

Managing Water Quality in Urban Lakes and Wetlands

Wetland Management and Restoration

Thursday 6th September

Atrium Theatrette

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land and water solutions



What the Swan Coastal Plain might have looked like...

- Interconnected swamps, wetlands, creeks, inlets and the River

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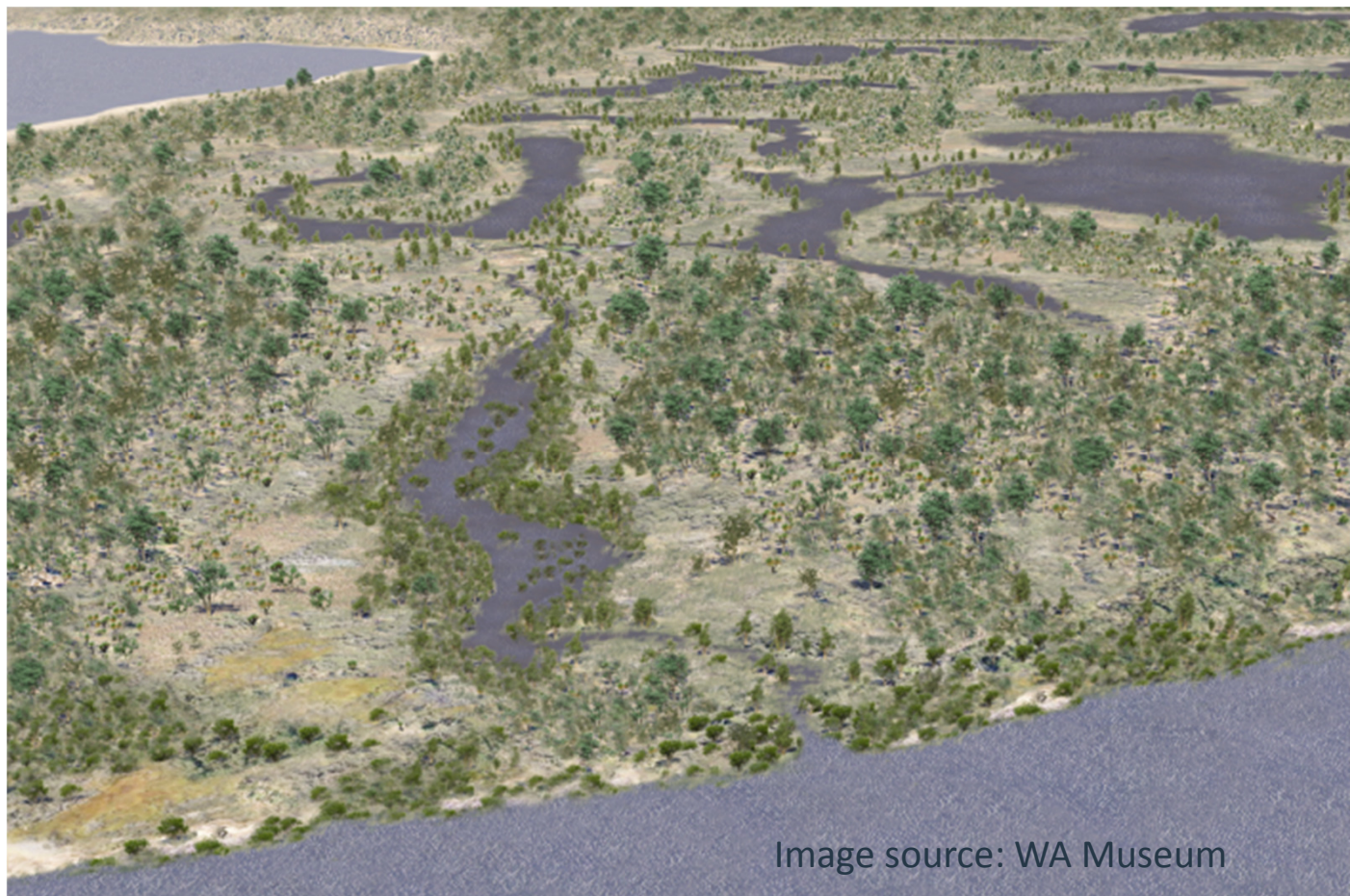


Image source: WA Museum



Planning and developing for Perth

- Constraining and regulating the wetlands
- Draining the swamps
- Burying the creeks



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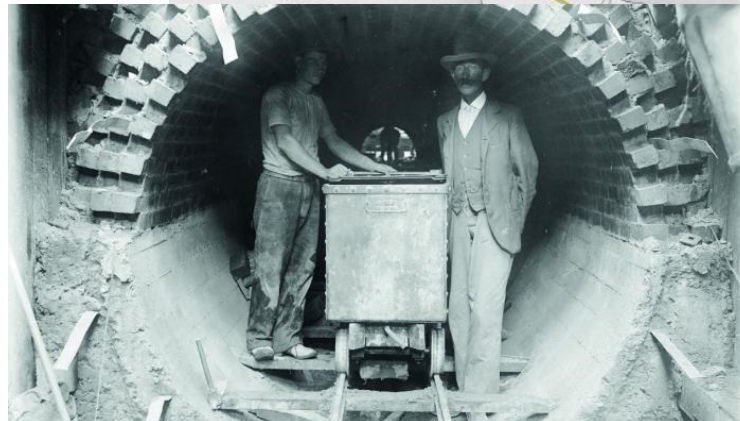
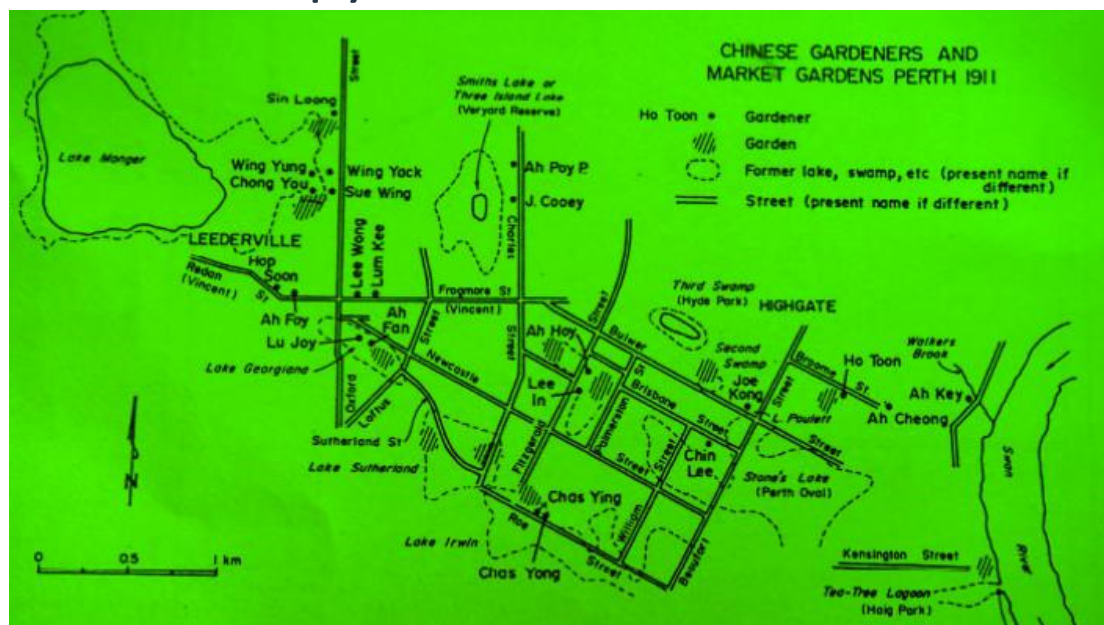


Image source: WA Museum



Working the landscape

- The best soils for growing were on the swampy land



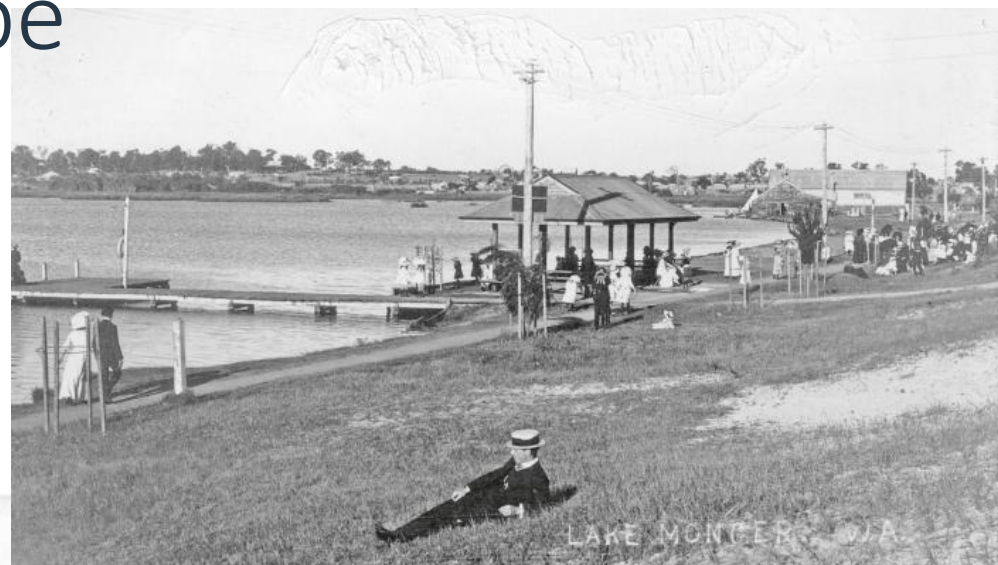
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Image source: WA Museum



Adapting the landscape

- Lake Monger c1912



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Image source: WA Museum



Just keep building...



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And now...



- The water is still there!



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Case study – Maylands Lakes

- Historical site of Maylands Brickworks clay pits
- Now three hydraulically connected lakes
- Former clay pits allowed to fill naturally with groundwater seepage
- Brickworks fed with groundwater
- Stormwater discharges to all three

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Case Study – Gosnells Lakes

- 54 water bodies:
 - Lined/unlined
 - Stormwater and/or groundwater fed



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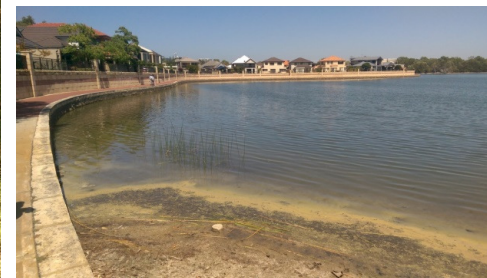
What are the issues?

- Algal blooms (eutrophication)
- Mosquitos and Midges
- Sedimentation
- Weed growth
- Poor aesthetics (litter, water colour, smell)
- Fish deaths and
- Bird excrement

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Poor water quality
is a cause and/or
consequence of all
of these!





How do we respond?

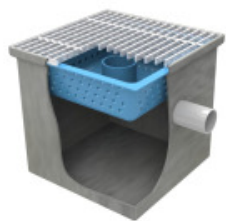
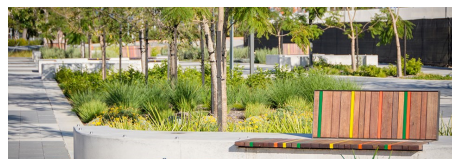
- Catchment management ➤ Best long term outcomes but can be hard to achieve!
 - Water sensitive urban design
 - Community education
 - Maintenance
 - Reduced fertilizer use...
- Treatment ➤ Mixed outcomes (*jury still out on some of these*)
 - Phosphorous inactivation
 - Algicide
 - Bioaugmentation
 - Floating wetlands
 - Aeration
- Modification ➤ Expensive!
 - Reshaping
 - Revegetation
 - Dredging
- Do nothing/tolerate occasional issues ➤ ☹️





Catchment management

- Water sensitive urban design
- Community education
- Construction management
- Maintenance
- Reduced fertilizer use



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Treatment

- Phosphorous inactivation
- Algicide
- Bioaugmentation
- Floating wetlands
- Aeration
- Physical removal





Modification/design

- Reshaping
- Revegetation
- Dredging – not a new idea:
 - Lake Monger c1934
 - Lake Minnawarra 2018



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Image sources: WA Museum, City of Armadale



Do nothing

- Frequency of occurrence
- Community attention
- Location
- Downstream impacts
- Ecological impacts

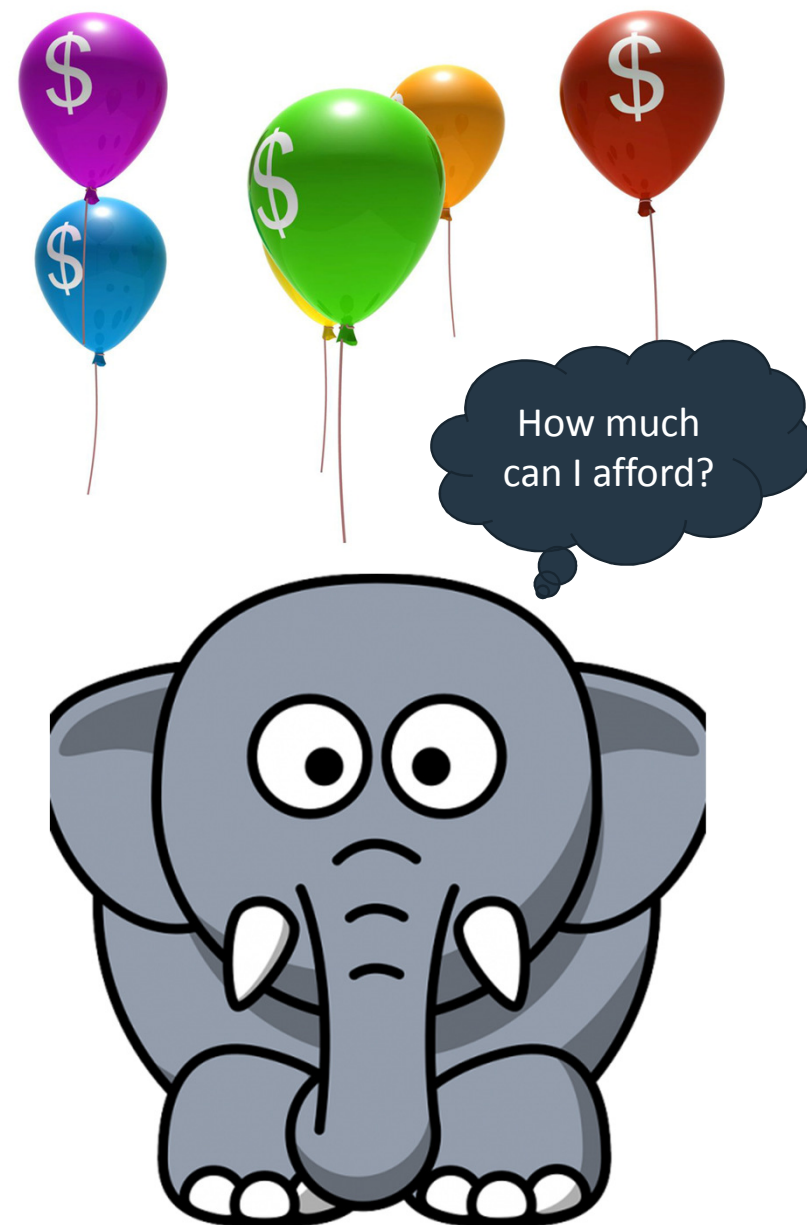




How do I choose?

- Environmental condition
 - Shape & size
 - Edge type
 - Inflows & outflows
 - Lined or unlined
 - Natural, modified or artificial
- Community preferences
 - Is the system understood?
 - Is the system used and/or valued?
 - How much disruption can be accepted?
- And the elephant in the room...

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Meaningful monitoring

- What do we want/need to know?
- Inspection/record keeping
 - When/where an issue arises (and when did it go away)?
 - Who has complained, when & about what?
 - What is the weather like (cloudy/bright, hot/cold, wet/dry)?
 - A picture can tell a thousand words...
- Water quality
 - Basic nutrient suite (TN, TKN, NO_x, NH₄, TP, PO₄)
 - Dissolved oxygen, Temperature, EC, pH
 - Suspended solids/turbidity
 - Others based on defined objective!! (metals, chlorophyll etc...)





Case study – Maylands Lakes



- What did the data tell us?
 - Nitrogen frequently above guidelines in the water column
 - Phosphorous rarely above guidelines in the water column
 - Strong correlation between seasonal rainfall & nutrient concentrations
 - High levels of nutrients present in sediment
- So what causes the algal blooms?
 - Groundwater? – **not likely** considering relatively good quality of Brickworks Lake
 - Stormwater runoff? – **likely** given numerous direct discharges & seasonal correlation
 - Management practices? – **likely** given evidence of floating grass clippings (also; fertiliser, rubbish)
 - Sediment? – **likely** build-up over time since establishment including dead algae, grass clippings, guano, and rubbish



Case Study – Gosnells Lakes

- What did the data tell us?
 - Mix of issues including:
 - Algal blooms
 - Botulism
 - Mosquitoes
 - Poor hydraulics
 - Litter/silt and other aesthetic issues
 - Algal blooms more prevalent when lakes are unlined and/or topped up with groundwater
 - WQ sampling needs to be supported by well timed maintenance and good general record keeping to obtain its full value





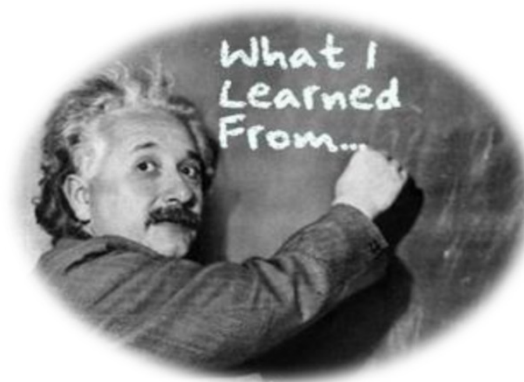
Case study recommendations

- Maylands Lakes
 - Phoslok application
 - Revegetation of suitable riparian areas
 - Floating wetlands
 - Modification of lake shape
 - Dredging
 - Community education
 - Gross pollutant traps (later added at request of community)
- Gosnells Lakes
 - Monitoring & maintenance changes
 - Management trials including some of the above





Take home messages



- ✓ Wetland management requires a combination of strategies that may be different for each site
- ✓ It may not be realistic to expect pristine water quality in all wetlands – specially if they are ‘treatment’ wetlands protecting a higher value downstream environment!
- ✓ Monitor with a purpose in mind and remember that regular inspection and good record keeping are paramount
- ✓ Community engagement is critical for:
 - Shared understanding on the values associated with individual wetlands
 - Building consensus on a suite of strategies (and the associated costs!)
 - Educating and informing for behaviour change

Thank you for your time

Helen Brookes

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The logo for Urbaqua, featuring the word "urbaqua" in a white, lowercase, sans-serif font. The letter "u" has a small leaf icon above it. Below the word "urbaqua" is the tagline "land and water solutions" in a smaller, white, lowercase, sans-serif font. The background of the slide is orange with a large teal circle and a lime green circle overlapping on the right side.

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