

Georges Riverkeeper: the establishment and evolution of a catchment management organisation

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Key Points

- Georges Riverkeeper is one of Australia's longest running catchment management organisations, which has progressed from humble beginnings as a group of passionate and committed volunteers working together to protect the Georges River with local council support since 1979.
- Through the 1990s and into the new millennium, there was increased recognition of the need for government to coordinate and fund catchment management initiatives. This coincided with striking evidence of the consequences of the declining condition of the Georges River. Secure funding from local councils allowed Georges Riverkeeper to develop core Programs, which were supplemented by successful delivery of grant-funded projects.
- The present-day strong reputation, longevity and stability of Georges Riverkeeper are key to developing and maintaining relationships with a range of stakeholders who assist to remove litter; rehabilitate bushland; conduct catchment-scale ecological monitoring; coordinate the development and implementation of management plans; disseminate information and educational materials; and, advocate on behalf of the river.

Abstract

In 1979, volunteers who shared a passion for protecting the Georges River in southern Sydney formed a group with support from local councils. That group grew and evolved into the catchment management organisation now known as Georges Riverkeeper. Initially, the group focused on reporting pollution incidents, litter collection, and encouraging others to care for the river. In that era, the Georges River estuary had NSW's second most productive oyster industry, but around the world there was growing recognition that pollution from industry and urbanisation were threatening the values of waterways. In the 1990s, the Georges River oyster industry was decimated, all commercial fisheries were closed and restrictions on recreational fishing were imposed. The insults provided added impetus to increase coordinated management of waterways across the Georges River catchment. Core programs of the organisation continued to rely upon volunteers, but entering the new millennium the establishment of secure funding enabled employment of full-time staff. Today, Georges Riverkeeper receives funding from local councils to support four staff and continue core Programs that are the pillars of the organisation's operations, supplemented by successful delivery of grant-funded projects. Reflection on Georges Riverkeeper's evolution can inform the development of other waterway management groups.

Keywords

Georges River, catchment group, catchment management, waterway management, Riverkeeper, River Health, waterway legislation, governance

Introduction

Georges Riverkeeper (formerly Georges River Combined Councils' Committee, commonly known as GRCCC) is a catchment management organisation that has evolved over almost 40 years, making it one of the longest continuous organisations of its type in Australia. Although it has changed significantly, the underlying focus has remained to provide information and implement actions to protect and enhance waterways in the Georges River catchment in southern Sydney. That catchment flows into Botany Bay, and although it has less iconic built features than the neighbouring Sydney Harbour, it is still subject to stressors associated with the expansion of Sydney's human population, intense urbanisation and industrialisation.

This paper explores the journey Georges Riverkeeper has taken over the 40 years of its existence, and the influences of the local community, the NSW government and the Georges River itself in directing that journey. Unlike a traditional literature review, much information about the history of the organisation used for this paper was sourced from hard copies of meeting minutes and correspondence. Information was compiled from such scattered sources to consolidate the 'corporate memory' and provide salient lessons from the evolution of Georges Riverkeeper, which may be used to guide the development of burgeoning waterway management groups.

The Georges River

The Georges River catchment has an area of 960 km², with the main channel of the river flowing from National Parks in the upper catchment, through the Chipping Norton Lakes and down to Botany Bay. Valued uses of freshwater reaches include picnicking, bushwalking, swimming and industrial cooling and washing. The Woronora River subcatchment that flows into the Georges River, provides drinking water from its upper reaches. Lower reaches of the estuary are used for boating, fishing and passive recreation. There are public baths in the lower Georges River estuary (GRCCC 1997), although declining water quality has reduced the use as some of the baths as the water quality has been rated as 'poor' (NSW OEH 2017). At the mouth of the river, the Towra Point Wetlands are an ecologically significant wetland under the Ramsar Convention, being listed in 1984 upon meeting 5 out of the 9 ranking criteria (NSW DECC 2007).

Threats to the ecology and valued uses of Georges River have increased over time. Water quality was likely at its worst in the 1970s, which was the catalyst for instigating the formation of GRCCC in 1979 (GRCCC & NSW Waterways Authority, date unknown). Although the water quality might have improved with improved controls of licenced discharge from industry, many of the threats to the river have remained more or less the same over the past 40 years. Major threats include stormwater runoff, erosion and sedimentation, habitat removal, incursion of exotic vegetation, invasive fauna, dredging, development, and industrial runoff to name a few. Unfortunately, the consequences of these threats to the Georges River have been realised by the collapse of the second most productive oyster industry in NSW, the virtual elimination of seagrass beds, the collapse of commercial fishing, the banning of all fishing in the middle reaches of the river due to pesticide and PCB residues, the continuing decline of beaches being safe for swimming, and declining biodiversity.

1979 to 1998: The initiation of a volunteer program to be the 'eyes and ears' for the Georges River

GRCCC commenced in 1979 for the purpose of having an active lobby group representing communities from the nine local council areas along the Georges River. At that time, the GRCCC was a group of volunteers who shared concern about the declining health of waterways in the Georges River catchment and Councillors from local councils who participated in monthly meetings with the group. Volunteers focused on reporting pollution incidents, litter collection, and disseminated information to encourage others to care for the Georges River. They were informed, active residents acting as the 'eyes and ears' for enforcing environmental law, feeding information about waterway condition to the councils and acting as ambassadors for the river (GRCCC 1997). For example, all GRCCC volunteers had Pollution Incident Reporting Forms to formalise reporting of pollution events in the river.

In 1986 and 1988 there were two of the largest floods in 45 years, both estimated one in twenty year floods. It was estimated that the 1988 flood inundated over 300 residential properties along Georges River, Prospect Creek and Cabramatta Creek, with an estimated damage of over \$40M in 2000 (Maddocks 2001). A voluntary purchase scheme was introduced through Councils by the Commonwealth government, whereby approximately 200 houses were identified for the scheme. Over half of the identified houses have been successfully acquired and removed, however the Commonwealth funding was withdrawn in 2001, making the completion of the scheme relatively impossible (Maddocks 2001).

Local councils supportive of GRCCC included: Bankstown City Council, Campbelltown City Council, Fairfield City Council, Hurstville City Council, Kogarah Municipal Council, Liverpool City Council, Rockdale City Council, Sutherland Shire Council and Wollondilly Shire Council. There is limited surviving information about specific activities from the initiation of GRCCC to the mid-1990s, but it is evident that it continued operating with a structure that remained more or less unchanged over that period. However, there were changes in the way the NSW government viewed waterway management beginning in the late 1980s, when the Catchment Management Act 1989 was enacted. The Act, the first of its kind, included provisions that directed funding and government involvement in waterway management at catchment-scales, which was to assist GRCCC with consolidating its role. In the 1990s, there were also cataclysmic events that acted to draw attention to the plight of the Georges River.

The Catchment Management Act 1989 defined Total Catchment Management (TCM) as the coordinated and sustainable use and management of land, water and vegetation and other natural resources on a catchment scale to balance resource utilisation and conservation. TCM was coordinated by the NSW Department of Land and Water Conservation (NSW DLWC 1994). TCM was focused on bring together and coordinating community and government efforts on a catchment basis so to ensure productive lands, cleaner water and maintain a diversity of vegetation and wildlife. Total Catchment Management covered 98% of New South Wales and had formally established 33 Catchment Management Committees (CMCs) (NSW DLWC 1994).

It was through TCM that grants were disseminated to the CMCs to help them achieve their objectives of: coordinating policies, programs and activities as they relate to catchment management; achieve active community participation in natural resources management; identify and rectify natural resource degradation; promote the sustainable use of natural resources; and, provide stable and productive soil, high quality water and protective and productive vegetation cover within each of the state's catchments.

The Georges River Catchment Management Committee (GRCCMC) comprised of 13 Councillors from 13 councils within the Georges River catchment and was established in August 1991 (GRCCC 1999, GRCCMC 2001). The overall issues of focus for TCM across NSW in 1994 were dryland salinity, water quality (specifically a focus on algal blooms), soil erosion and streambank degradation. After a review of TCM was conducted in 1995, the following issues were added to the focus of TCM: litter control, sandmining & dredging, flooding, bushland and natural areas management, fish and oysters, and urban development controls. The issues and actions aligned closely with what GRCCC had been working on for years, enabling the GRCCMC to use GRCCC knowledge and networks to 'hit the ground running'.

Unfortunately, catchment management came too late to preserve all valuable uses of the river. In 1992, the lower estuary supported the State's second most productive oyster growing area, with 95 leases that each year produced approximately 18,000 bags of oysters with a market value of over \$3.5M (GRCCC 1997). But, the Georges River oyster industry suffered major losses in the mid-1990s from QX disease, a protozoan parasite, *Marteilia sydneyi*, which is harmful to oysters but not to humans. With the general pollution levels of the river, cultivation of oysters at the majority of the leases became uneconomic (Glaister 1996). The oysters were killed by the QX disease, but only after being weakened by years of sewage, toxins, dredging and acid sulphate sediments contaminating the river (GRCCC 1997).

Then, in 1995, the Healthy River Commission (HRC) was established by the New South Wales government to conduct independent public inquiries into selected NSW rivers and make recommendations to the government on appropriate long-term approaches and strategies to achieve environmental, social and economic objectives for the river system. Various government departments including the Department of Land and Water Conservation (DLWC) and the Environmental Protection Authority (EPA) made submissions to the HRC. The EPA's role was also to review the recommendations from the HRC.

In addition to the loss of the oyster industry, in 1997 the State Government announced the closure of the lower Georges River to commercial net and trap fishing. NSW Fisheries also issued warnings to recreational fishers not to eat fish caught in those areas. The EPA reported finding Polychlorinated biphenyl (PCBs) and

organochlorine pesticides in the tissues of sampled fish. Dichloro-diphenyl-trichloroethane (DDT) and/or metabolites were also found in all samples but not above Maximum Residue Limit (MRL) levels. All of this occurred in association with an expanding urban population along the river. By 1997, there were 1.2 million residents in the Georges River catchment, making it the most highly urbanised catchment in NSW.

There were tremendous sediment loads dumped in the Georges River by urban development and dredging from 1987-97 that destroyed most seagrass, with concomitant destruction of the Georges River fishing industry. GRCCC recognised evidence that urban stormwater pollution was detrimentally affecting the Georges River, noting that 'The siltation of waterways as a result of gravel, sand and soil being washed from urban streets was of major concern.' GRCCC asked volunteers to provide photographs of gravel, sand or soil on streets being washed into the stormwater drains as evidence of this issue. In 1997, sewer overflows in south western Sydney suburbs caused the middle reaches of the Georges River to be suitable for swimming only 9% of the time, with swimming listed as a 'very high health risk'. The lower Georges River remained suitable for swimming 88% of the time (GRCCC 1997), as regular tides flushed out most waterborne pollutants.

In 1997, GRCCC was successful in its application to become an incorporated entity. The Department of Fair Trading granted incorporation to GRCCC under the Associations Incorporations Act, 1984 effective from 20 November 1997. The benefits of incorporation were continuing to exist regardless of a change or lack of memberships and the ability to apply for grants and enter into contracts on our own rather than through a council. Around the same time, the process of developing a Georges River Riverkeeper Program also began.

Initiation of the Riverkeeper Program

The Georges Riverkeeper Program was inspired by the success of New York's Hudson River 'Riverkeeper': a group of fisherman became so annoyed with the state of the Hudson River, including the lack of aquatic life, that they appointed one of their fellow workers to become a 'Riverkeeper'.

In 1996, the process of developing a prospectus detailing the proposed duties included in the Georges River Riverkeeper Program began and was to be used to apply for funding from the State government. GRCCC could receive 50/50 funding from state government, which would have entailed a \$20,000-\$30,000 per annum commitment from each of the member councils. Previously, Councils did not contribute financially to the GRCCC. Although, three or four councils were in favour of committing financially to the program, the others were not. There was a lot of hesitation around the Program, specifically around who the Riverkeeper would report to and what specifically they would achieve. For some, confidence was dampened through the recent experience of a Hawkesbury Riverkeeper Program, which had started and failed because of 'lack of teeth and no cooperation'.

By February 1997, the Riverkeeper Program had still not progressed and in May the GRCCC called a Crisis Seminar to take place with all of the relevant stakeholders. The aims of the Crisis Seminar were to develop support for the Riverkeeper Program amongst all stakeholders (especially Councillors, council directors and agencies), and to generate support for NSW government action to focus upon and improve the coordination of management of the river.

There were several versions of the model for the Riverkeeper. The initial model was to incorporate a more holistic approach to the issues affecting the river, with the role of the Riverkeeper shifted slightly to be two pronged: education (of volunteers, media monitoring, and encouraging community audits of government authorities) and enforcement (stop pollution by industry, from entering drains, trace polluters, upgrade council's policies, and water quality and habitat monitoring).

However, by the end of 1997, the Riverkeeper Program had changed to be modelled on the successful 'Earth Works' program run by the NSW Environmental Protection Authority (EPA). Earth Works was a community education based program that trained interested participants about a range of environmentally sound management practices (Resource NSW 2003). All volunteer graduates were able to call themselves

Riverkeepers and would receive an identification badge and stickers for cars and boats. All were required to perform at least 40 hours of education and outreach works in the community, as well as report on the state of their local creeks and drains.

The first Coordinator was appointed in November 1998, which was the first step in GRCCC shifting from entirely dependent on volunteers to becoming an organisation with dedicated staff. The Riverkeeper Coordinator’s duties included coordinating the volunteer network, organizing training for the volunteers, promoting the Riverkeepers, coordinating field surveillance and water testing activities, coordinating education activities (i.e. stalls, talks by volunteers), maintaining high media profile for the Riverkeepers, maintaining a 24 hour hotline for reporting pollution incidents, maintaining a database of volunteers, maintaining a database of incidents and complaints, and maintaining strong links with stakeholders. Major stakeholders of the Riverkeeper Program, at that time, were considered to be: member councils, NSW EPA, GRCCMC, Georges River Environmental Alliance (a community group), Liverpool City Council’s Community Enforcement Initiative and Chipping Norton Lakes Authority.

1999 to 2007: Consolidation of partnerships and funding to employ staff for the Georges River

Establishment of the Riverkeeper Program helped to clarify the outputs that would be possible with council funding and it was clear that some funding was required to support hiring of staff. By 1999, five councils contributed \$20,000 annually each to the GRCCC’s Riverkeeper Program: Bankstown City Council, Hurstville City Council, Kogarah Municipal Council, Rockdale City Council and Sutherland Shire Council. Wollondilly Shire Council, Campbelltown City Council and Liverpool City Council were also members of the GRCCC, although were unable to provide funding at that time. Benefits of the new staffing arrangements are reflected in improved documentation, making it easier to explore activities of GRCCC after the Riverkeeper Program was established.

In 1999, there were 22 Councillors on the committee, six volunteer groups in the Riverkeeper Program, and approximately 300 volunteers. GRCCC continued to meet monthly. The six volunteer groups covered administration, education, boat, land survey, research and water testing (Table 1). For water testing, GRCCC became a coordinator of the Streamwatch Program that was established in the early 1990s: initially GRCCC worked with 12 schools from Rockdale and Kogarah Council areas.

Table 1 The roles of GRCCC volunteers in 1999

Administration Group	Education Group
<ul style="list-style-type: none"> - Maintained volunteer database and manual records. - Maintained Riverkeeper website. - Collected newspaper clippings of Riverkeeper reports and articles concerning the Riverkeeper Program. - Updated map inventory, library, filing. - Produced bi-monthly volunteer newsletters. 	<ul style="list-style-type: none"> - Developed brochures, posters, stickers, kits and other informative resources to promote understanding of issues related to management of the river. - Identified and cooperated with community groups in sub-catchment areas to establish linked programs. - Presented at community fairs, shopping centres and groups of school children and the public to promote responsible behavior and to explain the Riverkeeper initiative.
Water Testing Group	Boat Group
<ul style="list-style-type: none"> - Determined locations and conducted water testing at strategic sites. - Were provided training in basic analysis of water samples. - Accessed existing records of water quality tests from other sources such as Streamwatch and local councils. - Researched appropriate sampling regimes. - Arranged installation of monitoring equipment on suspect drains. 	<ul style="list-style-type: none"> - Responded to emergency call outs regarding pollution. - Provided transport for the volunteers when required to access difficult sites for surveys or testing. - Maintained a visible presence on the river with a watching brief of sources of pollution and degradation through regular river-based activities. - Participated in river clean-up operations, public displays, etc.
Land Survey Group	Research Group
<ul style="list-style-type: none"> - Recorded and mapped drain pipe-ends and other land-based sources of pollution, using GIS. - Completed a Drain Data Sheet for each drainpipe encountered. - Reviewed and monitored identified trouble spots. 	<ul style="list-style-type: none"> - Responded to reports, Environmental Impact Statements, plans of management and other documentation relating to the river and the catchment.

There was increased momentum propelling GRCCC forward and in 1999 the Riverkeeper Coordinator was joined by a Riverkeeper Field Officer. The Officer was a new position to do many of the roles initially proposed for the Coordinator, as it became clear that the Coordinator was required to perform more administration, marketing and networking than anticipated.

There were also significant developments at State government level. In 1999, the Healthy Rivers Commission reviewed information about the Georges River System for the NSW Government in its *Independent Inquiry into the Georges River – Botany Bay System final report*. The comprehensive recommendations from that report are detailed in Table 2 (Healthy Rivers Commission 2000).

Table 2 Recommendations from the Healthy Rivers Commission Independent Inquiry into the Georges River – Botany Bay System

River flows and water supply	Stormwater and sewage
RF1 Water management in the Sydney metropolitan area RF2 Environmental flow released from Woronora Dam RF3 Provision of fish passage	WM1 Improved institutional arrangements for wastewater management WM2 Integrated stormwater management at the local level WM3 Stormwater management by public land owners
Botany Bay	Natural Areas
BM1 Integrated management framework for Botany Bay BM2 Accountability for ‘resource management’ within Botany Bay BM3 Assessment procedures for activities within Botany Bay and surrounds BM4 Protection of lands on the Kurnell Peninsula BM5 Protection and management of the southern shores BM6 Preservation of wetlands, western shores BM7 Management of Botany Aquifer, northern shores	NA1 Protection of remaining natural lands, including those currently under Commonwealth ownership and management NA2 Management of longwall coal mining NA3 Clay mining in upland swamps NA4 Management of Crown land on urban fringe, including that reverting to Aboriginal ownership that was degraded under prior Crown ownership NA5 Provision of ‘offsets’ and ‘trade-offs’
River Corridors	River and Bay health objectives
RC1 Protection of urban streams	RHO1 Environmental values RHO2 River corridor objectives RHO3 River flow objectives RHO4 Water quality objectives RHO5 River and bay health data

In 2000, the budget for the CMCs was cut by 80%, followed by the replacement of the 43 Catchment Management Committees with 18 Catchment Management Boards.

In 2002, there was a significant shift in the focus of the Georges River Riverkeeper Program. The revised Georges River Riverkeeper Program was modelled on the Hacking Riverkeeper, which was initiated in December 1999 and was a joint venture between NSW Waterways Authority and Sutherland Shire Council, being two-thirds funded by Waterways and one-third funded by Council. The main change to the past Riverkeeper Program was that this Riverkeeper was trained in law enforcement by NSW Waterways Authority. As a Waterways Officer, the Riverkeeper had official power as a Class 4 Officer under the Protection Of the Environment Operations Act 1997, which allowed the Riverkeeper to prosecute for water or noise pollution incidents.

The Riverkeeper Program became a joint venture between the GRCCC and the Waterways Authority. Around that time, the stated Program aims were: to improve, protect and monitor the ecological health of the river, implement objectives of the GRCCC annual work plan, identify gaps in community awareness and provide community education and ensure continuity of compliance for the safe, equitable and sustainable use of the River (Robins, date unknown, estimated 2002).

A change in government in 2003 was followed by the Healthy Rivers Commission being abolished and the Catchment Management Act being repealed and replaced by the Catchment Management Authorities Act 2003 that became effective in January 2004. Thirteen Catchment Management Authorities (CMAs) were established across NSW to replace the various Committees under the Total Catchment Management approach to catchment management. The Georges River catchment was covered in the Sydney Metropolitan

CMA. Most of the recommendations from the Healthy Rivers Commission report in 2000 were not followed. Unfortunately, those issues are eerily similar to present day issues, except now with increased population.

2007 to 2018: The maturation of Georges Riverkeeper

From 2007, GRCCC became less dependent upon volunteers to run day-to-day operations and was focused more on working with member councils, although volunteers continued to contribute to litter collection, stream monitoring and providing feedback to councils. All member councils had now become financial contributors, which moved the funding structure for the Riverkeeper Program from two-thirds NSW Waterways Authority and one-third GRCCC to full funding from GRCCC. This also removed the authorised officer component of the Riverkeeper role.

In 2008, the GRCCC developed a Management and Implementation Plan, which was used to guide the establishment of new grant-funded Programs. The GRCCC was involved with three major projects, spanning from 2009-2012 that were successful in obtaining funding from the NSW Environmental Trust: the Lower Georges River Sustainability Initiative, the Mid Georges River Sustainability Initiative and the Upper Georges River Sustainability Initiative. The focus of the initiatives was: on-ground Water Sensitive Urban Design projects, riparian vegetation projects, and community and council education and capacity building. Part of the funding was used to employ a Communications and Engagement Program Coordinator. From 2009 to 2012, federal funding for the River Health Program (see below) allowed the employment of a River Health Coordinator.

In 2011, GRCCC undertook a strategic review of the M&I Plan, which resulted in a number of key recommendations regarding the funding of Programs, including the need to secure funds to continue core Programs, independent of grant funding. Following a fee review it was decided to continue with the River Health Program and discontinue the Communications and Engagement Program Coordinator in 2013. That left the Riverkeeper Program (recently renamed Catchment Actions Program) and River Health Monitoring Program as the two core Programs funded by GRCCC. Details about these Programs are provided below.

The Georges River Coastal Zone Management Plan (CZMP) set the strategic framework for the future management, over a period of 5-10 years of the Georges River estuary and also includes an action plan. The plan aims to conserve and improve the existing natural environment of the estuary and improve water quality. Under the Environmental Planning & Assessment Act 1979, CZMPs are to be taken into consideration in determining development proposals under Section 79C. This has implications for development assessment decisions as the plan is relevant to proposals that may have an impact on the Georges River (GRCCC 2018).

In 2013, there was another change at State government level. The Catchment Management Authorities Act 2003 and the thirteen associated CMAs across NSW were repealed by the Local Land Services Act 2013. The boundaries of CMAs were redrawn and they became Local Land Services (LLS), with more focus on rural regions than on urban regions. The Georges River is within the boundaries of the Greater Sydney Local Land Services area, maintaining periodic contact related to specific issues, although the linkages to urban waterways management are less clear than under the CMA model.

Another achievement of GRCCC at this time was the Aboriginal Riverkeeper Team project, further described by Anthony Wales and Vanessa Cavanagh in 9ASM Conference paper titled: Georges Riverkeeper Aboriginal Riverkeeper Team: a model for successful engagement of Aboriginal communities in natural resource management of urban areas. Resources have included Federal Government Caring for Country funding for the Aboriginal Riverkeeper Team and contractor works and 15 Green Army teams over two and a half year period.

Catchment Actions Program

The Catchment Actions Program is the present-day extension of the Riverkeeper Program. As detailed above, that Program evolved from its inception in 1998 into a program focused on the delivery of on-ground works aimed to improve the overall health and amenity of the Georges River.

The program has two main delivery streams: litter collection and bush regeneration, and an advocacy role based around plastic pollutants in the environment. The Catchment Actions Program has taken an active role in the issues associated with plastic pollution having served on the NSW Government's Environment Working Group as a component of the NSW Container Deposit Scheme, increasing community awareness through social media and working with the scientific community through education and research.

The litter collection program is the core activity of the Catchment Actions Program and utilises the resources of NSW Corrective Service offenders in removing litter from river foreshores, riparian areas and catchment wide litter hotspots. The litter collection program has collected an average of just over 100 tonne of litter over each of the past six years. The bush regeneration program is grant fund dependent and over the past three years from July 2014 to June 2017 delivered 170.5 hectares of on-ground works and planted 68,600 plants.

River Health Monitoring Program

Up to 2009, GRCCC assisted with coordination of Streamwatch within the Georges River catchment. Involving the community in stream monitoring was expanded with initiation of the River Health Monitoring Program in 2009, with funding from a federal grant over three years. The objectives during the grant period were to conduct catchment-scale waterway monitoring, whilst engaging the local community through involvement in the monitoring. Report Cards were a key component of River Health, as the simplification of complex monitoring data into grades facilitated effective communication to a broad audience. For most of that audience, it would have been the first time they had ready access to information about the ecological condition of their local waterways, as most of the waterways had not been monitored previously, with River Health being one of the first catchment-scale waterway monitoring programs in NSW. In freshwater tributaries, River Health monitored the condition of riparian vegetation, water quality and aquatic macroinvertebrates. In the estuary of the lower Georges River, River Health trialed the monitoring of infauna and vegetation, but it was difficult, messy and uninformative for comparisons between sites, so estuarine monitoring settled on measuring water quality. During the grant-funded period, 590 community members (including students from 23 schools) were engaged in monitoring over four seasons. Georges Riverkeeper member councils realised the value of River Health monitoring and continued to fund it beyond the term of the grant.

In 2014, there was a thorough external review of the Program to ensure that it was still relevant and scientifically rigorous. A major outcome from the review process was a decoupling of the collection of monitoring data and community engagement. All reported River Health data is now collected by professionals, although a River Health study showed that experienced citizen scientists can provide useful data with adequate guidance (Reid et al. 2016). Other publications that have used River Health data include: assessment of the association between catchment imperviousness and ecosystem degradation (Tippler et al. 2012a); development of guidelines for stream conservation (Tippler et al. 2012b); lack of seasonality of macroinvertebrate communities in Sydney (Tippler et al. 2014); and, recent work showing the similarity in ecological condition and communities occurring in urban streams with natural substrates and concrete channels (Reid & Tippler 2018; Tippler & Reid 2018).

Beyond 2018: The future of Georges Riverkeeper

GRCCC continued on in this fashion until 2017, when yet another significant step in its evolution began. That step is ongoing and implementation of a new strategy will occur over 2018-22.. So far, GRCCC adopted the business name of Georges Riverkeeper. That name changed was partly driven by the merging of member councils, particularly the merging of Hurstville and Kogarah Councils to form Georges River Council, the

naming of which overlapped with Georges River Combined Councils' Committee and caused considerable confusion. The name change is also an acknowledgement that for many years, Riverkeeper was the main Program of GRCCC and many local residents always thought of GRCCC as 'the Riverkeepers'.

In addition to the name change, additional Programs that have received formal recognition are a Research Program, Stormwater Program and Education & Capacity Building Program. The strategy facilitates strengthening existing partnerships and continuing the good work of Georges Riverkeeper. Unfortunately many of the same issues from 20 years ago (stormwater runoff, erosion and sedimentation, habitat removal, incursion of exotic vegetation, invasive fauna, dredging, development, and industrial runoff) still exist, but with a lack of government funding and support that also existed 20 years ago.

There are signs that management along the Georges River is having positive effects, for example less pollutants being pumped into the river by industries and the rehabilitation of Horning Street saltmarsh. Although it is unlikely that the oyster industry will return in the foreseeable future, recently mud oysters have returned to the Georges River and jellyblubbers and solder crabs have recently been sighted too. With increased development within the catchment the population is meant to increase from the 1.38 million people it is today to almost 1.7 million by 2031, intensifying all of the human induced pressures discussed throughout this paper. The Georges River will face many challenges in the future and with the continued support of local councils the river could thrive as a liveable urban river, as long as this is paired with enough public interest and knowledge, renewed government support and grant funding, and further coordination amongst the relevant stakeholders.

Acknowledgments

All volunteers who have contributed to the organisation. The Aboriginal People who are the original inhabitants that managed the river over thousands of years before first contact and formation of Georges Riverkeeper.

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