



Are stormwater wetlands 'ecological traps' ?

Brad Dalrymple



The background of the slide is an underwater scene. It features numerous small, clear bubbles rising from the bottom towards the surface. Sunlight rays penetrate the water from the upper right, creating a shimmering effect. The overall color palette is a range of blues, from deep navy to a lighter, sunlit turquoise.

What is an “Ecological trap?”

What is an 'ecological trap' ?

- ④ A habitat or habitat component that represents an unsafe condition for plant or animal species (Gates & Gysel 1978)
- ④ Characterized as habitat that attracts wildlife without revealing hazards within the habitat that will result in species mortality and lack of reproduction (Tilton 1995)
- ④ Frequently, are areas where species mortality exceeds reproduction, resulting in a long-term decline of population density (Tilton 1995)

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Stormwater wetlands

Stormwater wetlands

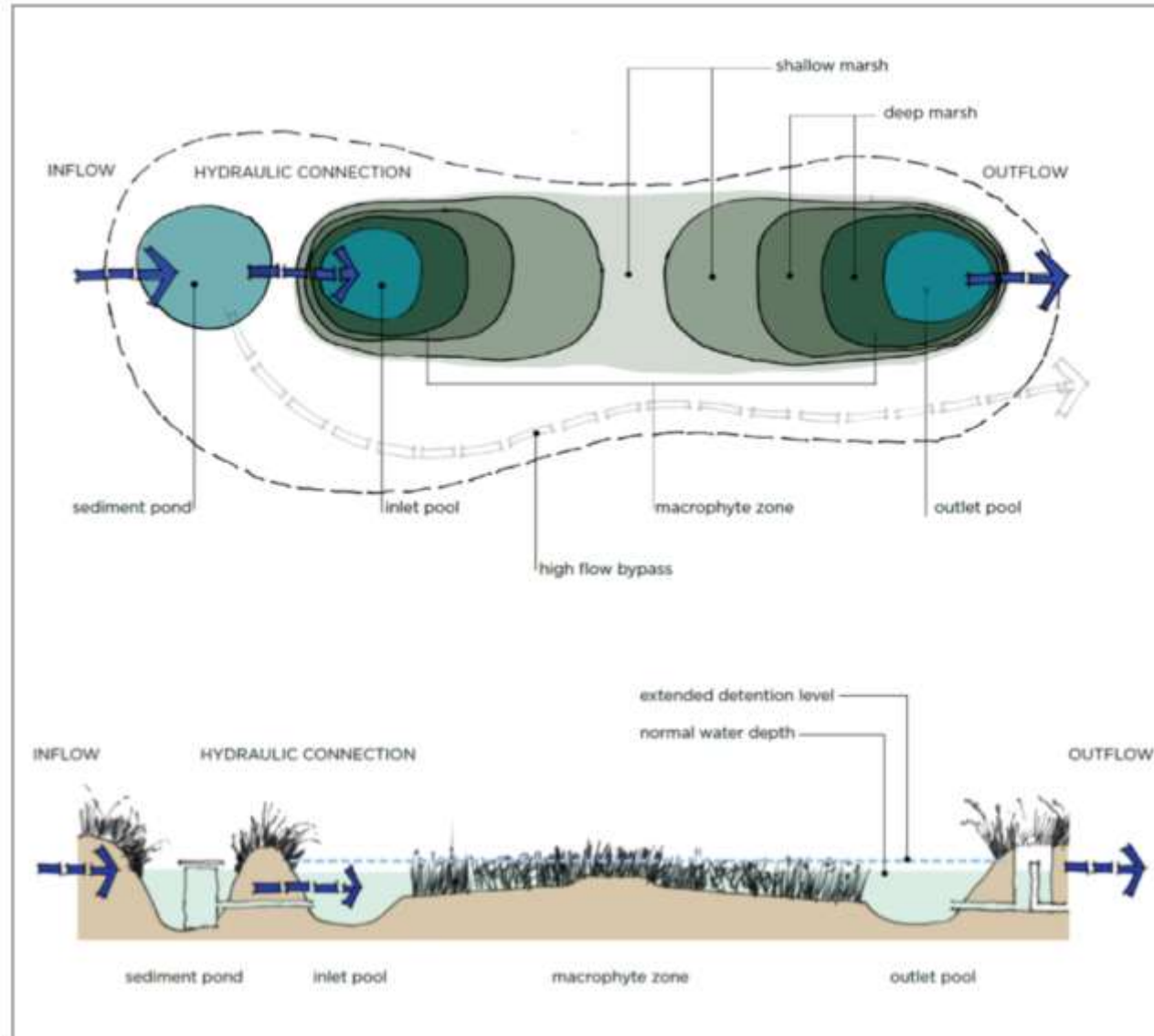


Image Source: Water By Design (2017) Wetland Technical Design Guidelines



Wetland @ Morayfield, QLD



Wetland @ Waterford, QLD



Wetland @ Coomera Waters, QLD



Wetland @ Varsity Lakes, QLD



Wetland @ Southport, QLD



Wetland @ North Lakes, QLD

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Objectives of stormwater wetlands

Typical design objectives

- ④ Improve stormwater quality
- ④ Manage flows
- ④ Amenity
- ④ Ecology



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My conflict of interest

Conflict of interest declaration



Conflict of interest declaration (cont'd)

☉ I really like wetlands



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A “conflict” of stormwater wetlands

☉ Stormwater quality

- Retention of pollution
- Removal of retained pollution



☉ Habitat for wildlife

- Potential for inadvertent 'harm' ?



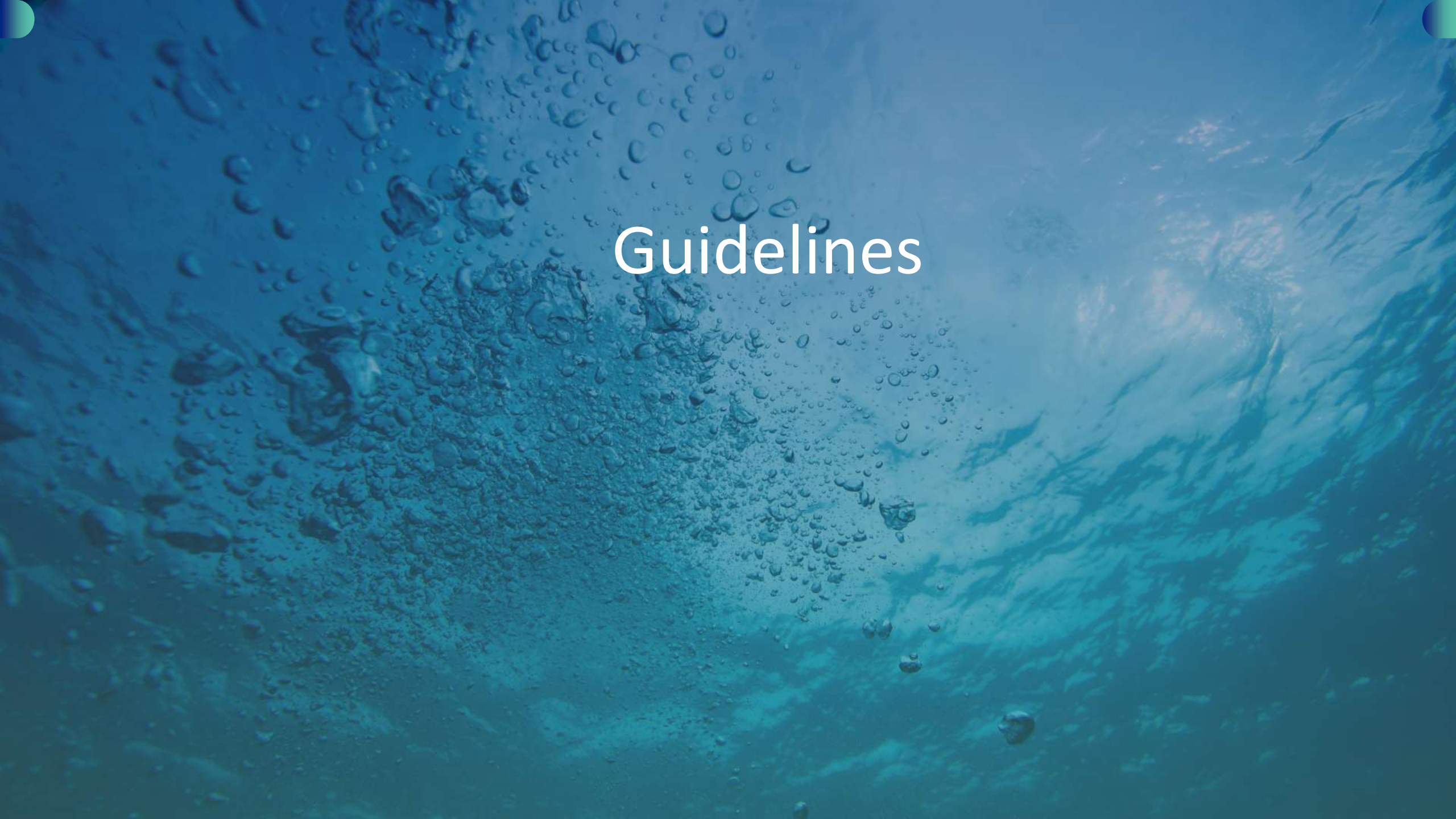
Photo Source: Paul Dubowski (2014: Pers.Comm.)



Is this an 'Ecological trap'?

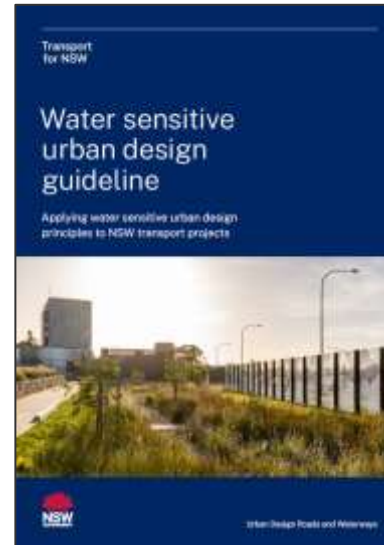
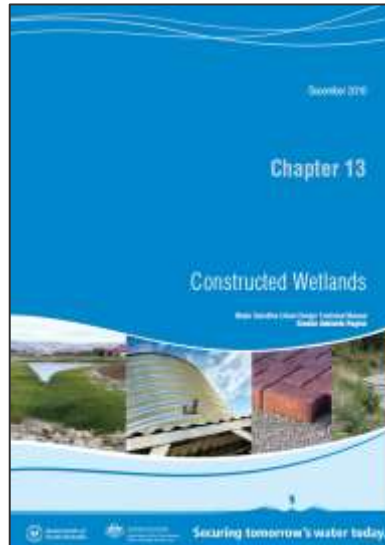
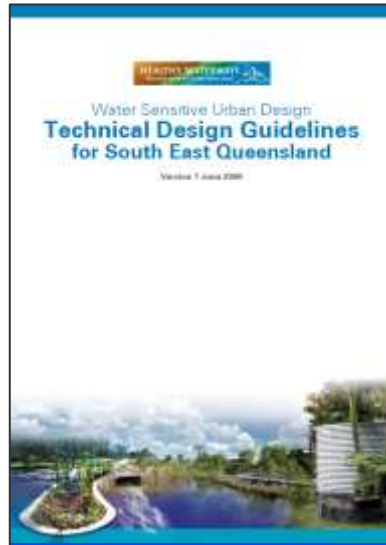
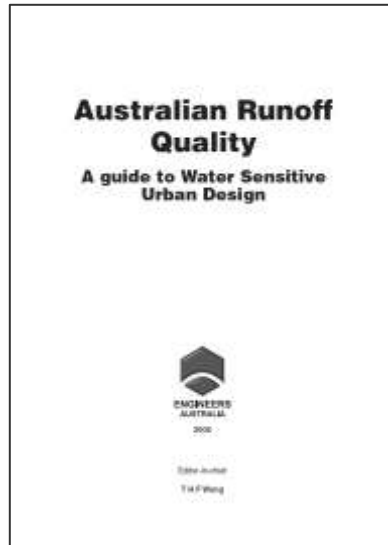
We better ask Brad

Wetland @ Morayfield, QLD

The background of the slide is an underwater scene. It features a dense cluster of bubbles on the left side, with light rays filtering down from the surface on the right. The overall color palette is a range of blues, from deep navy to a lighter, sunlit turquoise. The word "Guidelines" is centered in a white, sans-serif font.

Guidelines

Guidance ?



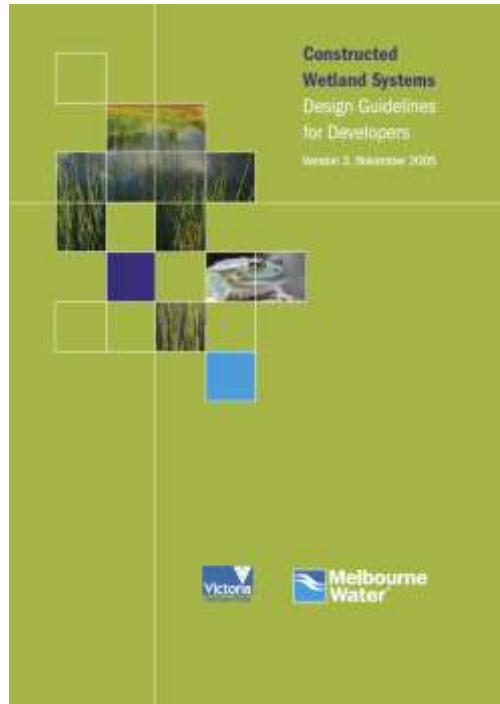
Guidance ?



TABLE 4 - WHEN NOT TO USE CONSTRUCTED WETLANDS

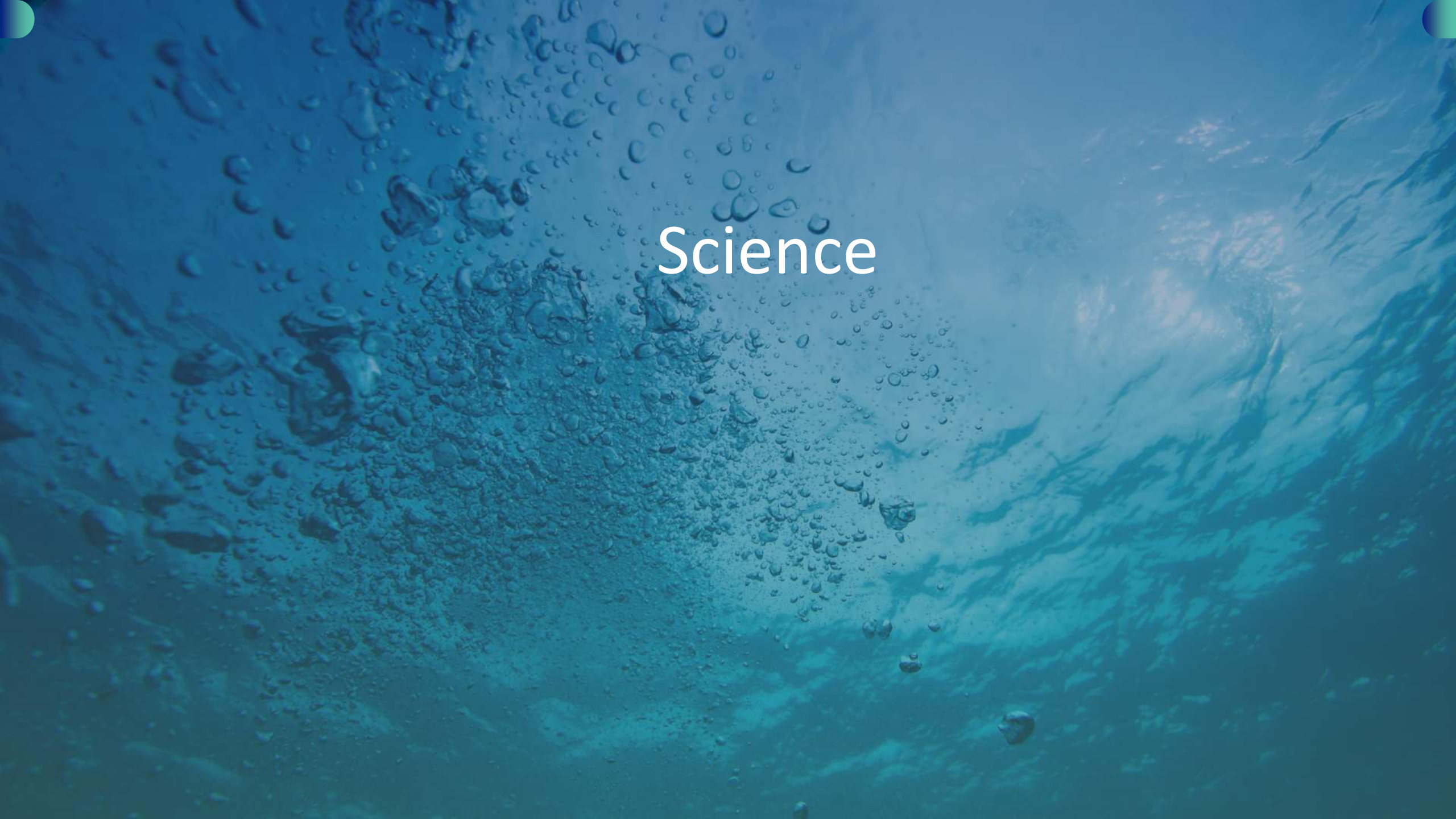
SITUATION	WHY CONSTRUCTED WETLANDS ARE NOT SUITABLE
For sites with tidal influence	Saline water compromises the biological function of freshwater constructed wetlands. Marine wetlands can be used to treatment stormwater, however, these are not covered in this guideline.
For sites with high velocities	High-flow velocities are likely to scour wetland systems
For sites subject to toxic runoff	When the system is likely to be exposed to toxic substances (e.g. herbicides, solvents or industrial contaminants), biological function will be compromised. Structural separation should be used to exclude contaminants from the stormwater system.
When the system cannot be easily accessed for maintenance	Constructed wetlands require periodic maintenance to ensure optimal function. As such, it is essential that easy access for maintenance is available.
Where implementation of a wetland does not fit with the surrounding landscape context	Wetland footprint may disturb high value natural environment. For example change to hydrology could impact on natural wetlands

Guidance ?



6. Integrating with Ecological and Landscape Setting Benefits

The primary objective for constructed wetlands is to provide stormwater treatment, however where possible secondary benefits, such as amenity (landscape setting) or habitat creation should be explored. It is important to note that sometimes the primary objective can compromise the ecological value as the impacts of catchment derived pollutants maybe deleterious to the wetland ecology.

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Science

Hale et al (2018)

- Location: Melbourne, VIC
- Biota studied: Dwarf galaxias (*Galaxiella pusilla*)
- Contaminants: -
- Main findings:
 - Fish did not avoid stormwater wetlands that reduce their survival and delay their ovarian maturation



Photo Source: Fishes of Australia

"stormwater wetlands can be equal-preference ecological traps for G. pusilla,"

Sievers et al (2018a)

- ④ Location: Melbourne, VIC
 - 6 stormwater wetlands
- ④ Biota studied: Frogs (*Litoria raniformis*)
- ④ Contaminants: Heavy metals & pesticides
- ④ Main findings:
 - No indication of avoidance of contamination
 - Breeding adults laid comparable numbers of eggs across wetlands with high & low contaminant levels
 - Tadpoles had lower survival rates & were less responsive to predator olfactory cues when raised in more polluted stormwater wetlands



Photo Source: Gippsland Threatened Species Action Group

"Our study confirms the potential for urban stormwater treatment wetlands to function as ecological traps"

Sievers et al (2018a)

- 🕒 **Location:** Melbourne, VIC
 - 67 stormwater wetlands across 2 seasons
- 🕒 **Biota studied:** Frogs
- 🕒 **Contaminants:** Heavy metals & pesticides
- 🕒 **Main findings:**
 - Frogs inhabited wetlands with abundant vegetation, regardless of their pollution status



"Urban managers could inadvertently be creating ecological traps in countless cities."

Lettoof (2023)

- 🌀 Location: Perth, WA
 - 4 'lakes'
- 🌀 Biota studied: Tiger snakes
- 🌀 Contaminants: PFAS
- 🌀 Main findings:
 - Higher PFAS concentrations in urban lakes
 - Bioaccumulation of PFAS likely
 - Negative health impacts (e.g. body condition, metabolic processes) linked to elevated PFAS concentrations



Hale et al (2019)

- ④ Location: Melbourne, VIC
 - 4-year empirical study
- ④ Biota studied: Native frogs & fish
- ④ Contaminants: -
- ④ Main findings:
 - Fitness and survival of *G. pusilla* and spotted marsh frog (*Limnodynastes tasmaniensis*) tadpoles were lower at more polluted sites



Photo Source: Central QLD Coastal Landcare Network

"stormwater wetlands can be ecological traps, (but) their effects can be properly managed."

... and maintenance/ rectification



Truganina, VIC

Source: Steve Darwent & Hugh Williamson (Optimal Stormwater, Pers.Comm.)

Last week ...

Lake Ginninderra, ACT



ABC NEWS

Search...

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Grieving Canberra dog owner warns of deadly blue-green algae but testing shows no increased risk

By Tahlia Roy

By Ruby Thomas

By Adrienne Francis

Water

14h ago



Miranda's dog Scout died suddenly after swimming in Lake Ginninderra. (ABC News: Dave Sciasci)



Scout loved swimming and was described as an explorer. (Supplied)



So, are stormwater wetlands
be 'ecological traps'?

They can be

Wetland @ Morayfield, QLD

Likely key pollutants of concern

- ◉ Sediment & litter
- ◉ Nutrients
- ◉ Heavy metals
- ◉ Pesticides
- ◉ PFAS



Photo Source: Central QLD Coastal Landcare Network

"stormwater wetlands can be ecological traps, (but) their effects can be properly managed."

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Key recommendations

Key recommendations

- ◉ Review suitability of wetlands
- ◉ If wetlands are to be applied:
 - Reduce pollution generation “at source”
 - Pre-treatment is **essential**
 - Sediment & litter (minimum)
 - Heavy metals, pesticides, PFAS ?





www.oceanprotect.com.au

1300 354 722

THANK YOU

Brad Dalrymple
Principal Environmental Engineer
bradd@oceanprotect.com.au