult to estimate the total cost to date for the development of Ecohealth from the initial \$50 000 scoping study conducted in 2007, for which the cost was shared between DLWC and NRCMA, through to implementation of the three trial projects (Bellingen Shire Council, Coffs Harbour City Council and Port Macquarie Hastings Council) and development of future projects in Clarence, Richmond and remaining catchments.

In terms of cash and in-kind contribution NRCMA has invested approx: \$250 000 and OEH (Coast and Estuaries) have contributed approx: \$300 000 in Cash contribution to councils with a dollar for dollar investment from Local Government Authorities towards the projects. OEH has also contributed much in-kind contribution via the allocation of several staff to assist with Ecohealth planning and implementation over the last 4 years including senior natural resource managers from the State Monitoring Evaluating and Reporting (MER) Teams, technical experts and local coasts and estuary officers.

It is possible to extrapolate that the overall investment by Federal, State and Local government in the development and implementation of Ecohealth to November 2011 would exceed \$1 000 000.

Current and Future Projects

- The first Ecohealth pilot was completed for Bellingen Shire Council during 2011 with lessons learnt adopted in the Coffs Harbour City Council and Port Macquarie Hastings Council pilots which are currently being undertaken and will be completed by April 2012.
- UNE is currently preparing the Ecohealth Manual to document the methodology so it can be utilised across the Northern Rivers region.
- Clarence Catchment and Ballina /North Creek component of Richmond Catchment Ecohealth projects are proposed to start over the coming months with all stakeholders currently negotiating site selection and allocation of resources.
- The remainder of the Richmond catchment is anticipated to become involved later in 2012 depending upon OEH funding.
- Nambucca valley Council and Macleay Catchment Councils (Kempsey Shire and Armidale Dumaresq Council) are also undertaking preliminary investigations to participate in Ecohealth in 2013 -2014.
- NRCMA envisage that Tweed Council and Byron Shire Council will embrace Ecohealth in 2014 although only preliminary negotiations have been initiated at this stage.

Current and planned research to be incorporated into Ecohealth includes:

- a) Investigate low risk contaminant concentrations/loads for the study systems and develop regionally derived guideline values for environmental stressors such as nutrients, primary productivity, plankton respiration, turbidity and suspended solids.
- b) Develop standardised protocols for the use of an Optical Plankton Counter (OPC) to estimate zooplankton abundance and biovolume in estuarine environments.
- c) Examine the relationships between the key contaminants found in the river systems, spatially explicit trigger values, and zooplankton abundance and biovolume to develop plankton-based indicators of estuarine health. Dr Yoshi Kobayashi has extensive field and laboratory experience within OEH in biogeochemical processes and zooplankton ecology. Prof. Iain Suthers is a world leader in OPC techniques in marine and estuarine systems and brings extensive experience in the development and testing of zooplankton assemblages and their relationship to catchment condition.
- d) Research projects that may develop new health indicator species guidelines such as using Pigmy Mussels and Freshwater Mussels.

Challenges

The uncertainty relating to future long term funding to ensure that Ecohealth continues to provide the information as designed is disconcerting. Currently, investment into Ecohealth is through NSW State government contributions via opportunistic OEH & NRCMA annual allocation funding with LGA's contributing large proportions of their annual budgets toward the projects. Future options for ensuring that a ongoing baseline funding opportunity becomes available to support the program will need to be investigated to ensure that recording change in 'condition' of aquatic ecosystems over time can be achieved.

Achieving meaningful NRM monitoring outcomes for limited funding and balancing what is achievable with limited resources and meeting community expectations will be the main challenge for Ecohealth over the next few years.

Problems associated with data management, accessibility and useability regarding the current NRCMA data portal and proposed exchange of data with State and Federal agencies still needs to be overcome as well as potential to incorporate data regarding terrestrial and specific community concerns in order to satisfy Regional State of Environment reporting aspirations. This also encompasses disseminating and synthesising resource information across various NRM organisations and disciplines, MER themes, agencies and stakeholders.

Ultimately, the overall challenge for Ecohealth is to attain a collaborative LGA “Whole of Catchment” reporting program that crosses local government borders with transparent and agreed cost sharing arrangements. This will only be achieved by maximising partnerships with other government agencies and universities, and clearly communicating to all parties involved the positive outcomes that are possible from such a program. It will only be then we will see meaningful measurement of lasting behaviour change for aquatic ecosystem management by the community, industry and government.

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