MONASH University

MANNINGHAM

Way Beyond Best Practice: Grassed Based ZAM-WSUD Profiles Demonstrate Up To 80% Total Nitrogen Removal

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GROUP OF EIGHT AUSTRALIA

ZAM-WSUD systems

- Water Sensitive Urban Design without Additional Maintenance

- Design objective:
  - ZERO additional maintenance costs compared to typical maintenance costs for an urban streetscape

- Initiatives

ZAM-WSUD systems

- Initiatives
  - Channel grooves capture sediment, removed by street sweeper
  - Protective layer of coarse sand on media surface helps delay clogging
  - Nature strip biofilters planted with lawn grass, mowed by residents
  - 50+ year ZAM design life?

ZAM-WSUD systems

- Water Sensitive Urban Design without Additional Maintenance

- Design objective:
  - ZERO additional maintenance costs compared to typical maintenance costs for an urban streetscape

- Design Handbook available - https://www.clearwatervic.com.au/resource-library/publications-and-reports/zero-additional-maintenance-water-sensitive-urban-design-zam-wsud-handbook-2018-edition.php

Grassed-ZAM WSUD systems

Nara Native Zoysia | Soft Leaf Buffalo Palmetto | Kenda Kikuyu | Empire Zoysia | Soft Leaf Buffalo Sapphire

- Different lawn grass species tested in the field
- Grass condition affected by different factors
  - Growth in sand based media
  - Shading (installations will vary depending on “full sun” sites and sites with minimal shade)
  - Pedestrian traffic

Grassed-ZAM WSUD systems

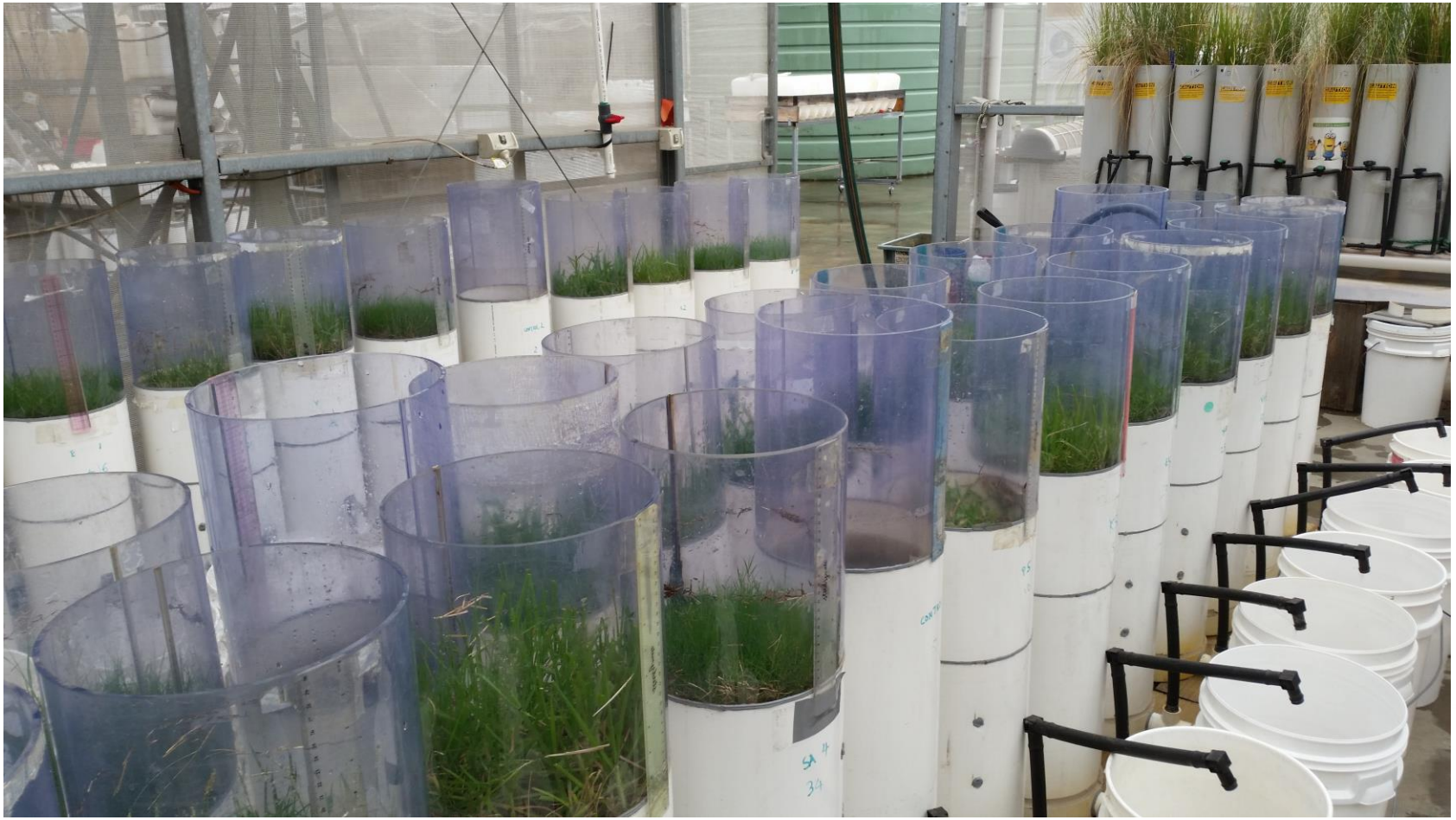
Nara Native Zoysia | Soft Leaf Buffalo Palmetto | Kenda Kikuyu | Empire Zoysia | Soft Leaf Buffalo Sapphire

- However, what do we know about their treatment function? Are grassed-ZAM WSUD systems achieving best practice stormwater management?

Research Program

Laboratory trial

- Monitoring for about 1 year period encompassing different seasons & wet and dry weather conditions
- Water quality monitoring
- Infiltration testing



Laboratory trial – 6 lawn grass species tested

Palmetto Soft Leaf Buffalo

Kenda Kikuyu

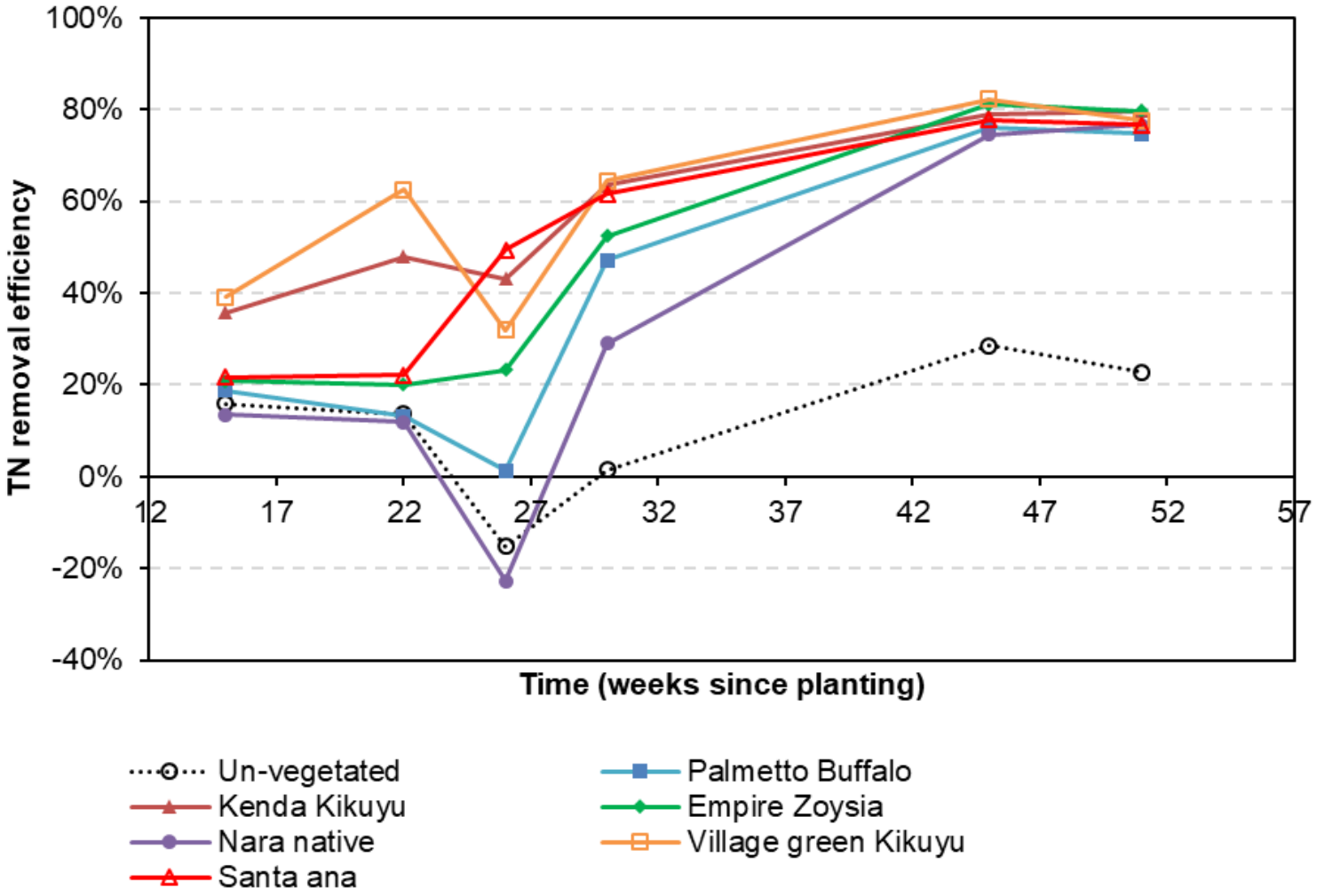
Empire Zoysia

Nara Native Zoysia

Village Green Kikuyu

Santa Ana Couch

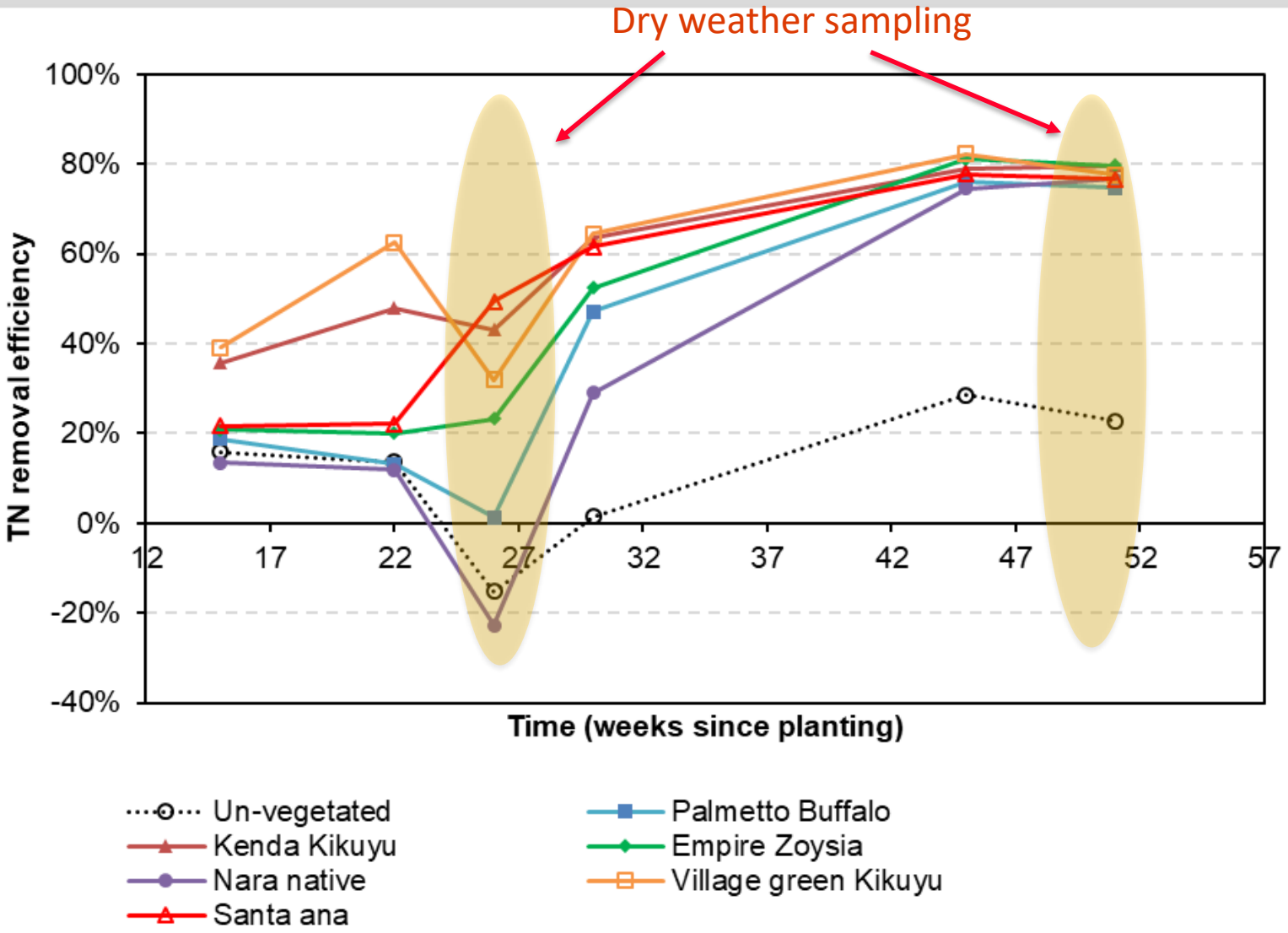
Results – Nitrogen removal performance



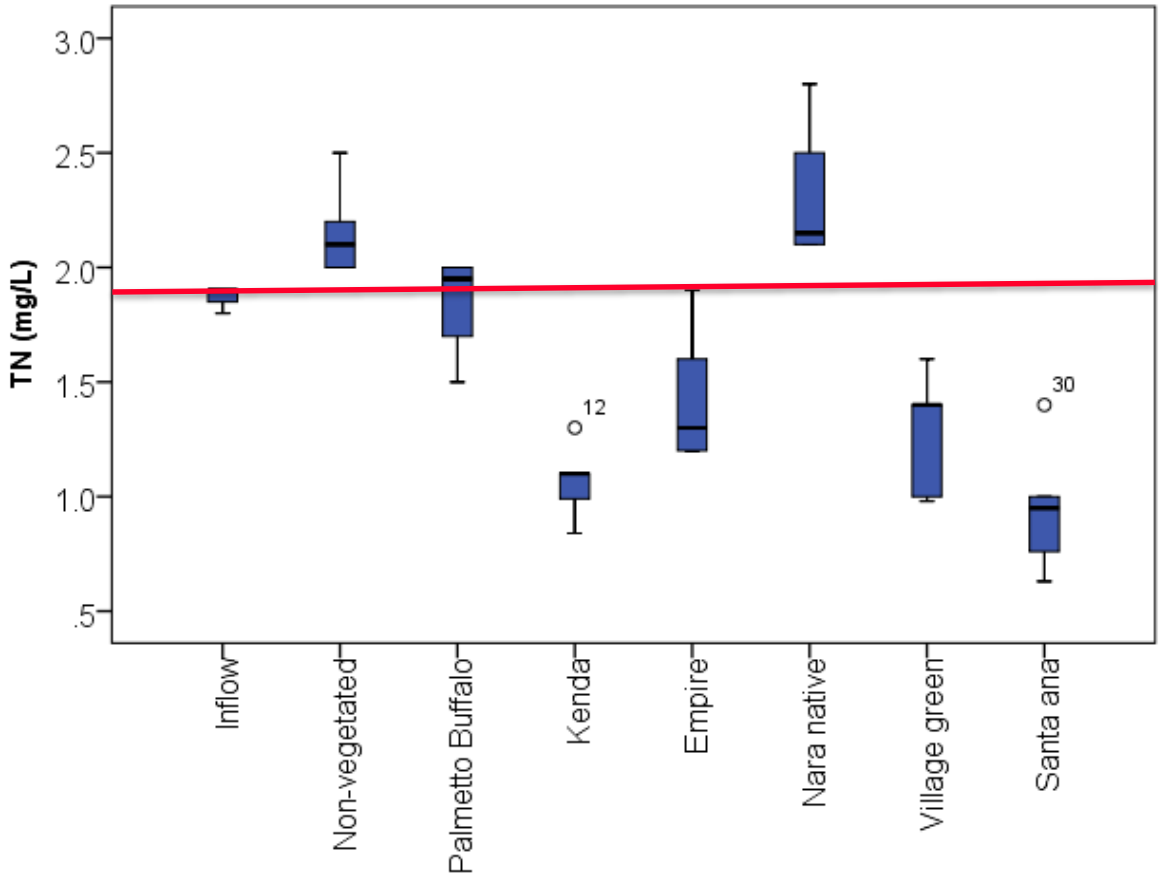
Grasses over time

Sept ’17 (early Spring)	Nov ’19 (end Spring)	Feb ’18 (Summer)	
			Nara Native Zoysia
			Empire Zoysia
			Village green Kikuyu

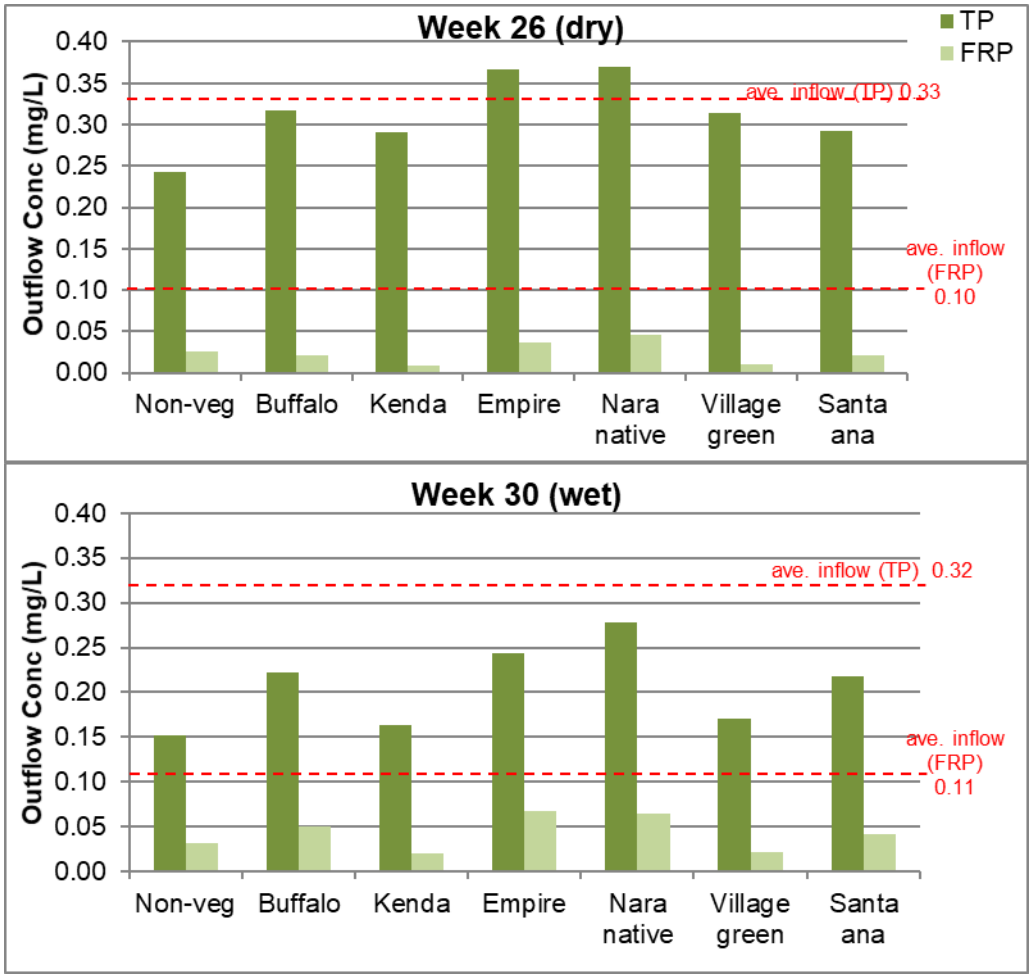
Results – Nitrogen removal performance



Results: Nitrogen (Dry - Winter)



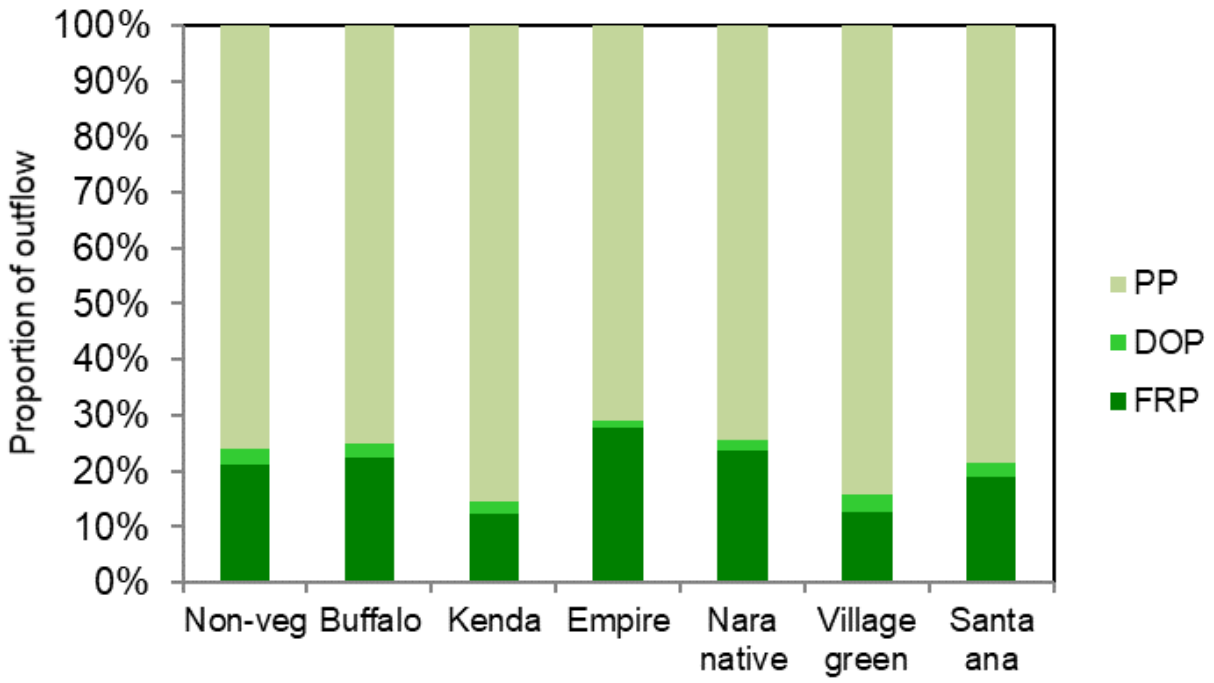
Results – Phosphorus removal performance



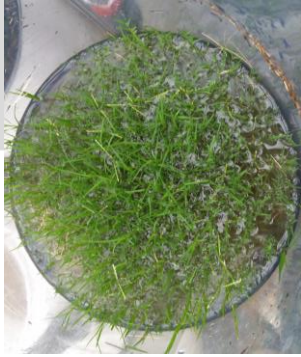
-50% to 50% remo

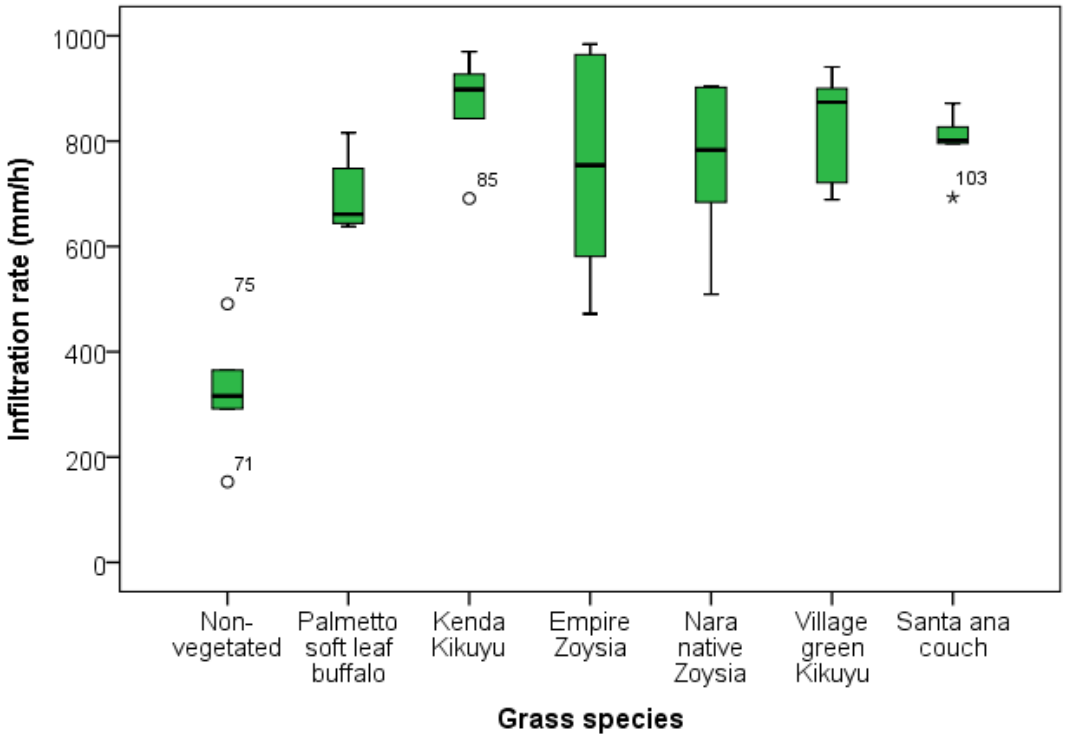
-11% to 63% remov

Results – Phosphorus removal performance



Results – Infiltration rate





Conclusions

- Very likely that nutrient removal of lawn grasses is a function of grass health and growth rate
- If installed under correct conditions, a diverse range of lawn grasses are able to meet regulatory requirements and best practice standards for nitrogen reduction
- Some lawn species may experience seasonal variation in their treatment function