Vegetated Stormwater Assets – Finding the Positive Deviants

Mullaly, J[1], O'Neill, A[1], Jones, S[1]*

[1] Water by Design

*Corresponding author email: jack.mullaly@healthywaterways.org

ABSTRACT

Vegetated stormwater assets are being installed at a rapid rate throughout Queensland. They benefit waterways by reducing pollutant loads in stormwater and lessening the impact of stormwater on waterway hydrology.

Over recent years industry has successfully designed and constructed many assets in Queensland. At the same time, we often discuss and learn from examples of vegetated stormwater assets that function due to bad design, incorrect construction, or inappropriate maintenance,

Less profiled are the ever increasing numbers of vegetated stormwater assets in typical residential areas that perform well and require little, if any, maintenance.

In their book, *The Power of Positive Deviance: How Unlikely Innovators Solve the World's Toughest Problems*, Richard Pascale, Jerry Sternin and Monique Sternin (2010) explore how individuals or ñpositive deviantsòfind unique ways to look at, and overcome, seemingly unsolvable problems.

Inspired by *The Power of Positive Deviance*, this paper applies positive deviance thinking to vegetated stormwater assets. It profiles nine sites that have one or more vegetated stormwater assets that perform well. This paper describes four features that these sites have in common that contribute to their success.

KEYWORDS

Water Sensitive Urban Design; Bioretention; success; positive deviants; vegetated stormwater assets

REQUESTED PRESENTATION FORMAT

- 10 minute Presentation and 20 minute Group Discussion

1 INTRODUCTION

Vegetated stormwater assets (e.g. bioretention systems, wetlands, swales and detention basins) are being installed at a rapid rate throughout Queensland as an outcome of water sensitive urban design (WSUD), and to comply with stormwater design objectives contained in local and state planning requirements (e.g. pollutant load reduction targets). Vegetated stormwater assets benefit waterways by reducing pollutant loads in stormwater and lessening the impact of stormwater on waterway hydrology.

Over recent years industry has successfully designed and constructed many assets in Queensland, and particularly South East Queensland. A number of these have been highly profiled through awards, case studies and tours (e.g. assets at Southport Broadwater Parklands, North Lakes, Fitzgibbon Chase and Willawong Bus Depot).

At the same time, we often discuss and learn from examples of vegetated stormwater assets that function poorly due to bad design, incorrect construction, or inappropriate maintenance,

Less profiled are the ever increasing numbers of vegetated stormwater assets in typical residential areas that perform well and require little, if any, maintenance.

In their book, *The Power of Positive Deviance: How Unlikely Innovators Solve the World's Toughest Problems*, Richard Pascale, Jerry Sternin and Monique Sternin (2010) explore how individuals or ñpositive deviantsòfind unique ways to look at, and overcome, seemingly unsolvable problems.

Inspired by *The Power of Positive Deviance*, this paper applies positive deviance thinking to vegetated stormwater assets. It profiles nine sites that have one or more vegetated stormwater assets that perform well. It tries to understand why those assets are successful.

The paper first describes each vegetated stormwater asset. It then identifies the common features between each site and makes recommendations for successfully implementing vegetated stormwater assets.

2 METHODS

Each site was inspected at least once between October 2012 and June 2013. A visual inspection was undertaken. Sites were considered to perform well when they:

- contained well established vegetation
- contained few weeds
- performed well hydrologicaly (e.g. bioretention systems drained well)
- integrated into the surrounding landscape in a visually pleasing way

3 THE POSITIVE DEVIANTS

This section describes nine sites with successful but low profile vegetated stormwater assets. The size, construction date, reasons it is considered successful and areas that could be improved are listed.

Regarding size:

- Small <200m^2 total area
- Medium = between 200m^2 and 1500m^2 total area
- Large >1500m^2 total area

Site: Detention Basin at Boxer Avenue, Shailer Park

Date Constructed: Unknown (circa late 1990s)

Size: Large

Successes: Presence of canopy and understory allows basin to blend into surrounding landscape, provides habitat for wildlife and reduces maintenance requirements.

Room for improvement: Minimal

Site: Wetland and Detention Basin at Lind St, Thornlands

Date Constructed: Unknown

Size: Medium

Successes: Proactive and passionate individuals identified the opportunity to simply and cost effectively convert a farm dam into a low maintenance wetland that treats and detains stormwater and provides habitat for wildlife.

Room for improvement: Minimal: some weed management required.

Site: Bioretention Swale at Jacksonia Drive, Seventeen Mile Rocks

Date Constructed: 2001

Size: Medium

Successes: Integrates a bioretention system to manage stormwater into an attractive streetscape feature. Functions effectively approximately 10 years after construction.

Room for improvement: Could have been applied to more streets in the subdivision. Set down from road to filter media could be lower to improve lifespan as material accumulates onto filter media surface.

Site: Bioretention Basin at Hoyland St, Bracken Ridge

Date Constructed: 2001

Size: Medium

Successes: Combination of hardy melaleucas (canopy) and Lomandra (understory) produce a very low maintenance, high function basin that continues to function 12 years after construction.

Room for improvement: Minimal

Site: Multiple Bioretention Swales at Nungatta Court, Parkinson

Date Constructed: Unknown (circa early 2000ês)

Size: Small

Successes: Bioretention swales located adjacent to riparian corridor treat stormwater, are low maintenance and take up minimal developable area.

Room for improvement: Some swales would benefit from additional vegetation and removal of rubbish.

Site: Bioretention Basin at Jerrys Place, Thornlands

Date Constructed: Unknown

Size: Medium

Successes: New but well vegetated bioretention system that blends with its surrounding landscape.

Room for improvement: Sediment is accumulated on filter media surface, but plants appear to be keeping media freely draining. Trees could be used to further blend with adjacent bushland.

Site: Wetland at George Thorn Drive, Thornlands

Date Constructed: Unknown

Size: Large

Successes: Large farm dam converted into a stormwater treatment wetland with good vegetation cover.

Room for improvement: Outlet is prone to blockage and the elevated water levels have caused the loss of some vegetation. Modern outlet designs would rectify this issue.

Site: Wetland off King St, Thornlands

Date Constructed: circa 2011

Size: Large

Successes: Proactive and passionate individuals identified the opportunity to convert a large farm dam into a stormwater treatment wetland.

Room for improvement: Water level may be too deep in parts that are lacking dense vegetation cover.

Site: Multiple Bioretention Basins near Boambillee Drive, Coomera

Date Constructed: Mid 2000ûs

Size: Medium

Successes: Well established bioretention basins with dense vegetation cover integrate well with adjacent riparian area. Despite high proportion of fine particles in filter media used, basins continue to function appropriately.

Room for improvement: Trees could have been planted in filter media to enhance connection to adjacent riparian areas and increase habitat provided.

4 COMMON FEATURES

The successful examples of vegetated stormwater assets profiled in this paper have a number of features in common that have contributed to their success:

- Presence of a canopy
- Located adjacent to bushland
- Those systems profile that treat stormwater typically do not also perform a flood mitigation function (where they do, the treatment system is a wetland)
- Often championed by one or more passionate individuals

Interestingly, the nine vegetated stormwater assets inspected were of varying size. This suggests that vegetated stormwater assets of all size can work if appropriately designed, constructed and maintained.

This section explores each feature in further detail.

4.1 Presence of a Canopy

Six of the nine sites have a canopy of trees either surrounding or within the assets. An asset at an additional site is likely to develop a canopy once the vegetation is established.

The canopy performs several important functions. It:

- provides shade: shade helps to reduce weed growth and regulates temperature, which protects the understory plants from extremes in temperature

- helps systems integrate with surrounding natural areas
- provides habitat for wildlife
- builds the resilience of the assets by mimicking natural processes.

4.2 Location – Adjacent to Bushland

Six of the nine sites were located adjacent to bushland. These systems smoothly integrate into the landscape, creating a visually pleasing outcome.

4.3 Flood Mitigation Function

Three of the sites contained vegetated stormwater assets that performed both a stormwater treatment function and a flood mitigation function. These were all wetlands and were large systems. Compared to current industry practice, this is a very low proportion of sites performing a dual purpose.

Systems that combine stormwater treatment with detention are typically deeper than standalone stormwater treatment systems. Combined systems therefore typically have longer, steeper batters, and integrate less smoothly into the landscape. As the size of system increases, the steepness and size of batters into detention systems appears to become less noticeable.

4.4 Champions

In many of these case studies, one or more champions identified and pursued the opportunity to construct the systems. These champions contributed significantly to the outcome achieved.

5 CONCLUSION AND RECOMMENDATIONS

Vegetated stormwater assets (e.g. bioretention systems, wetlands, swales and detention basins) are being installed at a rapid rate throughout Queensland. Many high profile vegetated stormwater assets have been designed and constructed in Queensland in recent years. There are also plenty of examples of vegetated stormwater assets that function poorly, either because they were designed or constructed poorly, or did not receive the necessary maintenance.

This paper investigated the little known, but ever increasing number of, vegetated stormwater assets in typical residential areas that perform well and require little, if any, maintenance. Nine sites with successful vegetated stormwater assets were profiled. They contained a combination of bioretention systems, constructed wetlands and detention systems. Four features common to these successful examples of vegetated stormwater assets were identified:

- Presence of a canopy
- Located adjacent to bushland
- Typically do not perform a flood mitigation function (where they do, the treatment system was a wetland)
- Systems were often championed by one or more passionate individuals

On the other hand, the ten vegetated stormwater assets inspected were of varying size, suggesting that vegetated stormwater assets of all size can work if appropriately designed, constructed and maintained.

This paper recommends that, subject to site constraints, designers implement as many of these features as possible when creating vegetated stormwater assets. Implementing one or more of these features increases the likelihood of success.

6 ACKNOWLEDGEMENTS

The authors would like to thank Peter Maslen for directing us to and teaching us about a number of vegetated stormwater assets in Redland City profiled in this paper.

7 AUTHOR BIOGRAPHIES

Jack Mullaly is an Environmental Engineer from Brisbane. There he works as part of the Water by Design team within Healthy Waterways Ltd, building capacity in the region to deliver sustainable water management.

But Jack isn't just about work. He enjoys long slow walks in and around constructed wetlands. He likes to spend time with bioretention systems of all sorts. Raingardens, biopods, bioswales and bioretention basins - it doesn't matter to Jack. Wetland plants are another interest. If there's a *Carex Appressa* to lovingly caress, all the better.

Jack particularly enjoys exploring new bioretention systems and constructed wetlands, and luckily enough for you, that's exactly what he'll be speaking about today.