State of the Streams

2017 Review

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1 Findings and Proposed Solutions

Water by Design is at an exciting stage of developing a suite of tools to improve the state of Queensland's waterways and streams. The aim of these efforts is to help improve waterway health and water quality flowing to the Great Barrier Reef and Moreton Bay. These tools are being developed in alignment with the principles of the Erosion and Sediment Control (ESC) and Urban Stormwater Strategy for Queensland. The key principles relevant to waterways are:

- A responsibly managed stormwater system helps to protect locally and regionally recongised values and provides multiple benefits to the environment, local communities and to local economies.
- Queensland's highly variable climate and geography requires locally relevant and context specific stormwater management solutions.
- Urban development must be designed, planned, constructed and maintained in order to mitigate negative impacts to the environment and to enhance liveability.
- Planning and management of our catchments, communities and water infrastructure will be integrated, underpinned by good science and evidence-based decision making
- Science, strategic planning and strategic investment are required to deliver evidence-based and cost-effective outcomes for the Queensland community.
- Adaptive management is a key approach to enhance catchment and waterway resilience to a changing climate.

Consultation with a wide range of professional stakeholders around waterway management has been ongoing since 2014 (refer WbD, State of the streams, 2014). A short survey was also conducted more recently to assess capacity building needs (refer Appendix). Key stakeholders include local governments and associations, utilities, industry (ports, urban development), consultants and contractors, Natural Resource Management (NRM) bodies and partnerships, state and federal government departments and authorities, and research organisations. Through robust discussion with these diverse groups, Water by Design has formed a comprehensive understanding of the challenges and successes of developing and delivering waterway programs and projects in different regions across the State.

1.1 Definition of the problem

The urban footprint and its expansion has altered the hydrologic landscape of Queensland. Increased surface flows, and higher loads of sediment and pollutants pose a threat to the Great Barrier Reef, and our coastal and waterway resources. The solution to improving waterway health isn't as simple as ensuring compliance with SPP stormwater quality targets.

There are many management actions that can improve catchment and waterway health and include less imperviousness, more infiltration, stormwater harvesting, urban greening, passive watering, riparian zone protection and enhancement, addressing and stopping gully erosion, re-engagement of floodplains, protection of high value waterways and low order streams, restriction of catchment development and/or imposition of frequent flow management requirements for high value, sensitive streams. However, the challenge we face is how facilitate the adoption of these actions across the diverse institutional, social and physical landscapes of Queensland.

Some key governance problems have been identified as:

Inability to grasp the complexity of the problem; short term thinking and decision making; lack of support for innovative projects; lack of appropriate catchment planning; legislative and financial limitations on what can be done within the existing institutional environment.

1.2 The solution

The urban waterway stakeholders have identified a need for strategic planning and investment and also better coordination and communication across the diverse regions of Queensland, and across the diverse disciplines involved throughout the phases of waterway asset management.

Specific to waterways

There is a need for more monitoring, trials and sharing of learnings and experiences from waterway improvement and Natural Channel Design projects. There is demand for examples and demonstrations of what works and what doesn't so that these projects can be approved and implemented cost efficiently to achieve desired outcomes for each unique region. Improved catchment planning and requirement for flow management to be considered for sensitive and/or high value waterways. Recognition that expertise in waterway ecology and geomorphology is critical to achieving a good waterway rehabilitation outcome that responds to the location conditions.

It is noted that the CRC for Water Sensitive Cities has recently released "Riparian Design Guidelines to Inform Ecological Repair of Urban Waterways" 2017. This is a great foundational document and provides a scientific basis for management of waterways. It also provides guidance on how to prioritise management actions.

Significant time and investment has be spent in developing the Catchment Action Plans Throughout SEQ under the Resilient Rivers Scheme and Water Quality Improvement Plans throughout the state. There is a need to document this process and share lessons learnt.

Based on the above, Water by Design is proposing the development of the following products to fill a need from the industry:

1 A Waterway Management Guideline for Queensland

2 Region Specific Technical Design Guidelines for Natural Channel Design and Waterway Improvement Projects

1.3 Waterway Management Guideline for Queensland

The aim of the Waterway Management Guideline for Queensland is to provide a concise easy to read summary document for waterway management, relevant to all regions of Queensland. It would be a high level document and would guide local councils and waterway managers through the policy landscape.

The guideline would cover the full lifecycle of projects, and would be based on the structure of the Waterbody Management Guideline (2013). There would be a staged approach to the development of this guideline to address each of the key elements or phases of waterway asset management.

1 **Risk Management:** identification of key threats in the catchment, e.g. erosion, change in hydrology, fertilizer and pesticides, weeds and pest species

2 **Opportunity Management:** Identification of key opportunities in the catchment e.g. rehabilitation potential, targeted rehabilitation of threatened species, maximising co-benefits, fostering stewardship

3 **Strategic planning:** a review of the adequacy of current legislative, policy and planning mechanisms for the full spectrum of planning and development processes

4 **Development application:** a review of the process, and development code for waterways.

5 **Spatial analysis:** a guide for GIS mapping of values, threats, opportunities and hotspots. It would include advice on typical layers, surrogates, rolling up layers and multi criteria analysis

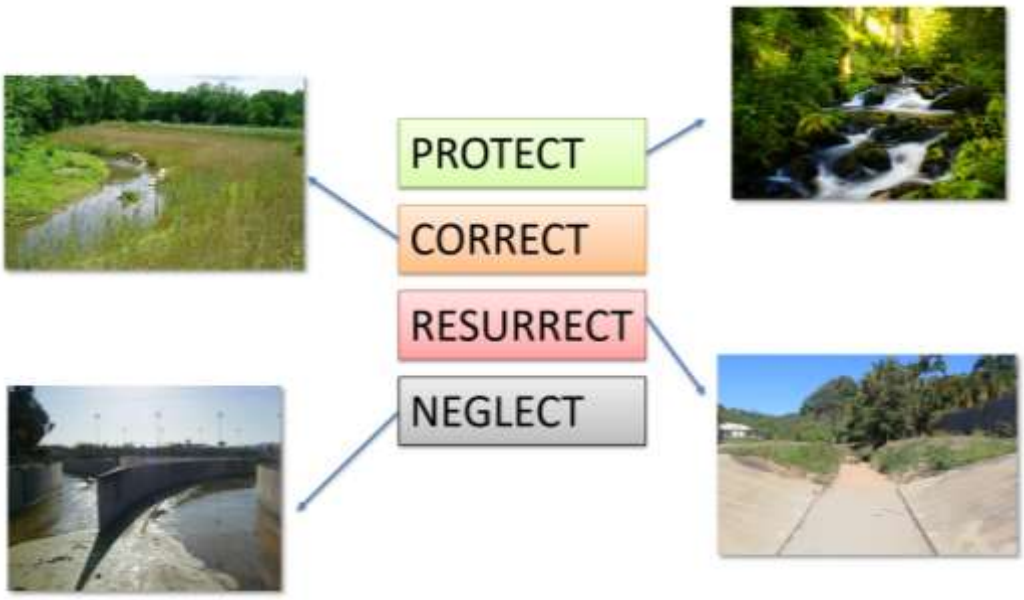
6 **Works prioritisation**, a guide for assessing waterways, prioritising waterway management actions according to the framework of Protect, Correct, Resurrect and Neglect.

7 **Maintenance operations and asset management:** a review of the roles, responsibilities and resources, a guide to scheduling inspections and maintenance, identifying issues and actions; and determining Extent of Service, Type of Service and Level of Service.

8 **Extension and engagement:** a guide to securing participation in extension programs, identifying and setting priority issues and actions; implementing waterway plans; and fostering stewardship.

9 **Environmental accounting:** this module would be a guide for managing ongoing expenditure on green assets including waterways. It would provide advice on typical costs for managing waterways and valuing direct and intangible benefits with a view to maximising return on investment. It would also explore possible revenue streams for Councils and waterway managers.

10 **Monitoring and Evaluation:** a guide to effective use of monitoring and evaluation programs for ecological health, environmental stewardship and economic productivity.



Protect	Protect existing high value waterways
Correct	Correct waterways through weeding, stabilisation and fencing programs
Resurrect	Revive through NCD and channel naturalisation programs
Neglect	Low priority waterways - no amenity or ecological value

1.4 Region Specific Technical Design Guidelines for Natural Channel Design and Waterway Improvement Projects

These guidelines would be prepared as an addendum to the Waterway Management Guideline for Queensland for four regions of Queensland:

- The wet tropics (Far North Queensland);
- The dry tropics (North Queensland);
- Central Queensland; and
- South East Queensland.

The addendum would provide detailed site analysis and design procedures to account for regional variations in climate, soil, hydrology and other key variables for the four regions. This document would be based on the structure of the Brisbane City Council Natural Channel Design Guideline (2000, 2003), and will cover planning aspects, design procedures, revegetation, and evaluation and monitoring associate with waterway improvement projects. This will provide practical guidance on how to achieve hydraulic conveyance of a drainage channel and floodway while also providing multiple benefits to the community and environment. The natural channel design principles are based on four levels of investigation and design to ensure that waterways integrate well with the catchment hydrology, ecology, and local community values. The four levels are:

1 Regional level of catchment management;

2 Local plan form of the watercourse;

3 Channel cross-section; and

4 Design of in-channel features.

1.5 State of our future streams

In order to facilitate continual improvement of our streams and avoid the negative impacts of expanding urbanisation we need to coordinate our efforts towards achieving healthy waterways in liveable urban environments. The tools identified in this document have been designed to address the challenges experienced by our urban waterway stakeholders. The future state of our streams depends on changes in behaviour and more effective strategic planning to be implemented now.

2 Case studies

Throughout Queensland there are exceptional examples of good waterway management. The following case studies have been identified to highlight what has been learned throughout the phases of implementation to assist and guide future projects.

2.1 Waterways case studies

- Enoggera Creek
- Creek Filtration Systems (Brisbane City Council)
- Small Creek (Landscapology)
- Little McCready's Creek Rehabilitation (Mackay Regional Council)
- Slacks creek recovery work (Logan City Council)

3 Creek filtration systems

Project summary

Brisbane prides itself as a clean, green and sustainable city, with waterways at its heart. From 2012 to 2015, Brisbane City Council constructed six, low capital and maintenance cost stormwater treatment systems across Brisbane. Known in Brisbane as 'creek filtration systems', these sites were delivered as a Lord Mayor's Cleaner Waterways Initiative. The systems build upon well-established treatment approaches such as bioretention systems, level spreaders and swales to remove pollution from the city's stormwater in a cost effective, affordable and aesthetically pleasing manner. Brisbane's creek filtration systems won the 2015 Stormwater Queensland Award for Excellence in Integrated Stormwater Design.

Project scale and objectives

Six creek filtration systems were delivered across the suburbs of Greenslopes, Holland Park West, Oxley, Rocklea and Upper Kedron (two systems). The systems were retrofitted onto existing stormwater outfalls in parks, and ranged in size from 200m^2 to 1500m^2. They were designed with four goals in mind:

- To be simple and cost little to maintain.
- To be easy to construct and establish.
- To improve waterway health through reducing pollution and mimicking natural hydrology.
- To improve visual appeal and social amenity of creeks and surrounding areas.

Site context

Brisbane City Council was at the forefront of the initial development of stormwater treatment and water sensitive urban design; however, it faces unique challenges when it comes to mitigating the impact of its stormwater on its waterways. Unlike other local governments in Queensland, whose urban footprints continue to extend outwards, Brisbane has for the most part reached the limit to which it can expand. While other local governments can manage the impacts of stormwater in new urban development on their fringes, Brisbane City Council must find ways to manage these impacts within its existing urban form, where space is limited and the landform is already set. Their simplicity, amenity and ease of construction make creek filtration systems an ideal solution to retrofit onto existing stormwater drains that discharge into parks and waterways.

Issues and constraints

Each of the sites upon which a creek filtration system was built was different, and presented its own unique challenges that needed to be addressed during design. Site specific challenges included managing erosion risk and soil type, as well as flow velocities on the sites with larger catchments. Timing construction to avoid damaging storms also proved to be a challenge on one site.

More generally though, the short duration of the program (several years, compared to an ongoing, rolling program of work) posed some challenges of its own. For ongoing programs of work, relationships and processes are established and maintained over time. These ensure the smooth and timely delivery of the program. In the case of the creek filtration systems these relationships and processes needed to be established from scratch. They continued to evolve as the creek filtration systems were rolled out.

Construction and ongoing costs

The six creek filtration systems varied in both size and form, and construction costs varied accordingly. Critically though, costs were lower than comparable, traditional stormwater treatment systems. One creek filtration system for example, was constructed for approximately 30% less than a traditional bioretention system and will cost 80% less to maintain; all the while delivering similar water quality outcomes to a bioretention system, and better hydrologic and amenity outcomes.

Monitoring

Brisbane City Council applied a monitoring, evaluation, reporting and improvement (MERI) process to track and learn from sites as they were designed, constructed and as maintenance began.

Lessons learned

Brisbane City Council's creek filtration systems demonstrate that it is possible to implement cost effective, aesthetically pleasing stormwater management systems into the existing urban fabric. In the process, lessons were learned about the importance of building relationships and understanding with stakeholders to ensure that the project intent is carried through its lifecycle. Lessons were also learnt about the ability for systems with functional ecosystems comprised of diverse species and plant types to establish into low maintenance systems, and the importance of managing velocities to prevent erosion.

Reference

Brisbane City Council website

Brisbane City Council case study

Conversation with Josh Luck (former BCC employee, now in private sector – involved in design of several systems)

Conversation with Mark Gibson (former BCC employee)

Photos – Jack Mullaly

4 Little McCreadys Creek

Project summary

Flat terrain and a sugar cane farming history are synonymous with the region around Mackay. Traditionally, on such flat terrain, drains across the region were designed solely for stormwater conveyance. Drains were concrete-lined, with turfed batters requiring maintenance for the life of the asset.

Mackay Regional Council identified Little McCreadys Creek in Rural View as a site suitable for developing and showcasing best practice methods for improving stormwater quality, rehabilitating waterways, enhancing aquatic habitat and improving ecological corridors. Council, with assistance from local natural resource management body Reef Catchments, used funds collected under Council's *Voluntary Mechanism for Stormwater Quality Management* to restore a section of Little McCreadys Creek. This was done by installing rock and timber bed and bank controls, fishways, benched wetlands and dense riparian vegetation.

Project scale and objectives

A 720m stretch of Little McCreadys Creek between Bucasia-Mackay Rd and Dawson Blvd was rehabilitated. This stretch of waterway had in the past been heavily modified, including being straightened and formed into a trapezoidal channel. Sitting within a catchment with an existing catchment management plan, the project aimed to:

- improve water quality entering estuarine and Great Barrier Reef habitats,
- increase biodiversity, fish habitat and fish passage,
- provide a local example of a naturalised waterways, for comparison against traditional concrete and turf channels,
- improve visual amenity, and
- re-establish riparian vegetation and ecosystem service values.

Site context

Little McCready's Creek flows east through Rural View before joining with other local waterways and entering the Great Barrier Lagoon. The surrounding catchment is progressively transitioning from rural to urban residential. In the past, it was used for cane farming. During this period, the creek was generally shallow, boggy and filled with sediment from land clearing and agriculture.

Issues and constraints

Consultation with the community revealed most people to support the project, however concerns were raised about the potential for the works to increase local flooding and mosquito populations. Council undertook hydraulic analysis to ensure that there was no increase in flooding on private property. Mosquitoes were found to be an issue in the existing drain. Fish passage was incorporated into the design to, amongst other benefits, allow fish to move into the rehabilitated waterway to prey on mosquito larvae.

Fish passages must be constructed to tight tolerances if they are to function as designed. If constructed incorrectly, they can themselves become a barrier to fish movement. It took several attempts to appropriately key the rocks in the fish passage into the bed and bank.

Construction and ongoing costs

Restoring this section of Little McCreadys Creek, including all community consultation. civil design, landscape design and construction cost $350,000. All plants were provided in-kind. At present, long term ongoing costs are unknown.

Monitoring

Visual inspections are undertaken as part of regular maintenance operations; however, there is no regular monitoring program.

Lessons learned

In tropical climates, weeds are an issue that must be managed. Plants were installed at a density of 5 to 6 plants per square meter, but even at this density, bare earth remained. Weeds took hold in these bare spaces, and maintenance became intensive. A thick layer of forest mulch was retrofitted to the site to fill the gaps and suppress weed growth. In areas at risk of erosion, the mulch was pinned down to prevent it being washed away. This strategy was successful in limiting weed growth to a manageable level.

Reference

Existing case study provided by Luke Galea at Mackay Regional Council.

Email conversation with Luke Galea.

5 Enoggera Creek

Project summary

From 1996 to 2007, local resident Athol Brown, with assistance from various Green Corps groups, Work for the Dole volunteers and people completing community service, restored an 800m long stretch of Enoggera Ck. The restored area of creek stretches along Yoorala Street, from Elgata Street to Warana St. As a part of the restoration, enormous quantities of waste, including bricks, concrete, steel, car bodies and litter were removed from the creek, along with exotic weeds. The area was replanted and tended to as plants established. Today, to the untrained eye, this stretch of Enoggera Creek appears as if it is a natural, undisturbed waterway.

Project scale and objectives

Over 11 years, approximately 800m of waterway were progressively rehabilitated to a width of 30m or more. Beginning adjacent Elgata St, and working upstream, it is estimated that Athol alone invested 15,000 hours of his time in the site. A further 5,000 hours were contributed by other volunteers. Athol's aim in undertaking the work was the restore the creek to as near to natural condition as feasible given the site's history and ongoing pressures.

Site context

Enoggera Creek originates on the southern slopes of Mount Nebo, and flows east, through Enoggera Reservoir, to the Brisbane River. The headwaters, upstream of the reservoir, are largely undisturbed, while the area downstream is entirely urbanised, and the creek degraded. The project site is located less than 1km downstream of the reservoir.

Degradation began as the areas surrounding the site were developed in the 1960's and 1970's. In 1971, a sewer was laid along the creek itself. Construction of the sewer significantly damaged the creek. This damage, along with hydrologic changes, mean that many of the original geomorphic features no longer exist. The copious, apparently natural looking, angled boulders present today are the result of the sewer installation, where excavation was completed using dynamite. Damage continued throughout the 1980's and 1990's. In 1996, when works commenced, the creek was in effect a pest-ridden dump containing copious amounts of building materials and exotic weeds.

Issues and constraints

The overwhelming success of the restoration of the portion of Enoggera Creek adjacent to Yoorala Street is due almost entirely to the work of dedicated volunteers, however it was not without its challenges.

In 2008, the site was severely damaged when a microburst storm tore through the suburb of The Gap. Subsequent work repaired much of that damage, although its effects can still be seen in several large trees.

The site is an example of the difficulty faced when attempting to eliminate exotic aquatic weeds from waterways. While the riparian restoration has been largely successful, in patches it has proved exceptionally difficult to prevent aquatic weeds from re-emerging in the centreline of the creek.

Construction and ongoing costs

As the creek was primarily restored by volunteers, the cost of the project is unknown.

Lessons learned

The process taken to restore this portion of Enoggera Creek teaches several important lessons about creek restoration. The volunteers applied a staged approach to restore each section of the creek. First, rubbish and waste materials were removed. Next, weeds were sprayed or removed, and trees planted. Critically, these trees were allowed to establish before any understorey plants were installed. By allowing the canopy to establish, light was reduced and weed growth suppressed, although not eliminated. When it was time for the understorey to establish, it could do so in favourable conditions, with little competition from weeds.

The site demonstrates that even in well restored creeks weeds must be continually managed. Despite the success establishing a canopy on the site, weeds have re-emerged in certain areas. Athol describes how far fewer weeds were present on the site in 2007 than at present in 2017. Until 2007, Athol continued to manage weeds as they re-occurred.

Reference

Athol Brown – conversation on site 27 July 2017

http://www.saveourwaterwaysnow.com.au/01_cms/details.asp?ID=2457

http://www.saveourwaterwaysnow.com.au/01_cms/details.as

6 Slacks Creek

Project summary

Community concerns led to Logan City Council commission the Slacks Creek Catchment Futures Study in 2012. The study outlined a long-term approach to catchment recovery that is built around community partnerships, and spawned the Slacks Creek Catchment Recovery Project; a pilot initiative founded on strong community partnerships and guided by an 'activate, beautify and clean' (A.B.C) approach to improve waterway health and return valuable community space. The project included community tree plantings, cleanup activities, art installations and environmental enhancement. Council's project won the titled of Best Government Project and was a finalist in the Urban Renewal Award Category at the 2014 Healthy Waterways Awards.

Project scale and objectives

The project comprises numerous sites along the length of Slacks Creek, with the aim at each site to restore a section of Slacks Creek to increase habitat for wildlife, improve habitat quality and reconnect areas of riparian vegetation. The works aim to improve water quality and bank stability, reduce pollutant migration and increase the knowledge and engagement of the community to better conserve, manage and protect natural resources.

In its first four years, the project has activated parkland by installing and enhancing facilities, walking paths and play equipment, improved riparian function by restoring 2.6km of riparian vegetation, removed 5 tonnes of rubbish from the creek, improved connectivity by constructing a rock ramp fishway and disconnected and treated 8ha of urban catchment by installing three stormwater infiltration systems. In total, approximately 90,000 plants have been installed. Key to the success of the A.B.C approach is the focus on achieving a clean, healthy creek which supports and is supported by active and vibrant open spaces. A variety of community events and activities have been run.

Site context

Slacks Creek flows through the heart of Logan City and has suffered significantly from changes in catchment land use. Development has urbanised the catchment including reshaping some of the smaller tributaries. Slacks Creek is under pressure from erosion and pollution from unfiltered stormwater from urban areas. The creek and catchment still supports large wildlife areas and possesses enduring ecological and community values.

Issues and constraints

Over the past 50 years the catchment has changed from forested landscapes to urban uses. The impacts this change has brought has significantly compromised the creek's ability to support biodiversity as well as recreational and social amenity values. The extent and types of rehabilitation works are constrained by available space and access. Rehabilitation measures must look beyond restoring the original creek. Instead it must accommodate past alterations and increased rates of runoff as a result of urbanisation.

Construction and ongoing costs

The Slacks Creek Recovery Project has driven an increase in Council investment and significant funding from both the State and Federal governments. Ongoing maintenance will be required; however a key aspect of the recovery project is to enhance resilience through the establishment of vegetation to reinstate the riparian zone and thus minimise the cost and requirements of future maintenance.

Monitoring

A monitoring, evaluation, reporting and improvement (MERI) process is applied on a site by site basis as works are completed. Parameters monitoring to date have included water quality and the condition and extent of mangroves.

Lessons learned

The projects collaborative approach to urban creek renewal has led to increased funding and generated widespread community support. Creating places for people and nature allows for multiple benefits to be achieved, drives investment from multiple sources and encourages stewardship from residents, businesses and the broader community.

A cleaner creek improves ecological conditions and more active parklands create a sense of place for everyone to enjoy. Couple with opportunities for residents and businesses to be an active part of the recovery process, the collaborative approach drives improved stewardship leading to reduced pollution, healthier creeks and a healthier community.

Reference

Logan City Council (and their website www.logan.qld.gov.au)

7 Small Creek

Project summary

Small Creek was once a meandering stream that flowed into Deebing Creek. Today, it's a straight concrete channel in Raceview that offers very little value to the community or environment; but that is changing. Ipswich City Council is restoring Small Creek.

Small Creek was identified as a potential creek rehabilitation site while Council searched the city for sites to deliver offsite stormwater solutions. In 2016 Council commissioned a joint landscape architecture and engineering team to work with the local community, using a co-design process, to develop a concept for rehabilitating Small Creek. As of August 2017, Council has received tenders to complete the first phase of construction.

Project scale and objectives

The Small Creek project involves rehabilitating a 1.6km stretch of creek to provide cleaner water, wildlife habitat, better paths and bikeways, education opportunities and access to nature for play and enjoyment.

The co-design process employed to develop the concept design involved a week long, Design Your Creek Week. Unlike traditional consultation processes, which typically see a concept developed in isolation, then circulated to the community for feedback, the co-design processes allowed the project team to work with the community on-site, in real time, to develop concepts, without first putting pen to paper. Doing so allowed the community to meaningfully participate on the design process, and guide an outcome that they desire.

Design Your Creek Week ran from one Friday, to the following Wednesday. The project team set up onsite at Small Creek and over the course of the week ran workshops with residents, school children, Council officers, maintenance crews and Councillors, provided expert talks on creek naturalisation, established a scale model creek to demonstrate creek geomorphology and much more. The project team met with the community, and learnt about their experiences and desires for Small Creek. In the background, as concepts began to take form, flood modelling was completed. On the final day, a large sheet of paper was rolled out onto a table, and the first formal concept drawn up.

In total, over 180 people participated in Design Your Creek Week.

Site context

The concrete drain once known as Small Creek rises adjacent to Raceview St, in Raceview. It flows west under Whitehill Rd and Warwick Rd prior to entering Deebing Creek, the Bremer River and ultimately Moreton Bay. The 1.6km section from Whitehill Rd to Warwick Rd is the subject of Council's efforts to rehabilitate the creek.

Like most waterways, it was once surrounded by large iconic tree species such as the Queensland blue gum, with an understorey of native grasses and rushes. In the early days following European colonisation of the area, the waterway was cleared and grazing

introduced, instigating a period of ongoing decline. This led to the creek being replaced in the early eighties with the concrete drain that we see today. The few trees that still exist are remnants of the original landscape along the creek that once upon a time would have had their roots in or close to the water.

Issues and constraints

The co-design process identified flooding and maintenance as two important topics for stakeholders. By working with stakeholders to develop the initial concept, the co-design process created opportunities to address concerns about both flooding and maintenance in the concept design. It also allowed the project team to respectfully and meaningfully challenge existing perception as to the role of drainage, and present the idea that good drainage can look like a creek rather than concrete, and deliver multiple benefits. Ultimately, it was critical to ensure that the final product would be practical and affordable to maintain, and would not increase flooding.

An additional constraint came in the form of previous attempts at creek naturalisation in the local area. Several years prior to the Small Creek concept design, an unrelated, and poorly designed and delivered attempt had been made at creek naturalisation at a nearby site. That site was subsequently converted into a concrete channel. The project team identified the importance of distinguishing between previous attempts at creek naturalisation and the intent for Small Creek. The co-design process assisted with this.

Construction and ongoing costs

The on-ground works to rehabilitate Small Creek are not yet completed, and hence costs are not known. The co-design process was completed for the same cost and in the same amount of time as a more traditional concept design and community consultation process.

Monitoring

As construction is yet to commence, no monitoring has been completed, however an ongoing monitoring program is planned. It is anticipated that this monitoring program will involve partnerships with local schools, to engage students through their science program, and a university.

Lessons learned

The co-design process employed at Small Creek delivered a well-received concept design, and provided three key lessons:

1 While a co-design process may, appear to be more work than a traditional concept design process, the concept design for Small Creek was delivered at no additional cost.

2 Actively engaging with the community up front unearthed information that, as one project team member said, "could not have been discovered in 10years of searching on Google and in the library"

3 Design Your Creek Week allowed the project team to discuss, with residents, maintenance crews and school children, what might be possible for the site, without first laying a design on the table. In doing so, those people could genuinely shape the final design.

Reference

Conversation with Ben Walker, Ipswich City Council

Conversation with Amalie Wright, Landscapology

Conversation with Alan Hoban, Bligh Tanner


design your
creek week

The problem

What are the underlying social issues and activities causing the problems we have to manage?

Urbanisation, human land use, and riparian clearing, changed catchment land use, poorly designed and/or constructed waterway crossings, Filling in/building on floodplains

What are the physical problems we are facing?

Increased surface flows, and higher loads of sediment and pollutants.

- Hydrologic change, loss of instream and riparian habitat, poor water quality, weeds
- Change to Sediment balance. Riparian loss. Water quality. Baseflow regime changes
- Various instream erosion and ecological disturbance caused by increased water quantity, instream disconnection
- Urban setting - increased flow volumes from urban development that increase erosive forces in already impacted/unstable waterways and the complete lack of erosion and sediment control during construction
- Rural setting - unstable waterways and inappropriate land and road management generating large volumes of sediment in rain events
- Changes in hydrology (through and increased stormwater runoff) which causes erosion, incision, loss of habitat, exposure of dispersive soils. Also, which cause head-cut erosion.
- Poor water quality from adjacent land uses; stream bank erosion from increased flow velocities and changes in overland flow hydrology
- Point and non-point source pollution including erosion and sediment runoff, litter, increased flow duration, reduced engagement of flood plains
- Loss of floodplain functionality (both from a waterway health and flood risk perspective)
- Weeds

What are the governance problems we are facing?

The management actions to improve catchment hydrology are well known and have been articulated in numerous guidelines. However the challenge we face is how facilitate the adoption of these actions across the diverse institutional, social and physical landscapes of Queensland.

General

- Inability to grasp the complexity of the problem - losing our cool every time we do grasp the magnitude of the problem - short term thinking - decision making to take the pressure off situations rather than solve problems etc (the rush to implement offsets being the classic example of all of these)
- Lack of understanding by the community including construction workers, road designers, residents etc about the threats to waterways and how their actions or those of development affect the waterway e.g. not aware that stormwater drains flow to creek. Also not aware and do not have time to be across how best to manage the risks

- Lack of support for new projects that are untested. Also cost - both construction and maintenance and that these soft works are not considered capital/Assets.
- Cross pollination of disciplines. Most programs require many disciplines and stakeholders to interact - e.g. PM's, Comms officers, Community groups, Scientists, Planners, Engineers etc. It is hard to get co-ordinated outcomes, which stakeholders take ownership off.
- Cost, difficulties in securing funding; limitations on what can be done on private properties; push back from the development sector; lack of legislative backbone so Council are limited in their ability to influence outcomes; lack of and/or inaccurate technical information being circulated in the industry; lack of appropriate catchment planning.
- Some "experts" have very strong views on certain approaches, their views are very one sided and not balanced or contextual (e.g. stormwater detention is good/ stormwater detention is bad; effective imperviousness is a strong influencing factor to waterway health/it isn't a factor at all). Their views many hold true for some waterways but not for all. The fact is, waterways are very diverse and any project (planning or design) needs to be informed by the local waterway and catchment conditions and context. So one of the most important factors is having the skill and breadth of knowledge to accurately interpret the waterway and its needs.
- Unintended consequences of state planning policies (temporary solutions become permanent since no one will do the ultimate job if they have to do the interim job too)
- Governance, competing demands and priorities, funding including optimal use of existing funding, compliance
- The systems are complex and integrated and projects are site specific based on who owns what land. Competing land use e.g. bikeways, residential property, services etc all using waterway corridor/flood plain

ESC

- ESC non compliance

Waterways

- Not allowing for the provision of NCD in new developments.
- Limited opportunities to design natural channels as part of the rehabilitation of degraded waterways in an urban environment. We do try to include a large portion of natural channel principles in our rehab works.
- There is a misconception in the industry that increase in flows don't matter in Qld - this is rubbish and needs to be addressed so that developers aren't able to argue that flow management is not required / or is too hard

9 Solutions

'Where do you start.'

Solutions or actions to address the physical problems

- Not develop upstream of fragile or high value waterways
- Identify key environmental assets for protection and their tolerances, determine targets / objectives

- Guidelines/research in Ecohydraulics, Key aquatic asset preference values, Hydraulic modelling of turbulent flows, Geomorpholgical regimes in urban environments, Baseflow changes in urban environments,
- 'The management actions are well known. We can all make a list of them from guidelines etc'
- Improved management of catchment hydrology - less imperviousness, more infiltration, stormwater harvesting, urban greening, passive watering, riparian zone protection and enhancement (for more resilient banks), addressing and stopping head-cut erosion, re-engagement of floodplains, protection of high value waterways and low order streams. For high value, sensitive streams catchment planning should restrict catchment development and/or impose frequent flow management requirements.
- Improve riparian zones, increase awareness about the plight/risk of losing our valuable waterway spaces, limit development in floodplains

Solutions or actions to address governance problems

General

- Genuine collaboration with the industry.
- Education (community and industry),
- Standardise naming conventions and terminologies
- A coherent approach is needed to put together: a strategy, a diagnosis of the problem, a guiding policy and specific actions to achieve our goal.
- There needs to be a well articulated strategy for improve waterway health to meet stormwater treatment objectives. Need to look at governance barriers – 'why we aren't achieving… our vision for our waterways/ WSUD/ whatever'
- It would be good to quantify the cost of how much it will cost Councils/community to try and improve waterway health after further damage is done from development vs how much it would cost to actually manage flows/water quality in the development. I think this could help Council understand why they need to be strict in terms of stormwater management in developments.
- See Townsville WQIP and collaboration to the rescue outputs amongst others
- Fund site specific regional solutions planning for each relevant catchment associated with future development areas.
- Fund or provide the site specific catchment plan for water quality... it may not be perfect but a start is better than nothing
- Consolidation of existing research would be useful and the emphasis on context when guidelines are produced
- Pollutant trading / offsets in a Total Water Cycle Framework. Treatment performance of WQ improvement devices in dry tropics, effectiveness of BMP programs,
- Not necessarily more guidance and training but WbD should be the centralised repository of guidance / training for Qld (with addendums for different regions) to ensure consistency of approaches across the State. Funding from the State should facilitate this with funding from other partners including LG and industry

- Identification of key parcels of land that should be managed differently e.g. allowed to flood to slow flows and detain sediment and implementation pathways e.g. greater community pays land owner for this to occur and space is used as natural area

Waterways

- Need more research and trials to demonstrate that NCD can be cost beneficial and is an asset.
- Research into the requirements for waterways for each unique region and priorities for restoration. What works and what doesn't in NCD.
- I previously used the BCC Natural Channel Design Guidelines and received training from Catchments and Creeks. Would be good to share knowledge of NCD projects and learnings.
- Cost-benefit analysis of different approaches and types of waterway health projects.
- I don't think more guidelines is the solution. WbyD / HLW should be trying to influence policy and legislation to ensure appropriate catchment planning is undertaken with the lens of protecting and enhancing waterway health. Real financial incentives are required for private land owners to allow/enable appropriate management of waterways on private land. Rainwater tanks and frequent flow management needs to be put back on the agenda particularly where new urban development is occurring in the catchments of sensitive and/or high value waterways. Training of engineers - that rock is not always the best solution! Recognition that expertise in waterway ecology and geomorphology is critical to achieving a good waterway rehabilitation outcome that responds to the location conditions.