

Mangroves and coastal saltmarsh of Victoria

DISTRIBUTION, CONDITION,
THREATS AND MANAGEMENT



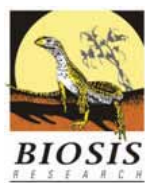
Paul I Boon, Tim Allen, Jennifer Brook, Geoff Carr, Doug Froid,
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June 2011



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Professor Paul Boon

Institute for Sustainability and Innovation

Victoria University (Footscray Park campus)

PO Box 14428, MCMC Melbourne VIC 8001

Email: paul.boon@vu.edu.au

Author details

Paul I Boon – Institute for Sustainability and Innovation, Victoria University (Footscray Park campus), PO Box 14428, MCMC Melbourne VIC 8001

Tim Allen – Caring for our Country Facilitator – Environment (Victoria) c/- Department of Sustainability and Environment, Level 3, 8 Nicholson Street, East Melbourne VIC 3002

Geoff Carr, Andrew McMahon and Steve Mathews – Ecology Australia, 88B Station Street, Fairfield VIC 3078

Doug Frood – Pathways Bushland and Environment, PO Box 360, Greensborough VIC 3088

Chris Harty – Chris Harty Planning and Environmental Management, PO Box 179, Camperdown VIC 3260

Jasmine Hoye and Jennifer Brook – Ipsos Eureka, Level 4, 493 St Kilda Road VIC 3004

Neville Rosengren – La Trobe University, Melbourne VIC 3086

Steve Sinclair and Matt White – Arthur Rylah Institute, Department of Sustainability and Environment, 123 Brown Street, Heidelberg VIC 3084

Jeff Yugovic – Biosis Research, 38 Bertie Street, Port Melbourne VIC 3207

Suggested citation

This report should be cited as:

Victorian Saltmarsh Study* (2011). *Mangroves and coastal saltmarsh of Victoria: distribution, condition, threats and management*. Institute for Sustainability and Innovation, Victoria University, Melbourne. *Paul I Boon, Tim Allen, Jennifer Brook, Geoff Carr, Doug Frood, Chris Harty, Jasmine Hoye, Andrew McMahon, Steve Mathews, Neville Rosengren, Steve Sinclair, Matt White and Jeff Yugovic.

Printed in Australia by Trojan Press
in Scala Sans and Garamond

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Roles of the authors

The report is a collaborative effort of staff from a number of organisations. All those identified as authors had roles in writing various sections and reviewing progressive drafts. With a project of this scale, however, it was inevitable that different people took leadership for different sections of the report.

Paul Boon was project manager and responsible for seeing the work to completion, collating material from the contributors, arranging for external contributions and review, and collating and editing the draft and final reports. He took the lead role in writing Chapter 1 (Literature review). A section in that chapter, on Ecological Vegetation Classes, was written mostly by Doug Frood; sections on floristics and weeds were mostly by Geoff Carr. Steffan Howe (Parks Victoria) contributed text on Parks Victoria's *Spartina* control program, and Glenn Ehmke (Birds Australia) contributed text and images on mangroves and coastal saltmarsh as bird habitat. Steve Sinclair and Geoff Carr reviewed various drafts of the entire chapter, and indeed of the entire draft report.

Text for Chapter 2 (Management arrangements) was written by mostly Chris Harty and Steve Mathews, and edited into its final form by Paul Boon.

Chapter 3 (Social and agency perceptions) was collated by Paul Boon, using text provided by Jasmine Hoye and Jennifer Brooke on community focus groups and by Steve Mathews and Geoff Carr on agency attitudes to mangroves and coastal saltmarsh. Paul Boon undertook the communication tasks in Chapter 3.1.

Chapter 4 (Floristics and structure) was prepared by Doug Frood and Steve Sinclair, with important inputs from Andrew McMahon, Geoff Carr and Jeff Yugovic.

Chapter 5 (Current distribution, inventory and condition) and Chapter 6 (Pre-European extents and climate change modelling) were done mostly by Steve Sinclair and Matt White, respectively, with assistance from Neville Rosengren in both cases. In the main, Steve Sinclair and Doug Frood devised the condition assessment protocols. The large amount of field work necessary to ground truth the aerial photographs was led by Geoff Carr, Andrew McMahon, Steve Sinclair, Matt White and Jeff Yugovic, assisted by the large number of people identified in the Acknowledgements.

Chapter 7 (Management template) was prepared mostly by Jeff Yugovic (issues) and Chris Harty (policy and legislation), with feedback from Geoff Carr and collation by Paul Boon. Steve Sinclair prepared the map and inventory information.

The very considerable amount of work entailed in compiling the information in Appendices C and D was done by Geoff Carr, and in Appendices E and F by Doug Frood. Steve Sinclair devised the mapping rules shown in Appendix G.

All authors contributed photographs and other images: photograph credits are shown in Appendix K. Note that photographs are copyright and may not be reproduced without written permission from the authors.

Acknowledgements

The following are thanked for their input into the literature review and for general discussions about the project: Geoff Wescott (Deakin University, Melbourne), Janine McBurnie (Deakin University, Melbourne), Rae Moran (Department of Sustainability and Environment, Melbourne), Mike Ronan (Queensland Environment Protection Authority, Brisbane), Neil Saintilan (Department of Environment and Climate Change, Sydney), Jeff Shimeta (RMIT University, Melbourne), Mike Vanderzee (Department of Sustainability and Environment, Melbourne), Rob Williams (Aquatic Ecosystems Research Unit, Cronulla Fisheries Centre, Sydney), and Debra Canty (Department of Environment and Heritage, Adelaide). Greg Hunt (Western Port Greenhouse Alliance) reviewed the section on climate change; Steffan Howe and Leslie Leunig (Parks Victoria, Melbourne and Foster) contributed to material on **Spartina*. Glenn Ehmke (Birds Australia) kindly contributed information on birds in coastal saltmarsh. Nick Clemann and Michael Johnston (Arthur Rylah Institute) provided helpful comments on reptiles and feral animals, respectively. Additional help came from Bernadette Schmidt and Darren Quin (Ecology Australia) on policy and legislation; Jane Abbey, Linda Fries and Billy Flett (analysing quadrat data for the revised typology); Paul Gullan (preparing preliminary two-way floristic tables in an editable format). Paul Adam (University of New South Wales, Sydney) and Richard Mount (University of Tasmania, Hobart) were external peer reviewers of the draft report, and their comments have been incorporated into the final version. Staff of the Department of Sustainability and Environment also proved useful feedback on the draft report.

A large team of people assisted with ground truthing the aerial photographs: John Kershaw and Fiona Sutton (Ecology Australia); Victoria Allen, Jill Anderson, Shona Arber, Nicola Barnes, Liz Conolly, Sera Cutler, Imelda Douglas, Darcy Duggan, Sam Gilbert, Samantha Ibbetson, Michelle Love, Kylie Payze, Gidja Walker and Nathan Wong (Biosis Research); Geoff Sutter, Arn Tolsma, Claire Moxham and Michele Kohout (Arthur Rylah Institute) did a great deal of field work around Western Port and in south-western Victoria. Julie Medley (La Trobe University, Melbourne) and Michele Kohout (Arthur Rylah Institute) made important contributions to the final GIS layers. Dylan Osler and Damien Cook (Australian Ecosystems, Melbourne) contributed map data for the Gellibrand and Barham Rivers and Curdies Inlet. Alison Oates (Oates Environmental Consulting, Melbourne) provided ecological advice and assisted with arranging access to private properties on Phillip Island and Western Port. The following also made valuable contributions: Jodie Honan and Andrew Pritchard (Department of Sustainability and Environment, Warrnambool), David Pitts (Department of Sustainability and Environment, Portland), Valentino Stajsic (National Herbarium of Victoria, Melbourne), Geoff Sainty (Sainty and Associates, Sydney), Molly Whalen (Flinders University, Adelaide), John Kershaw, Carole McWilliam, Fiona Sutton, Jamie McMahon, Darren Quin and Beverley Mussen (Ecology Australia), Mick Douglas (Parks Victoria, French Island), Maarten Hulzebosch (Zoological Board of Victoria, Werribee), Kelly Shepherd (Western Australian Herbarium, Perth), Alan Yen (Department of Primary Industries, Victoria), and Peter Robinson (Wildlife Profiles, Melbourne). Thanks to Barbara Vaughan Publishing Services for design, layout and editorial oversight. Thanks to Tracey Townsend and Carol Tillyer for assistance with proofreading.

The project was funded under the Strategic Reserve of the National Heritage Trust (Project 204052) and ran from 2008 to 2011.

SUMMARY

Victorian mangroves and coastal saltmarsh have suffered from long-term neglect by researchers, natural-resource managers and the wider community. On a statewide basis their distribution and extent have not been mapped other than at a quite coarse scale, and little is known of their ecological condition. In broad terms the processes that threaten mangroves and coastal saltmarsh are well understood, but specific knowledge is lacking for most sites. In contrast to the case in Victoria, comprehensive statewide mapping and inventory studies have been completed recently, or are nearing completion, for coastal and estuarine systems in Queensland, South Australia and New South Wales. The project, therefore, seeks to fill a number of important gaps in the current understanding of mangroves and coastal saltmarsh in Victoria.

MANGROVES AND COASTAL SALTMARSH IN VICTORIA

Only one mangrove species, *Avicennia marina* subsp. *australasica* is present in Victoria and the plant community it forms is classified as Ecological Vegetation Class (EVC) 140 Mangrove Shrubland. The most southerly occurrence (indeed, the highest latitude occurrence) of mangroves in Australia (and the world) is in Victoria, at Corner Inlet, where *Avicennia marina* occurs to a latitude of 38° 45' S.

Victorian coastal saltmarshes are floristically and structurally more complex than mangroves. For the purposes of this report, we define coastal saltmarsh as:

land that experiences recurrent low-energy inundation by seawater and which is vegetated by low-growing vascular plants (generally < 1.5 m height), such as succulent chenopods and salt-tolerant monocots.

This definition of coastal saltmarsh excludes salt-tolerant vegetation in the salt-spray, wave and splash zone in high-energy coastal environments, such as along high cliffs. While the focus of the current project is on mangroves and coastal saltmarsh (both examples of intertidal wetlands), it necessarily considers also some other types of estuarine wetlands (e.g. Estuarine Wetland EVC 10, dominated by *Juncus kraussii*) where they are spatially integrated with coastal saltmarsh.

LITERATURE REVIEW

A comprehensive literature review describes current understanding of the extent, distribution and ecology of mangroves and coastal saltmarsh in south-eastern Australia. Zonation, sedimentation and successional change are described, followed by a review of plants' salt and water relations and reproductive strategies. A detailed analysis of the ecological, economic and social values of mangroves and coastal saltmarsh is provided, followed by a description of the main threatening processes, including the likely impacts of climate change. Prior classification and mapping studies of coastal wetland vegetation are described.

REVISED TYPOLOGY FOR EVC 9 COASTAL SALTMARSH AGGREGATE

The report describes the wide variation within the existing EVCs used to map coastal saltmarsh in Victoria: Coastal Saltmarsh Aggregate (EVC 9). The variation is floristic, structural and ecological in nature. On the basis of a new structural and floristic classification, we describe seven new EVCs from within the existing aggregate unit:

- Coastal Dry Saltmarsh, a low herbland or prostrate shrubland, occurring in the rarely-inundated upper marsh zone, scattered along the Victorian Coast.

- Coastal Hypersaline Saltmarsh, a succulent shrubland growing in areas of low rainfall, infrequent inundation and evaporation-induced hypersalinity, found in rain-shadow areas between Melbourne and Torquay, and in Lake Reeve, Gippsland.
- Coastal Saline Grassland, mat-forming grasses, sometimes forming hummocks, growing in damp areas which may receive some freshwater input, scattered along the Victorian Coast.
- Coastal Tussock Saltmarsh, growing on well drained or slightly raised areas, dominated by large grass or sedge tussocks.
- Saltmarsh-grass Swamp, an open grassland growing in hypersaline conditions, restricted to the Barwon River estuary.
- Wet Saltmarsh Herbland, a frequently-inundated succulent herbland, common along the Victorian Coast.
- Wet Saltmarsh Shrubland, a frequently-inundated succulent shrubland, common from Torquay to the Gippsland Lakes.

We provide floristic, structural and ecological descriptions of these seven units, along with photographs of representative sites. We describe also variants within each unit, defined by different structural dominants.

MANAGEMENT ARRANGEMENTS

The management framework for mangroves and coastal saltmarsh is complex, with Commonwealth, state and local levels of government having a range of legislation and policy that touch on these environments. Chapter 2 reviews the existing policy, legislative and planning framework for managing mangroves and coastal saltmarsh in Victoria. Because of the complexity of matters affecting mangroves and coastal saltmarsh, it is important that their management is based on a strategic process. Planning and management must integrate environmental, economic and social issues relating to the protection and sustainable use of mangroves and coastal saltmarsh on public and private land and across the catchment-to-coast continuum.

AGENCY AND COMMUNITY ATTITUDES

Workshops were held with staff from natural-resource management agencies across the state to assess attitudes to intertidal wetlands. Agency staff recognised that human impacts on intertidal wetlands were dependent on the intensity and concentration of the activity, type of vegetation involved, level of management applied, and area over which the impact was distributed.

Focus-group workshops were held with the general public to assess people's attitudes to intertidal wetlands. They demonstrated that coastal saltmarsh is largely unknown and therefore 'invisible' to the wider community, despite the fact that many people living on the coast regularly see intertidal wetlands. In contrast, mangroves are more familiar to coastal residents. Mangroves are more valued by the community since they are understood, at least by some, to be important breeding or nursery grounds for fish and habitats for birds. Mangroves, however, are not well loved by the wider community. A range of mechanisms is proposed to explore people's preparedness to change their behaviour in order to conserve mangroves and coastal saltmarsh and to engage the wider public in conserving Victoria's intertidal wetlands.

Overviews and progress reports of the project were presented at 30 meetings or workshops since its commencement. A wide variety of agency staff and members of community groups or the general public attended these meetings and workshops.

CURRENT DISTRIBUTION, EXTENT AND CONDITION

Detailed new mapping based on extensive field work and aerial photograph interpretation demonstrates that Victoria supports slightly more saltmarsh vegetation, and slightly less mangrove vegetation, than has been estimated in the few available studies to date. Field teams were able to view about 70% of Victoria's saltmarsh patches (measured by area of visited polygons), which makes the present study better ground-truthed than previous statewide mapping projects.

We identified 19,212 ha of saltmarsh (encompassing all the proposed new EVCs described above), 5,177 ha of Mangrove Shrubland (EVC 140) and 3,227 ha of Estuarine Wetland (EVC 10). Detailed areas are presented, arranged according to the recommended new EVC typology. We report also on the area and extent of each new unit according to different sectors of the Victorian coast. These sectors – defined expressly for the purpose of reporting on saltmarsh extent and condition – combine nearby areas with geomorphological and land-use similarities.

The concept of 'ecological condition' is analysed with reference to the Victorian policy context. Using field observations and aerial photographs, we describe the condition of saltmarsh in each coastal sector, according to the level of degradation caused by particular threatening processes. The analysis revealed a wide range of degrading processes acting on mangroves and coastal saltmarsh across the state, and highlights those processes that have taken the largest toll: notably land-claims that involve drainage works. To enable condition to be assessed at a finer scale, we propose a site-based condition-assessment method. The method deliberately takes a similar approach to other assessment tools already used in Victoria but which currently exclude saltmarsh and other marine-influenced wetlands (i.e. Habitat Hectares and Index of Wetland Condition). We stress that the method is not endorsed for use in planning purposes, such as 'net gain' or 'offset' calculations.

PRE-EUROPEAN EXTENT

Analysis of archival maps, along with aerial photography and field observations, enabled us to reconstruct the pre-European (i.e. 'pre-1750') distribution of intertidal wetland vegetation across Victoria. Although the level of accuracy varies from place to place according to the resolution of the original sources, our pre-European map is more accurate and better-supported than the existing pre-1750 mapping held by the Department of Sustainability and Environment.

Losses of coastal saltmarsh have been very uneven across the Victorian coast, with some areas having suffered massive loss (notably Corner Inlet and parts of the Nooramunga coast, Anderson Inlet, Shallow Inlet and Port Phillip Bay) but other areas having retained most of their re-colonial area of intertidal wetland. Some of the greatest losses have occurred along the Nooramunga coast, and we estimate that only about 40% of the original marsh area remains. This represents a loss of > 2,500 ha (> 25 km²) of intertidal wetland in the sector. We estimate the overall, statewide loss of coastal marsh vegetation (Mangrove Shrubland, Coastal Saltmarsh aggregate and Estuarine Wetland combined) to be ~30–40%. Estimated losses are tabulated by coastal sector, and described with reference to the sources and their reliability.

We used the current and pre-1750 area data, along with our overview of ecological condition, to assign a Bioregional Conservation Status to each of the proposed new coastal saltmarsh EVCs.

MODELLING OF CLIMATE CHANGE IMPACTS

Given the vulnerability of coastal wetlands to sea-level rise and the necessity for them to 'migrate' inland if they are to survive, it would be of great value to be able to predict which areas could be capable of supporting coastal wetland vegetation under higher sea levels. We use Western Port as a case study to explore the feasibility of such an exercise. Our results show clearly that, while some useful information can readily be obtained with existing approaches, the naivety of currently available modelling techniques make the results difficult to interpret and, in some cases, misleading. We discuss the specific limitations of such modelling for Western Port in particular and the Victorian coast in general.

MANAGEMENT TEMPLATE

A management template, based on the Barwon River estuary as a case study, is provided. A wide range of management issues and actions are identified and discussed to assist in the preparation of management plans for mangroves, saltmarshes and estuaries along the Victorian coast.

RECOMMENDATIONS

Fifty-one recommendations are made to improve management of mangroves and coastal saltmarsh in Victoria. Recommendations fall into 16 categories: i) classification and inventory; ii) condition assessment; iii) pre-European distribution; iv) conservation status; v) reservation; vi) sea-level rise; vii) provision of buffer zones; viii) planning; ix) stronger action on the part of responsible authorities; x) action on invasive plants; xi) action to reduce impacts of exotic vertebrate fauna; xii) maintain and restore natural hydrological conditions; xiii) sea walls; xiv) provision of information on conservation management; xv) establish a body charged with coordinating protection, preservation, and conservation management of mangroves and coastal saltmarsh; and xvi) further research.