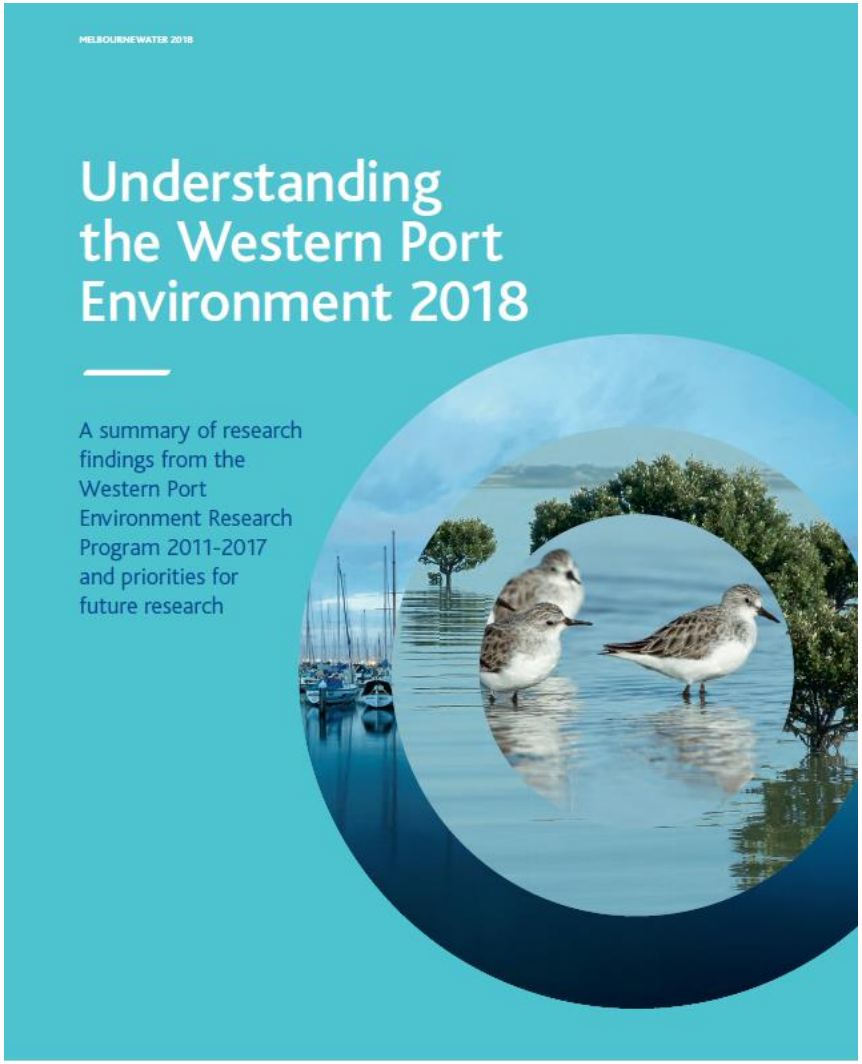
Overview of the Western Port Environment Research Program

Rhys Coleman
Waterways and Wetlands Research Manager
Melbourne Water

VICTORIA State Government

Melbourne Water

Understanding the Western Port Environment 2018



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Western Port

Catchment area 3,365 km^2,
2,232 km rivers & creeks

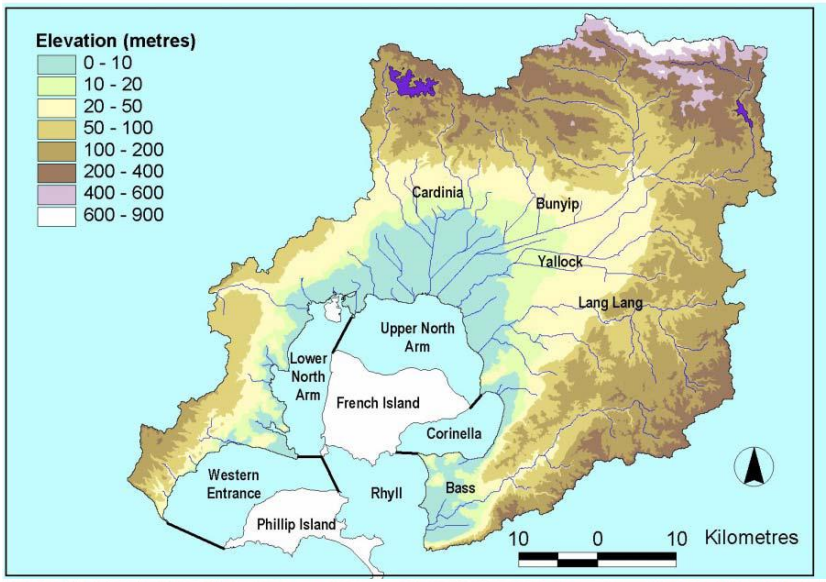
Catchment Land use
- 6% Urban
- 69% Agricultural
- 25% Forest

680 km^2 bay area

Extensive seagrass beds in north & south east

40% bay exposed as mudflats during low tide

30% of water volume is exchanged with each tidal cycle



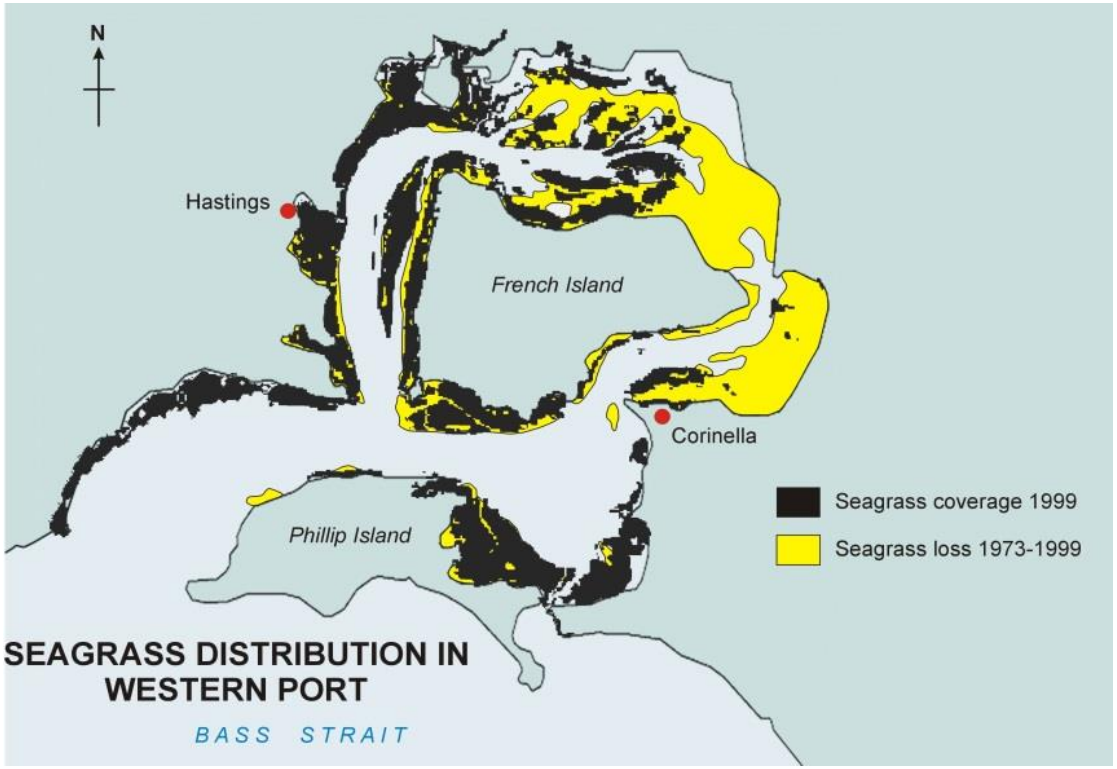
Historical Changes

Substantial changes to the waterways and catchments over past 200 years e.g.

- Draining Koo Wee Rup Swamp (formerly 400km^2) 1857-1930s
- Previously few streams flowing to north, now many artificial channels
- Extensive catchment vegetation clearing
- Dams and diversions e.g. Tarago and Cardinia Reservoirs, Bunyip Diversion
- Progressive urban growth

Management Issues

Seagrass loss of ~50-70% mid-1970s-80s, some recovery since
Reduction in mangrove and saltmarsh coverage
Declining fish stocks
Decline in waterbirds species
Pest plants and animals e.g. *Spartina*
High nutrients from intensive agriculture e.g. Watsons Creek catchment



Supports Important Ecological Values

Ramsar

Waterbirds

Seagrass

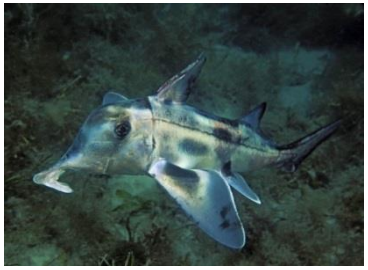
Saltmarsh

3 Marine national parks

Rocky reefs

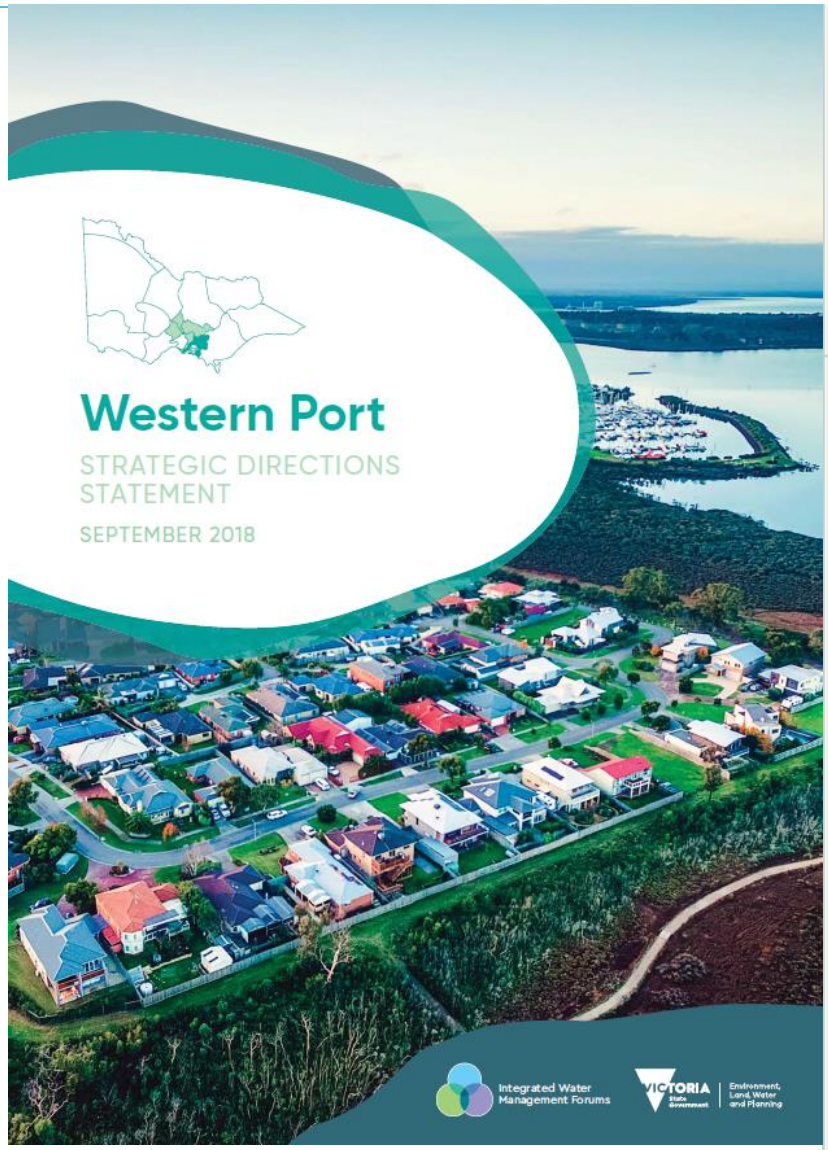
Mangroves

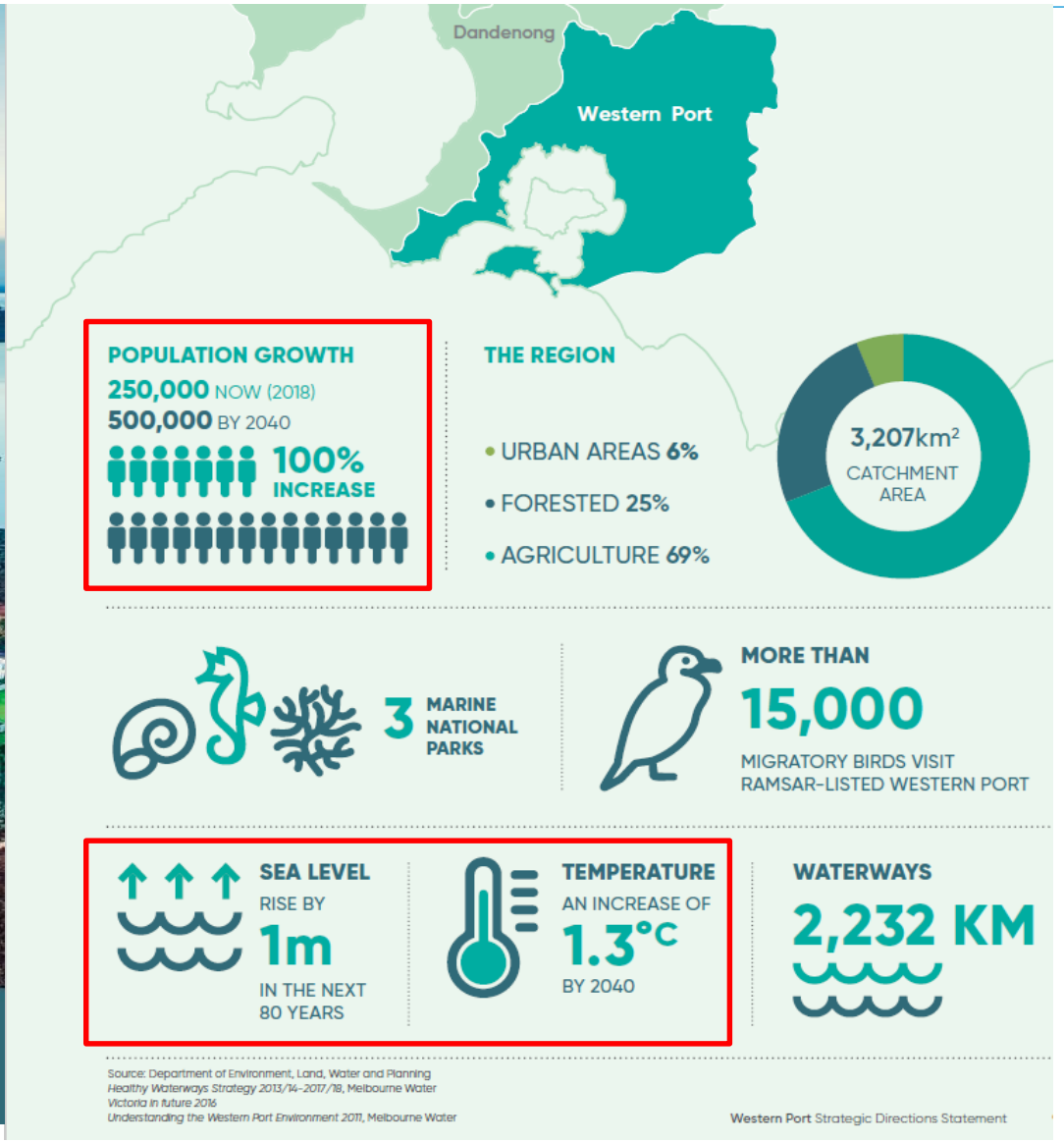
Invertebrates



Fish

Future Challenges

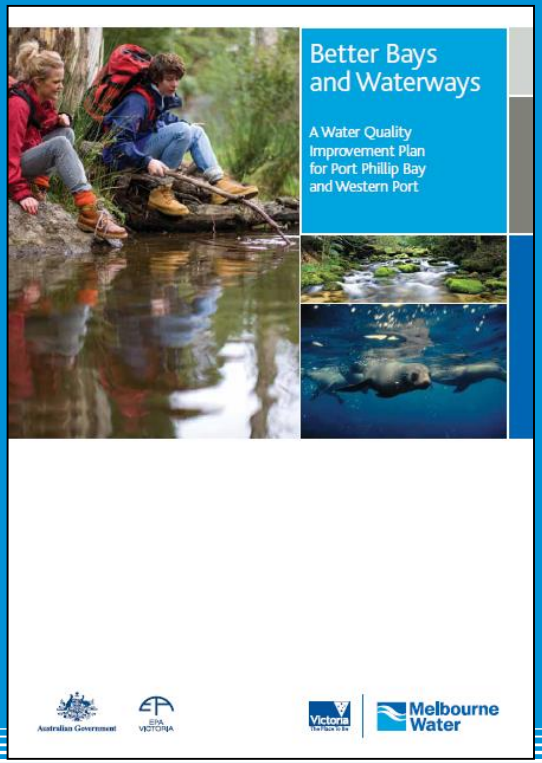




Lack of research since 1970s

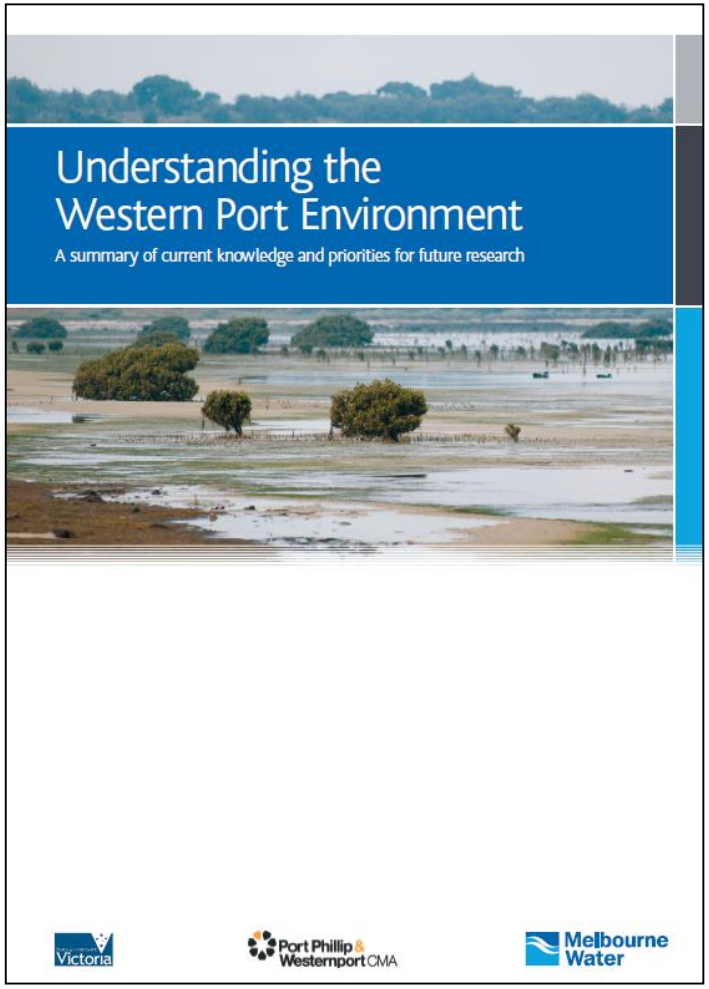
Lack of consolidated information about key values, threats and management priorities

Need for Strategic Understanding of Western Port Environment (*Better Bays & Waterways 2009*)



Western Port Environment Science Review

- What's important about the environment?
- What are the major threats?
- Do we know enough to protect it?
- What are the strategic research gaps?



Western Port Environment Science Review

Project led by Melbourne Water

Funding and support from DSE (DELWP) and P&WP CMA

9 government agencies, 11 researchers (Prof. Michael Keough UoM)

Broader stakeholder input e.g. WPCC

Review released in March 2012

Research program commenced in 2011 and ongoing

Melbourne Water

State Government Victoria Department of Sustainability and Environment

Port Phillip & Westernport CMA

Central Coastal Board

South East Water

EPA Victoria

Parks Victoria

State Government Victoria Department of Primary Industries

State Government Victoria Department of Transport

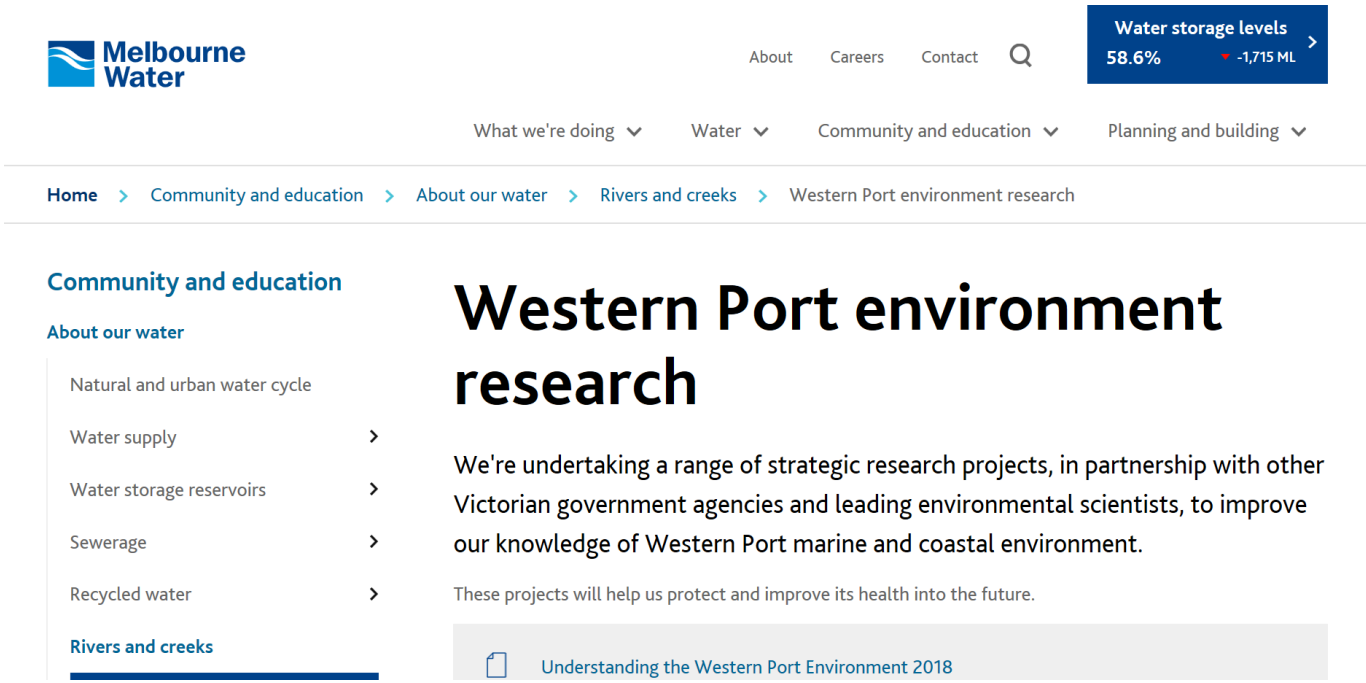
Western Port Environment Research Program

- All very high priority research projects now completed or well underway
- Information published on Melbourne Water's website:

www.melbournewater.com.au

– science review
– project summaries
– publications

- 4 public seminars



Collaborators

Substantial co-funding/in-kind resources from other organisations:

Partner Organisations

DELWP
DEDJTR
EPA Victoria
Parks Victoria
Port Phillip and Westernport CMA
Central Coastal Board
The Nature Conservancy
Western Port Seagrass Partnership

Research Organisations

Arthur Rylah Institute
CSIRO
Deakin University
Eco Insights
eCoast
Federation University
Hydronumerics
Monash University
Museum of Victoria
Phillip Island Nature Parks
Riverbend Ecological Services
Southern Cross University
The University of Melbourne
University of Tasmania
Victoria University

Initial Focus of Research

Physical processes

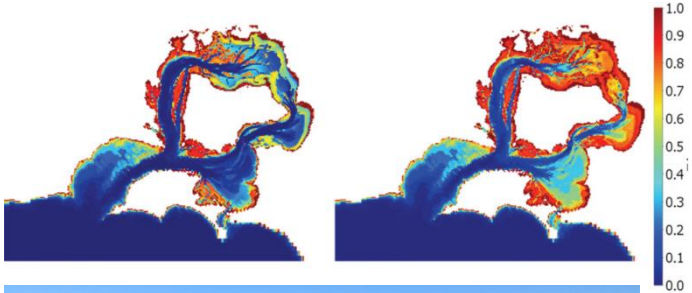
Nutrients and sediments

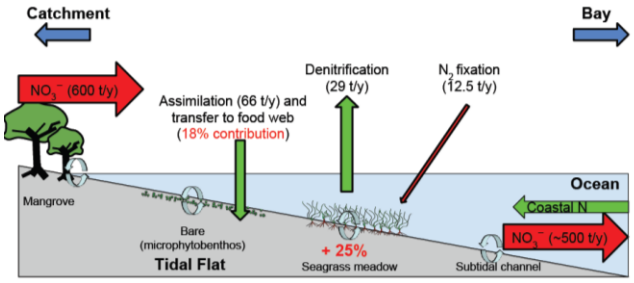
Seagrass, mangroves, saltmarshes

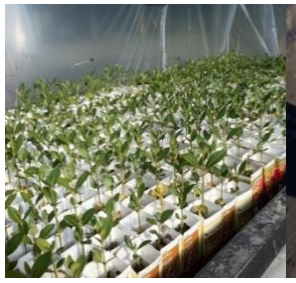
Iconic species - waterbirds, fish

Toxicants

Invasive weeds







Examples of how research supports waterway management

General resource to support informed decision making

Priority issues/opportunities for major strategies and plans e.g. Healthy Waterways Strategy

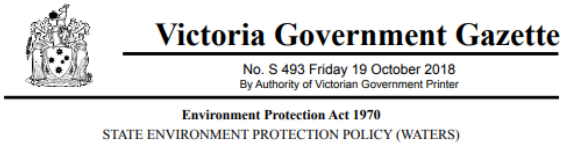
New SEPP sediment loads/concentration targets

Catchment planning tool to identify sediment management priorities

Ongoing mangrove planting programs e.g. WPSP

Environmental flow objectives for Australian grayling

'State of the Bays' reporting



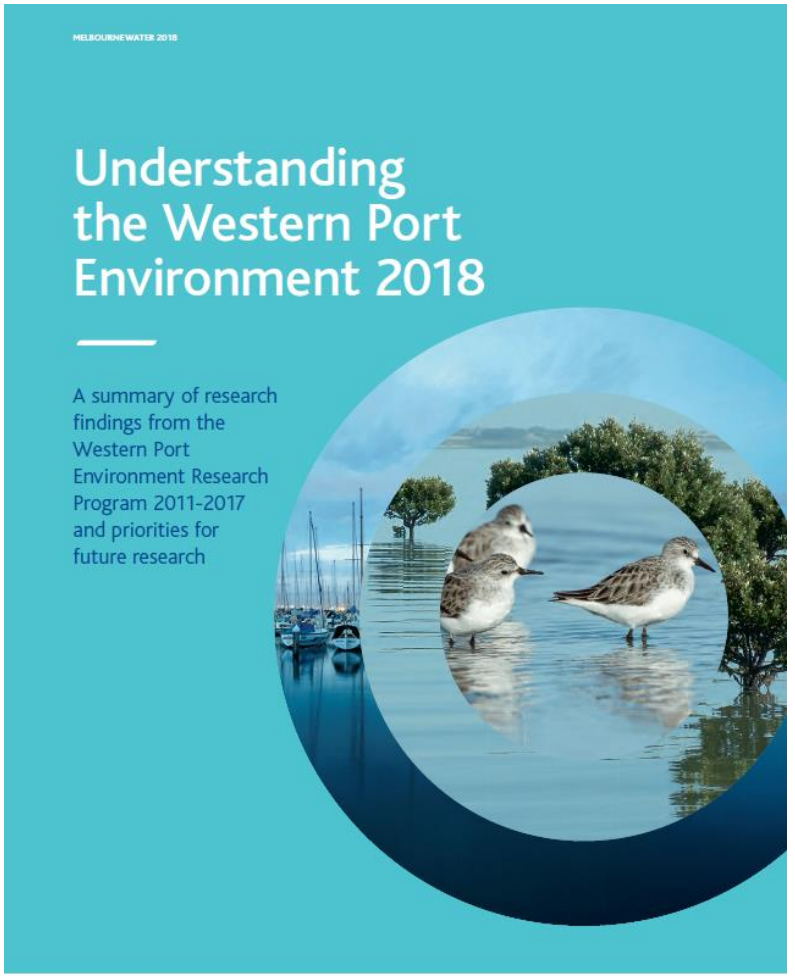
Understanding the Western Port Environment 2018

Summary of research findings since 2011

Threats and opportunities for management

Significantly increased our knowledge

Updated research priorities



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Agenda

REGISTRATION tea/coffee		**9.00 - 9.15 am**
Welcome to Country	Uncle Shane Clarke Bunurong Traditional Owner	9.15 - 9.25
Overview of Western Port Environment Research Program	Rhys Coleman Melbourne Water	9.25 - 9.40
Sediments and seagrass	Scott Wilkinson, CSIRO	9.40 - 10.00
Seagrass, light, nutrients and genetics	Craig Sherman, Deakin University	10.00 - 10.20
Modelling sediments for seagrass restoration	Kath Cinque Melbourne Water	10.20 - 10.40
MORNING TEA		10.40 - 11.10
Toxicants – identification and management	Jackie Myers, RMIT	11.10 - 11.30
Birds – population trends and conservation	Richard Loyn, Eco Insights	11.30 - 11.50
Fish – recreational fish population trends, drivers and habitats	Greg Jenkins University of Melbourne	11.50 - 12.10
Grayling – Migratory life cycle	Wayne Koster, Arthur Rylah Institute	12.10 - 12.30 pm
LUNCH		12.30 - 1.20
Mangroves and saltmarsh	Thomas Hurst Melbourne Water	1.20 - 1.40
Mangrove and seagrass research at Deakin University	Peter Macreadie Deakin University	1.40 - 2.00
WRAP UP	Rhys Coleman	2.00 - 2.05


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Research Complete or Underway

Project	No.	Priority	Funded by	Led by	Status	Publications
Physical processes						
Detailed and up-to-date bathymetry for Western Port	R.1	1	DELWP	DELWP	Complete	DELWP 2017
Calibrate hydrodynamic models for more accurate water movement	R.2	1	DELWP/ CMA/EPA	Hydronumerics	Complete	Hydronumerics (in prep)
Atmospheric inputs into Western Port	R.8	2	MW/EPA/ CSIRO	EPA/CSIRO	Complete	EPA/CSIRO 2013
Identify contribution of waves to sea-level changes in Western Port	R.9	2	MW/DELWP	Water Technology	Complete	Water Technology 2014
Determine the contribution of storm tide sea levels to waterway flooding (when accompanied by high rainfall)	R.10	2	MW/DELWP	Water Technology	Complete	Water Technology 2014, 2015
Incorporate shoreline erosion into climate change predictions	R.11	2	MW/DELWP	Water Technology	Complete	Water Technology 2013
Nutrients and sediments						
Measure residence time of sediments entering the bay	R.4	2	MW/CSIRO	CSIRO	Complete	Wilkinson et al. 2016
Contribution of coastal erosion to nutrient and sediment budgets	R.6	1	MW	CSIRO	Complete	Tomkins et al. 2014 Wilkinson et al. 2016
Develop a preliminary nitrogen and phosphorus budget	R.12	1	MW	Monash University	Complete	Evrard et al. 2013 Wilkinson et al. 2016
Measure nutrient cycling in major habitats	R.13	1	MW	Monash University	Complete	Evrard et al. 2013; Russell et al. 2016
Build a process-based biogeochemical model	R.14	2	MW	MW/ Hydronumerics	Complete for hydrodynamics and sediments	Yeates and Okely 2016

Research Complete or Underway

Seagrasses, mangroves and saltmarshes						
Assess the degree of nutrient and light limitation of seagrass, benthic microalgae, macroalgae and phytoplankton	R.15	1-3	MW/EPA/PV	Monash University	Underway (seagrass only)	Russell et al. 2016 Manassa et al. 2017
Determine water quality targets for sediments and nutrients that support seagrasses, benthic microalgae, reef algae, saltmarshes and mangroves	R.16	1-3	MW/EPA/PV	Monash University	Underway (seagrass only)	Holland et al. 2013
Confirmation of seagrass species using genetic markers	R.19	1	MW/DELWP/ CMA	Deakin University	Complete	Keough and Sherman unpublished
Estimate extent of invasion of key habitats	R.22	2	MW	Victoria University	Tall wheat grass in saltmarsh only	Hurst and Boon 2016
Characterise importance of saltmarshes and mangroves for biodiversity	R.24	3	Deakin	Deakin University	Complete for invertebrates in mangroves	Monk 2012
Use historical aerial photographs and ground-truthing to quantify historical and current distribution of mangroves and saltmarsh vegetation	R.25	2	MW/TNC	Deakin University	Underway	
Capacity for Zostera to recover and colonise new areas	R.26	1	MW/EPA/PV	Monash University	Underway	
Identify determinants of saltmarsh and mangrove recovery and seedling establishment	R.27	2	MW	Deakin University	Underway (mangroves only)	Hurst 2013; Hurst et al. 2015; Hurst et al. (in press)
Relationships between sea levels, sedimentation/ erosion rates and vascular plant communities	R.29	2	MW/TNC	Deakin University	Underway	

Research Complete or Underway

Iconic species						
Determine linkages between fish and habitats	R.28	1	MW/DELWP/ CMA	Melbourne University	Complete	Jenkins et al. 2013; Jenkins et al. 2015
Investigate marine and estuarine requirements of the listed Australian grayling	R.32	3	MW	ARI	Underway	
Determine relative significance of shorebird and waterbird intertidal feeding areas	R.34	2	CCB	ARI	Complete	Hansen et al. 2011
Examine the trends of fish-eating birds in Western Port and Corner Inlet	R.35	1	MW/DELWP/ CMA	ARI	Complete	Menkhorst et al. 2015
Determine the effects of recreational fishing on fish stocks	R.39	1	MW/DEDJTR	Melbourne University/ DEDJTR	Complete	Jenkins and Conron 2015
Effects of sea level rise on shore birds	R.42	2	CCB	ARI	Complete	Hansen et al. 2011
Toxicants						
Initial estimate of risk from toxicants	R.36	1	MW/DELWP/ CMA	Melbourne University	Complete	Sharp et al. 2013
Impacts of toxicants on vegetation	R.37	2-3	MW	Melbourne University	Underway (mangroves and seagrass only)	Myers et al. (2015)
Investigate climate change and toxicant effects on fish	R.38	2	MW	Melbourne University	Underway (toxicants only)	Hassell et al. (2016)