A photograph of a wetland landscape. In the foreground, there is a calm body of water reflecting the sky and the surrounding vegetation. The middle ground is dominated by tall, dense grasses in shades of green and yellow. In the background, there is a line of trees under a clear blue sky. The overall scene is peaceful and natural.

Enhancing urban wetland biodiversity by reducing trade-offs between multiple ecosystem services

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AUSTRALIAN CENTRE FOR BIODIVERSITY
ANALYSIS POLICY MANAGEMENT



MONASH University
Science



Maximising one ecosystem service often results in a decline in other ecosystem services

Demand for all ecosystem services is increasing

Need to increase synergies and minimise trade-offs amongst multiple ecosystem services

Bennett, EM, Peterson, GD & Gordon, LJ (2009) Understanding relationships amongst multiple ecosystem services *Ecology Letters* 12: 1394-1404.



Land Cover/Land Use Change Urbanisation

Urbanisation



loss of
freshwater
coastal
wetlands



Constructed Wetlands



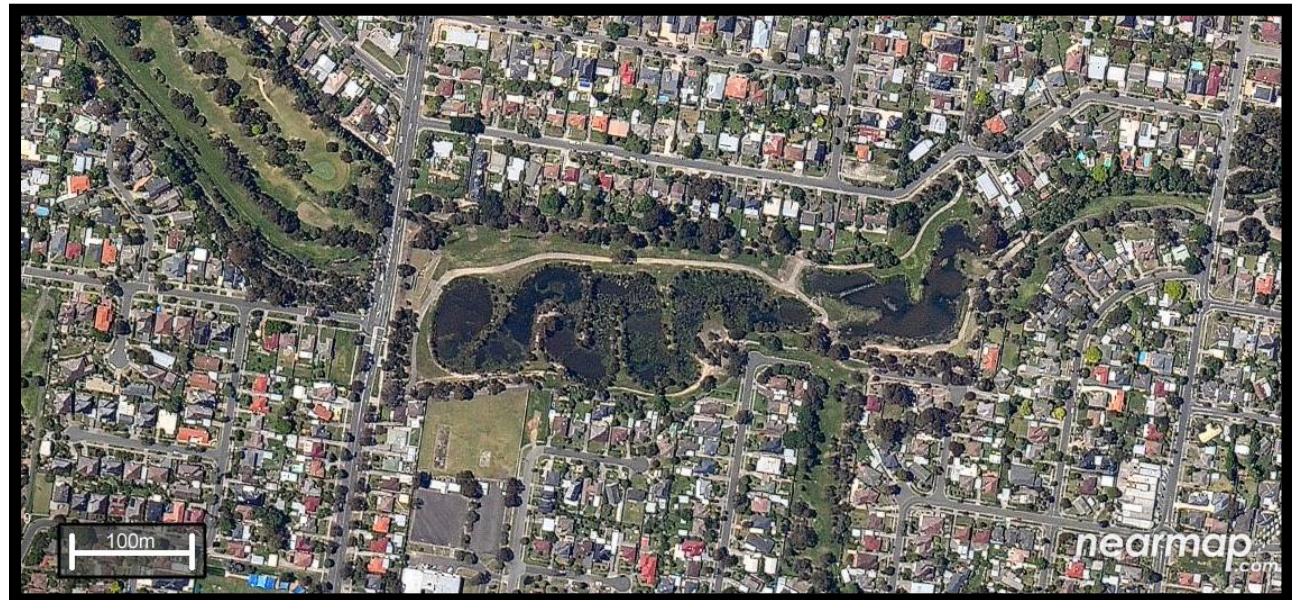
Stormwater treatment wetlands built to reduce nutrient loads (especially nitrogen) entering Port Phillip Bay



Constructed Urban Wetlands

Multiple Ecosystem Services

- **nutrient retention**
- flood mitigation
- landscape amenity
- recreational open space
- **biodiversity support**
- microclimate modification
- carbon sequestration



Community Monitoring of Bird Utilisation of Constructed Wetlands in the Dandenong Catchment



Annual Report
July 2007 – June 2008

Prepared by Jenny Lau
BOCA Conservation Officer
September 2008

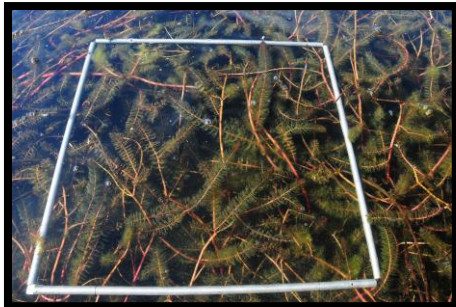
Snapshot

Water Quality

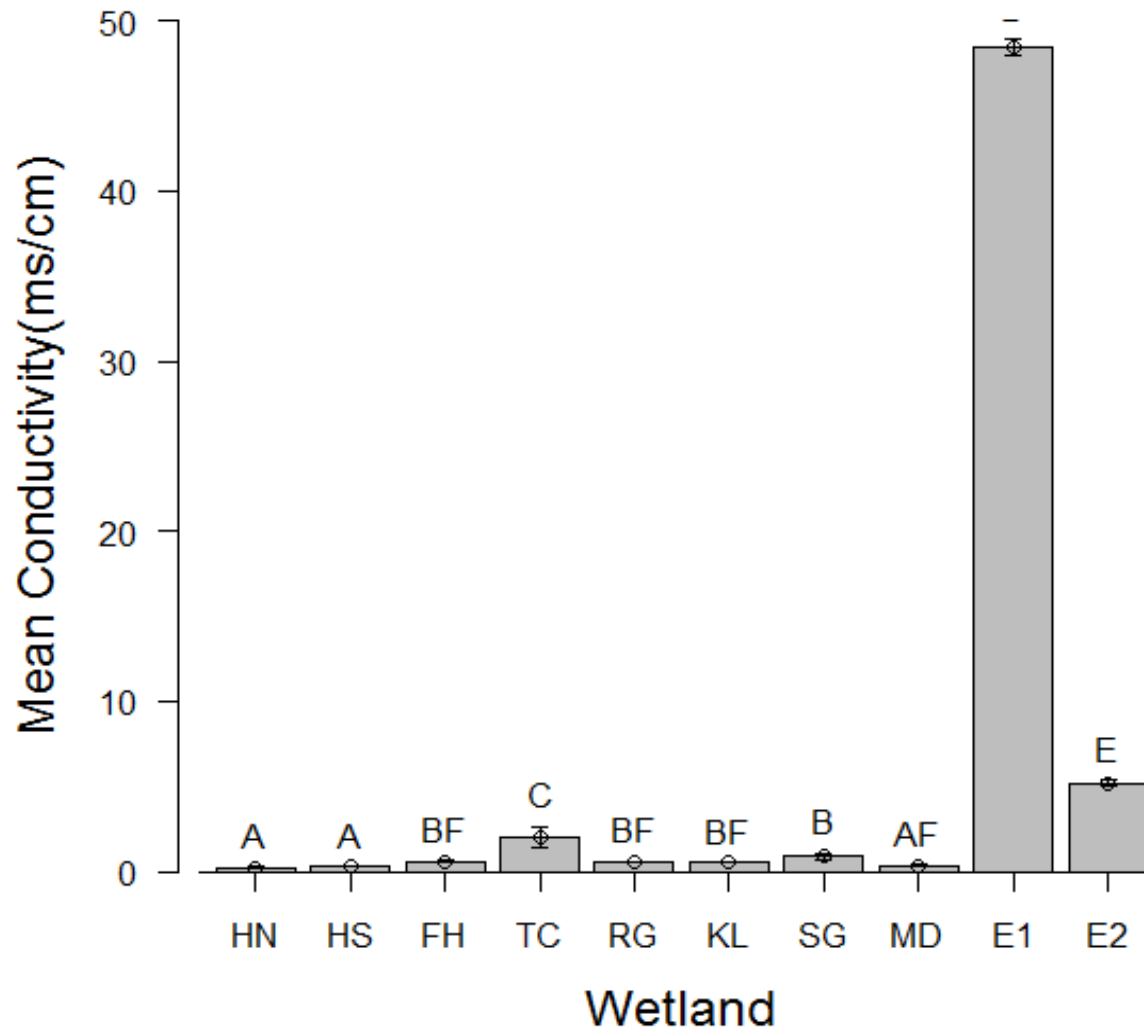
Submerged Aquatic Plants

Aquatic Invertebrates

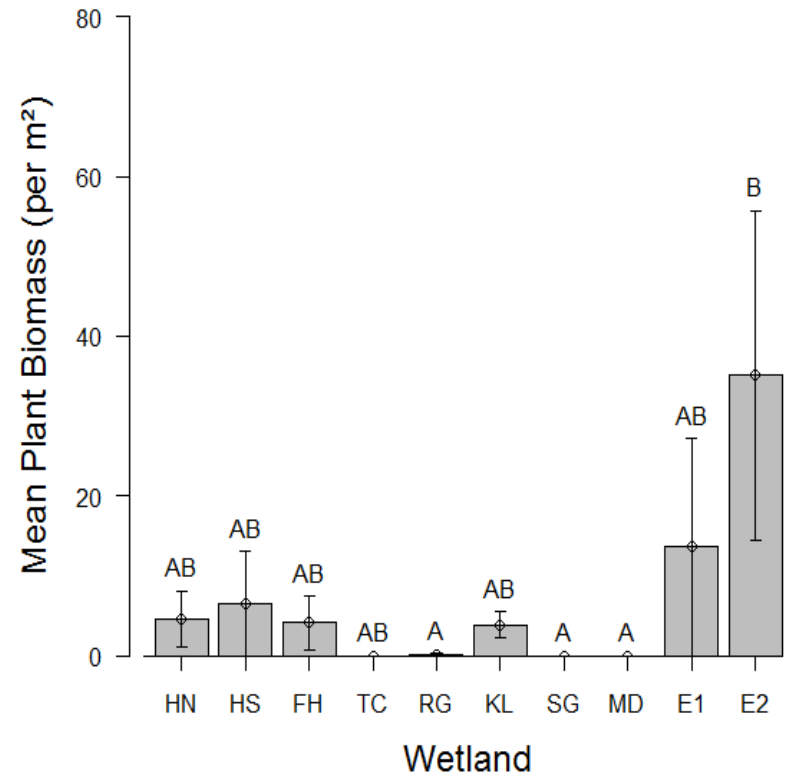
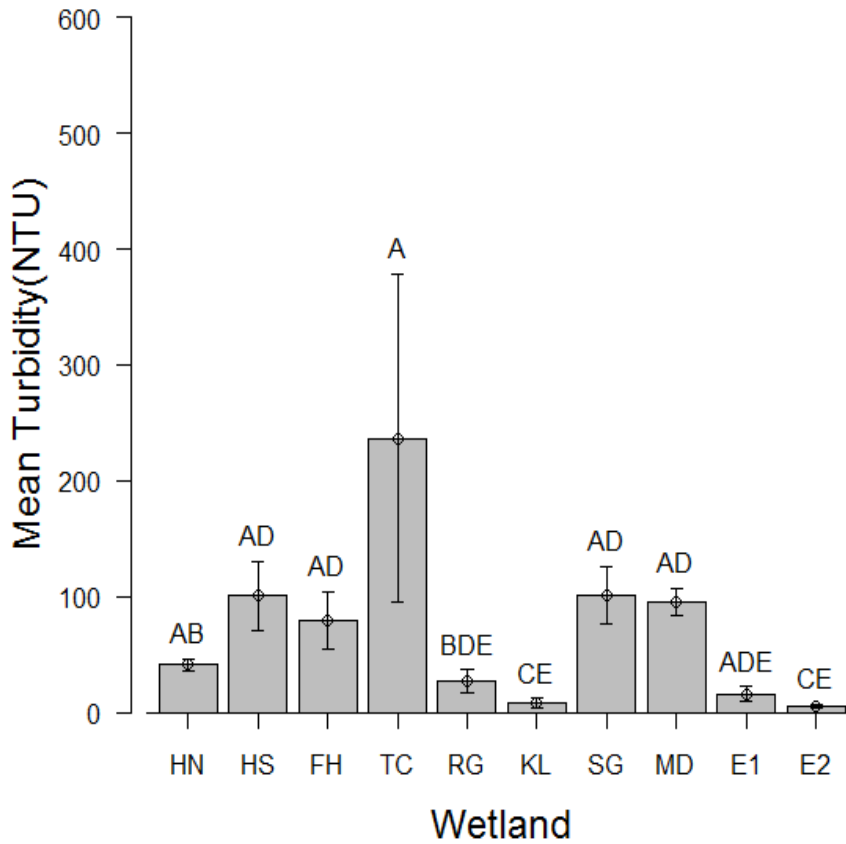
Fish & Turtles



Edithvale-Seafood Ramsar Site
remnant original coastal wetlands

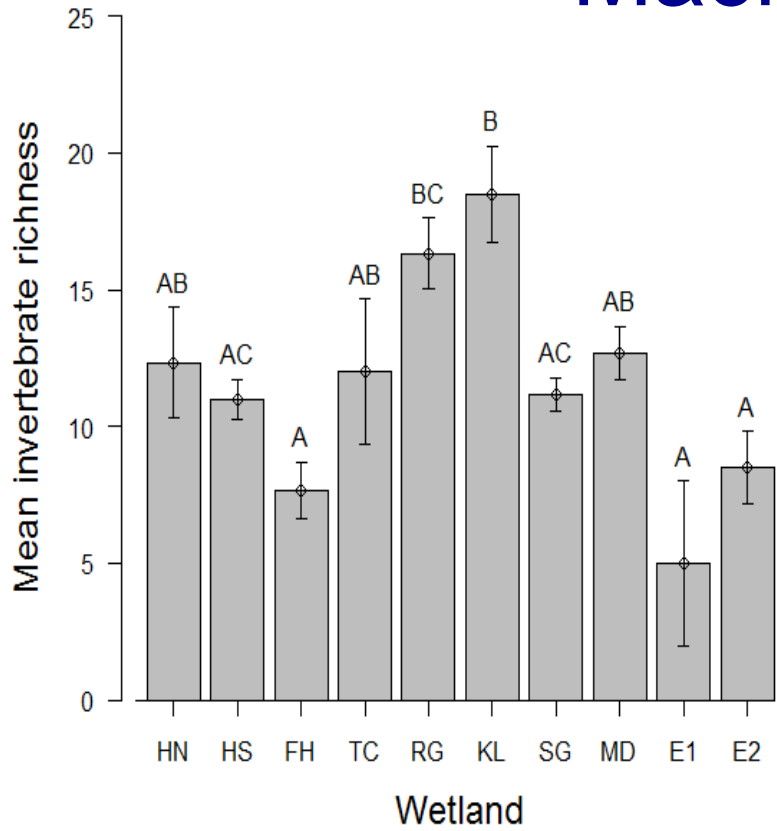


✧ low conductivities

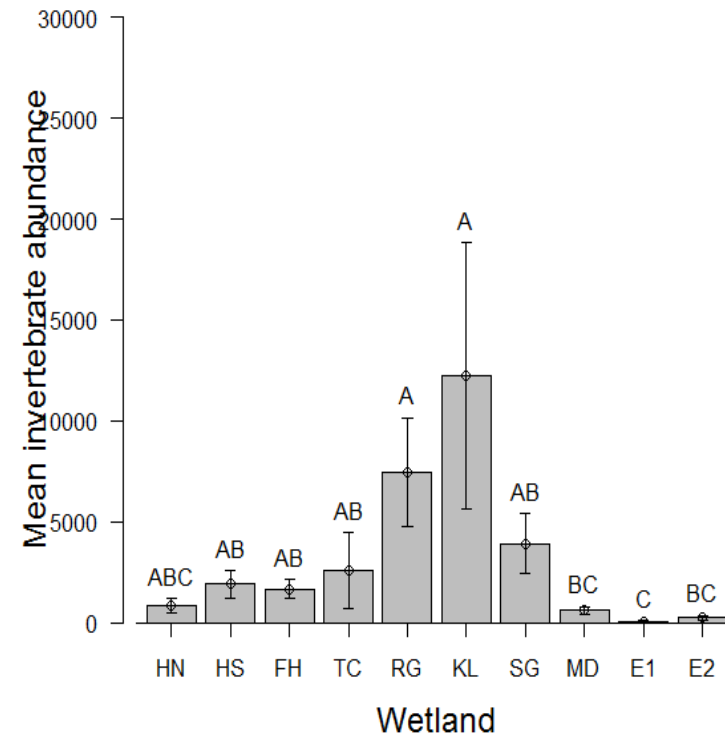


✧ high turbidities
 ✧ low plant biomass

Macroinvertebrates



✧ highest richness & abundance at two constructed wetlands



Fish Communities

Transform: Log(X+1)
Resemblance: S17 Bray Curtis similarity

2D Stress: 0.01

ED1

NS

ED2



✧ native & exotic spp



Transform: Log(X+1)
Resemblance: S17 Bray Curtis similarity

2D Stress: 0.1

KL

RG

HS

MD

SG

HN

FH

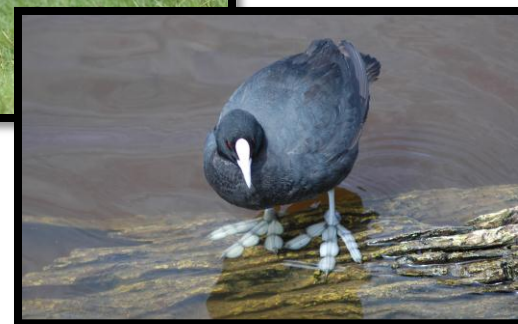
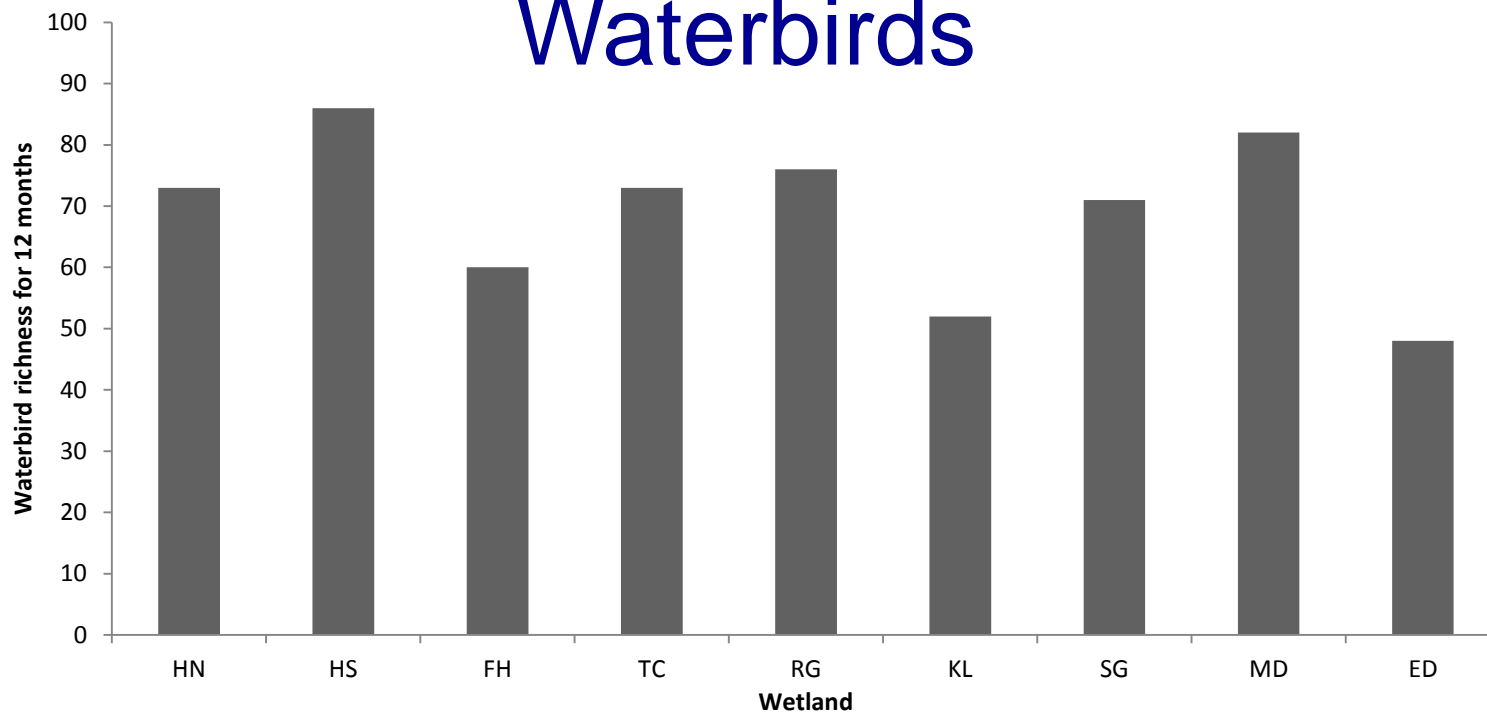
Turtles



Eastern long-necked turtle *Chelodina longicollis*

✧ present in wetlands within 2 years of construction

Waterbirds



Synergies

permanent water regime



drought refugia for biota



Seaford Ramsar Site

May 2008



Heatherton Rd Wetland

Synergies

- ✧ habitats ↑
- ✧ connectivity



Trade-offs

- ✧ constructed do not replace original
- ✧ exotic and invasive fish dominant



Ecological Leverage Points

Small management investments
can yield substantial benefits



remove exotic fish
alter connectivity
~ selective barriers