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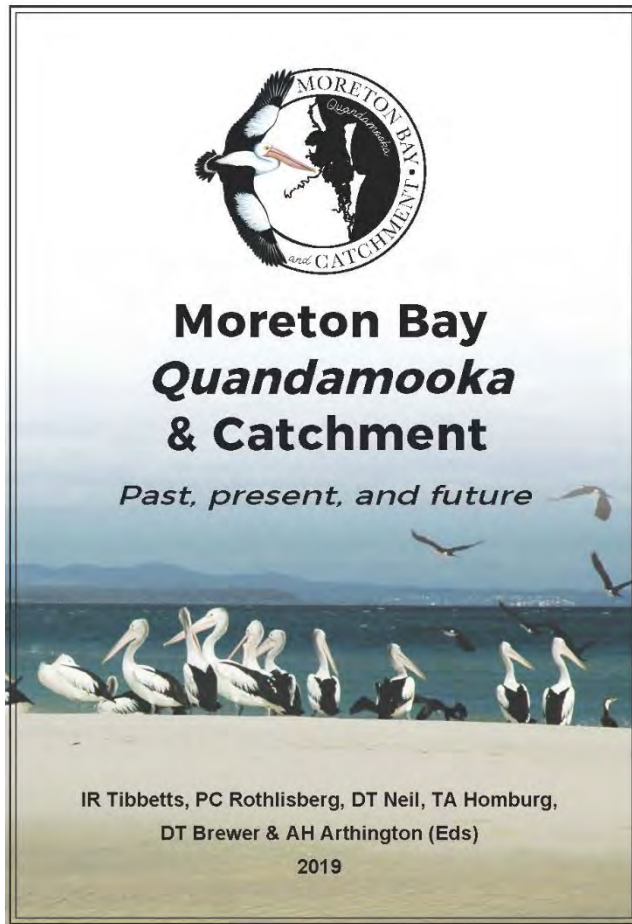
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Stewardship as a driver for environmental improvement in Moreton Bay

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Abstract

Individuals and communities care for South East Queensland's waterways in a wide variety of ways. Stewardship began with Indigenous peoples who have cared for lands, species and waterways for many thousands of years. In South East Queensland there are now more than 500 community groups which volunteer their time and effort to manage and protect our waterways. These include Traditional Owners, Landcare, Coastcare, Bushcare, catchment management organisations, citizen science monitoring groups, non-government organisations and environmental education groups. They are collectively coordinated through collaborative organisations such as Healthy Land and Water, and are supported by their state and local governments and other partners. They contribute enormous effort, passion and awareness-raising to restoring and improving waterway systems. Landholders and industry, applying best management practices in their production and land management systems, and individuals taking their own initiatives and offering leadership, are equally stewards of our waterways. This paper presents an overview of the development of stewardship activity in South East Queensland, and discusses enabling conditions, pressures and drivers, and the changing face of the many types of waterway stewardship across the region. Brief case studies illustrate the variety of initiatives and their achievements. The paper concludes with a summary of achievements in the face of declining environmental conditions, and canvasses the information needs, actions and directions put in place to meet the challenges the region faces in the future.

Keywords: community, community groups, landholders, industry, catchment management, Indigenous

Introduction

Moreton Bay (Quandamooka) has outstanding environmental and cultural values. As long as humans have inhabited Moreton Bay and its catchments it has been valued highly for its

resources and contribution to society and economy (1, 2). The Bay and its catchments have been managed beginning at least 20,000 years ago through Traditional Owner occupation and care (3). The original custodians of South East Queensland managed the Bay and its catchments to preserve their inherent resource value.

More recently however, the rapid and widespread urbanisation, together with commercial and recreational exploitation of the Bay and its catchments, have had serious negative impacts on the extent and quality of its resources. Therefore, land care groups, concerned community members, academic groups, Traditional Owners, government and industry have all played a part in the stewardship of Moreton Bay (4). Stewardship and its role in environmental management became more widely accepted with increasing public understanding that approaches to land management could not be guided by economics or science alone but should also be underpinned by the many other types of values which shape people's connections to place (2).

In assessing stewardship and its effectiveness, there has traditionally been a focus on achieving changes to environmental condition, including actions that lead to an improvement in environmental quality. In a complex system such as Moreton Bay, many interrelated drivers affect condition (5, 6). Measures of outcomes, while indicative, may not provide the only measure of effectiveness of stewardship actions. Continued population growth and urban expansion, coupled with sediment and nutrient addition, associated with erosion in upstream primary production landscapes due to historical land-clearing practices, continue to place pressure on the environmental condition and closely related social and economic values of Moreton Bay and its catchments.

The current management paradigm in Moreton Bay and catchments is collaborative, involving many partners with different responsibilities in land and water management (7). It attempts to balance differing interests and encourages development in ways that mitigate or minimise impacts on the rivers and Bay. As such, stewardship support systems in the region have, in the main, been designed to create conditions that foster and enable actions, policy and behaviour that results in the preservation, protection or enhancement of environmental condition and serve to mitigate negative outcomes for the Bay's natural assets and the communities that benefit from them.

What is Stewardship?

According to Myers *et al.* (8), stewardship refers to the values held by individuals, communities, corporations and government organisations, and the actions of those bodies to manage something in a way that ensures its functionality and existence into the future. Western concepts of stewardship are commonly understood as voluntary individual and community environmental activity, occurring within institutional, social and economic frameworks including legislated or government-led requirements of duty of care for environments (9, 10). Indigenous concepts of stewardship are holistic, and involve management of resources through culture, knowledge, and family connections to place, drawing from the wisdom and experience of ancestors and seeking to hand on to future generations (Pinner *et al.* this volume (11)). UNESCO, in the Convention for the Safeguarding of the Intangible Cultural Heritage also draws attention to less tangible aspects of stewardship of nature: oral traditions and

expressions, including language; performing arts; social practices and rituals; knowledge and practices concerning nature and the universe; and traditional craftsmanship (12). Consideration of stewardship also includes activities and processes that facilitate behaviour change, such as uptake of new and innovative practices, and institutional environments that nurture capacity for stewardship and people's willingness to engage.

The region's Ecosystem Health Monitoring Program (13) definition of waterway stewardship combines many of these elements:

the process by which individuals, organisations and industry actively manage and value waterways and associated environments to remove, avoid or minimise negative impacts on all relevant waterways and receiving waters and proactively restore or conserve ecological health of waterways, wetlands and aquatic and marine environments.

For the purposes of this paper the term stewardship is applied to the values (caring) and actions of the diverse range of individuals and groups who manage and care for Moreton Bay and its catchments. Our emphasis is on voluntary, non-government activity, while recognising the enabling roles that government policies and programs play. We recognise facilitating as well as direct actions.

The paper is built from the professional knowledge of the authors, all practitioners in facilitating stewardship in South East Queensland. Short case studies, from our working knowledge, are included to illustrate the many aspects of stewardship we highlight.

Stewardship in Moreton Bay and its catchments

The management of Moreton Bay has been recognised internationally for its strong collaboration and regional focus (7). This collaborative and regional focus has been a significant factor in stewardship of the Bay. It has been motivated by a number of factors. The spatial attributes of Moreton Bay and catchments involve a large catchment to bay ratio, environmental and climatic variability, and highly varied land use. Moreton Bay is considered as a system, with attention to upstream-downstream relationships, competing users, and the nature of the Bay as a receiving body. Added to this are competing influences of social, economic and environmental values and usage, needing to be incorporated within large scale policy and management interventions.

Within this collaborative, regional set of arrangements, stewardship actions take on a 'shared value' approach that focuses on management of public goods, such as oceans, waterways, forests and fisheries based on the premise that we are all accountable for the sustainable management of these resources (14).

Types of stewardship actions undertaken in and around Moreton Bay are diverse and range from grassroots community action through to policy and regulatory actions. Some of these have included:

- Actions taken by individuals, organisations or industry sectors to protect, maintain, restore or rehabilitate waterways, marine and aquatic condition and associated

terrestrial environments and natural processes (riparian revegetation, conservation easements, dune rehabilitation)(15);

- Adoption of practices that reduce or mitigate negative impacts associated with certain activities e.g.: best management practices (BMP) in agriculture; erosion and sediment control; Water Sensitive Urban Design; (16–18);
- Community engagement and education (19, 20);
- Investment that increases the capacity or willingness of individuals, organisations and industry sectors to manage waterways and associated terrestrial environments in a responsible and sustainable manner (including government initiatives, local government capacity building programs and education extension);
- Government policy and legislation, corporate policy and actions aimed at mitigating or regulating associated negative impacts of resource use impacting waterways and associated terrestrial systems (21);
- Monitoring and reporting on social, economic and environmental condition and linkages (15).

Stewardship in this region, as elsewhere (7), relies heavily on collaboration. The following five case studies illustrate different examples of stewardship through collaboration. The first case study, Healthy Land and Water, shows region-wide collaboration in waterway and natural resource management, while also supporting a wide variety of organisations and individuals in undertaking stewardship ‘on ground’ at more local levels. The second case study, the Healthy Country Program, illustrates how collaboration between scientists and practitioners can inform and guide successful, well targeted, stewardship efforts. The third case study, the Aura Community Stewardship Program, illustrates local collaboration, in this case stimulated by a private sector organisation. The fourth case study, Grazing Best Management Practice, illustrates the way institutional arrangements can support stewardship activity. The fifth and final case study, the Journey of QYAC, is that of the Quandamooka Yoolooburrabee Aboriginal Corporation, an Indigenous organisation with a long track record of effective stewardship of Moreton Bay and islands.

1. Healthy Land and Water

Healthy Land and Water was formed as a community-focused and science-based waterway and natural asset management organisation to continue to improve the coordination and implementation of best practice catchment management. It was formed through the merging of Healthy Waterways and SEQ Catchments, two collaborative organisations that have long supported and enabled stewardship actions to improve and protect Moreton Bay. It is one of Australia’s 56 regional bodies for natural resource management. Healthy Land and Water is 50% owned by the South East Queensland Catchment Management Association, a collective with over 70,000 community members with a focus on all of the region’s natural assets, with waterway and catchment health as key priorities – the remaining 50% of the organisation is equally owned by the South East Queensland Council of Mayors and the region’s water utilities. Thus Healthy Land and Water has the capacity to engage with, and mobilise over 70,000 volunteers in South East Queensland to inform, support and deliver demonstrable community change and on-ground outcomes.

Healthy Land and Water takes a collaborative approach to preserving the region’s natural assets, involving landholders, community groups, industry, Traditional Owners and

government. These partners work to share understanding and knowledge, promote regional collaboration, and identify solutions across the catchments of South East Queensland. Researchers and policy-makers (including government representatives from China, Singapore, The Philippines and Indonesia) have extensively studied the organisation's collaborative style, and their work also attracts national attention with formal commendations from the Wentworth Group of Concerned Scientists and the Australian House of Representatives (22).

2. The Healthy Country Program

The Healthy Country Program was established in 2007 to support communities, farmers and scientists to improve the health of South East Queensland's waterways and Moreton Bay. It was set up as a "proof of concept" to share ideas and trial methods to reduce sediment and nutrients polluting local waterways and putting at risk the health of Moreton Bay.

Healthy Country is a science-based program that adopts a collaborative delivery model that combines the latest scientific knowledge with community priorities, to deliver innovative projects that improve water quality and landscape resilience. The focus to date has been on managing sediment and nutrient discharge from priority catchments. Modelling completed by SEQ Catchments, Healthy Waterways and the Australian Rivers Institute at Griffith University found that the Logan, Bremer, Lockyer and Pumicestone catchments contributed the greatest amount of sediment and nutrients flowing into our waterways (23). The on-ground initiatives included a mixture of well-established techniques such as managing eroding gullies, planting trees, and installing fencing to keep livestock out of creeks, as well as 'soft' engineering works such as rock chutes and sediment ponds and the trialling of newer methods such as engineered log jams. These initiatives have been focused around reducing erosion, improving livestock management and weed control, and providing expert advice to promote good practice and innovation across the catchment.

The key partnerships formed and developed during the Healthy Country Program were with: private landholders, the Department of Environment and Resource management (DERM); the Department of Employment Economic Development and Innovation (DEEDI); Griffith University; Healthy Waterways, and Indigenous Traditional Owners (Jagera, Yuggera and Ugarapul people). These partnerships operated through regional and local committee meetings, extension officers' and project managers' meetings/workshops, field trips and one-on-one interactions. The Healthy Country Program has been able to demonstrate that the original "proof of concept" works, i.e. using a science based approach to identify sediment sources and prioritise areas according to the highest sediment export loads combined with a local participative approach to engage landholders in the planning and implementation of sediment control works (24). The broad-scale rollout of the initial Healthy Country proof of concept has produced positive results for the environment in the past 10 years, including when floodwater caused by Cyclone Debbie inundated the Lockyer Valley in March 2017. Here sections of Laidley Creek previously rehabilitated as part of the Healthy Country program withstood the brunt of the floodwater and suffered only minor damage, and more mud and soil than expected was prevented from entering the waterway. Further, in early 2018 the Queensland Government announced it had allocated \$1.4 million over three years to continue the program, a clear demonstration of confidence in the concept.

The Healthy Country Program has successful water quality outcomes due to the extensive engagement process with the local communities in priority catchments (24). This process allows the identification of local concerns and priorities and alignment with science driven support tools. Hence, the Healthy Country engagement process can see the formation of projects that meet the expectations of landholders and deliver strong environmental outcomes. Key to this was the long-term investment by Healthy Land and Water staff based in the catchments, building trust and facilitating the integration of community knowledge and science. This engagement resulted in extensive support from local communities in achieving enhanced landscape resilience and healthy waterways.

3. Aura Community Stewardship Program

In 2013, Stockland property group gained Australian and Queensland Government approval, with conditions, to develop a 2,310 hectare ex-pine plantation south of Caloundra, now known as the City of Aura. As part of the conditions under the *Environment Protection and Biodiversity Conservation Act 1999*, Stockland was required to establish an “environmental engagement strategy” to include a mechanism for ensuring community engagement with management practices required to protect ‘Matters of National Environmental Significance’.

Since 2013, the Aura Community Stewardship Programme overseen by the Aura Community Advisory Group and facilitated by Healthy Land and Water staff has been achieving early outcomes for the ecological restoration and future sustainability of the development. The group has representation from over 16 community groups and government agencies, and meets quarterly to share information, plan and build knowledge.

The restoration work focusses on a peninsula of land between North and South Bells Creeks, known as “Little Italy” because of its boot shape. This area was previously grazing land. From 2014 it was fenced to exclude livestock, to create an Environment Protection Zone extending over 400 hectares. Two teams of participants from the Federal Government’s Green Army employment program removed pine seedlings from 500 hectares of the 700 hectare future conservation zone. The Aura Community Stewardship Programme uses events, such as celebrating World Wetland Day and National Tree Day each year with the local Unity College and community groups, for building a frog pond, tree and other planting, as well as talks. The first cultural fire management training and burn has been undertaken, and the community Faunawatch programme has gathered two years of baseline data as the site regenerates. An Aura Flora nursery has been established initially for training purposes to collect and propagate seeds from the site. The community has had input in many of the sustainability initiatives on site, and into the development of the “welcome pack” offered to new residents. This program has been so successful that Stockland is using the Aura model to build community engagement and participation, achieve environmental outcomes, secure green star ratings and promote these credentials in future developments across Australia.

4. Grazing Best Management Practice (GBMP)

Grazing is a significant land use in South East Queensland. Best management practice guidelines help farmers to find sustainable ways of demonstrating good environmental stewardship, while also improving their economic outlook. Like elsewhere in Queensland,

without careful management grazing land use can be a significant contributor of sediments and nutrients into waterways. GBMP is delivered in South East Queensland by Healthy Land and Water, the Department of Agriculture and Fisheries, and AgForce.

The GBMP program is a voluntary, industry-led process that assists graziers to identify improved practices to enhance the long-term profitability of their business and improve catchment water quality. An online, self-assessment tool, GBMP (www.bmpgrazing.com.au), allows participants to benchmark their current practice against an industry-developed set of standards, which have been verified by a producer reference group and are based on industry experience and science (through the Department of Agriculture and Fisheries). By participating in the program, graziers assess how they currently measure up in their industry and identify opportunities for improvement. It also provides an indication of current practices in the industry across the state.

In South East Queensland, 166 businesses covering 107,367 hectares have completed a GBMP module (16).

To illustrate the unique work of voluntary organisations, we highlight an Indigenous organisation, the Quandamooka Yoolooburrabee Aboriginal Corporation (QYAC), as example number 5.

5. The journey of QYAC

The Quandamooka Yoolooburrabee Aboriginal Corporation, formed in 2011, is the Native Title holder body for the Traditional owners of 24,903 hectares of land and 29,525 hectares of water on and surrounding North Stradbroke Island (Minjerribah). It includes areas of national parks and reserves, state land and other leases. Legal recognition of native title followed successful negotiation with the State of Queensland, the Commonwealth, two city councils, and a range of commercial interests and infrastructure providers.

Traditional Owners have cared for the waters, islands and mainland of Moreton Bay for at least 20,000 years (3). QYAC and its predecessor organisations set up formal capacity for stewardship activities in 1991, with the formation of the Quandamooka Land Council (later Quandamooka Aboriginal Land and Sea Management Agency, from 1998). Their stewardship includes: advocacy for their country (including a voice on development proposals); cooperation with other management organisations including the Queensland Parks and Wildlife Service in marine and terrestrial management, monitoring of marine and land conditions; and on-ground works, in conjunction with a wide range of partners which contribute policy, program, science and practical support. For example, Quandamooka elders and SEQ Catchments worked together to restore the culturally and ecologically significant Myora Springs wetland on North Stradbroke Island. QYAC has also worked with Queensland Parks and Wildlife Service to expand the protected area of Minjerribah from 2% in 2010 to currently 50%.

Following the Quandamooka people's native title settlement in 2011, QYAC has increasingly played a lead role in the management of Quandamooka Country and has secured a Queensland Government commitment to end sand mining in 2019, progress a UNESCO World Heritage

listing for the area, as well as further expand the National Park to as much as 80% of Minjerribah.

QYAC's land and sea management capacity has grown significantly over recent years so that QYAC is now one of the largest land management employers in South East Queensland. It now employs over 100 staff and leads the management of reserves, the National Park, and the Camping Areas across Minjerribah. Priorities include: ecological assessment and landscape restoration following cessation of sand mining; development, training and employment for young people; protection of sacred areas; and management of groundwater.

QYAC also has the largest membership of any Native Title Body Corporate in Australia. It is playing a lead role in demonstrating how Traditional Owners are well placed to lead the stewardship of their country.

Institutional Arrangements

Any attempt to describe and explain stewardship in Moreton Bay should include the enabling conditions (institutional arrangements, plans, policies and programs) that support the on-ground aspects of the management system (25). Further, Snouder (26) suggests that for the most part, managing waterways and increasing uptake of stewardship activities have been enhanced by technical knowledge and agreement that behaviours and environmental conditions need improvement. Therefore, the stewardship activity is heavily influenced by either willingness or ability, or both. In Moreton Bay over the last 30 or more years that the following management components have influenced the degree to which stewardship actions have been successful:

- High levels of trust to enable partnering and certainty;
- Striving for cultural appropriateness or cultural 'fit' of planned activities;
- Social, political and economic context, including people's values, local and regional political priorities, the mix of enterprises in the region and variations in economic confidence or pressure;
- Willingness to pay for investment in the environment;
- Willingness to incorporate the true cost of production into value chains;
- Equitable funding arrangements for interventions that improve the quality of waterways;
- Correct information; the use of rigorous science to inform stewards;
- Stakeholder understanding of the impacts of behaviours (negative and positive), removing stakeholder doubt, that there are issues;
- Incorporation of risk management principles in program design and activities;
- Lack of availability or access to incentives to support landholders and organisations;
- Lack of resources, or undeveloped resource pathways, impacting on ability of stewards to undertake actions that improve environmental condition;
- Access to reliable and trusted sources of information;
- Availability of Natural Resource Management and Best Management Practice information;

- Regulations or conditions for operation that may be inappropriate or extremely difficult, or expensive, to implement; and
- Alignment of policy and regulation. Support by the broader community for environmental policy and regulation and the willingness of regulators to enforce non-compliance with environmental policy.

History and future of funding

Most funded projects in Moreton Bay and catchments are resourced collaboratively through federal, state, and local government, industry, water utilities and landholder/community resource pools. In many instances the projects rely heavily on in-kind support or volunteer works to achieve outcomes. Funding for stewardship has been driven, over time, by a series of national and national-state policies and programs:

1989: Federal funding for Landcare enables local Landcare bodies to be formed throughout Australia, and employ part-time facilitators. National and state coordinators were also employed;

1990: Land and Water Australia established, combining fragmented former research funding schemes under a single, more strategic body;

1990: Integrated Catchment Management was introduced formally in Queensland (27);

1991: Co-operative Research Centres established. These promoted research under collaboration between universities, CSIRO, industry and government partners;

1992: Federal Government's Decade of Landcare Plan developed and launched. The *Natural Resource Management (Financial Assistance) Act 1992* was established to manage and assign funding to natural resource management projects and programs (National funding of \$320 million committed for the life of the program);

1992: Community grants become available, for projects with a limit of \$15,000 and a requirement of 1:1 funding matching ratio from the community (this contribution could be in-kind);

1992: High level of partnering between states and federal government required under *The Natural Resource Management (Financial Assistance) Act 1992*;

1995: Waterwatch and Coastcare programs established;

1997: Natural Heritage Trust established. \$1.25 billion made available nationally over five years. This expanded the national Landcare Program by providing large grants awarded on a competitive basis to community groups for on-ground works;

2002: \$1.4 billion of funding over seven years through the National Action Plan for Salinity and Water Quality, a program to address these issues in designated catchments, and \$1.032 billion over five years through the Natural Heritage Trust extension (NHT2). These Commonwealth-state programs established 56 regional bodies for natural resource management across Australia, scaling up the Landcare model into community-based organisations for planning, coordinating, leveraging partnerships

and distributing funds. These organisations were recommended to have broad stakeholder bases in their membership and boards;

2008: Caring for our Country program, \$2 Billion over five years. This replaced the National Action Plan for Salinity and Water Quality and NHT2, and reduced the level of funding to all regional bodies in favour of nationally competitive funding for specific purposes; and

2014: Green Army, a federal government funded initiative consisting of a combined employment and natural resource management program that aims to support local environment and heritage conservation projects across Australia whilst providing hands-on work experience for unemployed youth.

This evolving set of initiatives is internationally unique in its degree of focus on community-based action for stewardship. The time period covered above saw a focus on community-based action, shifting to a regional focus from the early 2000s which left the funding of Landcare groups to the discretion of regional bodies, at reduced levels. Thus, many Landcare and similar groups withered during this period, while others continued under their own resources and ability to attract funds (28). Meanwhile, the regional bodies for natural resource management received varied resourcing after 2008, depending on the extent to which national funding priorities applied in their areas (28).

This adaptation and innovation has stimulated collaboration, and increasing financial self-reliance. Industry, community groups, not-for-profit organisations involved in catchment management, governments and utilities are committed to working together in Moreton Bay and catchments to: increase cost-effectiveness through in-kind support for implementations; reduce 'silo-ing' and duplication of works; ensure correct information is used; partner to resource projects; and open up new or novel resource pools. Two regional collaborations led these processes, Healthy Waterways (from the late 1990s, self-started), and SEQ Catchments (from 2003, established under the National Action Plan for Salinity and Water Quality and NHT2 programs). The former specialised in water quality and the latter in all forms of natural resource management. These bodies merged in 2016 as Healthy Land and Water (see Case study 1: Healthy Land and Water).

Many organisations responsible for managing impacts on the waterways of South East Queensland and Moreton Bay have moved away from a reliance on government funding and have established self-funded business models – often relying on partnerships that allow greater autonomy and independence and deliver better funding security.

Self-reliance has also been realised through the establishment of social enterprises and commercial entities that feed profits back into the organisation through undertaking activities that achieve water-quality outcomes.

Stewardship organisations in South East Queensland

There are many types of stewardship organisation in South East Queensland, some originating spontaneously, others reflecting the types that developed nationally under stimulation from the national Landcare program, National Action Plan for Salinity and Water Quality, and other

support programs listed above. One of the first advocacy groups, the Queensland Littoral Society (now Australian Marine Conservation Society), was formed by South East Queenslanders in 1965. The Moreton Island Protection Committee, and the Stradbroke Island Management Organisation, were formed in 1978. The first recognised citizen science program in SEQ was a Brisbane wildlife survey held in 1980.

There was a spurt in formation of voluntary organisations in the 1980s and 1990s. The first Bushcare group, Grange Forest Park Bushcare, was formed in 1984. The Gold Coast Environment Centre was established in 1989. Barung Landcare was founded in Maleny and the Blackall Range in 1989, just prior to the declaration of the Decade of Landcare. Other early Landcare groups were Noosa and District Landcare, and the precursor to Norman Creek Catchment Management Coordination Committee (both in 1991). When Queensland introduced Integrated Catchment Management (ICM) in 1991, as a voluntary system of groups based on the land care model, The Oxley Creek Catchment Association became the first urban ICM organisation, and the body that became Lockyer Catchment Association (building on the Lockyer Watershed Management Association of the late 1970s) was another of the first ICM bodies to form.

The Habitat Brisbane program was established by Brisbane City Council in the mid-1990s, and now has 78 participating groups. Karrawatha Forest Protection Society formed in 1991 to save an area of bushland, and establishment of Brisbane City Council's Bushland Levy enabled purchase of land. Similarly, Boondall Wetlands Management Committee, founded in 1992, arose from a community campaign to save these wetlands.

The Brisbane Catchments Network formed in 2012 to help the 11 catchment groups along the Brisbane River to coordinate, and represent themselves collectively. The state-wide organisation Queensland Water and Landcare, formed in 2004, provides another vital coordination medium for all voluntary groups in South East Queensland. As well as providing valuable resources, it is particularly important for providing public liability and accident insurance for its members and volunteers, solving an insurance crisis that had placed many voluntary groups in jeopardy during the 2000s.

Generational change

Nationally, the challenge of an ageing cohort of community stewards has been well documented (29, 30). The initial cohort of community members who engaged in environmental stewardship in the "Decade of Landcare" in the 1980s (31) are still in the field and remain the core of volunteers active in waterway stewardship. In the main, stewardship groups across South East Queensland report low-levels of renewal in catchment care groups associated with a failure to engage younger generations in environmental stewardship (32).

The ageing of the population is an opportunity for volunteering through which, collectively, volunteering organisations can 'turn grey into gold' (33). Living longer, in better health, and the active lifestyles of many senior Australians makes becoming involved in volunteering possible (34). Realising this opportunity to recruit further contributors to environmental management also relies on volunteer organisations being adaptable and able to offer flexible ways to volunteer (34). In Australia in general, stewardship is beginning to be recognised with

a range of awards now existing at the regional, state and Commonwealth level to recognise the efforts and achievements of individual volunteers and stewards (34).

Alongside this trend in the ageing of the population, volunteering has become more common nationally among young people (34) offering a potential opportunity for an aging stewardship cohort to recruit younger people. The rate of volunteering by young people in Australia increased from 16% in 1995 to 27.1% in 2010 (34). Young people are engaging in volunteering in diverse ways. For example, volunteer tourism particularly during the student gap year is a growing area of involvement for young people and a start to engaging in lifelong experiences of volunteering. Through partnerships with young people, educational institutions, peak bodies and volunteer-involving organisations are developing new approaches to volunteering (34).

Environmental education research strongly suggests that learning experiences in the natural environment are extremely important in developing students' environmental knowledge, attitudes and responsible actions (35–43). Palmer's 1999 research (44) found that direct experiences with nature had far more impact on subsequent involvement in pro-environmental activities than did formal education.

Education Queensland has established 25 Outdoor and Environmental Education Centres (O&EECs) throughout the state, three of them in the Moreton Bay and catchments area. These centres are curriculum aligned and provide students with the opportunity to study aspects of environmental sustainability. O&EECs provide the personal nature-based experiences that have been identified as critical for the formation of pro-environmental attitudes, and are in a prime position to build positive and productive relationships between school students, the local community and the natural environment (45). O&EECs are significant contributors to building environmental stewardship within young learners through their use of experience-based learning (45).

The need for generational change in stewardship in the Bay and catchments is widely acknowledged (32), and the continuing need to engage younger generations or newcomers to act as stewards presents as an inherent problem for many stewardship groups. Community and catchment groups, governments, utilities and schools all understand the need to recruit the next generation of stewards to ensure the values of the waterways are sustained. By supporting, facilitating and designing programs aimed at engaging and raising the awareness of the broader community and the youth of South East Queensland, the important work of renewing the initial cohort of stewards is being undertaken.

Conclusions

Moreton Bay (Quandamooka) and its catchments are loved by their many stakeholders. The drive for improved water quality and ecosystem health has led to wide ranging and important stewardship activities by diverse individuals and groups. These include Traditional Owners, land care groups and catchment management bodies, the Brisbane Catchment Network, and the sustainable management efforts of individual landholders, and organisations such as urban utilities, local and state governments. Growing concern and awareness about the health of waterways has also resulted in greater community interest in monitoring, on-ground action and decision-making to support sustainable management of the region's natural resources.

The establishment of Natural Resource Management (NRM) organisations, the Healthy Waterways Partnership, SEQ Catchments, and now the integrated Healthy Land and Water, have helped to galvanise activities by state and local governments, business and industry and by stewardship groups, towards management of environmental conditions in the Bay. The extent and contribution of community stewardship has become better recognised in recent years (46), and is seen as a major driver that can lead to change.

Challenges remain. Stewardship activities need to be supported by funding, strategies, guidance, training and resources. Without these, participation and activities are likely to decline. Generational change may influence the availability of volunteers. While the interest and commitment of the younger generation to improved environmental outcomes in the Bay is clear, much needs to be done to recruit more young people into stewardship groups and activities. The outcomes associated with stewardship activities also need to be monitored and reported, which is critical for maintaining commitment and enthusiasm. These are critical components in supporting voluntary stewardship organisations and activities in delivering effective outcomes for Moreton Bay (Quandamooka) into the future.

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