Cultural systems, science and natural resource management:

Aboriginal management of wetlands in the west Kimberley, Australia

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This thesis is presented for the degree of
Doctor of Philosophy
of The University of Western Australia
with enrolment in:

UWA School of Agriculture and Environment
2017
Declaration

I, Michelle Pyke (formerly Walker), certify that:

This thesis has been substantially accomplished during enrolment in the degree.

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Additional approvals were obtained prior to commencing the relevant work described in this thesis from the Kimberley Land Council, Bardi Jawi Prescribed Body Corporate and the Nyul Nyul Ranger Cultural Advisory Committee.

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Signature: [Redacted]

Date: 2 March 2017
Abstract

This thesis investigates Australian Aboriginal conceptualisations of wetland ecosystem management. The research occurs within the context of cross-cultural Indigenous natural resource management (NRM) in northern Australia, where Aboriginal groups collaborate with wetland researchers and managers trained in the natural sciences and government policy-based (conventional) NRM. I respond to Muir et al. (2010, p. 260) who call for a “…conceptual turn around”:

Instead of perceiving society’s current circumstances as a Western system that is starting to ‘bring in’ some Indigenous knowledge, we imagine it from the other side: that the non-Indigenous society and system has been accommodated into the more situated and longer established Indigenous system.

Two coastal Aboriginal groups from the west Kimberley region of northern Western Australia participated in the research: the Bardi Jawi and Nyul Nyul peoples of the Dampier Peninsula, north of Broome. Using a participatory action research method, Indigenous rangers from each group assisted in the interviewing of elders and Traditional Owners about wetlands on their traditional lands (Country). Semi-structured interviews were held with 26 Bardi Jawi people and 19 Nyul Nyul people, involving day trips to wetland sites, home interviews and overnight camps. Additional information emerged from participant observation during fieldwork and feedback from participants on interim research findings via community workshops. The research findings are presented in three chapters that, together with a discussion, constitute the thesis emphases, content and analyses: two focus on Aboriginal conceptualisations of wetland management at different scales, whereas the third reflects on how a research approach can influence academic interpretations of Indigenous knowledge systems.

In Chapter 3 I offer a holistic conceptualisation of Aboriginal wetland management. Particular knowledge, practices and beliefs were found to provide a cultural framework for Bardi Jawi and Nyul Nyul interactions with water places. Consistent with beliefs about human-wetland relationships, four principles were identified that guide Bardi Jawi and Nyul Nyul people’s direct engagement with wetlands including custodial ownership, respectful use, active maintenance and knowledge management.
The enacting of these principles constitutes a system of wetland ecosystem management that has purpose and structure. Through this system the two groups satisfy cultural responsibilities and enjoy cultural opportunities and ecosystem services, but also generate services to ecosystems that shape wetland ecological character, potentially contributing to desired Indigenous, scientific and conventional NRM outcomes.

Chapter 4 discusses further how Bardi Jawi and Nyul Nyul peoples’ management and use of particular wetlands historically shaped their ecological character. Effects were found to include the maintenance of certain vegetation assemblages, regulation of freshwater eel populations, expansion of open surface water, and enhancement of water quality. Unlike conventional perspectives, Aboriginal people perceive some wetlands as non self-sustaining, requiring ongoing visitation, use and (at times) active maintenance, to thrive. Also, both Bardi Jawi and Nyul Nyul prioritise wetland characteristics that are not a focus of conventional approaches, such as water quality sufficient for drinking. This chapter discusses how conventional wetland management would benefit from a better understanding of how Indigenous peoples’ practices influenced, or continue to influence, wetlands, particularly through a place-based perspective.

Chapter 5 compares two academic approaches to investigating and interpreting how Indigenous knowledge systems relate to wetland management. While both approaches benefited the Aboriginal participants and contributed to science, one revealed more complexity in how Aboriginal knowledge, beliefs and practices relate to, or influence, wetland condition. The findings demonstrate that understanding the suite of potential Indigenous knowledge system contributions to environmental challenges like wetland management requires methods that facilitate in-depth, holistic interpretations.

The research highlights the following outcomes: 1. Investigating Aboriginal wetland management from within a holistic cultural (rather than conventional) paradigm uncovers complex interconnections between knowledge, practices and beliefs. 2. From this perspective, Aboriginal people can offer new models for understanding and managing wetlands that potentially benefit both Indigenous aspirations and scientific and conventional NRM objectives. While some principles of Aboriginal
wetland management are already accommodated within Indigenous NRM, others are not. Cross-cultural wetland management and research can better strengthen Aboriginal ways of managing wetlands through a place-based, culture-centric approach that interweaves nature and culture, accommodates the integrated nature of Indigenous knowledge systems, and prioritises Aboriginal aspirations. Such approaches rely on the strong cultural capacities of non-Indigenous project partners, fostered through active and long-term ‘being and doing’ with Indigenous partners. Overall, through a conceptual turn-around based in Indigenous perspectives the research presents new ways of envisioning wetland management.

Contents

DECLARATION ............................................................................................................................ III
ABSTRACT ..................................................................................................................................... V
CONTENTS ............................................................................................................................... IX
LIST OF FIGURES ....................................................................................................................... XIII
LIST OF TABLES ........................................................................................................................ XV
ACKNOWLEDGEMENTS ........................................................................................................... XVII
AUTHORSHIP DECLARATION: CO-AUTHORED PUBLICATIONS ........................................ XXI

CHAPTER 1 THESIS JUSTIFICATION AND CHALLENGE ............................................... 1
1.1 THESIS WELCOME .............................................................. ........................................ 1
1.2 THESIS JUSTIFICATION ........................................................... 3
1.3 THESIS CHALLENGE ...................................................................................... 7
1.4 DEFINITIONS AND CONCEPTS ............................................................................. 9
1.5 OVERVIEW OF CHAPTERS (CHAPTERS 2-6) ................................................. 26
  1.5.1 Thesis as a series of papers ................................................................. 26
1.6 SUMMARY .............................................................................................................. 33
1.7 REFERENCES ........................................................................................................ 33

CHAPTER 2 STUDY APPROACH, PEOPLE AND AREA .............................................. 49
2.1 STUDY APPROACH ............................................................................................... 49
  2.1.1 Developing relationships in the early stages ........................................... 52
  2.1.2 Local authorisation for the research ................................................... 54
  2.1.3 A participatory approach and choice of methods ................................ 55
  2.1.4 Enabling critical review ........................................................................ 59
2.2 INTRODUCING THE STUDY AREA ................................................................. 61
  2.2.1 The Kimberley as study location ....................................................... 61
  2.2.2 The Dampier Peninsula - an overview ............................................. 62
  2.2.3 Wetlands in the northern part of the Dampier Peninsula ................ 65
2.3 AN INTRODUCTION TO THE BARDI JAWI AND NYUL NYUL PEOPLE ...... 67
  2.3.1 The Bardi Jawi people and their Country ......................................... 67
  2.3.2 Water places: a Bardi Jawi perspective ........................................... 71
  2.3.3 The Nyul Nyul people and their Country ......................................... 73
  2.3.4 Water places: a Nyul Nyul perspective ........................................... 76
2.4 SUMMARY .............................................................................................................. 79
2.5 REFERENCES ........................................................................................................ 80
CHAPTER 3  MAINTAINING TRADITIONAL WATER PLACES: A FRAMEWORK FOR UNDERSTANDING AUSTRALIAN ABORIGINAL APPROACHES TO MANAGING WETLANDS ...... 89

3.1 ABSTRACT .................................................................................................................. 89
3.2 INTRODUCTION ........................................................................................................... 90
3.3 METHODS .................................................................................................................... 95
3.4 RESULTS....................................................................................................................... 99
  3.4.1 Beliefs underlying wetland interactions ................................................................. 99
  3.4.2 Principles guiding wetland interactions ................................................................. 102
3.5 DISCUSSION AND ANALYSIS .................................................................................. 107
  3.5.1 The meaning of Indigenous wetland management .................................................. 107
  3.5.2 The organisation of Indigenous wetland management ............................................. 109
  3.5.3 Maintaining knowledge about wetland management .............................................. 110
  3.5.4 From wetland management to “services to ecosystems” ...................................... 111
3.6 SUMMARY .................................................................................................................. 113
3.7 REFERENCES .............................................................................................................. 114

CHAPTER 4  WETLANDS THAT NEED PEOPLE: THE INTER-DEPENDENCE OF AUSTRALIAN ABORIGINAL USE, MANAGEMENT AND WETLAND CONDITION ................. 127

4.1 ABSTRACT .................................................................................................................. 127
4.2 INTRODUCTION .......................................................................................................... 128
4.3 STUDY AREA AND SITE LOCATIONS ...................................................................... 132
4.4 METHODS .................................................................................................................. 134
4.5 RESULTS..................................................................................................................... 135
  4.5.1 Goornganggoon .................................................................................................... 136
  4.5.2 The ‘Causeway’ and the springs area .................................................................. 139
  4.5.3 Shallow freshwater lakes .................................................................................... 141
4.6 DISCUSSION AND ANALYSIS .................................................................................. 142
  4.6.1 Associating Aboriginal management and use with wetland characteristics .......... 142
  4.6.2 Relating Aboriginal and conventional perspectives of wetland condition and management ........................................................................................................ 143
4.7 SUMMARY .................................................................................................................. 143
4.8 REFERENCES .............................................................................................................. 147

CHAPTER 5  A RESEARCH APPROACH TO ENHANCE HOW INDIGENOUS KNOWLEDGE SYSTEMS ARE APPLIED TO WETLAND ECOSYSTEM MANAGEMENT .............................. 157

5.1 ABSTRACT .................................................................................................................. 157
5.2 INTRODUCTION .......................................................................................................... 158
5.3 STUDY AREA .............................................................................................................. 161
5.4 METHODS .................................................................................................................. 162
  5.4.1 Nyul Nyul Ecology Study .................................................................................... 162
  5.4.2 Nyul Nyul and Bardi Jawi Culture Studies ............................................................ 164
5.5 RESULTS, DISCUSSION AND ANALYSIS ................................................................ 167
  5.5.1 Project focus and design ....................................................................................... 167
  5.5.2 Outcomes and benefits for participants and Indigenous Rangers ......................... 168
  5.5.3 Application of IKS to wetland management .......................................................... 169
  5.5.4 Using culture-centric studies to enhance the application of Indigenous
                      knowledge systems to wetland management ...................................................... 170
5.6 SUMMARY ................................................................................................................. 173
5.7 REFERENCES .............................................................................................................. 173

CHAPTER 6 DISCUSSION ..................................................................................................... 181
  6.1 INTRODUCTION: BRIDGING THE ‘UNCOMMON GROUND’ ................................. 181
  6.2 IMPLICATIONS FOR WETLAND ECOSYSTEM MANAGEMENT ............................. 183
  6.3 THE PRESENCE OF ABORIGINAL WETLAND MANAGEMENT WITHIN
                     INDIGENOUS NRM ....................................................................................... 190
  6.4 APPLYING ABORIGINAL WETLAND MANAGEMENT THROUGH A
                     PLACE-BASED APPROACH ........................................................................... 194
  6.5 RESEARCH PROCESS: THE IMPORTANCE OF BEING AND DOING .................... 202
  6.6 RESEARCH LIMITATIONS ....................................................................................... 208
        6.6.1 Problems of power and scale .......................................................................... 208
        6.6.2 The risks and imperatives of investigating Indigenous knowledge systems .... 210
  6.7 CONCLUDING REMARKS ....................................................................................... 212
  6.8 REFERENCES .......................................................................................................... 215
APPENDICES

APPENDIX A UWA RESEARCH ETHICS APPROVAL................................................................. 229
APPENDIX B PARTICIPANT INFORMATION FORM............................................................. 231
APPENDIX C PARTICIPANT CONSENT FORM..................................................................... 233
APPENDIX D ARTICLE IN POSTSCRIPT .............................................................................. 235
APPENDIX E CONFERENCE PRESENTATIONS RESULTING FROM THE RESEARCH........................................................................................................ 237
APPENDIX F SUMMARY OF A FRESHWATER-THEMED TRIP TO NEW ZEALAND WITH BARDI JAWI OORANY RANGERS ........................................ 239
APPENDIX G BARDI JAWI FIELD INTERVIEW TEMPLATE .............................................. 245
APPENDIX H BARDI JAWI HOME INTERVIEW TEMPLATE .............................................. 247
APPENDIX I BARDI JAWI FOCUS GROUP BRAINSTORM PROMPTS ...................... 249
APPENDIX J QUESTION SLIDE PRESENTED TO NYUL NYUL CULTURAL ADVISORY COMMITTEE DURING FEEDBACK SESSION .................................................................................................................... 253
APPENDIX K BARDI JAWI RESEARCH NOTICE................................................................. 255
APPENDIX L NYUL NYUL RESEARCH NOTICE ............................................................... 257
APPENDIX M PAPER ARISING FROM THE NYUL NYUL ECOLOGY STUDY .............................................................. 259

xii
List of figures

Figure 1.1 Map of Kimberley Aboriginal language groups including location of the Jawi, Bardi and Nyul Nyul groups. (Source: Kimberley Language Resource Centre, n.d.) ................................................................. 9

Figure 1.2 Flow diagram of thesis structure depicting links between the research questions and chapters. ................................................................. 27

Figure 2.1 Bardi Jawi Oorany Ranger Rikkia Williams (left) and I (middle) video record an interview with Traditional Owner Bernadette Angus (senior) about a nearby water place called Djaridjang. (Source: Bardi Jawi Oorany Rangers) ............................................................................. 57

Figure 2.2 Outline of participatory research approach highlighting the formal research stages, informal feedback mechanisms and communication of the research. ............................................................................. 61

Figure 2.3 Location of the major Bardi Jawi and Nyul Nyul communities, and Bardi Jawi and Nyul Nyul Ranger management areas on the Dampier Peninsula, north of Broome, Western Australia. (Source: Kimberley Land Council, 2016) ............................................................................. 63

Figure 2.4 A freshwater soak located on a tidal mud flat near the Beagle Bay community. A bucket with the bottom cut out has been used to encourage freshwater to collect. (Source: Michelle Pyke) ................................ 78

Figure 3.1 Conceptual framework depicting the Bardi Jawi and Nyul Nyul wetland management system, including beliefs (inner blue circle), principles (orange circles) and related elements (small circles). ............................................................................. 95

Figure 4.1 Zac Ejai (Bardi Jawi Ranger) standing in the pool of Goorrnganggoon and tasting freshwater flowing into the pool. Also depicting thick enclosing vegetation including banana trees, introduced passion vine (Passiflora foetida) and native species. (Source: Michelle Pyke) .......... 137

Figure 4.2 Thick sedges covering the wetland north of Beagle Bay community at what was formerly a large open freshwater pool. (Source: Michelle Pyke) ............................................................................. 139
List of tables

Table 2.1  Some Bardi Jawi terms for types of freshwater sources (adapted from Aklif, 1999) .................................................................................................................................................... 72
Table 3.1  Age and gender of participants interviewed (female: X-f, male: X-m). ............ 97
Table 3.2  Coding frame used to analyse all qualitative data (interview transcripts, observational notes and transcripts of meetings). ......................................................... 98
Table 4.1  Examples of ways that Aboriginal people modified (or modify) wetlands and the intended or potential effect on ecosystem components or processes. ......................................................................................................................... 129
Table 4.2  Description of wetlands investigated; the number, gender and age range of participants interviewed about each site; and the length of time each site was observed. .............................................................................................................. 134
Table 4.3  Perceptions held by Bardi Jawi and Nyul Nyul respondents of changes to study sites. The nature and timing of change, and whether rehabilitation is required, are also identified. .............................................................................................................. 136
Table 5.1  Key elements of Huntington’s (2005) three archetypal research approaches for investigating Indigenous knowledge systems including the Ecology, Culture and Knowledge Studies. ................................................................. 159
Acknowledgements

There are many people that I wish to thank for their support, guidance and conversation.

Firstly, to the Bardi Jawi and Nyul Nyul people of the Dampier Peninsula. Thank you to all of the individuals and families who contributed to this research by providing knowledge, memories, thoughts and access to your traditional lands. You are not only the heart of this research, but provided a home, friendship and a fun and active life to Damon and I for four years. Thank you for welcoming us and for sharing your beautiful Country.

I am very grateful to the Bardi Jawi Rangers, the Bardi Jawi Oorany Rangers and the Nyul Nyul Rangers for your collaboration with this research. I especially thank the coordinators, managers and cultural advisors including Kevin George, Debbie Sibosado, Daniel Oades, Phillip (Bibido) McCarthy, Bernadette Angus Snr, Mark Rothery, Damon Pyke and Ingrid Indriana. Your individual support plus willingness to provide ranger time and resources were central to the research being successful. Also, particular thanks to the Bardi Jawi Oorany Rangers Cecelia Tigan, Rikkia Williams, Bernadette Angus Jnr and Elaine Riley, to the Nyul Nyul Rangers Zynal Cox, Devena Cox, Preston Cox, Brendan Smith and Albert Wiggan, and to ranger team administration staff, especially Joanne Shadforth and Dale Marshall.

There are many strong Bardi Jawi and Nyul Nyul elders and your strength and commitment to your families and culture continue to inspire and motivate me. While I can’t mention everybody here, I would like to express my gratitude to Irene Davey, Bessie Ejai and Alma Ejai, with whom I shared many conversations over cups of tea. Bessie was also my Bardi language teacher. Another thanks to Nyul Nyul elder, Stephen Victor, for always being willing to share his time and thoughts.

Next I would like to thank my four excellent supervisors Julian Clifton, Paul Close, Rebecca Dobbs and Sandy Toussaint. Your expertise ranged across the disciplines of geography, aquatic ecology and anthropology. You worked amazingly as a team and individually provided me with constant support and encouragement. While I worked remotely, I didn’t once feel isolated from academic guidance.
Julian, as my coordinating supervisor, you kept my work on track and were always at the ready to deal with paperwork, of which there was a lot. Your calm and encouraging attitude, and advice on qualitative research methods, helped to develop my skills and confidence as a researcher. Paul, your cheerful outlook, speedy feedback and always being available on the phone were a huge support. I’m very grateful for the time and thought you put into your advice, and for providing an aquatic science-oriented check to my ideas. Rebecca, our conversations about cross-cultural work, particularly your aquatic science perspectives, were invaluable. Thanks for the experience of closely co-authoring a paper, for testing my assumptions, your positive attitude and committed support. Sandy, your guidance, based on your years of experience in the Kimberley, provided a foundation to develop my research skills in this context. Your advice was always insightful and thought provoking, and encouraged deeper focus rather than expanding scope, for which I’m very grateful.

An Australian Government Research Training Program Scholarship and a University of Western Australia top-up scholarship supported my candidature. Various aspects of the research were also supported through grants. I am particularly grateful to have received a Ronald and Catherine Berndt Foundation Postgraduate Award in 2014. This award supported my fieldwork and the professional design and printing of photo books for Bardi Jawi and Nyul Nyul families. I am also very grateful for receiving a Convocation of UWA Graduates Geoffrey Kennedy Research Travel Award, which facilitated my travel to a conference in New Zealand accompanied by two Bardi Jawi women. Several other organisations also supported either my attendance at conferences or attendance by rangers including the UWA Graduate Research School, UWA Postgraduate Students Association (PSA), Ecological Society of Australia and the Australian Society for Limnology. A UWA PSA fieldwork grant supported my fieldwork and enabled me to print a trial photo book for Bardi Jawi families. I am also grateful for the overall support offered by the Kimberley Land Council (KLC), for example with rangers attending conferences, and a special thanks to Will Davis (KLC) for creating the map of the Bardi Jawi and Nyul Nyul Ranger management zones.

During my candidature I was lucky to join several PhD student networks. This included the Tropical Research Network (TRN), which brought together a group of students working across the tropics. I made some lasting contacts and friendships through the TRN and am grateful for the exposure to big picture, inter-disciplinary thinking. I also joined the Wentworth Group of Concerned Scientists 2015 Science Program. I valued
the chance to learn from an innovative group of scientists and am very grateful for the mentoring provided to me by Dr Richard Davis.

Another thanks goes to Gail Tipa for generously hosting two Bardi Jawi Oorany Rangers and I in Dunedin, New Zealand, and for teaching us about key cultural water sites in the area. Similarly, a big thanks to Phil Duncan (Australian Society for Limnology) and Brett Cockeram (New Zealand Freshwater Sciences Society) for supporting our attendance at the joint ASL/NZFSS freshwater conference in Wellington, New Zealand, and for arranging some memorable cultural side activities.

Being an external student, maintaining a connection to campus was important. My appreciation extends to the UWA Graduate Research School (GRS), particularly Dr Krystyna Haq and Dr Michael Azariadis (plus Dr Cecily Scutt) for running the GRS Writers Retreats. Step-by-step the retreats shifted my writing from a laborious task to something more creative and enjoyable. Thank you to the School of Earth and Environment student representatives for your support and outreach, especially Genevieve Simpson. Also thanks to Gilbert Karareba, Tegan Davies and Mariana Atkins for our regular Works in Progress (WIP) group, and to the virtual “Shut up and write” twitter community: both activities provided a very welcomed social way to write.

Throughout the PhD I appreciated many friendships including Estelle, Laurette, Daniel and the kids, and Jules, my running buddy in One Arm Point, plus the great mob working in Indigenous land management in Broome and beyond.

To my parents, thank you for your constant support and love over this period. In the final weeks of thesis writing and thesis corrections you took care of all of my needs. Thank you as well to Helen and Tony for always supporting me during my many stays in Perth.

And finally, to Damon. Thank you for graciously handling my dedication to work over these years, your good humour and the many excellent conversations we had travelling up and down the Cape Leveque road.
Authorship declaration: co-authored publications

Results and analyses from this research are presented primarily in three chapters that were formatted as papers for journal publication. Each of these chapters can be read as a stand-alone journal paper that includes an abstract, introduction to the literature, methods, results, discussion, summary and references. As chapters, the three papers correspond to three research questions that frame the work and develop the main thesis argument. Results and analyses presented in the three chapters are drawn together and expanded upon in the thesis discussion. A fourth paper, included as an Appendix, also relates to this research. My contributions (the student), co-author details and contributions, and journal submission details follow.

Details of the work:

**Title:** Maintaining traditional water places: a framework for understanding Australian Aboriginal approaches to managing wetlands

**Authors:** Michelle Pyke, Sandy Toussaint, Paul Close, Rebecca Dobbs, Irene Davey, Kevin George, Daniel Oades, Deborah Sibosado, Cecelia Tigan, Bernadette Angus (Jnr), Elaine Riley, Devena Cox, Zynal Cox, Brendan Smith, Preston Cox, Albert Wiggan, and Julian Clifton.

**Submitted to:** Ecology and Society 9 February 2017

**Location in thesis:** Chapter 3

**Student contribution to work:**
The student led the design and implementation of qualitative data collection that the paper is based on, conducted the data analysis and wrote the paper. Co-authors include supervisors, who guided the paper development, and Bardi Jawi and Nyul Nyul elders and ranger team members, who contributed to the research through the participatory research method employed as outlined in the thesis.

Details of the work:

**Title:** Wetlands that need people: the inter-dependence of Australian Aboriginal use, management and wetland condition

**Authors:** Michelle Pyke, Paul Close, Rebecca Dobbs, Sandy Toussaint, Brendan Smith, Zynal Cox, Devena Cox, Kevin George, Phillip McCarthy, Bernadette Angus (Jnr), Elaine Riley and Julian Clifton.

**Submitted to:** Journal of Environmental Management 1 March 2017

**Location in thesis:** Chapter 4

**Student contribution to work:**
The student led the design and implementation of qualitative data collection that the paper is based on, conducted the data analysis and wrote the paper. Co-authors include supervisors, who guided the paper development, and Bardi Jawi and Nyul Nyul elders and ranger team members, who contributed to the research through the participatory research method employed as outlined in the thesis.
Details of the work:

Title: A research approach to enhance how Indigenous knowledge systems are applied to wetland ecosystem management.

Authors: Michelle Pyke, Paul Close, Rebecca Dobbs, Sandy Toussaint and Julian Clifton.

Submitted to: Not submitted

Location in thesis: Chapter 5

Student contribution to work:
This paper compares the methodological approaches employed in two studies. One study is the student’s doctoral research, in which the student led the design and implementation of qualitative data collection that forms one data source for this paper. In the second study the student collected the qualitative data and assisted with data analysis and interpretation, which forms the second data source for this paper. With regards to the paper, the student led the analysis and interpretation of all data and wrote the paper. Co-authors are supervisors who guided the paper development. (A paper focused on the second study is included as Appendix M and described next).

Details of the work:


Location in thesis: Appendix M

Student contribution to work:
The student conducted the qualitative data collection and assisted with data analysis and interpretation. The student co-wrote the paper with her relative contribution to the paper authorship being 25:75 (Pyke:Others). (Note authorship under the student’s maiden name, Michelle Walker). This paper is included as an Appendix for the convenience of the reader, given that this paper describes one of the studies being compared in Chapter 5 (A research approach to enhance how Indigenous knowledge systems are applied to wetland ecosystem management).

Student signature:

Date: 2 March 2017

I, Julian Clifton, certify that the student statements regarding their contribution to each of the works listed above are correct

Coordinating supervisor signature:
Date: 2 March 2017
Walking across the tidal flats with Bardi Jawi Oorany Rangers and Traditional Owner Madeline (Munya) Gregory, to interview Munya about freshwater on her Country. (L-R) Cecelia Tigan (Bardi Jawi Oorany Ranger), Rikkia Williams (Bardi Jawi Oorany Ranger), Munya, Michelle Pyke (doctoral candidate) and Ingrid Indriana (Bardi Jawi Oorany Ranger Coordinator). (Source: Bardi Jawi Oorany Rangers)
Chapter 1  Thesis justification and challenge

1.1  Thesis welcome

In this chapter, I introduce the research challenge, describe how the thesis is organised and provide an overview of the three chapters and discussion that comprise the core of the work. The research challenge is introduced through two quotes that provide different perspectives of wetland management within the study area. The first is from an Aboriginal research participant, a Nyul Nyul man who grew up in and around Beagle Bay, located on Nyul Nyul traditional lands (Country). The second is written by an ecologist participating in a National Environmental Research Program (NERP) that sought to inform the management of wetlands on Nyul Nyul Country.

…if you'd see that [a spring] was being overgrown by some reeds or rubbish or thing like that, it was then your duty, as an individual, to make sure that the place was clean. You'd clean it…So we had to maintain these areas of cleanliness and tidiness…[I]t was not only for us [humans] that we could have freshwater or clean water to drink, but it was also for the little people that were there, spiritual people. You know, make the place look clean. It's our respect to the land. You have to respect that. And this is how we were taught, yeah. That's how we were taught to respect Country. (Nyul Nyul Traditional Owner, 2016)

The Traditional Owner’s comment suggests various ways that Nyul Nyul people perceive wetland condition and actively seek to sustain particular wetland characteristics. Monitoring occurs as Nyul Nyul people observe and make judgements about wetland condition and degrading forces. Active human intervention is required to keep check of degrading forces (such as overgrown vegetation), with responsibility endowed on all individuals to maintain a clean and tidy site and drinking water source. However, site-cleaning activities not only benefit people but also satisfy spiritual beings by manifesting respect for place. Indigenous perspectives of wetland management that embody practical actions and an ethic of respect for metaphysical dimensions occur throughout Australia and other nations (Blackstock, 2001; Toussaint et al., 2005; Langton, 2006; Singh, 2006; Williams, 2006). Ways of conceptualising and interacting with wetlands suggested by the Traditional Owner are very different from the following ecologist’s perspective:
The food web analysis for the Nyul Nyul wetlands emphasises the overall importance of periphyton algae as the primary food source for aquatic consumers including fish and macroinvertebrates...Management for the maintenance of these food webs would involve minimizing disturbance around the wetlands such as via donkey activity that may reduce aquatic plant cover, disturb sediments in the littoral zone and increase water turbidity disrupting the growth of periphyton. Donkey (and cattle) disturbance may also increase nutrient inputs, which can result in dense blooms of phytoplankton and filamentous algae which will also detrimentally affect periphyton. (Pettit, 2014, p. 52)

In this example, wetland condition is related to food webs. Management seeks to maintain water quality and primary food source production to support higher order organisms such as macroinvertebrates and fish, rather than drinking water. Management is focused on removing threats and allowing the wetland to function with minimal disturbance from humans, unlike the previous Nyul Nyul perspective. While the Nyul Nyul man sees (at least some) riparian and aquatic vegetation growth as a problem, the ecologist recommends protecting this vegetation. Also, while the Traditional Owner evoked notions of individual responsibility, the ecologist’s perspective provides general recommendations, the responsibility of which is not attributed to a particular person.

While both quotes refer to ways of managing wetlands, the Nyul Nyul man and ecologist use different terms, embody different values and concerns, and evoke different ways of conceptualising wetlands and their management. Anthropologist Veronica Strang uses the term “uncommon ground” to encompass the different ways that Aboriginal people and pastoralists of Cape York Peninsula in Queensland, value, categorise and manage the land (Strang, 1997; also see Strang, 2009a). These quotes also foreshadow uncommon ground between Aboriginal and scientific or conventional views of wetland management. Via a focus on uncommon ground as analysis I reveal how, why and to what extent Aboriginal people undertake wetland management, an understanding of which is crucial for informing contemporary and future cross-cultural wetland management, and wetland management in general. I find that the problem of uncommon ground can be overcome through a place-based perspective that elevates culture-centric research, revealing that Indigenous knowledge systems, while appearing ‘uncommon’, represent alternative models of management.
1.2 Thesis justification

Monsoonal northern Australia is important to the nation’s economy and identity, perceived as a place of beauty and development potential, and home to many Aboriginal groups who continue to live on and access their traditional lands. Managing the natural resources of this vast landscape is both a bureaucratic industry and an expression of Aboriginal Australians’ custodial responsibilities to the land and sea (Altman and Kerins, 2012; Dwyer, 2012). Aboriginal groups of northern Australia (and many other Australian Indigenous groups) work within this nexus, formally employed in natural resource management (NRM) (Hill et al., 2013).

Practical governmental commitment to Indigenous people’s participation in NRM (Indigenous NRM) arises through two main initiatives: the Indigenous Protected Area (IPA) program and the Working on Country (WoC) Program. IPAs are added to the National Reserve System with Indigenous groups supported by the Australian Government to protect biodiversity and cultural heritage, often through Indigenous ranger teams (Department of the Environment and Energy, 2016). WoC funded Indigenous ranger teams conduct land and sea management under the guidance of cultural authorities while also contributing to government policy-based (conventional) NRM priorities such as biodiversity conservation, and weed, feral animal and fire management (Department of the Environment, 2015). This formal Indigenous NRM provides a context in which diverse worldviews intersect as non-Indigenous scientists and NRM practitioners, trained in particular natural science or technical fields, work with Indigenous people and their knowledge systems to tackle environmental challenges (e.g. Ens et al., 2010; Dobbs et al., 2016).

Scientific motivation to incorporate Indigenous knowledge1 within environmental management derives from evidence that Indigenous peoples’ practices can increase landscape heterogeneity; conserve, restore or augment biodiversity; enable sustainable resource harvesting; and contribute knowledge and theories relevant to ecology and ecosystem management (Gadgil et al., 1993; Berkes et al., 2000; Turner

1 My use of the term Indigenous knowledge embraces the multitude of knowledge systems held by Indigenous peoples worldwide, rather than representing a singular term that suggests a homogenous body of knowledge. I also use the plural term Indigenous knowledge systems or IKS (see section 1.4).
et al., 2000; Usher, 2000; Berkes and Berkes, 2009; Uprety et al., 2012; Ens et al., 2015). The extent and nature of Aboriginal people’s influence on the Australian landscape is difficult to assess (for example, see Brook and Bowman, 2006; Romanin et al., 2016), however, some scholars (in particular see Gammage, 2011; Pascoe, 2014), argue that their influence was substantial and widespread. Indigenous knowledge has extended scientific understanding of native mammal declines (Ziembicki et al., 2013), wetland and riverine ecology (Liedloff et al., 2013; Jackson et al., 2014), and fire ecology and management (Russell-Smith et al., 1997; Yibarbuk et al., 2001). Conventional NRM across northern Australia has been most influenced by Aboriginal burning techniques, with vast burning programs incorporating scientific and Aboriginal knowledge (McGregor et al., 2010; Fitzsimons et al., 2012), although the extent to which different programs embody traditional practices is debated (Fache and Moizo, 2015; Petty et al., 2015). These efforts incorporate ‘complementary’ Indigenous knowledge within conventional frameworks. However, a focus on complementary knowledge may impede the expression of Indigenous knowledge that diverges from, or provides alternative perspectives to, conventional approaches.

The success of Indigenous NRM is commonly framed in terms of its contributions to categories conventionally defined as society, culture, economy and environment (e.g. Commonwealth of Australia, 2013; Social Ventures Australia, 2016). Despite the positive outcomes of Indigenous and cross-cultural NRM within these categories (e.g. Jupp et al., 2015; Social Ventures Australia, 2016), Indigenous and non-Indigenous scholars argue that the dominance of conventional knowledge systems over ecological work constrains Indigenous people’s capacity to participate and limits on-ground outcomes (Barbour and Schlesinger, 2012; Howitt et al., 2013). Indigenous ranger teams commonly work towards conventional NRM priorities such as managing fire to reduce carbon emissions, and tackling invasive plants and animals (Hill et al., 2013; Social Ventures Australia, 2016). Often, Indigenous people are perceived to lack capacity, with training and experience in conventional NRM techniques offering improved skills, confidence and income generating prospects (Dobbs et al., 2016; Saunders and Xuereb, 2016). Yet, the perpetuation of conventional NRM perspectives, tools and strategies may not only preclude or limit
incorporation of Indigenous perspectives (Barbour and Schlesinger, 2012), but also eventually alter how Indigenous people view the land (Strang, 1997).

The integration of Indigenous knowledge with conventional knowledge is often presented as a key challenge for Indigenous contributions to NRM (Nadasdy, 1999; Bohensky and Maru, 2011; Bohensky et al., 2013). Such integration can be hampered where non-Indigenous individuals or institutions lack the capacity (or will) to understand and support the application of alternative knowledge systems, methods and perspectives (Muller, 2012; Howitt et al., 2013). Even where positive intentions exist, uncritical attention to research methods can limit how Indigenous knowledge is interpreted and applied in ecological work (Huntington, 2005). For some scientists and NRM practitioners, the possibility of working with Indigenous people and their knowledge may be very new and therefore challenging (Crook et al., 2016). A belief that Indigenous Australians had little, or very limited, environmental influence also likely generates a barrier to novel research\(^2\). A consequence is that some fields of academic science and conventional NRM have given very limited attention to the potential value of Indigenous peoples’ knowledge, practices and beliefs, with one of these areas being wetland ecosystem management (Humphries, 2007; Ens et al., 2015).

Evidence from a range of disciplines demonstrates that, historically, and in some areas continuing today, Aboriginal people have intentionally managed wetlands to maintain or generate particular characteristics (Lourandos, 1980; Head, 1987; Humphries, 2007; Builth et al., 2008; McGregor et al., 2010; Preece, 2013; Barber and Jackson, 2014). Gammage (2011) compiles extensive historical evidence to argue that Aboriginal people’s ways of managing Country had substantial and widespread influence in shaping wetland ecological character, including increasing aquatic species diversity and abundance, and surface water occurrence, volume and persistence. Wetlands are of great value to many Aboriginal groups, who interact with these ecosystems guided by complex beliefs, knowledge and practices (Langton, 2002; Strang, 2005b; Toussaint et al., 2005; Langton, 2006; Weir, 2009, 2009).

\(^2\) The influence of Aboriginal people over the Australian environment is contested. Some scholars (e.g. Gammage, 2011) argue that their influence was widespread and substantial, whereas others (e.g. Strang, 2009a) contend that broader scale climatic and physical processes may have subsumed local scale or temporal anthropogenic impacts.
As with Indigenous peoples elsewhere (e.g. Harmsworth et al., 2016), Aboriginal peoples’ enduring commitment to manage wetlands has catalysed their involvement in contemporary wetland research and management through partnerships with scientists and NRM practitioners (Jackson et al., 2005; Crook et al., 2016). Many of these projects apply Indigenous knowledge within conventional wetland or freshwater monitoring and management frameworks (e.g. Ens et al., 2010; Jackson et al., 2014; Nursey-Bray and Arabana Aboriginal Corporation, 2015; Dobbs et al., 2016). Only a few studies investigate how Indigenous knowledge systems manifest to shape wetlands (e.g. Humphries, 2007; Barber and Jackson, 2014), and fewer apply these theories to inform contemporary management (e.g. Weir, 2009; McGregor et al., 2010; Rose et al., 2016). As such, considerable potential remains for Aboriginal knowledge to be applied to wetland management theory and practice (Humphries, 2007; Ens et al., 2015; Crook et al., 2016).

Scholarly efforts to improve the application of Indigenous knowledge, including to wetland management, have crossed disciplines. Social scientists have demonstrated methods that enhance Indigenous participation and leadership within cross-cultural research, yielding better prospects for knowledge integration (Nursey-Bray et al., 2009; Hill et al., 2012; Moorcroft et al., 2012; Howitt et al., 2013; Woodward and Marrfurra Mctaggart, 2015). Anthropologists have documented complex qualitative accounts of Indigenous values and knowledge to inform water planning (Yu, 1999; Toussaint et al., 2001). Research focus has shifted from an emphasis on water-related objects, entities and values, to the capacity of Indigenous groups to govern and produce these values (Jackson, 2006; Rea and the Anmatyerr Water Project Team, 2008; Jackson et al., 2012). However, the shift in research focus to understand cultural perspectives of water (Toussaint, 2008) and improve collaborative approaches (Jackson and Douglas, 2015) has not widely influenced the practical management of ecosystems like wetlands. One issue concerns how complex qualitative information familiar to the humanities is made intelligible and applicable to the more quantitative and linear scientific disciplines (Strang, 2009b). Another concerns the propensity to integrate complementary Indigenous knowledge within conventional knowledge frameworks, despite the apparent incompatibility of some aspects of the two systems.
1.3 Thesis challenge

Indigenous knowledge has not yet achieved its potential for informing or leading wetland ecosystem management. Cross-cultural efforts have adopted research methods that improve Indigenous participation (Jackson and Douglas, 2015; Dobbs et al., 2016; Ens et al., 2016). Research with Aboriginal groups has made clear their strong affiliations and interests in freshwater, and provided some new ideas for wetland management (Jackson and O’Leary, 2006; Jackson and Altman, 2009; Finn and Jackson, 2011; Gratani et al., 2011). Also, a small body of literature highlights the ecological influence Aboriginal use and management can have on wetlands (Humphries, 2007; Preece, 2013; Barber and Jackson, 2014). Yet, Indigenous perspectives are still not commonly used to inform or critique conventional approaches to wetland management (Humphries, 2007; Ens et al., 2015; Noble et al., 2016). In particular, Indigenous theories and practices for shaping wetland ecological character have received very limited application (although see McGregor et al., 2010; Rose et al., 2016). Instead, Indigenous ranger teams often learn, apply and incorporate their knowledge within standard scientific or conventional NRM approaches to manage ecosystems (e.g. Ens et al., 2010; Dobbs et al., 2016). Alternatively, Aboriginal ways of managing wetlands may be perceived as ‘cultural’ activities rather than relevant to ecological management.

It is clear that Indigenous people can and do provide novel ideas for wetland management that differ from conventional approaches. An improved understanding of these differences could foster new models of environmental management (Strang, 2003; Muir et al., 2010). As such, Muir et al. (2010, p. 260) challenge scientists and NRM practitioners working with Indigenous people to engage in a “…conceptual turn around”:

Instead of perceiving society’s current circumstances as a Western system that is starting to ‘bring in’ some Indigenous knowledge, we imagine it from the other side: that the non-Indigenous society and system has been accommodated into the more situated and longer established Indigenous system.

A conceptual turn-around requires first understanding how Indigenous knowledge applies to an environmental challenge as a system. That is, how do all elements of a
group’s cultural system comprising knowledge, practices and beliefs relate to an environmental issue?

This thesis seeks to explore how Aboriginal people perceive wetland management via a ‘conceptual turn-around’ that begins with a holistic cultural perspective. Through case studies with two Aboriginal groups, the Bardi and Jawi (Bardi Jawi) and Nyul Nyul peoples from the Kimberley region of Western Australia (Figure 1.1), the research is guided by the following questions:

• How do Indigenous people perceive wetlands and their management, and how does this relate to conventional wetland ecosystem management theory and practice? (Chapter 3)
• What, if any, influence does Indigenous management of wetlands have on aquatic ecosystems, and how does this relate to conventional theory and practice? (Chapter 4)
• How do different methods and approaches for investigating Indigenous knowledge about wetlands influence how this knowledge is documented, interpreted and applied? (Chapter 5)

Using a participatory action research approach and qualitative methods, the research finds that the Bardi Jawi and Nyul Nyul people have a purposeful and organised way of understanding and managing wetlands. These Aboriginal ways of managing wetlands are manifested through interrelated knowledge, practices, social institutions and beliefs that arise from Bardi Jawi and Nyul Nyul peoples’ broader cultural system and worldviews. Of relevance to conventional wetland ecosystem management is evidence that suggests that Bardi Jawi and Nyul Nyul ways of managing wetlands can promote ecologically beneficial characteristics such as open water and vegetation diversity. Key to these Aboriginal ways of managing wetlands is the importance of human presence within and use of ecosystems, and ongoing active maintenance (wetland ‘cleaning’) that integrates practical, social and metaphysical motivations. I argue that place-based management, rather than a threats-based or regional approach, best aligns with Aboriginal people’s ways of conceptualising and implementing wetland management. Improving place-based approaches within existing Indigenous NRM programs can occur by engaging with Traditional Owner families, evaluating water place health using appropriate
qualitative methods, and prioritising Indigenous aspirations. Also important is that non-Indigenous researchers and NRM practitioners engage with Indigenous knowledge as highly integrated systems, which requires skilled application of social science research, methods that seek a holistic understanding of Indigenous knowledge, and the cultivation of particular personal cultural capacities.

Figure 1.1 Map of Kimberley Aboriginal language groups including location of the Jawi, Bardi and Nyul Nyul groups. (Source: Kimberley Language Resource Centre, n.d.)

1.4 Definitions and concepts

Indigenous and Aboriginal

Some important terms and concepts used within this thesis require explanation, the first being ‘Indigenous’ and ‘Aboriginal’. Indigenous is the term adopted by the United Nations (UN) for those peoples who: identify and are accepted by their community as such; hold continuity with societies that existed prior to colonisation; hold distinct cultural, linguistic, social, economic and political systems; have a strong link to natural environments; and resolve to maintain these links and their peoples’
distinctiveness (United Nations, n.d.). In Australia the terms ‘Indigenous’ and ‘Aboriginal’ are used, both aligning with the UN definition. Indigenous Australian is the collective term encompassing both Aboriginal and Torres Strait Islander (sometimes referred to as ATSI) people who occupied the mainland of Australia and surrounding islands prior to colonisation, whereas Aboriginal mainly refers to the mainland people. My use follows these conventions when referring to Australia and I also use the term Indigenous when referring to Indigenous groups outside Australia.

**Country and its management**

Despite considerable diversity within the cultural and linguistic form of Australian Aboriginal societies, there are some widely held beliefs or worldviews (assumptions of reality). Aboriginal Australians believe that the physical earth and all life were generated by ancestral, spiritual beings (creator spirits). The notion of spiritual beings residing within land and waterscapes is central to Aboriginal concepts of the environment (Langton, 2006), often referred to as ‘Country’. Country encompasses the accumulation of physical characteristics and processes that occur at a place, but also spiritual and supernatural forms, which endow lands and waters with transformative powers, that is, a capacity for independent action (Toussaint et al., 2005; Young, 2006). Through this transformative capacity Country can exert a powerful influence on physical environmental processes and characteristics, and affect the conditions of human life. How humans act within Country is therefore of central importance, as appropriate behaviour can facilitate environmental stability and human well-being, while inappropriate behaviour can potentially incite environmental destabilisation and possibly human harm (Toussaint et al., 2005; Langton, 2006).

The geographical area to which the term Country corresponds can vary, for example encompassing a language, clan or particular family’s area (Weir, 2012a). However, regardless of scale, the constitution of Country is always multi-layered, as expressed by participants of a “Country-based planning workshop” held in Cairns, Queensland:

> “Country is my home, the backbone of my culture and who you are. It is my language, cultural values, identity, knowledge and everything we know.” (Smyth and Grant, 2012)
Aboriginal Australians feel a responsibility to manage or care for the Country to which they are connected, “…‘keeping it alive’ and healthy” (Dwyer, 2012, p. 12). Management can include activities common to conventional NRM, such as controlling weeds or feral animals, but also involves respecting and working within cultural protocols. For example, Kimberley Aboriginal people have expressed ‘caring for Country’ as “…based on the principle of ‘right people, right country and the right way’” (Dwyer, 2012, p. 12). As such, management involves not only maintaining valued places, species, landscapes and their resources, but maintaining the knowledge, language, practices, relationships, ceremonies and so on, that are associated with the use and proper functioning of Country (Kerins, 2012; Weir, 2012a). Within formal Indigenous NRM, many groups have expressed their priorities for managing Country through IPA and Indigenous ranger programs.

Planning mechanisms within the IPA and Indigenous ranger (WoC) programs reflect the holistic vision Aboriginal people hold for their Country and its management. For example, IPA management plans, which are required by the Australian government for all IPAs, reflect a group’s integrated perspectives and approaches to managing Country by including “(1) a focus on customary institutions in governance; (2) strategic planning approaches that respond to interlinkages of stewardship between people, place, plants, and animals; (3) planning frameworks that bridge scales, encompassing all of an indigenous people’s territory; and (4) varied communication modes appropriate to varied audiences, including an emphasis on visual and spatial modes” (Davies et al., 2013, n.p.). Similarly, through the WoC program Indigenous rangers’ work is shaped by the aspirations and guidance of their local communities and Traditional Owners, and involves working within Indigenous knowledge systems (IKS). That the IPA and WoC programs represent a substantial component of Australia’s national reserve system and environmental management efforts highlights the potential influence of Indigenous Australian’s influence on NRM. In question, Indigenous people’s knowledge systems and interests have also influenced Australian law associated with water management, particularly through the 2004 National Water Initiative (NWI). An intergovernmental agreement, the NWI sets out a national policy framework for the efficient allocation of water property rights that also provides for environmental, social and Indigenous cultural outcomes. According to the NWI water allocation plans should account for native title holder interests and include Indigenous social, spiritual and customary objectives and strategies (see http://webarchive.nla.gov.au/gov/20160615061050/http://www.nwc.gov.au/nwi). However,
however, is how and the extent to which Indigenous perspectives of Country and its management are applied in collaborations with scientists and NRM practitioners who assume different worldviews and adopt different perspectives of management.

**Scientific knowledge and ‘conventional’ NRM**

At issue in this research is how Indigenous, academic and conventional knowledges can come together to create new solutions for NRM. While not unanimously accepted (see Agrawal, 1995), the distinction between, and subsequent integration of, Indigenous and scientific knowledge forms the basis of many of the challenges of cross-cultural work (Nadasdy, 1999; Bohensky and Maru, 2011; Bohensky et al., 2013). Here I describe the types of sciences that interplay with Indigenous NRM, including the natural and social sciences. I also explain what I mean by mainstream or conventional NRM. (In the following section *Questions of knowledge, nature, culture and management* I further discuss Indigenous knowledge and the challenge of ‘integration’).

This research is focused on cross-cultural NRM in which Indigenous, natural scientific and conventional NRM knowledge engage. Specifically, scenarios involve Indigenous people, often Indigenous rangers, working with (often non-Indigenous) researchers or NRM practitioners educated and experienced in natural science fields such as ecology and biology, or environmental sciences. While some natural science challenges the assumptions underlying ‘positivist science’ (see Connolly, 2013; Wilcock et al., 2013), its tenets typify much conventional NRM and related scientific research.

Positivist science assumes a distinction between reality (the external world) and knowledge (Escobar, 2008), and between humans and nature (Pierotti and Wildcat, 2000). Generally, humans are considered separate from, and able to independently act upon nature, with natural resources available for human use (Pierotti and Wildcat, 2000). Authoritative knowledge is derived from information that can be detected by the senses, and investigated through systematic observation and experimentation to progress by states and territories towards to embed Indigenous interests within water plans has been slow (Tan and Jackson, 2013; Jackson et al., 2015).
generate empirical evidence and facts. I distinguish this field and individuals who assume these principles as, respectively, the natural sciences and natural scientists. The natural sciences inform efforts to manage Australia’s natural environment through what I refer to as conventional NRM.

Conventional NRM refers to the objectives and strategies defined and supported by the Australian Government for the purposes of managing natural resources. According to the Australian Government website, the purpose of national (conventional) NRM is “…to redress the decline in the health of Australia's landscapes, protect its national environmental assets, facilitate sustainable and productive natural resource management land use, support viable rural communities and better engage with Indigenous Australians in these actions” (see http://www.nrm.gov.au/news-and-resources/resources/natural-resource-management). Of key interest to conventional NRM is biodiversity and landscape productivity, supported through improvements to agricultural and pastoral practices, protecting key species and threatened ecological communities, mitigating ecological threats and promoting Indigenous NRM (Blanch, 2008; Government of Western Australia, 2011).

Conventional NRM, conducted by NRM practitioners, can be based on scientific evidence and methods. Evaluating NRM outcomes, for example, generally requires standard monitoring methods that employ systematic observation, such as monitoring wetland water quality over time. NRM also involves priorities and strategies that are sometimes not clearly evidenced through science or are contested. For example, a common NRM priority is removing weeds, although what constitutes a weed, their potential value (or cost) and the benefits of removing weeds are all contested (Barbour and Schlesinger, 2012; Bach, 2015; Pereyra, 2016). In another example, managing fire is a major NRM priority across northern Australia, and an activity in which both scientific and Indigenous knowledge can be applied (McGregor et al., 2010). However, the effects of fire management can be difficult to quantify and may not produce benefits to Indigenous participants or biodiversity conservation (Petty et al., 2015; Perry et al., 2016). As such, NRM priorities can represent subjective decisions rather than strategies based only on scientific evidence.
Also relevant to Indigenous and cross-cultural NRM are the social sciences (and social scientists). Where the natural sciences focus on the physical or natural world, the social sciences, including anthropology and geography, study human society and social relationships (OED, 2016). Strang (2006) notes that a holistic perspective is central to anthropology, meaning that the study of people and their culture (ethnography) requires full engagement with their beliefs, values and practices.

Both the natural and social sciences are used to frame research that seeks to apply Indigenous knowledge to inform NRM. This thesis is an example of a social science study based on the systematic observation, collection and interpretation of Indigenous knowledge beliefs, values, practices, and their interconnections as they relate to and can inform wetland management. However, whereas many social science studies are aimed at other social scientists, this research is primarily intended to inform natural scientists. Whereas social science “…assumptions about the nature of reality (ontology) [and] the ways of knowing that reality (epistemology)” (Scheurich and Young, 1997, p. 6) more substantially align with Indigenous thought (in part through the influence of IKS (see Strang, 2006)), the natural sciences and conventional NRM commonly adopt very different assumptions and ways of knowing.

Questions of knowledge, nature, culture and management

Cross-cultural collaborations between Indigenous people, natural scientists and NRM practitioners involve activities and interactions that cut across complex discourses about the constitution of knowledge, nature, culture and environmental management. Here I introduce the meaning of these concepts for this research. This discussion is usefully informed by considering different definitions or conceptualisations of Indigenous knowledge.

Various definitions or conceptual descriptions highlight features considered widely shared across Indigenous knowledge systems (also known as traditional knowledge systems or TEK). A well-cited definition of TEK is that adopted by Berkes et al. (2000, p. 1252), "...as a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one
another and with their environment.” Berkes et al. (2000) distinguishes TEK as a ‘body’ of knowledge and emphasises the process by which it is accumulated. In another example, Pierotti and Wildcat offer attributes of TEK that draw in place, values (ethics) and human-nature interconnectedness:

1) respect for nonhuman entities as individuals, 2) the existence of bonds between humans and nonhumans, including incorporation of nonhumans into ethical codes of behavior, 3) the importance of local places, and 4) the recognition of humans as part of the ecological system, rather than as separate from and defining the existence of that system. (Pierotti and Wildcat, 2000, p. 1335)

Alternatively, Escobar’s depiction of local or cultural models of nature more explicitly acknowledges the interconnectedness of human, physical and metaphysical domains within Indigenous thought:

A local model of the natural may exhibit features such as the following…: specific categorizations of human, social, and biological entities (for instance, of what is human and what is not, what is planted and what is not, the domestic and the wild, what is innate and what emerges from human action, etc.), boundary settings, and systematic classifications of animals, spirits, and plants. It may also contain mechanisms for maintaining good order and balance in the biophysical, human, and spiritual circuits (Descola 1992, 1994) or a circular view of biological and socioeconomic life ultimately grounded in Providence, gods, or goddesses (Gudeman and Rivera 1990). There may also be a theory of how all beings in the universe are “raised” or “nurtured” out of similar principles, since in many nonmodern cultures the entire universe is conceived as a living being with no strict separation between humans and nature, individual and community, community and the gods (Grillo 1991, Apffel-Marglin and Valladolid 1995). (Escobar, 1999, p. 8).

These definitions or descriptions draw attention to some of the features of Indigenous knowledge that are distinct from natural science and conventional NRM. Humans, nature (physical) and metaphysical elements exist in intimate relationship to each other, with the non-human world being sentient and holding agency (the capacity to act). Behaviours of human and non-human actors are mutually influential and thus relationships are of key concern to the functioning and well-being of the integrated human/non-human society. In contrast, natural science and conventional NRM (and popular knowledge more broadly) separate humans and nature, and endow only humans with agency. Hence the actions of humans are of key concern, with the assumption that only humans can control an inert and passive environment. Of
course, this simple divide does not reflect all cultural groups’ or disciplinary perspectives.

In part due to the influence of Indigenous thought some within the social sciences have challenged the nature-culture dualism, that is, “…the common view of distinct domains of nature and culture that can be known and managed separately from each other” (Escobar, 1999, p. 9). As Strang (2009, p. 29) describes, “[t]he assumption that humans merely engage with ‘natural’ forces masks the reality that ‘the environment’ is a creative product of culture”. Many scholars have explored how nature (and water) is both symbolically and literally constructed through the expression of human values (e.g. Escobar, 2008; Gibbs, 2009; Robertson, 2016). An example is Strang’s (2009) Gardening the world: agency, identity, and the ownership of water, which explores how Indigenous and non-Indigenous groups in Queensland, Australia, use water to create (garden) their homes, societies and ‘nature’ in complex ways governed by their beliefs and values.

At the same time, new ideas have emerged around the properties and capacities of matter that also draw from Indigenous thought and are influencing the natural and social sciences. Anthropologists have considered how the properties of water affect human engagements (e.g. Strang, 2014). For example, Strang contends that the properties of water lend itself to particular meanings that cross-cultures, “…presenting water as a matter of life and death; as a potent generative, and regenerative force; as the substance of social and spiritual identity; and as a symbol of power and agency” (Strang, 2005a, p. 115). In this way matter can contribute to meaning, knowledge and human practice. Further, “new materialism” encompasses a diverse set of ideas and theories that consider non-humans (other species, matter, processes such as weather and so on) as animate and able to respond to and affect their surroundings, including humans (for example see Coole and Frost, 2010; Connolly, 2013). These ideas collectively promote ways of understanding and interacting with the world that must account for the agency of non-human things traditionally (or conventionally) perceived of as inanimate or without intentionality. In Australia, Indigenous NRM is an avenue through which Indigenous peoples’ ideas about the agency of their Country and its components can be accounted for. Despite Indigenous influence and evolving academic ideas, however, cross-cultural NRM
and research often continues to be framed within conventional knowledge that assumes the separation of nature and culture, and the pre-eminence of humans. These contrasting outlooks result in different approaches to how Indigenous knowledge is considered in relation to improving NRM.

Academic study of Indigenous knowledge can be broadly categorised within two approaches. One perceives that Indigenous knowledge can be analysed to determine theories or reveal facts that can build the academic knowledge base and critique and improve on conventional environmental management techniques and theories. Key work in this area includes that conducted by Fikret Berkes, Carl Folke and colleagues. For example, Berkes et al. (2000) distinguish between management practices and their underlying and supporting social mechanisms, the latter including ways of generating, accumulating and transmitting TEK; institutions for implementing and enforcing practices; and processes that enable cultural internalisation of knowledge. These practices and social mechanisms are guided by worldviews and cultural values that provide an ontological and ethical framework. Through such work Berkes and colleagues argue that IKS have affinities with and can improve on some contemporary notions of ecosystem management such as adaptive management (Berkes et al., 2000; Berkes and Berkes, 2009). This approach typifies studies that seek to ‘integrate’ Indigenous and scientific knowledge, often framed within the natural sciences (Goodall, 2008; Bohensky and Maru, 2011).

The second approach perceives Indigenous knowledge as holistic cultural systems that are not necessarily commensurate with conventional knowledge systems, cannot be compartmentalised, and offer alternative perspectives to environmental questions and problems. More typical within the social sciences, these studies suggest that the (potentially) more sustainable ways in which Indigenous people interact with the environment derive from ontological and epistemological perspectives, and resulting ways of organising society, that are very different from conventional knowledge systems and mainstream society. Change therefore requires more than just amending or building on conventional approaches as the underlying organisation of society and ethical decoupling of humans from nature preclude social, political and economic conditions required for more sustainable approaches to NRM (e.g. Strang, 1997, 2009a; Bawaka Country including Suchet-Pearson et al., 2013). Of these two
CHAPTER 1 - Introduction

approaches, integration remains the focus of many cross-cultural collaborations within Indigenous NRM.

As efforts to integrate Indigenous and scientific knowledge to inform NRM increase, so too do debates about the relative benefits for Indigenous people and science (see Stephenson and Moller, 2009; Bohensky and Maru, 2011; Bohensky et al., 2013). Pertinent to NRM is the demonstrated potential for Indigenous knowledge to extend the academic science knowledge base and contribute solutions for managing landscapes, ecosystems and species. Also, as demonstrated in Australia, Indigenous knowledge can contextualise and thereby make more accessible standard NRM/scientific techniques, potentially increasing their adoption by Indigenous ranger groups who manage large areas of land and sea (e.g. Dobbs et al., 2016; Saunders and Xuereb, 2016). Integration also offers an external validation of Indigenous knowledge that can be appreciated by its holders and encourage confidence in applying their knowledge to new scenarios (Gratani et al., 2011). On the other hand, integration has been criticised as perpetuating dominant science-informed NRM (Jackson and Palmer, 2015), where aspects of IKS complementary to science tend to be favoured over aspects discounted as irrelevant or left unidentified (Barbour and Schlesinger, 2012). Integration can decontextualise IKS by disconnecting knowledge components from their cultural framework, allowing misinterpretations and missed meaning (Mazzocchi, 2008). Much scholarly effort has considered techniques to improve integration “…to enable a more productive and mutually beneficial relationship between indigenous and scientific knowledge” (Bohensky and Maru, 2011).

Integration is often characterised as a situation in which Indigenous groups interact with more powerful actors situated within dominant knowledge systems (Bohensky and Maru, 2011). Successful integration therefore requires enabling the non-dominant Indigenous group to engage such that the integrity of their knowledge is maintained. In their review of a decade of literature on integration, Bohensky and Maru (2011) “…suggest reframing integration as a process in which the originality and core identity of each individual knowledge system remains valuable in itself, and is not diluted through its combination with other types of knowledge...Alternatively, integration might begin from the perspective of IK and seek relevant scientific
knowledge.” Research towards this aim has considered the setting in which integration occurs with attention to balancing power relations, using appropriate research methods, and improving collaborative communication and relationships, with increased Indigenous participation and leadership improving outcomes (e.g. Ens et al., 2012; Hill et al., 2012). Others advocate helping scientists and NRM practitioners to become more familiar with and understand Indigenous knowledge through processes and products that aid communication and learning (Gratani et al., 2011; Holmes and Jampijinpa, 2013; Walsh et al., 2013). Alternatively, others redefine NRM from the perspective of Indigenous knowledge. An example of this type of research is a series of papers written by a collaboration of Yolngu people, non-Indigenous geographers and Bawaka Country, which I refer to as the Bawaka Country collaboration (including Lloyd et al., 2012; Bawaka Country including Suchet-Pearson et al., 2013; Bawaka Country including Wright et al., 2015; Bawaka Country including Wright et al., 2016).

The Bawaka Country collaboration explore Yolngu thought and life to reveal deep differences between how Yolngu and conventional NRM perceive the environment and its management, and to reflect on implications for Indigenous NRM (and NRM more broadly). The authors request academics and others to rethink commonly held constructions of NRM: the relationship between manager and managed/researcher and researched, the notion of management and, more fundamentally, the distinction between nature and culture, and humans and non-humans. In place the authors offer new ideas, many of which are radically different to the assumptions underlying natural science. While it is impossible to summarise the complex conclusions drawn through this collaboration, offering a few points yields a glimpse of the new ways of being and doing that the authors suggest are required to enable ways of ‘managing’ the environment that are more fully informed by Indigenous knowledge.

Bawaka Country including Suchet-Pearson et al. (2013) describe how all human and non-human ‘things’ have no essential identifiable nature, but instead emerge (or ‘become’) through relationships that constantly generate their being. Non-human things (rocks, plants, weather, animals, cars and so on) are therefore not passive and lifeless, but “…vital and sapient with their own knowledge and law…” (Bawaka Country including Wright et al., 2016, p456) and in constant communication with
each other and with humans. Places are similarly not fixed or independent but continually emerge through their relationships with other material and non-material, human and non-human beings. For Yolngu people these relationships are not infinite but bounded by place (within the Yolngu cosmos and its laws). Within place humans are shaped by, and shape, all of the things that surround them. Thus humans are also constantly emerging through their interactions, forming new knowledge that alters perspectives and behaviour (resulting in new ways of being and doing). In describing relationships the authors use the term ‘intra-action’ rather than interaction, given that each part of a place, including humans, are a part of a living whole rather than separate objects and beings (e.g. Bawaka Country including Wright et al., 2016). The implications of these ideas for NRM are profound. Accepting the idea that humans are not separate from, and therefore cannot objectively view and control an external ‘environment’, but constantly and tangibly affect their surroundings induces an ethical responsibility or duty of care that the authors call “caring as Country”. The authors offer a “methodology of attending” that prompts academics working within cross-cultural collaborations “…to listen, to feel and to act, to understand oneself differently, to care, to respond” (Bawaka Country including Wright et al., 2015, p. 277), and thereby understand how their relationships and intra-actions with animate and inanimate surroundings, human and non-human collaborators, constantly co-constitute knowledge, place, others and themselves.

Even as the authors acknowledge themselves, the practical implications of the Bawaka Country collaboration substantially differ from many manifestations of more conventional cross-cultural environmental work and research. For example, including Bawaka Country as an author “…stretches credibility within a Western ontological framework” (Bawaka Country including Suchet-Pearson et al., 2013, p. 193). Also the publications primarily address geographers, yet, to achieve widespread impact, findings from such studies must also communicate and be relevant to natural scientists. In considering Davis and Ruddle (2010), these papers would not meet the methodological requirements required to persuade natural scientists.

Davis and Ruddle (2010) argue that scientific confidence in IKS-based contributions will only be persuaded through studies that critically approach and validate IKS
using systematic science-based methods. Research attributes that should be made clear include clear explaining key concepts or identifying how these will be tested, research design and methodology, and sampling procedure. Lack of attention to these attributes in any study type, these scholars contend, will weaken the potential for research findings to affect positive change.

This research offers a bridge between the social and natural sciences. In particular I seek to communicate to natural scientists how wetlands are perceived and managed by two Aboriginal peoples from the west Kimberley, Western Australia. I attempt to capture some of the complexity of these groups’ knowledge by documenting and representing some dynamic and interacting beliefs, knowledge and practices relating to wetlands. While inspired by the Bawaka Country collaboration, this research is very different, needing to be accessible to scientists with limited exposure to social science fields. Hence the research is presented using standard scientific writing and non-specialised language, with a focus on the implications of Aboriginal knowledge, practices and beliefs for wetland condition and characteristics.

I consider Indigenous knowledge to be highly integrated and best understood in ways that emphasise connectivity of knowledge, practices and beliefs as situated within an integrated cultural framework, and hence use the term Indigenous knowledge systems (IKS) (rather than attempt to separate out environmental knowledge as in Indigenous ecological knowledge (IEK) or TEK). To emphasise contributions to the ‘hands on’ component of on-ground environmental work and research, however, I use the categories knowledge, practices and beliefs, and pay particular attention to the intentional practices and visible expressions of Indigenous knowledge and beliefs that shape wetland ecology and condition. In doing so I focus on the expressions and implications of Indigenous wetland management that are relatable to conventional NRM and of particular relevance to natural science (ecology and ecosystem management). At the same time I acknowledge the integration and even potential inseparability of knowledge, practice and beliefs (Gadgil et al. 1993), and demonstrate their interrelatedness within a broader cultural framework. I also

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4 I also maintain a plural term to acknowledge that while many Indigenous knowledge systems maintain some similar attributes, they are also different and offer unique expressions of their knowledge holders.
consider how nature and culture are integrated by emphasising interconnections between Indigenous peoples ways of managing wetlands and resulting wetland condition and characteristics.

Another important term that requires explanation is ‘management’. According to Howitt and Suchet-Pearson (2006), management and related terms and concepts like planning and capacity-building imply particular meanings and associated structures that are firmly embedded within conventional knowledge systems. These concepts become problematic in cross-cultural scenarios where they are unexamined and (intentionally or unintentionally) perpetuate conventional ways of thinking about and implementing NRM. For example, Howitt and Suchet-Pearson (2006) argue that management implies a hierarchy of beings that privileges humans and planning assumes that humans can directly intervene in and control an external environment, ideas that, as previously discussed, do not necessarily reflect Indigenous thought. However, although their motivations and inspirations differ, Aboriginal people’s actions do physically shape the environment and are not without intention. Also, through their practical commitment to managing Country and academic contributions on the subject, Indigenous Australians have already expanded the concept of management and demonstrated how it can embrace alternative ways of knowing, being and doing. Giving new meaning to these terms is not only important so that they “….mean something to people on the ground” (Howitt and Suchet-Pearson, 2006, p. 328), but to embrace more productive, ethical and sustainable concepts of NRM.

This thesis therefore seeks to expand on notions of management by examining what wetland management means from the perspective of two Kimberley Aboriginal groups. By maintaining use of the term management I do not mean to frame IKS within conventional knowledge systems. Instead I seek to critique and expand on the conventional meaning of management by examining how these Aboriginal groups (and other Indigenous peoples) purposefully interact with and shape wetland ecosystems. Through The Ramsar Convention on Wetlands (Ramsar Convention), Indigenous peoples’ ways of conceptualising and interacting with wetlands have already begun to redefine the meaning and practice of wetland management. Within this research I draw upon such relevant Ramsar Convention definitions and seek to
understand how they can be operationalised in a local context and with specific Aboriginal groups.

**Wetlands and wetland management**

I adopt the broad definition of wetlands offered by the Ramsar Convention on Wetlands (Ramsar Convention), where wetlands are defined as “…areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres” (Ramsar Convention Secretariat, 1994). Within this definition, of interest are any wetlands discussed by the research participants, with a focus on those that have a freshwater component. Throughout the thesis I also use the term ‘water place’ as synonymous with wetland, which is a shortened form of “…traditional Oola (water) places” a term adopted by Bardi Jawi people for culturally important freshwater ecosystems (see Oades and Meister, 2013, p. 37).

In Australia, conventional wetland management involves managing water volume (water allocation planning), water quality and the in-stream and surrounding ecosystem of a wetland. Within this work I am focused on the latter, managing the wetland ecosystem, which involves active, often practical, interventions to maintain or alter the ecological character of wetlands, and therefore maintain or restore wetland health or condition. Such interventions are within the scope and interest of Indigenous rangers, and many ranger teams and IPA management plans contain an objective to manage wetlands (e.g. Wunambal-Gaambera Aboriginal Corporation, 2010; Oades and Meister, 2013). Managing wetlands is also important within conventional NRM.

Australia is signatory to the Ramsar Convention which aims to “…halt the worldwide loss of wetlands and to conserve, through wise use and management, those that remain” (Department of the Environment, n.d.). ‘Wise use’ entails maintaining wetland ecological character\(^5\), in particular the ecosystem attributes that

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\(^5\)Ecological character is defined as “…the combination of the ecosystem components, processes and benefits/services that characterise the wetland at a given point in time” (Ramsar Convention Secretariat, 2010, p. 14).
support human well-being and poverty reduction (Ramsar Convention Secretariat, 2010). Ramsar Convention guidelines acknowledge reciprocal links between Indigenous people’s well-being and wetland condition, and recommend that Indigenous knowledge be incorporated within wetland management (Papayannis and Pritchard, 2008; Pritchard et al., 2016). However, the implementation of the guidelines is likely restricted to individual wetlands designated as Ramsar sites6.

Conventional NRM and scientific priorities more broadly influence wetland management in Australia. National and regional NRM priorities focus on ameliorating perceived drivers of wetland degradation (or threats) such as invasive species, water regulation, pollution, unmanaged fire, saltwater intrusion, mangrove destruction and incompatible land use and recreational activities (Close et al., 2012; Finlayson et al., 2005; Pittock et al., 2015). Davis et al. (2015) prioritise scientific research to better understand surface and groundwater characteristics and behaviour that will be key to protecting wetlands as anthropogenic stresses on land and freshwater intensify. Australian Indigenous groups are recognised for their potential contributions to address these priorities and for their commitment to protecting wetlands (Pittock et al., 2014; Davis et al., 2015). However Indigenous groups, as compared to scientists and NRM practitioners, can perceive wetlands and their management differently.

Studies from across northern Australia describe complex interrelationships between Aboriginal people and wetlands that embody spiritual, ethical and practical beliefs and actions (Yu, 1999; Toussaint et al., 2001; Barber and Rumley, 2003; Toussaint et al., 2005; Yu, 2006; Cooper and Jackson, 2008; Barber and Jackson, 2011; Sullivan et al., 2012; Barber and Jackson, 2014). Wetlands and riparian zones have often been a focus of Aboriginal life, with many of these relationships persisting through post-colonial conflict and change (Jackson and O'Leary, 2006), and entailing diverse cultural elements and activities such as: birth and death events, beliefs and rituals; ceremonies; hunting, gathering and fishing; obtaining drinking water; and art, teaching and story telling (Toussaint et al., 2005; Jackson and O'Leary, 2006; Yu, 2006; Toussaint, 2014). Systems of cultural rights and responsibilities guide access

6 Ramsar wetlands in the Kimberley include the Ord River floodplain, Lakes Argyle and Kununurra, Roebuck Bay and Eighty-mile Beach (Department of the Environment, n.d.)
to and management of wetlands (Jackson and O’Leary, 2006). Supernatural and spiritual beings are often associated with the creation and regeneration of freshwater and wetlands, and wetland condition and productivity can also depend on the appropriate treatment of these metaphysical dimensions (Toussaint et al., 2005; Jackson and O’Leary, 2006; Yu, 2006). As such, ‘management’, or activities to maintain a wetland in a desired condition, can entail efforts to satisfy metaphysical site elements through ceremony and enacting cultural protocols, as well as practical activities to directly influence water flows, quality and other physical site aspects (Toussaint et al., 2005; Langton, 2006; Yu, 2006).

**Cross-cultural**

In Australia the expression ‘two-way’ is sometimes used to refer to collaborative methods that bring together Indigenous and conventional knowledge in tackling environmental challenges (Ens et al., 2012; Muller, 2012). The concept originates from a metaphor of the Yolngu people of northeast Arnhem Land in the Northern Territory, Australia, and represents “…a “dialectical” relationship, in which two opposed patterns of ideas complement, interact and relate to one another, but never lose their distinctiveness as separate and opposed parts of one whole” (Yunupingu and Watson in Muller, 2012, p. 61). Similarly, the term ‘cross-cultural’ is widely used by Indigenous and non-Indigenous land managers and scientists (e.g. Robinson and Whitehead, 2003; Lloyd et al., 2005; Brennan et al., 2012). It is central to anthropological methods and I use this term as it reflects the cultural basis embodied in both Indigenous and non-Indigenous knowledge systems and acts as a reminder that Australia plays host to multiple cultures.

**Traditional Owner and terms for older Aboriginal people**

‘Traditional Owner’ is a term widely used by Aboriginal and non-Indigenous people to refer to individuals, families or groups of Aboriginal people who hold particular connections to areas of land and water. Traditional Owner is defined by the peak Kimberley Indigenous body, the Kimberley Land Council (KLC), as “…those Kimberley Aboriginal people who have, in accordance with their Aboriginal tradition, a social, ancestral, economic and spiritual affiliation with, and responsibilities for, all or any part of the lands and waters in the Kimberley, and
Aboriginal Cultural and Intellectual Property, as recognised by their Native Title Claim Group or Native Title Holding Group” (see http://www.klc.org.au/news-media/research-facilitation). The term Traditional Owner can represent language groups with an affiliation to a region and also family groups or individuals with an affiliation to a smaller area, with those affiliations also extending to natural features such as wetlands. The terms ‘elder’, ‘old man/woman’ and ‘senior’ man and woman are other terms of address used by Aboriginal people to respectfully refer to older community members. I adopt both Traditional Owner and the terms young, middle-aged, senior and elderly, to reflect both the age categories and cultural affiliations of the participants of this research.

Next I introduce the five chapters that comprise the thesis. Chapter 2 describes the overall study approach and introduces the study area and people. Chapters 3, 4 and 5 are presented in paper format, and represent the core of the research. For each of these chapters I present the purpose of each paper and how it contributes to the thesis research and conclusions. Chapter 6 provides a discussion that integrates the findings of the previous three chapters and identifies the broader significance of the thesis.

1.5 Overview of chapters (Chapters 2-6)

1.5.1 Thesis as a series of papers

This thesis is presented as a series of papers (Chapters 3 – 5) in accordance with The University of Western Australia’s regulations regarding Research Higher Degrees. Due to this formatting, there is occasional duplication of material across Chapters 3 – 5, for example descriptions of the study area and methods used. In Chapters 3, 4 and 5 I acknowledge the collective authorship of each paper by using the term ‘we’, however, in all cases I am the primary researcher and author. When referring to myself I use my full name, Michelle Pyke, and initials, MP. An introduction (this chapter) and detailed description of the methodology, study area and peoples (Chapter 2) provide context, with overall analysis provided through a general discussion (Chapter 6) (see Figure 1.2).
Figure 1.2 Flow diagram of thesis structure depicting links between the research questions and chapters.

Chapter 2 (Study approach, people and area)

In Chapter 2 I begin by introducing the overall study approach. Participatory cross-cultural research is expected to maximise contributions by participating groups, transfer skills to enable independent research and represent IKS in ways that transform non-Indigenous peoples knowledge. Hence, in outlining the process of working with the Bardi Jawi and Nyul Nyul people I consider two main points. One relates to how a research approach and selected methods enable Aboriginal participants and co-researchers to willingly and effectively contribute to research. The other relates to how the same approaches and methods facilitate the research leader (in this case myself) to learn about and carefully represent IKS. Chapter 2 addresses these points by: outlining how I went about developing relationships and
seeking research permission; describing the participatory approach and choice of methods; and reflecting on mechanisms I instituted for both internal and external review of the research findings.

In the second half of Chapter 2 I introduce the study area and people with whom I worked. I begin by describing briefly the Kimberley region and then the Dampier Peninsula, which the groups with whom I worked call home. I briefly describe the post-European history of the Dampier Peninsula and conventional values associated with its wetlands. Finally, I introduce the Bardi Jawi and Nyul Nyul peoples by outlining their culture, history and perspectives on wetlands.

Chapter 3 (Paper 1)

- Authors: Michelle Pyke, Sandy Toussaint, Paul Close, Rebecca Dobbs, Irene Davey, Kevin George, Daniel Oades, Deborah Sibosado, Cecelia Tigan, Bernadette Angus (Jnr), Elaine Riley, Devena Cox, Zynal Cox, Brendan Smith, Preston Cox, Albert Wiggan, and Julian Clifton.
- Title: Maintaining traditional water places: a framework for understanding Australian Aboriginal approaches to managing wetlands
- Journal: Ecology and Society
- Status: Submitted 9 February 2017
- Personal contribution: Designed and conducted qualitative data collection, data analysis and wrote the paper (Chapter 3).

Chapter 3 presents a conceptual analysis of how IKS relate to wetland management. We make extensive use of quotes to uncover the social and cultural structures underlying Aboriginal people’s interactions with wetlands. Rather than offering a discrete ethnographic piece, qualitative data is presented. The chapter aim is to communicate complex qualitative information using language and terms that are relevant to social and natural scientists, and NRM practitioners who work with Indigenous groups in cross-cultural wetland management. Chapter 3 contributes to the thesis in three ways.

Firstly it provides the broadest level of analysis of IKS by demonstrating how Aboriginal people purposefully interact with wetlands in ways that are guided by, or consistent with, broader cultural beliefs and societal institutions. This analysis contributes to scientific knowledge by providing new insights into how IKS relate to
wetland management, which is significant given that Aboriginal Australians own and manage a large part of the country. The chapter recommends, and provides examples of how, Aboriginal wetland management as a system should be fostered within cross-cultural NRM, with potential benefits for both wetland ecology and human well-being.

Secondly, Chapter 3 presents a novel approach at analysing IKS. Rather than beginning with a scientifically-framed or conventional wetland research or management program, and identifying where IKS can contribute, the work reverses this approach to explore what constitutes wetland management from Indigenous perspectives. This approach builds on a limited number of studies that seek to conceptualise and provide a context for tackling NRM challenges based within IKS. For the thesis, the chapter provides a context within which more narrowly focused research into IKS can occur while being informed by a system-level understanding, as presented in Chapter 4 (Wetlands that need people: the inter-dependence of Aboriginal Australian use, management and wetland condition).

Thirdly, the methods, analysis and findings presented in Chapter 3 provide a case study that is compared to a different research approach of analysing and interpreting IKS presented in Chapter 5 (A research approach to enhance how Indigenous knowledge systems are applied to wetland ecosystem management).

**Chapter 4 (Paper 2)**

- Authors: Michelle Pyke, Paul Close, Rebecca Dobbs, Sandy Toussaint, Brendan Smith, Zynal Cox, Devena Cox, Kevin George, Phillip McCarthy, Bernadette Angus (Jnr), Elaine Riley and Julian Clifton.
- Title: Wetlands that need people: the inter-dependence of Australian Aboriginal use, management and wetland condition
- Journal: Journal of Environmental Management
- Status: Submitted 1 March 2017
- Personal contribution: Designed and conducted qualitative data collection, data analysis and wrote the paper (Chapter 4).

Chapter 4 focuses on how two Kimberley Aboriginal groups purposefully shape the ecological characteristics of wetlands. While linking back to the broader concept of Aboriginal wetland management presented in Chapter 3 (Maintaining traditional
water places: a framework for understanding Australian Aboriginal approaches to managing wetlands), this chapter investigates in greater detail if and how Aboriginal people’s practices influence the nature and ecological health of specific wetlands. We achieve this by drawing upon participants’ quotes and my own observations that relate to several sites, thus constructing an oral history of these places.

Chapter 4 is directed at scientists, in particular ecologists and wetland scientists, and NRM practitioners who engage with Indigenous groups to conduct aquatic research or management. In this chapter we link social science research with the natural sciences by focusing on topics of particular interest to ecologists and freshwater sciences, that is, wetland ecological character, condition and change. Chapter 4 therefore represents an attempt to employ social science research to directly inform the practical management of wetlands.

There are many potential important effects of Aboriginal wetland management, for example, relating to the maintenance of cultural practices, customary economies and Indigenous water rights. However, in Chapter 4 we chose to focus on the ecological implications of this phenomenon as related to ecosystem management. This was to address a gap in attempts to improve how IKS are applied within NRM. Research efforts have been concerned with the benefits of integrating IKS for Indigenous people and demonstrating methods that can improve Indigenous participation. Fewer studies focus on the potential benefits from an ecological or conventional NRM perspective that would likely be of interest to scientists and wetland managers, and would therefore motivate deeper collaborations between Indigenous and scientific knowledge. To this effect, Chapter 4 evidences the likely positive influence Aboriginal management has on wetland condition and aquatic biodiversity at specific water places.

Chapter 4 also provides a novel contribution to science by highlighting the differences between Aboriginal and conventional perspectives of wetland health and management. This extends the argument (presented in Chapter 3 and in literature) that IKS are distinct from scientific knowledge by presenting particular examples of this divergence relating to practical wetland ecosystem management.
Finally, Chapter 4 recommends how wetland research and management activities can be modified to better understand and incorporate IKS within contemporary settings for productive and enduring wetland management.

Chapter 5 (Paper 3)

- Authors: Michelle Pyke, Paul Close, Rebecca Dobbs, Sandy Toussaint and Julian Clifton
- Title: A research approach to enhance how Indigenous knowledge systems are applied to wetland ecosystem management
- Journal: not submitted
- Personal contribution: The chapter compares two studies. In one study I led the design and implementation of qualitative data collection and analysis. In the second I conducted data collection and contributed to data analysis. I also wrote the paper (Chapter 5).

Chapter 5 reflects on the types of research approaches and methods that are used to investigate IKS. It is written for researchers, both social scientists and natural scientists, seeking to investigate, analyse and apply IKS to issues like wetland management. The work draws on research designed and conducted for my doctoral research and another project that I was involved in, in the very early stages of my candidature. The latter project collected baseline Indigenous knowledge and scientific data to assist an Indigenous ranger group to plan and conduct wetland management in a way that was informed by both IKS and scientific knowledge. I carried out the qualitative (Indigenous knowledge) data collection and assisted with its interpretation and recommended applications. I also co-wrote a resulting publication, Dobbs et al., (2016), that is attached as Appendix M, and that we draw upon as a data source for Chapter 5. The contribution of Chapter 5 to the thesis is three-fold.

Firstly, Chapter 5 offers a case study showing how employing a holistic ‘culture-centric’ anthropological approach versus a narrower natural science-framed or ‘ecology-centric’ approach can influence how IKS are interpreted and potentially applied to NRM (wetland management). While efforts to integrate IKS within a natural science-frame are thought to limit resulting benefits to Indigenous people and the environment, few studies provide empirical evidence for this claim within an Australian context. Chapter 5 presents such a case study and demonstrates that, while
producing demonstrable ecological and human benefits, the ecology-centric approach did limit the interpretation of IKS in relation to wetland management theory and practice.

Secondly, by analysing two different research approaches, the research contributes to the ‘methodological tool-kit’ for facilitating cross-cultural NRM. More specifically, Chapter 5 recommends that culturally-framed studies should be prioritised to improve the influence of IKS within ecological work, with examples being those studies presented in Chapters 3 and 4.

Thirdly, Chapter 5 recommends that more attention be given to the process by which non-Indigenous collaborators learn about IKS, and provides related recommendations.

Chapter 6 (Discussion)

The discussion draws together, and extends, the findings of Chapters 3, 4 and 5. I begin by discussing how the findings lead to a rethinking of how wetland characteristics arise and therefore of what constitutes ‘management’. This section discusses how Indigenous and conventional or scientific approaches to wetland management all adopt particular assumptions and worldviews, thus embodying different values and ‘ways of life’. As such, of key importance to wetland management is, firstly, whose values should be prioritised and, secondly, the ‘type’ of knowledge informing management. With evidence to suggest that Aboriginal values and aspirations for wetlands achieve both local-Indigenous and broader conventional ecological benefits, supporting Aboriginal-led wetland management becomes a priority. Next I consider which elements of Aboriginal wetland management are already incorporated within Indigenous NRM structures and cross-cultural work, and which are not. I then recommend an approach to improve how Aboriginal wetland management is accommodated within Indigenous NRM and cross-cultural projects through a focus on culture-centric (holistic) place-based management. In enhancing support for Aboriginal place-based wetland management, I also highlight implications for non-Indigenous research partners and draw attention to problems (and some opportunities) arising from wider scales. Finally, I discuss the
risks, but also the urgent need to better represent the holistic and integrated nature of IKS, as I hope to have collaboratively done so for Aboriginal wetland management.

1.6 Summary

This chapter has introduced the thesis challenge and situated this within literature to demonstrate its scholarly and practical relevance. I have explained how I define key terms and concepts. I have also introduced the main thesis chapters, including Chapters 3, 4 and 5 that comprise the heart of the research results and analysis. Chapter 2 introduces the research approach, and study area and peoples. Chapter 6 discusses the significance and potential application of the research, and provides concluding remarks and thoughts for future research.

1.7 References


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Chapter 2  Study approach, people and area

2.1  Study approach

My aim in this chapter is to contextualise the research by introducing readers to the study, people and the place, before detailing my analysis and interpretation of the data I collected. Important to cross-cultural research is how research is carried out and whom it benefits. Past ways of researching Indigenous people and their knowledge systems are wrapped in the colonial history of settler societies like Australia. While some research benefited its host communities, often Indigenous people were the subject of unethical approaches and methods that offered few returns. Experts or interested lay people from settler societies controlled how Indigenous knowledge was investigated and represented. Such practices came to be viewed as an extension of oppressive colonial practices, the experience of which left a legacy of apprehension and distrust of research among Indigenous people. In response, Indigenous and non-Indigenous scholars have strongly advocated for new research approaches and methods that elevate Indigenous contributions and ensure benefit to participating communities (for example see Rigney, 1999; Tuhiwai Smith, 1999, 2012; Coombes et al., 2014).

Critiques of conventional research methods identify problems with the philosophical framing and practical implementation of research. As raised in section 1.4, research methods based in conventional knowledge systems are problematic where they adopt ways of knowing, being and doing in the world that are very different from, and therefore potentially exclude or ignore, Indigenous ways of knowing, being and doing. One change to research has come from efforts to identify principles and guidelines that encourage ways of working that better reflect Indigenous peoples’ values and worldviews. For example, Louis (2007) suggests four principles are common across Indigenous methodologies: relational accountability, respectful representation, reciprocal appropriation, and rights and regulation. These principles require that a researcher nurtures and is accountable to relationships, respects Indigenous people’s ideas in representing their knowledge, ensures participants benefit, engages with cultural protocols, and allows Indigenous people control over the use of their intellectual property (Louis, 2007). Academic policy approaches in
different countries have evolved to encourage partnership approaches to cross-
cultural research (e.g. Holcombe and Gould, 2010; Castleden et al., 2012). In
Australia national guidelines assert that research account for a group’s particular
cultural protocols and language, and embrace six values of reciprocity, respect,
equality, responsibility, survival and protection, and spirit and integrity, the
application of which should be determined by the ATSI people involved (National
Health and Medical Research Council et al., 2007). National and international
literature canvas approaches, tools and case studies aimed at improving Indigenous
participation in, and influence over, NRM research and practice, with these
developments broadly situated within the concept of participatory action research
(PAR) (e.g. Huntington et al., 2011; Castleden et al., 2012; Ens et al., 2012; Adams
et al., 2014; Coombes et al., 2014).

Woodward and Marrfurra Mctaggart (2015, p. 130) describe PAR as “…a
methodological approach and an evolving research paradigm…[as well as] a
‘movement’ that is gaining popularity with researchers who are looking for
postcolonial approaches to research which are more empowering to local and
Indigenous people, and therefore have the potential to deliver more equitable
outcomes than researcher-only driven enquiry”. PAR embodies principles and
approaches for genuine collaboration between researchers and the research
community that involves shared construction of research problems and programs,
and seeks applied outcomes of value to those communities (Woodward and
Marrfurra Mctaggart, 2015). Methodological contributions to PAR within cross-
cultural NRM include frameworks that detail roles of Indigenous and non-Indigenous
collaborators across project stages (e.g. Adams et al., 2014), tools for investigating
and documenting Indigenous knowledge, particularly that can be adopted by
Indigenous co-researchers (e.g. Townsend et al., 2004; Maclean and Woodward,
2013), and case studies that provide detailed insights into the interpersonal skills
required of researchers, and challenges faced in co-constructing programs (e.g.
Woodward and Marrfurra Mctaggart, 2015; Hemming et al., 2017). The motivations
behind Indigenous-driven research are (at least) twofold, as a political tool for self-
determination and empowerment, and for the important contributions IKS can make
in generating more sustainable human-nature relationships (Rigney, 1999; Muir et
The extent to which PAR can achieve these goals, however, is contentious.

Effective PAR relies on overcoming a range of challenges and barriers. Among these are structural barriers where institutions preclude the time and flexibility required of researchers in developing relationships and sharing project construction and implementation (Coombes et al., 2014; Woodward and Merrfurra McTaggart, 2015). PAR that seeks to transfer capacity to host groups also requires a particular skill-set that not all researchers hold (Jackson and Douglas, 2015). Relating to both institutional and (researchers’) personal expectations, Coombes et al. (2014, p. 847) question whether PAR can fulfil its aspirations of Indigenous empowerment where it “…emphasizes cross-cultural dialogue at the expense of transferring research capacity” and subsequently reframe PAR through two criteria:

First, collaborative research should not be judged on its immediate outputs but rather its capacity to transition theory and methods to host communities so that, over time, they generate a base for independent research (Coombes, 2012). Second, partnership should be reconfigured away from simple conceptions of 50:50 (‘insider’:‘outsider’) influence and towards realizing the need for Indigenous leadership of cross-cultural teams. (Coombes et al., 2014, p. 848)

In this interpretation of PAR Coombes et al. (2014) and others (such as the Bawaka Country collaboration) call for non-Indigenous researchers to be open to new ways of perceiving knowledge, research, scholarship, ethics, relationships, communication and other deeply help concepts that frame both personal and work life. For the Bawaka Country collaboration this required the non-Indigenous geographers to consider how their knowledge (and their sense of themselves) had changed not only through their interactions and communications with human beings but non-human beings and the research context (being within Bawaka Country) (Bawaka Country including Suchet-Pearson et al., 2013; Bawaka Country including Wright et al., 2015). Such considerations echo Louis’ (2007, p. 133) urging of “relational accountability” between researchers and “…everything and everyone around them”, and demand an acute self and emotional awareness not typical of conventional research modes. Within this interpretation effective PAR relies not only on institutional flexibility and a particular set of research knowledge and skills, but also interpersonal and emotional skills required to immerse oneself within and learn from
another’s knowledge system (for example see Bawaka Country including Wright et al., 2015). Thus arises a new set of challenges in cultivating the skills and experiences that foster knowledge transformation within the non-Indigenous co-researchers.

Inspired by these challenges I consider and reflect on methodology as “…approaches to knowing rather than as only a set of research techniques” (Howitt and Stevens, 2010, p. 61 own italics). In a practical sense I present my approach to developing a participatory cross-cultural project, highlighting how I engaged with common research stages including: developing research legitimacy within the participating communities; seeking local research approval; and establishing a participatory research framework (see Howitt and Stevens, 2010; Adams et al., 2014; Woodward and Marrfurra McTaggart, 2015). Such detailed case studies are necessary for building institutional awareness of the time, flexibility, skills and local expectations required for researchers to engage in PAR. I first discuss my lengthy reconnaissance of the study area, during which time I began to develop relationships with the two Kimberley Aboriginal groups and scope their interest in the research topic. Next I outline the process by which I sought formal research approval from regional and local Indigenous authorities. I then describe the participatory nature of the research and discuss my choice of methods. Lastly, I briefly discuss my efforts to embed critical reflexivity and encourage regular feedback on the research from the Bardi Jawi and Nyul Nyul participants and co-researchers. In working through these stages I also reflect on the more personal challenges of instituting PAR (both throughout this section and in section 6.5).

2.1.1 Developing relationships in the early stages

One Arm Point is home to the Bardi Jawi people. Due to my partner’s appointment as coordinator of the men’s Bardi Jawi Ranger team in 2012, I benefited greatly from having local time there before commencing research. With formal training in environmental science and my limited prior exposure to Aboriginal culture, my first priority was to familiarise myself with the community, establish relationships and develop my own confidence in living and working within a new cultural landscape, before attempting to raise ideas about a potential research project.
Two initial activities catalysed my role as an active community member and offered opportunities for personal learning. The first was volunteering for the local women’s art and craft group, comprised of mostly elderly women engaged in sewing and painting projects. Here, I learnt to sew and ‘fix’ (re-thread) sewing machines, and spent many hours chatting to the women and other visiting men and younger people. Secondly, I began Bardi language lessons with a respected local female elder and fluent Bardi speaker. I undertook regular lessons for many months, for which I paid my teacher in recognition of her skills and time. These activities constituted preparation for research (see Howitt and Stevens, 2010) as I became familiar with day-to-day life, participated in cultural events, learned about local hopes and concerns, and discovered some cross-cultural challenges and protocols. While generating “[l]egitimacy…through social relationships” (Howitt and Stevens, 2010, p. 66), these activities allowed my own confidence to grow as I developed a local sense of identity that was otherwise not provided by cultural familiarity, family, pre-existing friendships or (at that point) work. I continued to spend time with the women’s group during the four years I spent at One Arm Point.

After developing some familiarity with the community (around 6 months) I began to scope interest in a project to document cultural knowledge about wetlands, an approach and time frame considered beneficial to all parties as in Woodward and Marrfurra Mctaggart (2015). I raised the matter of a research project with senior women, and also the Bardi Jawi Rangers. On recommendation of the Bardi Jawi Ranger Cultural Advisor, I also visited the homes and workplaces of several community leaders to discuss the idea. Senior and elderly community members reinforced the importance of freshwater and did not raise any immediate cultural sensitivities or barriers to my undertaking the project. The Bardi Jawi Rangers also highlighted the Bardi Jawi Indigenous Protected Area Management Plan (Bardi Jawi IPA Plan), which included an objective to protect the condition of “…traditional Oola (water) places” using several strategies, one of which was to “[c]ontinue the recording, documentation and storage of traditional knowledge” (Oades and Meister, 2013, p. 37). I also wished to work with the neighbouring Nyul Nyul people, locally known for their cultural affiliations with wetlands. Engaging a second group would allow more fieldwork without placing unrealistic expectations on a single group, and offer exposure to a different Aboriginal knowledge system. On discussion with the
Nyul Nyul Rangers in Beagle Bay, just over an hour’s drive from One Arm Point, I found that the research similarly related to local interests and the Ranger team’s workplan objectives.

These initial efforts reflect some of the challenges encountered by researchers in engaging effective cross-cultural PAR. It took time and personal commitment to begin to cultivate relationships, what would become “…cross-cultural friendships that sustain cooperation” (Coombes, 2014, p. 850), learn local cultural protocols, and begin to identify how the research could benefit participants and participating communities more broadly. Undertaking lessons in Bardi language and volunteering at the local women’s centre align with Louis’ (2007) relational accountability as I began to create and nurture relationships with “everyone”, not just potential research participants. To proceed towards a formal partnership with either group, the next step required gaining research ethics approval from both the University of Western Australia (UWA) and the KLC.

2.1.2 Local authorisation for the research

Over the past decade expectations and requirements have grown for researchers to achieve high ethical standards when working with Indigenous people (Howitt and Stevens, 2010), with standards instituted in national guidelines (National Health and Medical Research Council et al., 2007; AIATSIS, 2011) and research institution processes. Local research approval required applying through the KLC’s formal ethics process. Following a successful initial written application to the KLC’s Research Ethics and Access Committee, I sought additional approvals through formal presentations to Nyul Nyul and Bardi Jawi representative bodies, including the Bardi Jawi Prescribed Body Corporate and the Nyul Nyul Ranger’s Cultural Advisory Committee. The written application and presentations outlined the

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1 Some research disciplines, such as anthropology and archaeology, have established human ethics guidelines for members of professional bodies and students (see for example http://www.aas.asn.au/about-aas/code-of-ethics/). While no such guidelines currently exist for professional geography or environmental science representative bodies, within the past decade national environmental research programs have established ‘Indigenous engagement strategies’ or formal agreements to guide researcher conduct with Indigenous groups (see Jackson and Douglas, 2015).

proposed research, benefits for the participating Aboriginal people, and intended use of cultural information documented. Both groups granted approval, although the Nyul Nyul Cultural Advisory Committee requested a written ‘research protocol’ that described the project’s elements in more detail including roles of the Rangers and I.

UWA research approval was granted once I had provided written evidence of approval from the two Aboriginal groups (Appendix A). University approval also required developing Participant Information Forms that I gave to all interviewees (Appendix B) and Participant Consent Forms, which were signed by all interviewees (Appendix C). While formal research approval is essential, ethical considerations require constant attention throughout a project (Dowling, 2010). Also, similar to Woodward and Marrfurra Mctaggart (2015), community elders recommended that the project proceed in collaboration with key local representatives, in my case with the ranger teams. Hence, participatory processes and methods, which foster ongoing attention to ethics (Ens et al., 2012), became integral to the research.

2.1.3 A participatory approach and choice of methods

With their foundations in decolonising research, participatory approaches attempt to break down embedded power imbalances that privilege conventional paradigms within cross-cultural work (Howitt and Stevens, 2010). The results of participatory research with Indigenous groups have shifted both the purpose and practice of freshwater and wetland management. For example, such research has contributed to scientific knowledge of wetland ecology (Calheiros et al., 2000; Jackson et al., 2014), improved understanding of Indigenous freshwater-dependent values and management aspirations (Tipa and Nelson, 2008; Weir, 2009; Finn and Jackson, 2011; Maclean and Woodward, 2013; Dobbs et al., 2016), generated new practical wetland monitoring and management techniques (Townsend et al., 2004; Ens et al., 2010; Gratani et al., 2011; Liedloff et al., 2013; Nursey-Bray and Arabana Aboriginal Corporation, 2015; Gratani et al., 2016), and has been used to advocate

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3 Ensuring genuine free, prior and informed consent from all participants was important. With every interviewee or prospective interviewee I read through the Participant Information Form and Participant Consent Forms, and explained the project in plain English, discussing any questions or concerns that arose.
for the transformation of water management policy and strategy (Jackson et al., 2012; Woodward et al., 2012; Jackson and Barber, 2016). To position Indigenous perspectives, knowledge and preferences as central to ecological project design, Indigenous participants contribute to and shape the conception, planning and implementation of research, and dissemination of findings (Walsh and Mitchell, 2002; Williams, 2005; Berkes, 2009; Ens et al., 2012; Adams et al., 2014), as occurred with this research.

Local ranger teams were involved in all research stages, acting as co-researchers, including the Bardi Jawi Rangers (men), Bardi Jawi Oorany (BJO) Rangers (women) and Nyul Nyul Rangers. Factors affecting each team’s contributions did not relate to English or research literacy, which can be pertinent in other areas (Ens et al., 2012), but were more affected by availability and individual interests. Both the Bardi Jawi Rangers and Nyul Nyul Ranger men’s teams were well-established teams with full work schedules and limited time for new projects. In contrast, the BJO Rangers were recently established, available for new projects and interested in freshwater research. The women’s team subsequently dedicated about one-third of their annual work schedule to this research. However, strong support was still provided by all three teams, reflecting the alignment of the research with each of the Ranger teams’ priorities. Detailed methods and contributions of the Rangers in developing and implementing qualitative data collection are elaborated in Chapters 3, 4 and 5; however, an overview of the methodological approach is provided below.

The choice of data collection methods reflected both my capacities and those of the Rangers and Aboriginal participants. The main ranger-supported data collection method was semi-structured interviews, where possible conducted during field trips to wetlands (Figure 2.1). The second method was a community review of the research findings. In a cross-cultural context formal interviews may not always be appropriate (Howitt and Stevens, 2010), particularly where a researcher and participants do not share a common first language, however, for this research interviews had the following advantages.
Rangers conducted some interviews and the structured list of questions encouraged their confidence. In other studies, Indigenous participants have been enthusiastic to engage in cultural management practices, including wetland cleaning (e.g. Preuss and Dixon, 2012). For the groups involved in this research, often water places had not been accessed or cleaned by elders for years or decades. Sometimes the exact location of a water place had been forgotten. In other cases Traditional Owners wished to clean water places, but did not immediately feel comfortable undertaking such work, or cultural protocols dictated that an individual not present should undertake the work. Hence, interviews enabled Bardi Jawi and Nyul Nyul people to share their knowledge and perspectives without any other demands. In addition, collaborative planning of field trips contributed to shared ownership over the research (see Huntington et al., 2011), ensured fieldwork did not interrupt other community events (similar to Woodward and Marrfurra Mctaggart, 2015), and facilitated safe travel around the notoriously high Kimberley tides (because access to some wetlands required driving along beaches or travel by boat). During field trips Bardi Jawi and Nyul Nyul participants and co-researchers could also enjoy local

Figure 2.1 Bardi Jawi Oorany Ranger Rikkia Williams (left) and I (middle) video record an interview with Traditional Owner Bernadette Angus (senior) about a nearby water place called Djaridjang. (Source: Bardi Jawi Oorany Rangers)
resources - for example through fishing and gathering oysters (as advocated by Huntington et al., 2011) - providing deeper insights into cultural life (Woodward and Marrfurra Mctaggart, 2015).

Through the flexible participatory approach I also responded to several requests by Rangers and Traditional Owners. Firstly, I was invited by the Nyul Nyul Rangers and one Traditional Owner to attend two meetings held with Western Australian State Government staff leading a regional groundwater investigation. The Rangers and Traditional Owners present at the meetings were concerned about the groundwater investigations in relation to perceived invasive drilling techniques to place monitoring bores, how the government intended to gain consensus from the Nyul Nyul community for the drilling program, whether the investigation would lead to increased extraction of groundwater for industry, and how the government intended to account for Nyul Nyul cultural values. I assisted the Nyul Nyul representatives to express their concerns during the meetings and interpret the responses provided. The meetings provided an unexpected opportunity to understand the cultural value of wetlands. Also apparent was that Nyul Nyul people needed culturally appropriate ways or products to communicate those cultural values of wetlands to external organisations.

Secondly, I was invited by the Nyul Nyul Rangers to assist with an ecology-focused study that sought to develop tools to support Ranger-led wetland management. Beginning prior to my own research, the work involved collaboration between a team of researchers (ecologists) and the Nyul Nyul Rangers and Traditional Owners. Recognising parallels between the ‘ecology study’ and my proposed doctoral research, the Rangers asked that I assist with documenting Nyul Nyul knowledge for the project, suggesting this would avoid ‘asking the same people the same thing twice’. Through the ecology study I began to become familiar with Nyul Nyul knowledge and ways of life associated with wetlands, and I developed relationships valuable for my later doctoral research. While I did not rely on the ecology study data for the analyses presented in Chapters 3 and 4, my experience facilitated a comparison of methods to investigate IKS (Chapter 5).
2.1.4 Enabling critical review

My overall research approach, including participatory techniques and the ethnographic style of learning afforded by living locally, inspired substantial personal learning as well as valuable critical checks. I needed to ensure that the Aboriginal co-researchers with whom I conferred shared resonance with the research process and findings: that is, that the findings had local legitimacy. Such checks involved a critical reflexivity supported by formal and informal feedback provided by Bardi Jawi and Nyul Nyul co-researchers and participants.

Critical reflexivity, “…a process of constant, self-conscious scrutiny” (Dowling, 2010, p. 34) was central to my research and also to living in an Aboriginal community. Introspection, aided by a research diary that I kept, prompted attention to ethical challenges that could adversely affect both research progress and daily social life, and to improving interpersonal research skills. Multiple methods assisted to develop my capacities as a valued research “outsider” (see Howitt and Stevens, 2010, p. 61). In addition to regular discussions with the ranger teams, formal and informal mentor relationships within the One Arm Point community were maintained. The Bardi Jawi Ranger Cultural Advisor provided specific advice on cultural protocols and appropriate research process. I regularly spent time with several women elders who participated in multiple field trips and provided their thoughts on how the research could be improved or extended. Tailored research products were also invaluable for promoting local peer-review. Photo books that I produced, depicting photographs, maps of site locations and summarised interviews, helped participants to better understand the purpose of the research, enhancing their informed consent, catalysing more feedback and improving research accountability\(^4\) (Appendix D) (see Howitt and Stevens, 2010).

Conference presentations granted another avenue for critical reflection and feedback, particularly with the Ranger teams. I supported individuals from each Ranger team to

\(^4\) The idea to produce professionally published booklets arose through discussions with, and financial support from, the Ronald and Catherine Berndt Research Foundation. A preliminary ‘trial’ booklet was produced using i-photo with printing supported by a grant from the UWA Postgraduate Students Association (PSA). I published a short story about the production of the i-photo booklet in *Postscript* the annual magazine of the UWA PSA, which is included as Appendix D.
CHAPTER 2 – Thesis methodology

attend two Australian conferences and one conference in New Zealand, each with an ecology or limnology theme\(^5\) (with a list of conference presentations provided in Appendix E and a description of the New Zealand trip in Appendix F). The process of developing and presenting each talk encouraged Ranger’s familiarisation with, and feedback on, iterative representations of the research findings\(^6\). Finally, participatory workshops extended a formal opportunity for Bardi Jawi and Nyul Nyul participants and Rangers to provide feedback on the research findings. Major participatory research stages including feedback processes and communication of the research are outlined in Figure 2.2.

\(^5\) Conference attendance by the Rangers and I was facilitated through grants from the Convocation of UWA Graduates, UWA Graduate Research School, UWA Postgraduate Students Association, Ecological Society of Australia, and the Australian Society for Limnology, with additional financial and logistical support from the Kimberley Land Council.

\(^6\) Attending and presenting at conferences also helped the Rangers to see the contemporary relevance of the research they were assisting with, through the feedback they received on their presentations and by learning about the work of other Indigenous groups. This was particularly evident from the trip to New Zealand, with a summary provided in Appendix F.
2.2 Introducing the study area

2.2.1 The Kimberley as study location

The Kimberley region, including its coastal islands, occupies the most northern part of Western Australia, bounded by the Indian Ocean and Timor Sea to the west and north, and Great Sandy and Tanami Deserts to the south and east. Aboriginal people are thought to have lived in the Kimberley region for up to 48 000 years (Allen and O’Connell, 2014). Today close to 40 000 people live in the Kimberley, of which around 44 per cent are Aboriginal people (Kimberley Development Commission, 2016).

Figure 2.2 Outline of participatory research approach highlighting the formal research stages, informal feedback mechanisms and communication of the research.
The current Australian Government has a particular interest in developing the economic potential of northern Australia, including the Kimberley region. Policies are directed at increasing economic activity and rapid population growth across the north, which depend on water (Australian Government, 2015). The government has commissioned or proposed groundwater investigations to identify water availability and related infrastructure needs for agriculture, as well as piloting new agricultural projects in parts of the west Kimberley (Australian Government, 2015; Government of Western Australia, 2015; Department of Agriculture and Water Resources, 2017). A range of other policies and programs aim to expand both economic and conservation activities in the Kimberley (Australian Government, 2015). With 94 per cent of north-western Australia being determined native title or subject to claims, government policy recognises Indigenous people have a key role in the success of these developments (Australian Government, 2015). An industry that has already achieved substantial growth in the past few decades, supported by Australian government investments, is Indigenous NRM.

Kimberley Aboriginal people have been formally engaged in bureaucratic-based NRM for nearly 20 years. Established in 1978, the KLC represents Kimberley Aboriginal people and works to protect their traditional lands, waters, customs and laws (Kimberley Land Council, 2014a). The KLC’s Land and Sea Management Unit, established in 1998, is the main support structure for regional Indigenous NRM (Kimberley Land Council, 2014b). The KLC’s Kimberley Ranger Network supports 13 Indigenous ranger teams including around 100 full-time rangers and numerous part-time and casual rangers, and elders occupying cultural advisory roles (Kimberley Land Council, 2016).

2.2.2 The Dampier Peninsula - an overview

The Dampier Peninsula extends just over 200 kms north of Broome, being bordered by the Indian Ocean to the west and north, and the King Sound to the east. The traditional lands of several Aboriginal groups extend across the Dampier Peninsula, including the Bardi Jawi, Nyul Nyul, Nimanbur (or Nimanburru) and Jabirr Jabirr (or Jabirrjabirr) peoples (Figure 1.1). The Bardi Jawi and Nyul Nyul peoples occupy the northern half of the Dampier Peninsula, where the largest population centres are also located (Figure 2.3). One Arm Point, Lombadina and Djarindjin lie within Bardi Jawi
Country, with a collective population of around 600, while Beagle Bay lies within Nyul Nyul Country hosting around 200 people (Western Australian Planning Commission, 2015). Bardi Jawi and Nyul Nyul people also live on outstations (small family settlements) along the coast (Western Australian Planning Commission, 2015), or else live in Broome, Derby or other parts of Australia or the world. Major cultural and social changes began for the Bardi Jawi and Nyul Nyul peoples after the first non-Indigenous settlers arrived in the region from the late 1800s.

From the late 1860s pearling brought European people to the west Kimberley region, soon followed by pastoralism and missionaries (McGregor, 2003). The economics and politics of the pearling industry acted as a severe catalyst for the violent
treatment of many Aboriginal people. Aboriginal men, women and children, including from the Dampier Peninsula, were taken and forced to work as pearl divers, with many dying (McGregor, 2003). On the Dampier Peninsula, pastoralism began in 1879 near the present site of Beagle Bay (McGregor, 2003), although most pastoral land was transferred to missions by the 1930s (Western Australian Planning Commission, 2015). Diseases introduced by both pearlers and pastoralists led to the deaths of many Dampier Peninsula Aboriginal people throughout the 1900s (McGregor, 2003). Partly in response to the treatment of Aboriginal people by pearlers, a series of missions were established around the Dampier Peninsula from the late 1800s (Choo, 1997; McGregor, 2003). These missions added to the forces encouraging or enforcing cultural changes for the Bardi Jawi and Nyul Nyul people.

Today, while several religious groups are still active on the Dampier Peninsula, Bardi Jawi and Nyul Nyul communities are largely secular. Both have developed, or are developing local systems of governance (for example see Glaskin, 2007) and seek to expand local economies and land and sea management. Much of the northern part of the Dampier Peninsula is determined native title or subject to claim. Industry on the Dampier Peninsula and surrounding seas includes tourism, pastoralism, fishing, aquaculture, pearling, small-scale horticulture and agro-forestry, mining exploration and Indigenous NRM (Western Australian Planning Commission, 2015).

At a national scale Bardi Jawi and Nyul Nyul Country are considered important through their inclusion in the National Heritage listed west Kimberley area (Commonwealth of Australia, 2011). The west Kimberley, including the Dampier Peninsula, is nominated for its outstanding Indigenous, historic, aesthetic and natural values. Some of these values relate to Bardi Jawi and Nyul Nyul people’s cultural ways of life, including affiliations with freshwater. For example, the region is recognised for the landing of William Dampier at Pender Bay in 1688 and the careening of the *Cygnet* in Karrakatta Bay, where the crew lived for a time and observed, presumably, the Bardi people, including how they accessed freshwater from “wells”. The use of baler shells to transport freshwater during oceanic travels on *gaalwa* (log rafts), constructed by Bardi Jawi people, is another heritage value. In addition, freshwater springs and seepages are described as being culturally
significant to Aboriginal people of the Dampier Peninsula and ecologically important in supporting flora and fauna (Department of the Environment and Energy, 2011).

The Dampier Peninsula climate is characterised as “…dry hot tropical and semi-arid with summer rainfall” (Graham, 2001), although across the area conditions vary (Searle, 2012). The northern part of the Dampier Peninsula receives more rainfall than the southern part, varying annually between 650 to 1200 mm (Searle, 2012). The geology is largely comprised of sandstones, many aquifer-bearing. Much of the Dampier Peninsula is covered in a thin layer of red, silty-sandy soil (pindan sands), with beaches, aeolian dunes and mudflats along the coast (Searle, 2012). Drainage is poor with episodic flooding infiltrating to groundwater or forming ephemeral river systems such as the Bobbis Creek drainage line, which lies on Nyul Nyul Country (Searle, 2012; Pettit et al., 2016). Two major and other minor aquifers extend throughout the Peninsula, which contribute to springs, streams and freshwater discharges in the coastal zone, at least some of which are likely to be groundwater dependent (Mathews et al., 2011; Searle, 2012; Pettit et al., 2016).

2.2.3 **Wetlands in the northern part of the Dampier Peninsula**

Freshwater ecosystems differ somewhat between the neighbouring Bardi Jawi and Nyul Nyul Countries. Bardi Jawi Country hosts few permanent wetlands, although along the coastal zone there are seasonally inundated wetlands, dune swamps and freshwater seepages or soaks (Mathews et al., 2011). Around Beagle Bay, on Nyul Nyul Country, permanent lakes can form, which are unusual for the Dampier Peninsula (Department of Environment and Conservation, 2012). Nyul Nyul Country hosts different types of permanent and ephemeral wetlands, including shallow lake-like or lacustrine waterbodies; riverine water holes on the Bobbis Creek drainage line; springs, including mound springs; and freshwater seepages along the coast (Searle, 2012; Dobbs et al., 2016; Pettit et al., 2016).

There are no major national conservation values specifically associated with the wetlands of the northern part of the Dampier Peninsula. For example, there are no
Ramsar wetlands or listed nationally important wetlands\(^7\) (although there are two nationally listed wetlands in the southern part\(^8\)). Most of the flora and fauna associated with Dampier Peninsula wetlands are common throughout the Kimberley. However, the endemic *Nymphoides beaglensis* (Beagle Bay Marshwort) lives in some Nyul Nyul wetlands, with some other Nymphaeae species at their most southern limit (Department of Environment and Conservation, 2012). Also, the Indian short-finned eel (*Anguilla bicolor*), known to Nyul Nyul people as *nigilbuninj*, inhabits some Nyul Nyul wetlands (Dobbs et al., 2016). *Nigilbuninj* is of conservation value being restricted to parts of the Kimberley region (Allen et al., 2002). In addition, while not formally recognised, Dampier Peninsula wetlands are significant for the variety of wetlands produced by coastal freshwater discharges, and also because this discharge corresponds with the most southern occurrence of monsoon vine thickets, a threatened ecological community. Hence, careful management of these wetlands (Mathews et al., 2011), assisted by further scientific research (Close et al., 2012) is advocated.

Significant issues related to Dampier Peninsula water resources and wetlands include oil and gas development, supply of water to remote communities and limited knowledge of groundwater resources and groundwater dependent ecosystems, coupled with increasing pressure from tourism, horticulture and industry (Department of Water, 2009). Groundwater is thought to be strongly connected to wetlands, although there is limited understanding of this connectivity or of the location and values of groundwater-dependent ecosystems (Searle, 2012). Current use of groundwater is generally low, with aquifers showing no adverse impacts from water extraction (Searle, 2012). In a review of groundwater resources of the Dampier Peninsula, Searle (2012) concludes that there are significant quantities available for extraction to supply industry. Bardi Jawi and Nyul Nyul people also have an interest in freshwater given that groundwater resources support existing communities and freshwater ecosystems have a high cultural significance.

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\(^8\) This includes the Willie Creek wetlands and Bunda Bunda mound springs.
2.3 An introduction to the Bardi Jawi and Nyul Nyul people

2.3.1 The Bardi Jawi people and their Country

The Bardi and Jawi peoples\(^9\) are distinct groups who historically occupied different areas from each other and spoke different (although mutually intelligible) languages (Bowern, 2008). Historically Bardi people from five clans lived on the mainland of the Dampier Peninsula and several islands immediately offshore of the present-day community of One Arm Point. The four Bardi mainland clans are the Ardiyol, Baniol, Goolarrgoon and Olonggon, and Iinalabooloo the island clan. Jawi people were a singular group that occupied islands further east in the King Sound (Glaskin, 2007). However, they also retain cultural similarities that resulted in a joint native title claim over their collective Country. Both identify as “saltwater” or “sea people”, with strong connections between identity, religion, customary tenure and economy, and the sea and marine resources (Smith, 1984; Glaskin, 2007; Willing, 2011; Vigilante et al., 2013). During the native title proceedings, many Bardi and Jawi claimants began to refer to themselves as Bardi Jawi (Glaskin, 2007). In this section hereafter I refer to the two groups separately or collectively depending on the focus of available literature or the timeframe of events either preceding or succeeding the native title determination. For the remainder of the thesis I adopt the collective term Bardi Jawi.

Bardi people believe that ancestral spirits generated their Country and culture during the creation period, including one creator-spirit called Galaloong that “…brought the Bardi language to the area by walking over the whole of Bardi country, naming all the places” (Bowern, 2012, p. 66; also see Vigilante et al., 2013). Facilitated by abundant local food, in particular marine resources, Bardi people were largely sedentary (Smith, 1984). On the mainland, Bardi Country was divided into territories (between 42-46) now referred to as booroos, owned according to patrilineal descent (Elkin, 1933) and incorporating “…a constellation of sites…each one [with] at least one major permanent freshwater source” (Smith, 1987, p. 43). Bardi people distinguish two main landforms, referred to by Smith (1987, p. 43) as gara, which is

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\(^9\) Some Bardi people refer to themselves as Bard, reflecting a language dialect discussed by Bowern (2008). Jawi people have also been referred to as Jaawi, Djawi and Chowie.
“saltwater side”, and pindan, which is “inland or bush side”, and by Oades and Meister (2013) as jardagarr (coastal) and niimidiman (inland). Booroos exist along the coast (gara), extending some way into the pindan, with occupation (campsites) historically situated around dunes and beaches (Smith, 1987, p. 44). The coastal zone also offered the most easily accessible freshwater, which could be obtained by digging (Elkin, 1933). According to Smith (1987, p. 40) Bardi people did not move campsite locations to follow resource availability, but primarily moved within booroos between gara and pindan to maximise comfort, shade and shelter, and avoid “…unpleasant environmental factors”, including mosquito plagues, cyclones or other adverse weather. Bardi people recognise six seasons distinguished by temperature, wind, rainfall direction and intensity, ripening of fruits, and degree of fatness of marine and terrestrial animals (Smith and Kalotas, 1985).

As with other Aboriginal groups in the region, the Bardi and Jawi people were drawn into the pearling industry by blackbirding, the forced capture and trading of Aboriginal people for diving (McGregor, 2003; Bowern, 2012). In 1899, the pearler and reformed blackbirder, Sydney Hadley, began a mission on Sunday Island (Iwany) (Glaskin, 2007). In 1910 the Catholic Church established the Lombadina mission as an outpost of the Beagle Bay mission, which had been established further south on Nyul Nyul Country (McGregor, 2003).

The capacity of Bardi and Jawi people to continue practising cultural customs and speaking language varied according to prohibitions enforced by missionaries. For example, Sydney Hadley did not stop cultural practices and may himself have undergone some rituals (McGregor, 2003). However, the United Aborigines Mission assumed the Sunday Island mission in 1923 and actively discouraged certain cultural practices and speaking of local languages (McGregor, 2003; Glaskin, 2007). On the other hand, at both the Sunday Island and Lombadina missions, particular skills of the Bardi and Jawi people were used in local industries. For example the “Sunday Island missionaries used Bardi and Jawi labour to harvest pearl shell, trepang, tortoise shell and trochus shell in order to sustain the mission economically” (Glaskin, 2007, p. 66). At the Lombadina mission Bardi and Jawi people made artefacts and handicrafts used in trading and sometimes sales (Glaskin, 2007). Compared to the strict prohibitions on language and culture enforced by the Beagle
Bay missionaries, McGregor (2003) contends that Bardi and Jawi people had more freedom to continue speaking language and engaging in cultural ways of life.

After government support of the Sunday Island mission ceased, it closed in 1962 and many Bardi and Jawi people were moved to Derby (Glaskin, 2007). Dissatisfaction with town life and life outside of their Country caused Bardi and Jawi people to initiate a move back to the mainland Dampier Peninsula in 1972 without government support (Glaskin, 2007; pers. comm. Alma Ejai, 2012). A settlement was established on the beach (Galbarrnginy or Middle Beach), followed by the construction of One Arm Point community. Lombadina now exists as a secular community with Djarindjin community established immediately adjacent in the 1980s.

In 2005, the Bardi Jawi people were granted exclusive possession native title to most of the mainland part of their Country, in an area that extends from Pender Bay on the west coast to Goodenough Bay on the east coast of the Dampier Peninsula (Oades and Meister, 2013). In 2010, a second native title decision by the Federal Court saw Bardi Jawi Country formally extended to include sea Country, reefs and some islands to the east and north of One Arm Point, including Sunday Island and Jackson Island (Oades and Meister, 2013). Soon after their first native title was granted, the Bardi Jawi people established mechanisms to formalise local governance and engage in land and water management of their Country. According to legal obligations, a prescribed body corporate (PBC) was established with a constitution and a body of representatives for managing native title rights and interests (Glaskin, 2007). The men’s Bardi Jawi Ranger team began in 2006 with the support of the KLC and the North Australian Indigenous Land and Sea Management Alliance (NAILSMA), with an initial focus on dugong and turtle management (Oades and Meister, 2013). In 2013 the Bardi Jawi Indigenous Protected Area was declared and associated Bardi Jawi IPA Plan released, providing strategic direction to the Bardi Jawi Rangers who engage in a variety of activities to promote use and conservation of cultural and natural resources and practices (Oades and Meister, 2013).

Published information about the Bardi and Jawi people traverses a range of topics. Twentieth century anthropologists, explorers and missionaries were particularly interested in spiritual beliefs, cultural customs and language, although much of this work was not published, or remained in field notes or workbooks (for a description
of this work see Glaskin, 2007; Bowern, 2008). Other resulting publications contain sensitive information that caused community resentment (see Bowern, 2008) and are not cited here. Glaskin (2007) and Bowern (2008) provide compilations of this research history, concerning both Bardi and Jawi culture and language. Material of relevance to this study includes anthropologist A. P. Elkin’s descriptions of social organisation and totemism on the Dampier Peninsula, some of which relates to wetlands (Elkin, 1932, 1933). Later 20th and 21st century research has investigated Bardi Jawi knowledge, practices and beliefs with a focus on coastal and marine resources and customs (Rouja, 1998; Rouja et al., 2003; Buchanan et al., 2009; Car, 2012), and plants (Smith and Kalotas, 1985; Paddy et al., 1993; Kenneally et al., 1996; Bardi Jawi Oorany Rangers, n.d.). Of particular interest are Moya Smith’s descriptions of the day-to-day ways of life and social systems of Bardi people (Smith, 1984, 1987), and Tom Vigilante and colleagues’ descriptions of Kimberley Aboriginal peoples’ connections to islands (Vigilante et al., 2013). Other insights can be gleaned from within the Bardi language. That is, knowing the meaning of Bardi words spoken to me helped to deepen my understanding of beliefs, practices and knowledge associated with water places.

There are several dialects of Bardi language, including Bard or Baard, although Bardi is the form most commonly spoken and documented (Bowern, 2012; Bowern et al., 2015). Bardi language is well documented through the Ardiyooloon Bardi ngaanka: One Arm Point Bardi dictionary (Aklif, 1999) and the ongoing efforts of linguist Claire Bowern. For example, of relevance to this research are Bowern’s publications about the naming of Bardi places (Bowern, 2009) and an extension of the Bardi dictionary: the Bardi-English dictionary supplement (Bowern, n.d). I used both the dictionary and supplement to identify and understand some Bardi words raised through the research. While there is a small number of remaining fluent speakers of Bardi, Jawi language is no longer spoken (Glaskin, 2007; Bowern, 2012).

Glaskin (2007, p. 66) notes that historical research into aspects of Bardi and Jawi culture has “…typically concentrated on outward, observable cultural forms, not on the ‘inner workings’ of a system of land and sea ownership”, with the exception being research to inform native title. Similarly, while much research has covered aspects of cultural use of wetlands, none has presented a unified description of the
relations and rules that underlie Bardi Jawi interactions with these ecosystems. However, insights can be gleaned from the above-mentioned research, as well as reports and plans that document knowledge and perspectives provided by Traditional Owners.

2.3.2 Water places: a Bardi Jawi perspective

While Bardi Jawi people claim strong connections with the sea and saltwater, their systems of cultural beliefs, practices and knowledge also encompass freshwater and wetlands. In the Bardi Jawi IPA Plan, “…traditional Oola (water) places” is the term given to culturally important freshwater sources or ecosystems, most of which are located along the coastline of the mainland and islands (Oades and Meister, 2013, p. 37; and Vigilante et al., 2013). Water places, which include both surface water wetlands and groundwater expressions, provide drinking water, but are also associated with spiritual beliefs and social systems (Elkin, 1933). Bardi Jawi people recognise two types of groundwater places: *oomban* and *biidin*, with freshwater accessed by digging in coastal sands below and above the high tide mark, respectively (Table 2.1). Surface water sources include small creeks (*iidar*), shallow lakes, temporary rainwater that collects on rocks (*oongoor*) and rainwater that collects in deeper rock pools (*niimid*) (Table 2.1). Most surface water sources are ephemeral, although some are permanent and some are individually named (see Aklif, 1999).
Table 2.1  Some Bardi Jawi terms for types of freshwater sources (adapted from Aklif, 1999)

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>oola</td>
<td>Freshwater, rain</td>
</tr>
<tr>
<td>oomboan</td>
<td>A source of fresh water accessed by digging a hole in beach sand below the high tide mark. Sometimes referred to as soak.</td>
</tr>
<tr>
<td>biidin</td>
<td>A source of freshwater in the ground accessed by digging a hole, often above the high tide mark within dune swales. Sometimes referred to as wells or waterholes.</td>
</tr>
<tr>
<td>oongoor</td>
<td>Freshwater (rain) that collects on rocks</td>
</tr>
<tr>
<td>niimid</td>
<td>Freshwater (rain) that collects in deep rock holes</td>
</tr>
<tr>
<td>iidar</td>
<td>Creeks</td>
</tr>
</tbody>
</table>

Individual *booroos* are identified by their natural features, including water places (Smith, 1984; Bowern, 2012). Smith (1984) describes a custom observed by the Bardi people in which permission must be sought from *booroos* ‘owners’ before visiting an area and in particular when seeking to use resources. Permission “…presupposes correct behaviour”, which includes observing restrictions on accessing certain places or species, and requires sharing any (normally marine) resources obtained (Smith, 1984, p. 444). Bowern also refers to social systems affiliated with accessing freshwater:

> Finding the soakages required local knowledge. There are stories of strangers to the country trying to find water but being unable to do so. Either the water disappears, or the strangers are oblivious to its presence. Strangers must be introduced to the country in order to make use of this resource (Bowern, 2012, p. 33)

Some water places have spiritual associations or are affiliated with ancestral creation stories\(^\text{10}\). Bardi and Jawi people, as with other Dampier Peninsula Aboriginal peoples, believe in spirit-children called *rai* or *raya* (Elkin, 1933; Aklif, 1999;

\(^{10}\) Bardi Jawi Traditional Owners, with the help of Moya Smith, documented the story of an ancestral dreaming character that took place at a billabong close to Swan Point (Paddy and Paddy, 1988). The story offers moral lessons and a range of knowledge about the area’s physical landform and marine resources, while emphasising the power of the main ancestral figure.
Vigilante et al., 2013). *Raya* are the pre-existing form of children that “…live in definite centres such as waterholes, springs, trees and rocks on the land and in the sea” and reveal themselves to the father (Elkin, 1933, p. 438). The concept of totems was not discussed directly by research participants and is somewhat unclear in anthropological literature (see Elkin, 1993). However, Elkin (1993) concludes that totemism does exist in Bardi society where *raya* appear in the form of a plant or animal totem of the Country (*booroo*) on which they are found. These totems dictate kinship relationships (for a description refer to Elkin, 1993) and eating a totem was taboo (Elkin, 1993).

The importance of water places is clear in the Bardi Jawi IPA Plan, developed over three years of consultation with Bardi Jawi people. The Bardi Jawi IPA Plan includes seven targets or objectives, one of which specifically relates to freshwater: “By 2013 the condition of traditional *Oola* (water) places will be good and monitoring work continue” (Oades and Meister, 2013, p. 37). Five strategies are listed to achieve this objective, one being to record related Bardi Jawi knowledge (Oades and Meister, 2013), to which this research contributes.

2.3.3 The Nyul Nyul people and their Country

Nyul Nyul\(^{11}\) Country extends north of Beagle Bay on the west coast across to the eastern region of the Dampier Peninsula, meeting with Bardi Jawi Country to the north, around Pender Bay, and Nimanbur Country on the east coast of the Peninsula (Figure 1.1). Elkin, who conducted research in the 1940s, located 28 Nyul Nyul Countries, describing them similarly to Bardi Countries: patrilineal, small and generally close to the coast (Elkin, 1933). It is possible that the Nyul Nyul people were divided into clans although I could not locate this information in literature\(^{12}\). However, Nyul Nyul people describe a coastal and inland-living people (McGregor, 2003), as explained to me by one Nyul Nyul Ranger:

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\(^{11}\) Nyul Nyul people have also been referred to as Nyoool Nyoool, Nyulnyul, Nyul-nyul and Niol Niol.

\(^{12}\) It should be noted, however, that clan-based relationships were not, and are not, uniform across Aboriginal Australia.
There was sort of a division of Nyul Nyul people...the spring mob, the people that inhabited the spring country and then there were the fringe...the coastal family groups that lived along the coast and sort of lived on the fringes of the coast.

The linguist McGregor (2003) describes the impact of pearling, pastoralism and missionaries on the Nyul Nyul people. He describes how Aboriginal people, including Nyul Nyul people, were taken and traded within the pearling industry. Leprosy, influenza and measles, likely introduced by the foreigners, all caused many deaths of Nyul Nyul people throughout the 1900s. Some early encounters between Nyul Nyul people and pastoralists were also violent, although no deaths were attributed to such clashes. With pearler crews “laying up” their luggers near Beagle Bay during the wet season (when pearling activities ceased), competition for marine and terrestrial food resources also probably increased. As a result, Nyul Nyul people’s hunting and gathering activities were either prohibited or constrained. However, in some cases, Nyul Nyul willingly interacted with pearlers and missionaries to obtain food and other desirable goods (McGregor, 2003).

In 1890 French Trappist monks established the Beagle Bay mission (Choo, 1997). German Pallotines assumed the mission in 1901 and introduced stricter mechanisms for enforcing compliance with their regime, preventing Nyul Nyul people from “going bush” (engaging in cultural activities) or interacting with pearlers (McGregor, 2003). While initial efforts failed, the housing of women and children within the fenced mission compound and dormitories ultimately restricted cultural activities (Choo, 1997; McGregor, 2003). For example, Nyul Nyul children could only leave the mission on weekends to visit their families (McGregor, 2003), or perhaps even less frequently (Choo, 1997). After institution of the Aborigines Act 1905, the Western Australia State Government assumed formal authority to manage Aboriginal children under the age of 16. Strict enforcement of this power led to the transferral of large numbers of Aboriginal children of mixed heritage (many with European fathers), to the Beagle Bay mission from around the Kimberley (Choo, 1997). All of these factors, plus the movement of Nyul Nyul to other areas for work, and the

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13 McGregor (2003, p. 117) notes that the reliability of some of his sources is unknown, and his observations and conclusions should therefore be considered “tentative”.

74
settling of victims of disease and war evacuees in Beagle Bay, continued to alter the heritage and way of life of the Nyul Nyul people (Choo, 1997; McGregor, 2003).

Both McGregor and historian Christine Choo, describe the cultural shifts incurred by Nyul Nyul people. McGregor suggests that, by the 1890s, ill treatment and violence inflicted upon the Nyul Nyul people, particularly by pearlers, may have already caused a major cultural transformation:

Quite possibly by the end of this decade the Nyulnyul population had been seriously reduced and dispersed, and a new economic regime imposed upon them from without. They may well have found themselves increasingly vulnerable to the pearlers, and as their numbers shrank - and the pearlers proliferated - increasingly powerless. This could account for their apparent readiness to accept the Catholic missionaries, who arrived in 1890 (McGregor, 2003, p. 130).

McGregor (2003) also provides evidence that around 1900 a senior Nyul Nyul man with cultural authority directed his people to give up some cultural practices. Possible reasons for this direction were to encourage a peaceful existence with the growing number of non-Nyul Nyul Aboriginal people living at the mission, and a response to younger people’s declining interest in some cultural practices (McGregor, 2003). However, simultaneously, senior men may have continued to maintain knowledge and practice customs (McGregor, 2003). Choo (1997, p. 27) also notes that both old and young people, in particular women, attempted to maintain some cultural knowledge and practices. Children were taught some dances and songs, although their participation and knowledge did not traverse deeper cultural elements. Visits with families also enabled children to continue to learn something of the Nyul Nyul language (which was largely prohibited within the dormitories) and engage in collecting and learning about bush foods (Choo, 1997). Despite such restrictions and enforced cultural changes, many mission residents recall these days with ambivalence or even fondness (Choo, 1997, p. 28; also see Nailon and Huegel, 2001). One senior Nyul Nyul woman explained to me that growing up on the mission “…was hard. It was happy sometimes and sad sometimes”.

Today the Nyul Nyul community is comprised of people with a diverse heritage. The Nyul Nyul language is no longer spoken as a complete language, although words, such as those for plants and animals, are still used (McGregor, 2003). The Nyul Nyul
people are engaged in the Bindunbur native title claim for an area extending across the middle of the Peninsula\textsuperscript{14}. The men’s Nyul Nyul Rangers team began in 2009. While there is no IPA established across Nyul Nyul Country, the Nyul Nyul Cultural Advisory Committee, comprised of local representatives, supports the Rangers with their land and sea management activities.

Some aspects of Nyul Nyul culture have been well documented. For example William McGregor documents the history of research into the Nyul Nyul language (see McGregor, 2003) and has written about technical aspects of the language. However, there are few updated or peer-reviewed compilations of the Nyul Nyul language designed for public use; although, Nyul Nyul people have compiled some word lists (see Williams, 1999; Dann and Dann, 2002). In the case of the Bardi language, interrogating the definitions of words that I documented through the research assisted to clarify or deepen my understanding of some cultural concepts: this was not possible with the lack of language documentation in Nyul Nyul. Again 20\textsuperscript{th} century anthropologists, explorers and missionaries have written about Nyul Nyul beliefs and cultural practices. However, much of this work is not formally published, is not published in English, or contains culturally sensitive material, and hence is not cited here. Elkin’s work on social organisation and totemism on the Dampier Peninsula also relates to Nyul Nyul people’s relationships with wetlands. Some books document the first hand perspectives of Nyul Nyul people and refer to the cultural use or other affiliations with wetlands (Williams, 1999; Nailon and Huegel, 2001). Dobbs et al. (2016) documented some Nyul Nyul knowledge and perspectives about wetlands.

2.3.4 Water places: a Nyul Nyul perspective

Nyul Nyul people strongly identify with both fresh and saltwater places. Nyul Nyul Country holds a number of types of surface water wetlands, including springs, shallow lakes and riverine waterholes, as well as groundwater ‘wells’ and ‘soaks’, that are all valued by Nyul Nyul people (Nailon and Huegel, 2001; NAILSMA, 2014; Dobbs et al., 2016). It is likely that Nyul Nyul people attributed names to types

\textsuperscript{14} See the Government of Western Australia’s Land, Approvals and Native Title Unit, Kimberley claims (Bindunbur): https://www.dpc.wa.gov.au/lantu/Claims/Kimberley/Pages/Default.aspx
of freshwater sources (like *oomban* and *biidin*, the Bardi names for two types of ground-water places, see Table 2.1). While I have not confirmed any Nyul Nyul language water place ‘categories’, many wetlands are individually named (for example see Dobbs et al., 2016).

Nyul Nyul people believe in spirit-children, some of which live in springs or waterholes (Elkin, 1933). According to Elkin (1993) totemism as described for Bardi people (section 2.3.2) also exists for Nyul Nyul people. Given that Nyul Nyul Country hosts more wetlands and freshwater species, including the valued *nigilbuninj*, it is possible that totemism of freshwater species influenced how some species were harvested and consumed. However, I have not located any existing research on Nyul Nyul freshwater-related totemism. Further, more general historical information about Nyul Nyul relationships with wetlands is lacking in scholarly literature. However, information from participants suggests that ‘inland’ Nyul Nyul people may have relied on springs and riverine waterholes, whereas ‘coastal’ people relied on groundwater soaks and wells (Figure 2.4). Some Nyul Nyul people may have moved between the coastal and inland parts of their Country in response to seasonal changes or for ceremonial events or trading. One elder explained to me how a Nyul Nyul group would move between a coastal site and an inland lake on his traditional Country:

> People used to live around here [at the lake] during the winter time like this time, cold time now, six months here on the land. They get up from [their coastal camp]. They got big camp there at [X beach], they move from there, they move here. Six months here, six months there.

Springs, waterholes and lakes were visited by Nyul Nyul people throughout the mission period, as documented in some local accounts (e.g. Nailon and Huegel, 2001) and explained to me by Nyul Nyul men and women.
Today, these wetlands remain important for their spiritual, customary, historical, recreational and economic or material affiliations. For example, during the Nyul Nyul ‘ecology study’ one Traditional Owner associated poor spiritual or emotional health of the Nyul Nyul people with a lack of rain and fragmentation of wetlands:

The country was feeling it [the community dysfunction] and not filling up. It’s a spiritual thing; the country was responding to the liyan [feeling] and not giving back to the people. (Nyul Nyul Traditional Owner quoted in Dobbs et al., 2016, p. 717).

She also described a responsibility of the Nyul Nyul people to actively manage wetlands to maintain or reinstate their health:

We’ve got to clear it up [some wetlands] and make sure that the water is running through and the spirit is running through [the country]. (Nyul Nyul Traditional Owner quoted in Dobbs et al., 2016, p. 717).

Wetlands continue to provide resources that are valued by Nyul Nyul people and are visited for recreation (Dobbs et al., 2016). Some wetlands continue to hold strong spiritual or cultural significance, and springs are associated with the culturally
important *nigilbunginj* (Dobbs et al., 2016). The Nyul Nyul Rangers also actively monitor and manage particular wetlands and have engaged external support to improve their capacities for this (NAILSMA, 2014; Dobbs et al., 2016).

### 2.4 Summary

In this chapter I began by introducing my methodological approach to the research. Initially, living locally enabled familiarisation with Bardi Jawi and Nyul Nyul people and culture, and the beginnings of local relationships. Ensuring the research subject and process was meaningful and beneficial for participants helped to secure research approvals from each group. Participatory processes and critical introspection were then key to an ethical practice that places Indigenous knowledge and preferences as central to research design. Local Ranger teams provided substantial support in conducting fieldwork and interviews, as well as contributing to project design, analysis and communication of the findings. Attention to my personal capacities and conduct, as well as external ‘checks’ that yielded formal and informal feedback, also helped the research to progress well.

Next I described the study location and introduced the Bardi Jawi and Nyul Nyul peoples, their Country and their affiliations with wetlands. The study location is the Kimberley region, an area of government interest for its economic- and population-development potential. Within this context, Aboriginal people own and manage most of the region, with (bureaucratic or government-funded) Indigenous NRM a growing industry. Within the west Kimberley lies the Dampier Peninsula, home to (among others) the Bardi Jawi and Nyul Nyul peoples. Following the settlement of European pearlers, pastoralists and missionaries from the late 1800s, both groups incurred massive cultural changes. Despite this, Bardi Jawi and Nyul Nyul have pursued (or are pursuing) native title, continue to live on their Country, and have embraced Indigenous NRM through the advent of Ranger teams and, for Bardi Jawi, an IPA. Wetlands within Bardi Jawi and Nyul Nyul Country have unique ecological elements and are of scientific interest, although none have formal national conservation values. These ecosystems, however, are of significant practical and symbolic value to the Bardi Jawi and Nyul Nyul people, who already undertake, and seek to improve their management and protection.
2.5 References


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Chapter 3    Maintaining traditional water places: a framework for understanding Australian Aboriginal approaches to managing wetlands

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3.1    Abstract

Indigenous knowledge systems (IKS) can, and do, contribute to natural resource management (NRM). However, cross-cultural NRM and scientific research often emphasise particular components of IKS, rather than engaging with complex IKS in a more integrated or holistic way. We present a conceptual framework that represents how IKS can manifest as a wetland management system, using two case studies of Aboriginal groups in the Kimberley region of north-western Australia. The framework depicts how beliefs, knowledge and practices are interrelated, and form a meaningful and organised approach by which Bardi Jawi and Nyul Nyul people historically managed, and aspire to continue managing, wetlands. The framework presents a meso-scale representation of IKS that highlights four principles underlying Aboriginal wetland management: custodial ownership, respectful use, active maintenance and knowledge management. While the research focuses on the IKS of two northern, coastal Aboriginal groups from Australia, affinities exist with how other Indigenous groups manage wetlands and aquatic resources worldwide. The framework provides a visual tool that can assist the application of IKS to wetland management in a way that emphasises the active and integrated nature of these knowledge systems. The framework also highlights that Indigenous people benefit from, but also shape wetlands, which in turn provides “services to ecosystems”. We
argue that the potential human-ecological benefits of Indigenous wetland management are best achieved by supporting the integrity of interrelated IKS domains, including custodial ownership and other governance structures, ongoing respectful (wise) use of wetlands, active maintenance practices, and the simultaneous generation and transmission of knowledge that occurs through these engagements.

3.2 Introduction

Indigenous knowledge systems (IKS) can contribute to natural resource management (NRM) (Berkes et al., 2000; Ens et al., 2015) where there are opportunities for Indigenous people and scientists or NRM practitioners to collaborate. Collaborative NRM often involves integrating IKS within conventional NRM practice and academic-based scientific knowledge (SK) (Bohensky and Maru, 2011), however, within these cross-cultural collaborations, the complexity of IKS may not be fully realised (Muller, 2012). For projects framed within the natural sciences, components of IKS that complement conventional perspectives are often highlighted, precluding other dimensions of Indigenous knowledge from consideration (Barbour and Schlesinger, 2012; Weir, 2012). Conceptual frameworks have been offered as a method of expressing the complexity of IKS while still being relevant to NRM (Holmes and Jampijinpa, 2013; Walsh et al., 2013). Generated through extensive fieldwork with two Australian Aboriginal groups, this paper presents a conceptual framework that highlights how multiple and interacting dimensions of IKS relate to wetland management. The framework aims to inform cross-cultural collaborations that seek to apply IKS to wetland research and management.

The framework adopts a meso-scale perspective, offering a link between macro and micro conceptual scales, similar to Walsh et al. (2013) and Holmes and Jampijinpa (2013). Macro-scale analyses provide all-encompassing definitions, conceptualisations and applications of IKS (e.g. Gadgil et al., 1993; Berkes et al., 2000). For example, Berkes and colleagues liken Indigenous knowledge-based practices and associated social institutions to adaptive management and systems of logic that can inform or improve conventional NRM (Berkes et al. 2000; Berkes and Berkes, 2009). Micro-scale analyses focus on specific species or places, an approach common within the natural sciences. For example, micro-scale analyses within wetland management research have investigated components of Indigenous
ecological knowledge (IEK) pertaining to a particular species or wetland function (Calheiros et al., 2000; Silvano et al., 2008; Hallwass et al., 2013; Liedloff et al., 2013; Jackson et al., 2014), indicators of wetland condition (Ens et al., 2010; Gratani et al., 2016), and the application of specific management techniques (Kusabs and Quinn, 2009; Gratani et al., 2011). In contrast, meso-scale analyses emphasise not only components of Indigenous knowledge, but also how these are generated from, and relate to, beliefs, practices and cultural or social institutions. Such integrated analyses can provide new ideas for water management that involve local human action and better incorporate the cultural and social dimensions of water (Singh, 2006; Rea and the Anmatyerr Water Project Team, 2008).

Holmes, Jampijinpa and others (e.g. Dwyer, 2012; Comberti et al., 2015) emphasise that IKS are characterised by an ethic of reciprocity in which the actions of humans and nature are “…understood to support the healthy functioning of the other” (Holmes and Jampijinpa, 2013, n.p.). By incorporating beliefs, knowledge, practices and social institutions, and their interactions, a meso-scale analysis of IKS can express this reciprocal relationship (Holmes and Jampijinpa, 2013; Walsh et al., 2013). Associated with this reciprocity, IKS also relate to developing NRM concepts such as “services to ecosystems”, in which Indigenous people’s activities are recognised for their contributions to maintaining and enhancing ecosystems (Comberti et al., 2015). Given that in Australia and elsewhere, Indigenous people’s practices have maintained and enhanced wetlands (Humphries, 2007; McGregor et al., 2010; Verzijl and Quispe, 2013; Barber and Jackson, 2014), we pay particular attention to the reciprocal relationship that exists between Aboriginal people and these ecosystems.

A meso-scale conceptual framework also has the potential to bridge the natural and social science disciplines. Incompatible theoretical foundations, methods and data can hamper inter-disciplinary collaborations that aim to inform environmental management (Strang, 2009b). For example, rich ethnographic accounts of Australian Aboriginal freshwater perspectives provide new and potentially productive ways to conceptualise the management of wetlands and associated species or threats (e.g. Young, 2006; Toussaint, 2014). Ethnographic accounts, however, do not use methods or produce information that is familiar to practitioners educated in applied
scientific methods, potentially limiting their influence. Conversely, technical scientific approaches are often unable to incorporate social and cultural dimensions of knowledge (Strang, 2009b). Therefore, a challenge arises to depict complex qualitative IKS information in a way that is comprehensible to a varied audience (Strang, 2009b), including NRM practitioners and scientists. Conceptual frameworks of IKS, such as those generated by Walsh et al. (2013) and Holmes and Jampijinpa (2013), distil complex information into a simple visual format to aid scientists and NRM practitioners to better comprehend IKS (see Diemers, 1999; Gratani et al., 2011). Extending from Walsh et al. (2013), who focus on plants, and Holmes and Jampijinpa (2013), who highlight broader cultural concepts and their relationships, our conceptual framework focuses on wetlands and their management.

Our conceptual framework is similar to that offered by Berkes et al. (2000) in that it describes IKS as comprising of management practices, underlying social institutions and guiding worldviews. However, our approach differs by focusing on the integrated nature of these domains through case studies with two Australian Aboriginal groups. In doing so we argue that practices can only be understood as they occur in context and in association with social institutions and beliefs or worldviews. We aim to inform those working in wetland-related cross-cultural collaborations in northern Australia, in particular non-Indigenous people unfamiliar with IKS (see Crook et al., 2016).

Wetlands are of high conservation value across northern Australia and in the Kimberley region, although they are affected by diffuse threats and increasing pressure from water extraction for industry (Hermoso et al., 2011; Close et al., 2012; Australian Government, 2015). As in many parts of the country (see Weir, 2009), wetlands in northern Australia are also central to the beliefs, practices and knowledge of Aboriginal groups (Toussaint et al., 2005; Jackson and O'Leary, 2006; Langton, 2006; Yu, 2006; Strang, 2009a). Aboriginal people believe that the earth’s landscapes and life forms were generated by ancestral figures (creator spirits) during a long ago era often called the “dreaming” or “dreamtime” in English. These creator spirits, which also established the rules and ways of life of human society sometimes referred to as “law” (e.g. Strang, 2009a, p. 88), came to rest within landforms, many within wetlands. Affiliated with these and other metaphysical forces wetlands are
often considered significant cultural sites, whilst also providing places of ceremomial, economic, historical and recreational importance. Many Aboriginal groups express an obligation to care for wetlands, which can comprise symbolic and practical activities.

The Bardi Jawi and Nyul Nyul peoples are two Aboriginal groups who, like others across northern Australia (Jackson et al., 2005), seek to protect wetlands on their Country. While their Countries lie adjacent to each other on the Dampier Peninsula, west Kimberley region of north-western Australia, the Bardi Jawi and Nyul Nyul peoples are culturally distinct, having different languages and beliefs. Both groups host Indigenous ranger teams who conduct cultural and natural resource management, supported by the peak Kimberley Indigenous body, the Kimberley Land Council (Figure 2.3). Both Ranger teams aim to protect, maintain or enhance the condition of wetlands on their Country using both their own IKS and SK (for example see Oades and Meister, 2013), with the Nyul Nyul Rangers already having undertaken some cross-cultural wetland research (see NAILSMA, 2014; Dobbs et al., 2016). Bardi Jawi people refer to wetlands as “…traditional Oola (water) places” (Oades and Meister, 2013, p. 37), which has been adopted in this paper as “water places”, used inter-changeably with wetlands. Both groups recognise water places that are associated with surface and ground water (Table 2.1), many of which are individually named (see Aklif, 1999; Dobbs et al., 2016), with local terms for freshwater species and places also still used.

As with Indigenous groups across Australia and elsewhere, the Bardi Jawi and Nyul Nyul societies have undergone significant transformation since colonisation (see Choo, 1997; McGregor, 2003; Glaskin, 2007). Despite these pressures and changes, many Bardi Jawi and Nyul Nyul people continue to live on their Country and engage in cultural and customary activities. Bardi Jawi have been granted native title and an Indigenous Protected Area (Oades and Meister, 2013): Nyul Nyul are engaged in a native title claim. On the Dampier Peninsula the four major communities of Ardiyooloon, Lombadina, Djarindjin and Beagle Bay (Figure 2.3), collectively host between 650-950 mostly Bardi Jawi and Nyul Nyul people (Western Australian Planning Commission, 2015). Others (between 450 – 650 people) live in smaller family settlements on “blocks” (outstations) along the coast of the Peninsula
(Western Australian Planning Commission, 2015). Both groups maintain cultural tenure systems in which, within the larger language group, family units are affiliated with smaller well-defined territories (called booroos in Bardi) (see Elkin, 1933; Smith, 1984; Bowern, 2009), some of which now comprise outstations.

Through two case studies with the Bardi Jawi and Nyul Nyul peoples, this paper presents a conceptual framework that depicts how each groups’ IKS relates to wetland management (Figure 3.1). After describing our methods the conceptual framework is offered, comprising of three central beliefs, four principles and multiple related elements. The beliefs describe the nature of human-wetland relationships as perceived by Bardi Jawi and Nyul Nyul participants. The four principles include custodial ownership, respectful use, active maintenance and knowledge management. We discuss how, through their interacting beliefs, practices and knowledge, Bardi Jawi and Nyul Nyul people engage in a system of wetland management that has purpose and structure, with similarities to systems engaged in by other Indigenous groups. We lastly discuss how, through their wetland interactions and management, these groups provide services to ecosystems that could be better recognised and supported to improve Bardi Jawi, Nyul Nyul and conventional conservation outcomes.
3.3 Methods

Addressing the concerns of scholars (Davis and Ruddle, 2010), Aboriginal groups (Barbour and Schlesinger, 2012), and national and regional ethical policy (AIATSIS, 2011; KLC, 2011), the research methods sought both scientific rigour and benefit for the participating peoples. A working research collaboration between the primary researcher and author, Michelle Pyke (MP), and Indigenous Ranger teams facilitated these objectives, with the Bardi Jawi Rangers (men), Bardi Jawi Oorany (BJO) Rangers (women) and the Nyul Nyul Rangers (men and women) each involved. Ethics approvals were gained from both the University of Western Australia (RA/4/1/6504), the Kimberley Land Council and local governing bodies from the Bardi Jawi and Nyul Nyul communities. The research methods involved two main stages: 1) semi-structured interviews with Aboriginal participants about a wetland (or
CHAPTER 3 - Maintaining traditional water places: a framework for understanding Australian Aboriginal approaches to managing wetlands

wetlands) of their choice, and 2) a participatory review of interview results. In addition, MP lived in a Bardi Jawi community for one year prior and three years during the research, which fostered her personal gradual ethnographic learning and facilitated regular dialogue with each Ranger team.

Assistance provided by the Ranger teams varied in stage one. While the Nyul Nyul Rangers accompanied most interviews, MP mentored the BJO Rangers to conduct interviews based on a standard set of questions (Appendix G and Appendix H). The BJO Rangers also video-recorded interviews for their own records and assisted MP to review preliminary interview progress, with the Rangers suggesting an additional question to ensure no cultural information was unintentionally missed (Question 9 in Appendix G). Ranger assistance with nearly all interviews helped to prevent misinterpretation of interview questions as the Rangers “code-switched”, that is, used Aboriginal language or locally familiar English terms to explain concepts. Where possible interviews took place at wetlands to stimulate memories and facilitate direct engagement with Aboriginal knowledge systems for both participants and researchers (Woodward and Marrfurra Mctaggart, 2015). Otherwise, interviews were held at a participant’s home or at the local ranger base. Interviews took place between March 2014 and November 2015, involving 21 field days and a two-night camp for each group, and visits to at least 20 Bardi Jawi and 13 Nyul Nyul wetlands. Observation of participants and Ranger co-researchers during fieldwork planning and execution formed an additional information source.

Choice of Indigenous knowledge providers was an important consideration (as per Davis and Wagner, 2003; Huntington, 2005). We encouraged the participation of individuals considered cultural knowledge authorities, generally elderly men and women. This included Traditional Owners, being individuals and family groups with recognised cultural affiliations to particular wetlands (see KLC, 2011). For Bardi Jawi, their Prescribed Body Corporate (representative native title governing body) and the Ranger team’s cultural advisor referred participants; the Nyul Nyul Rangers offered referrals as a team¹. Both men and women were interviewed, involving a

¹ With both groups I also posted a research notice on public notice boards such as at the local store and health clinic (see Appendix K and Appendix L). The BJO Ranger Coordinator and
particularly high number (19) of senior (65-75) and elderly (75+) Bardi Jawi people (Table 3.1). Interviews were stopped after reasonable efforts had been made to recruit all referred participants and when no new themes were arising.

Table 3.1 Age and gender of participants interviewed (female: X-f, male: X-m).

<table>
<thead>
<tr>
<th>Age group</th>
<th>Bardi Jawi</th>
<th>Nyul Nyul</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-45 young</td>
<td>3-f, 0-m (3)</td>
<td>1-f, 2-m (3)</td>
</tr>
<tr>
<td>45–65 middle-aged</td>
<td>1-f, 3-m (4)</td>
<td>8-f, 1-m (9)</td>
</tr>
<tr>
<td>65-75 senior</td>
<td>5-f, 5-m (10)</td>
<td>2-f, 2-m (4)</td>
</tr>
<tr>
<td>75+ elderly</td>
<td>6-f, 3-m (9)</td>
<td>0-f, 3-m (3)</td>
</tr>
</tbody>
</table>

The second stage involved a participatory review of themes arising from interviews. The BJO Rangers, Bardi Jawi IPA Coordinator and MP co-facilitated a one-day interactive workshop involving 12 Bardi Jawi elders, representing a high turnout of respected knowledge-holders. For the Nyul Nyul group, MP presented research findings during a meeting of the Ranger’s Cultural Advisory Committee, with six elders and 11 Rangers present. Key themes presented at both meetings included: types of knowledge about wetlands; ways in which people and wetlands are connected; ways of looking after wetlands; perceptions of wetland condition (health); causes of wetland change or decline; spiritual associations; and ways of teaching and sharing knowledge. At both meetings participants were asked to discuss any concerns, identify any errors or emissions, or contribute additional thoughts (see Appendix I and Appendix J).

Interview transcripts, detailed notes from meetings and observational field notes comprised three data sources for analysis. Also, all Nyul Nyul and Bardi Jawi words were compiled in a glossary and defined based on available literature, particularly drawing upon Aklif (1999) for Bardi Jawi. All data were entered into NVivo and coded according to six main themes and related sub themes (Table 3.2). Themes were initially developed from literature and iteratively refined using concepts and

I also walked around communal areas (such as near the shop and local office) of both One Arm Point and Djarindjin, handing out copies of the research notice.
terms arising from interviews, expanding on Indigenous beliefs, knowledge and practices associated with wetlands. There were some realms of IKS not within the scope of this study that motivate and influence interactions with wetlands (for example see Toussaint, 2014), or that exist in culturally restricted realms.

### Table 3.2 Coding frame used to analyse all qualitative data (interview transcripts, observational notes and transcripts of meetings).

<table>
<thead>
<tr>
<th>Theme</th>
<th>Sub-theme or explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Beliefs</strong></td>
<td>Reference to beliefs regarding the human-nature relationship, or causes of environmental phenomena related to wetlands</td>
</tr>
<tr>
<td><strong>Ownership</strong></td>
<td>Reference to custodial relationships with wetlands</td>
</tr>
<tr>
<td><strong>Rules and respect</strong></td>
<td>Reference to rules or norms regarding human-nature relationships, including any reference to respectful behaviour</td>
</tr>
<tr>
<td><strong>Use</strong></td>
<td>Ceremony and law</td>
</tr>
<tr>
<td>(Ways wetlands are used, or contexts in which wetlands are used)</td>
<td>Ranger work</td>
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<tr>
<td></td>
<td>Holidays</td>
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<tr>
<td></td>
<td>Camping, fishing, hunting, gathering</td>
</tr>
<tr>
<td></td>
<td>School</td>
</tr>
<tr>
<td></td>
<td>Mustering</td>
</tr>
<tr>
<td></td>
<td>Life (drinking water, bore water)</td>
</tr>
<tr>
<td></td>
<td>Travel</td>
</tr>
<tr>
<td><strong>Wetland management practices</strong></td>
<td>Cleaning</td>
</tr>
<tr>
<td></td>
<td>Practice (excluding cleaning)</td>
</tr>
<tr>
<td></td>
<td><em>Nigilbuninji</em></td>
</tr>
<tr>
<td><strong>Methods of learning</strong></td>
<td>Environmental observation</td>
</tr>
<tr>
<td></td>
<td>Dream</td>
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<tr>
<td></td>
<td>Family</td>
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<tr>
<td></td>
<td>Story</td>
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<tr>
<td></td>
<td>Ranger program</td>
</tr>
<tr>
<td></td>
<td>Use or work</td>
</tr>
<tr>
<td></td>
<td>Learning language words</td>
</tr>
</tbody>
</table>

Overall the research took a participatory action research (PAR) approach, seeking to generate positive research experiences, benefit participating Indigenous groups and build the capacity of all involved (Maclean and Woodward, 2013; Woodward and Marrfurra Mctaggart, 2015). Central to PAR is shared community-researcher ownership of a project and a cyclical process of collaborative planning, action and reflection (Woodward and Marrfurra Mctaggart, 2015). The Rangers’ ongoing collaboration and MP living locally facilitated multiple formal and informal opportunities for discussion and reflection on research process. Other methods also
assisted. For example, the Rangers co-presented with MP about the research at several conferences, requiring us to refine communications about the research findings. Also, several Bardi Jawi elders (also co-authors) acted as cultural mentors, providing feedback on the project progress and iterative findings. Hence, while the Indigenous knowledge has been primarily interpreted and communicated by MP, feedback from participants and Indigenous Ranger co-researchers has contributed to and validated these findings, as acknowledged by the Bardi Jawi and Nyul Nyul co-authorship of this paper. Tangible benefits for research participants included a booklet containing photos and summarised interviews provided as a gift and as a record of their knowledge contribution. Ranger groups also paid participants in recognition for their contributions and as the research aligned with workplan or IPA objectives.

3.4 Results

3.4.1 Beliefs underlying wetland interactions

*Country has agency*

In simple terms, “Country has agency” means that Country can take independent action. This was evident through participants’ understanding that the supernatural forces that comprise Country can react positively and negatively to the actions of humans. Fundamentally, participants believed that Country intentionally provides for people, both the Traditional Owner family group but also to any human, as one elderly Bardi Jawi woman explained in relation to a *biidin*:

> Spiritually the water was there to look after our thirst. We believe it was there for us to use and benefit.

However, this act of giving is contingent on respectful and appropriate human behaviour. For example, Bardi Jawi participants explained in relation to groundwater sources (*biidin* and *oomban*, see Table 2.1) that Country would provide freshwater (that is, good quality water can be found in the ground) if people behave with respect and refrain from actions such as loud and unruly behaviour, and dropping rubbish. This was demonstrated by the actions of a Bardi Jawi woman:
[A] was calling out for [B] to come and dig the oomban, but [B] was off getting oysters off the rock. Eventually [A] set off to dig it herself. She scooped out a hole in the sand with an enamel mug and her hands, working quite gently and asking the place and the old people\textsuperscript{2} [spirits of ancestors] there to give her fresh water. She kept sipping the water, exclaiming “Mmm getting close” if the water was tasting less salty, or “They’re getting wild\textsuperscript{3}” when the water tasted more salty. At one point [a young ranger] came over but she acted quite brash with the water and with her presence in general, which [A] thought would make the ancestors wild.

The agency of Country is particularly evident at powerful water places, described by both Bardi Jawi and Nyul Nyul participants as those places associated with ceremonial (law) grounds or creator-spirits. As described by a Nyul Nyul Ranger, these sites can inflict harm on humans who wrongly enter them or carry out a prohibited act:

And there’s a rainbow serpent\textsuperscript{4} living in [X]. There is a story that a priest went to that waterhole, he was looking for something, a horse got stuck or something, and he got stuck down there. The old people\textsuperscript{5} say the rainbow serpent got him. He never came back up.

Other sites were associated with raya (spirit-children), which can choose to hide water or make it unavailable, unless visitors act respectfully and according to cultural protocols.

Nyul Nyul participants described two other elements of Country that are involved in the ongoing creation and health of springs. Four participants cited one wetland as being particularly important to Nyul Nyul Country. They described how a creator spirit resides in this spring and the spring provides the spiritual source of health of the surrounding water places. Also, most Nyul Nyul participants recognised the role

\textsuperscript{2} Bardi Jawi and Nyul Nyul people use the term “old people” in several ways. One is as a respectful term of address for elderly men and women. A second refers to elderly people or ancestors who have passed away. A third refers to the spirits of elders and ancestors who have passed away and returned in spirit form to reside in their Country. In this quote the Bardi Jawi woman is referring to the spirits of her ancestors that reside in the area.

\textsuperscript{3} Angry, here meaning the spirits of ancestors were becoming discontented.

\textsuperscript{4} Many Australian Aboriginal groups believe that some creator-spirits take the form of snakes that inhabit freshwater sources (for example see Yu, 1999). While neither Nyul Nyul nor Bardi Jawi people made reference to a ubiquitous rainbow serpent, several references were made to (supernatural) snakes inhabiting and watching over particular wetlands.

\textsuperscript{5} Here the Nyul Nyul Ranger is using the term old people to refer to elderly members of the Nyul Nyul community.
of nigilbuninj (freshwater eel or Anguilla bicolor) in the creation of new springs. Nyul Nyul participants discussed how historically their elders enforced restrictions on nigilbuninj fishing, to avoid over-fishing and any impact this might have on spring creation. Thus, for Nyul Nyul people, a healthy spring ecosystem rests on the presence, condition and actions of (at least) one key wetland and nigilbuninj.

**Country is related to people**

Bardi Jawi participants described direct relationships existing between water places and particular individuals or family groups. The most commonly discussed were genealogical or ancestral links to a booroo. That is, an individual is connected to the same Country (and water places) as their parents, grandparents and so on, as described by a senior Bardi Jawi woman in relation to an oomban:

> It belong[s] to us, the old people⁶…Mum was the last one left, passed on, the water is still there, left it for us, grandkids, future kids.

Relationships also exist between people and spirits, some belonging to ancestors that have passed away, their spirit returning to reside in their Country. These spirits, often referred to as “old people”, can respond favourably to the presence of their descendants on Country, or even to the presence of any person who engages in respectful and appropriate behaviour. Many participants also described a responsibility to act respectfully towards their entire language group’s Country, as expressed by a Nyul Nyul Ranger:

> With any Aboriginal place you go to, you've got to follow the rules you know…Here you just [have] to talk to the old people [spirits of ancestors] this side of the Country, you know. Tell them what you're here for and things.

**Country needs people**

Bardi Jawi and Nyul Nyul people expressed a belief that the relationship between Country and people is crucial to Country flourishing. The “aliveness” of Country relies on the physical presence and activities of people, in particular Traditional Owners making use of Country’s resources. A long absence of Traditional Owners

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⁶ In this quote the interviewee is referring to herself as an old person, being the oldest of the living generation.
can cause declines or changes within Country including the closing, disappearance or excessive growth of plants across surface and ground water places. Human absence may occur when a Traditional Owner passes away or younger generations stop visiting. One elderly Nyul Nyul man perceived that Country had irreversibly retracted resources from Nyul Nyul people due to a decline in customary activities:

…We used to have water, spring waters, [but] they all covered up now…all them days are gone now. It's [a] new life now, young people life.

MP: How have those springs changed?
Springs must be all finished now, finish. Springs were all finished...they all covered up. Mother nature get them you know.

MP: Did you catch eel, nigilbuninj, when you were young too?
Yeah but they small now, they nothing. You can't get 'em no more. We used to live on them you know. This time now it's nothing.

On the other hand, several participants explained that changes to Country are not necessarily permanent; if Traditional Owners return to Country it may rejuvenate even without any specific action by its owners.

3.4.2 Principles guiding wetland interactions

The following section describes four principles that guide Bardi Jawi and Nyul Nyul people’s interactions with wetlands in ways that are consistent with the beliefs already described.

Custodial ownership

Custodial ownership of water places was evident through participants’ comments and through the process of conducting interviews. For example, both Ranger groups expected the researcher to identify the custodial owners of water places and interview participants on their Country. Twenty Bardi Jawi people chose to visit and speak about a water place on their booroo. When asked about the importance or meaning of a water place, about half of the Bardi Jawi participants, both young and old, responded that the site was important because it belonged to their family, as described by a senior Bardi Jawi man:
What this place means to me is that, when I was a little kid growing up I was told by my grandparents that this was our Country, this belongs to us and they came from here, my grandfathers came from here. And they told me about it and my father's also told me that this land belongs to us. That's why we're here today. We built on this land because, knowing that it belongs to us, and everything around here is part of us, part of our dreaming.

Changing lifestyles have provided both groups with different opportunities to interact with water places. For example some elders, particularly women growing up on missions, were prevented from travelling long distances but continued to visit nearby water places. Conversely others, such as men engaged in cattle mustering, travelled widely across the Dampier Peninsula and visited many water places. As such, some Bardi Jawi and Nyul Nyul participants chose to visit and speak about water places on another person’s Country, if they felt more familiar and knowledgeable about that place. However, these individuals did not claim to be Traditional Owners.

During several visits Bardi Jawi and Nyul Nyul elders described genealogical site linkages to younger rangers present, that is, explaining which individuals were connected to particular areas. In discussing site management, several participants also emphasised that permission for any physical activities (such as digging waterholes), must be granted by Traditional Owners. Simultaneously, both Bardi Jawi and Nyul Nyul participants described a responsibility for water places across the whole of their respective Countries.

**Respectful use**

Senior and elderly participants desired that new generations continue to know about, use and maintain water places in a respectful way. Bardi Jawi and Nyul Nyul elders described that respect is enacted when individuals approaching a site introduce themselves to the water place, generally verbally, but also through their touch, such as placing a hand on the ground. Individuals are also expected to abide by norms and rules about restricted areas and prohibited activities. Other efforts that were described or observed by MP included avoiding “humbug” around water places, such as children misbehaving, complaining or yelling, or adults littering. Abiding by

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7 Dreaming in this context refers to the Bardi Jawi man’s ancestral (family) links that reach back to the creation-period.
8 “Humbug” refers to demanding or troublesome behaviour.
Traditional Ownership protocols was also important, including seeking permission from Traditional Owners before visiting or making physical changes at a water place. One Ranger also described a broader concept of respect that involved retaining and using cultural knowledge and language.

Many Bardi Jawi and Nyul Nyul men and women described visiting and using water places when travelling for fishing, camping, hunting or gathering bush foods, particularly during school holiday times. Some participants referred to these customary activities as the “right way” to use Country, as explained by a senior Bardi Jawi woman:

Interviewer [Ranger]: Were there any ways that the old people [ancestors of the past] looked after this place in the past?
Yes they looked after in a lot of ways. Because they used it right way, and they used to hunt and gather food and bush fruits, and they used to live in their areas. You all can see the middens here, the shell, they must have had a lot of things there and making sure that everything was good on their Country and they were happy.

The elderly Nyul Nyul man referred to earlier stressed that the use and management of Country was “automatic” in the sense that cultural beliefs, behaviours and ideas were so central to everyday life that they required no planning or forward thinking. Without implying essentialism, in his view it was clear that Country would decline and be unproductive without the human enactment of necessary cultural activity to sustain it. He lamented the major cultural shifts he had observed that mean young people are now engaged in other pursuits, particularly making money, rather than living more directly from Country, and he perceived little chance of reviving past ways of life.

MP: …[P]eople have told me these areas over here have changed. Can you remember what it used to be like…and has it changed?
It was the good old days you know. They were the golden days. Now it's nothing. You don’t see nothing now…

MP: Do you think there were ways, or can you remember ways, that people were maybe looking after the bush back then?
Well people always looking after the bush because they used to eat the bush tucker you know…

MP: …For water places, did people...
Too late, too late you come… All finished. The good old days are finished…
MP: Did you see people like cleaning water places when you were young?...
No they just keep it clean all the time. The old people used to keep it neat.
MP: How did they do that?...
…It’d be automatically for me you know. You come now too late…[W]e used to live on them you know, in our days, bushtucker and things. This time there's nothing, you get paid now.

Active maintenance

Bardi Jawi and Nyul Nyul participants, particularly senior and elderly people, described methods of maintaining or “cleaning” wetlands that were practiced in the past. Methods included controlling plant growth inside and around some ground and surface water places (e.g. water holes and springs), either by physically pulling out riparian or aquatic plants, or using small fires. These actions had the practical purpose of maintaining water flow, water quality (temperature, clarity, taste) of drinking water sources, and cleanliness and accessibility of sites. After wetland cleaning stopped, some water places have become overgrown with plants, with some sites construed as unclean, as explained by an elderly Nyul Nyul Traditional Owner:

MP: Were there any ways that the old people looked after this place in the past?
Ancestors would look after the spring. After we left in the 50s and nothing was happening, anybody would go around here, fishing for nigilbuninj. Now it’s all covered up…[We should] keep the pools but get rid of the muck and rubbish [bulrushes, reeds, some trees].

In addition to promoting freshwater flow, improving water quality for drinking, and maximising open water, wetland maintenance also served as a way to respect and maintain the metaphysical aspects of Country, as one senior Nyul Nyul man explained:
Like I say, sometimes when we used to use areas for swimming we'd go in there and clean it all out. Yep. Because, in most of this Country, most of these areas where freshwater was, our belief, through our spiritual belief and culture, is that...there were rayas in it, we call it little people. So they also used to be around these areas, alright? In our cultural belief. So we had to maintain these areas of cleanness and tidiness yes, to make sure that it was, it was not only for us [humans] that we could have fresh water or clean water to drink, but it was also for the little people that were there, [the] spiritual people. You know, make the place look clean. It's our respect to the land. You have to respect that. And this is how we were taught, yeah. That's how we were taught, to respect Country.

**Knowledge management**

Types of important knowledge about water places encompassed interrelated domains pertaining to the physical environment, social institutions and metaphysical and ethical dimensions including cultural ‘rules’. The physical environmental dimension included knowledge about: plant and animal species that live in and around wetlands, and have a myriad of cultural uses and values; the location, characteristics and functioning of water places; and knowledge of how to find freshwater in an unfamiliar environment. Social knowledge included an understanding of family structures or genealogies, through which individuals are associated with particular Countries and therefore wetlands, and related cultural protocols for respectfully accessing sites. Metaphysical and ethical knowledge related to the presence of spiritual beings, the location of sacred wetlands that cannot be accessed, or rules relating to whether visitation or certain activities are prohibited.

Bardi Jawi and Nyul Nyul participants described different ways and contexts in which they have been educated about water places. Many participants learned about the location and use of water places through family members, in particular during school holiday periods. After the advent of formal schooling, initiated by religious missions, both Bardi Jawi and Nyul Nyul people would send their children back to Country for school holidays, often to spend time with grandparents. Families spent school holidays fishing, camping and generally living on Country, including using and teaching children about freshwater sources. During time spent on Country, or otherwise, stories shared can also convey important information about wetlands. Employment that facilitates time on Country also provides opportunities for learning. For example, several male participants learned about and used water places while
travelling with elder family members during mustering. Participants from both groups also described how new water places can be located by observing environmental cues.

3.5 Discussion and analysis

Bardi Jawi and Nyul Nyul people have an organised and skilled way of understanding wetlands and their treatment, which can be construed as culturally specific systems of wetland management. Particular practices, institutions and norms vary, being rooted in culturally specific knowledge, beliefs, practices and language, and different environmental contexts. Therefore one Indigenous group’s wetland management system is specifically associated with that group’s ancestral lands and cultural system, and cannot be generalised and applied elsewhere. However, there are conceptual similarities in how Bardi Jawi, Nyul Nyul and other Indigenous peoples’ interacting beliefs, practices and knowledge manifest to guide the purpose and organisation, and maintenance of knowledge about wetlands and their management.

By making these elements and their interconnections explicit, the Bardi Jawi and Nyul Nyul framework potentially facilitates greater engagement with the complexity of IKS within wetland management.

3.5.1 The meaning of Indigenous wetland management

The concept of wetland management has multiple meanings for Bardi Jawi, Nyul Nyul and other Indigenous groups, relating to physical, social and metaphysical dimensions of these ecosystems. Through various practices and activities, Bardi Jawi and Nyul Nyul people seek to facilitate wetland productivity and cultural opportunities (as in Tipa and Nelson, 2008), while respecting and satisfying the metaphysical dimensions and social structures affiliated with Country. Studies of Australian Aboriginal values of freshwater consistently describe Traditional Owner obligations to undertake practices that simultaneously engender respect for metaphysical beings and promote particular wetland characteristics, processes, biota and functionality (e.g. Strang, 1997; Yu, 1999; Toussaint et al., 2001). In contrast, studies in India (Singh, 2006) and New Zealand (Kahui and Richards, 2014) relate Indigenous wetland management to a rational rules-based approach to meeting resource requirements. However, Singh (2006) concludes that Indigenous Indian
CHAPTER 3 - Maintaining traditional water places: a framework for understanding Australian Aboriginal approaches to managing wetlands

Water management is not purely based on rational assessments of material or economic costs, benefits and need. Rather, it is “…a mechanism to maintain and reinforce the cosmological constructions linking natural, supernatural, and social orders through water” (Singh, 2006, p. 364). Similarly, in New Zealand Kawharu (2000) contends the distinguishing feature of Māori environmental management is its “…structural principle which weaves together a triadic relationship between human beings, their environment and the spiritual realm” (Kawharu, 2000, p. 367). It is this indivisibility of the metaphysical and social from the physical elements of IKS that also characterises Bardi Jawi, Nyul Nyul and other Indigenous people’s paradigms of wetland management (see Langton, 2006; Lansing, 2007; Strang, 2009a).

Practical Indigenous efforts to manage wetland processes, biota and functionality also have a physical, social and metaphysical purpose. For example, historically Nyul Nyul people placed harvest restrictions on freshwater eels, a valued food source, to avoid their exploitation. While harvest restrictions supported long-term resource availability, this action may have been primarily conducted to maintain an environmental balance in which eels are culturally associated with the regeneration of springs. The notion of cleaning wetlands for both practical (e.g. water quality) and metaphysical purposes is widespread across Australian Aboriginal groups (Rea and the Anmatyerr Water Project Team, 2008; Walsh, 2008; Jenkin et al., 2009; McGregor et al., 2010; Preuss and Dixon, 2012). The primacy of satisfying the metaphysical dimensions of Country means that some Aboriginal activities construed as management are not akin to conventional activities. Principally, Aboriginal management requires the active presence and respectful use of Country through hunting, fishing, use of materials, ceremonial activities and so on. According to Strang (1997) the significance of these activities is the re-enacting of traditional lifestyles that began with creator-spirits, which one Bardi Jawi woman described as using Country the “right way” and a Nyul Nyul man described as “automatic”. While Aboriginal groups continue to grapple with historical and ongoing cultural change, and many ways of maintaining wetlands have declined or changed (for example see Walsh, 2008), Bardi Jawi, Nyul Nyul and others (e.g. White et al., 2011) wish to see some practices revitalised. Many such practices are communal, involving multiple members of a clan or family that reflect custodial structures and a type of management organisation.
3.5.2 The organisation of Indigenous wetland management

Indigenous land (and wetland) management operates at different scales, with individuals, families, and groups or clans holding responsibility for the management of specific wetlands. At a broad level, Kimberley Aboriginal groups express collective responsibilities for wetlands within the Country that is affiliated with their language or tribal group as a whole (e.g. Yu, 1999; Barber and Rumley, 2003; Lim et al., 2017). Within this collective perspective, finer-scale expressions of custodianship also arise. For example, within their native title area, Bardi Jawi families have affiliations with, and responsibilities for, their booroos and the wetlands within them. Within Bardi Jawi family groups, decision-making authority for wetland management activities was then further delegated to particular individuals. Similarly, smaller areas within Nyul Nyul Country, including wetlands, are affiliated with particular Traditional Owner family groups or individuals. In another example, for the Aboriginal people of the La Grange area in the south Kimberley, jila (permanent water places) belong to senior law-men, who hold the responsibility and knowledge for their maintenance (Yu, 1999). Such spatial organisation and affiliated custodial responsibilities existed among Aboriginal groups Australia-wide prior to European settlement (Strang, 2009a, also see Langton 2006). Even where custodial systems have changed, Kimberley Aboriginal groups still express responsibility for wetland management (see Toussaint et al., 2001).

Social structures underlying wetland management also exist within Indigenous groups outside of Australia. For example, in British Columbia, Canada, Haggen et al. (2006, p. 1) describe how Indigenous stewardship of salmon relies on “nested tenure systems” (Haggen et al., 2006, p. 19). Family groups and individuals within clans conducted fine-scale management of rivers and tributaries to maximise fish productivity, with the tenure system endowing both resource access rights and responsibility for management (Haggen et al., 2006). Maintaining systems of rights and responsibility for the use and management of wetlands also relies on sharing and maintaining a broad knowledge base.
3.5.3 **Maintaining knowledge about wetland management**

The interlinking of active wetland maintenance with beliefs, ethics and custodial structures requires maintaining knowledge pertaining to physical, metaphysical and social realms. Ways of learning or sharing knowledge engaged in by Bardi Jawi and Nyul Nyul people are common across the Kimberley region. Knowledge is gained, for example, through: observing environmental phenomena, spending time with family on-Country in practical customary pursuits, learning from others through stories, engaging in ceremony, and received in dreams (Toussaint et al., 2001; Toussaint et al., 2005). Most of these ways of acquiring and maintaining knowledge rely on direct interaction with the environment or time spent learning from family and other members of the community, systems of education that also exist within other Indigenous communities (Rea and the Anmatyerr Water Project Team, 2008; Paniagua-Zambrana et al., 2016). Similarly, Berkes et al. (2000, p. 1258) refer to “…mechanisms for cultural internalization, which include rituals, ceremonies, and other traditions”. As such knowledge generation, accumulation and transmission occurs through engaging with humans, non-humans and place, rather than representing a discrete, separate activity as in conventional academic education.

The transition of Indigenous groups away from customary ways of life to mainstream lifestyles has altered engagement in culturally-specific education systems (Strang, 1997; Reyes-Garcia et al., 2014). For example, research with Indigenous peoples of South America found that formal schooling (Reyes-García et al., 2010), less dependence on traditional resources, and exposure to new technology (Paniagua-Zambrana et al., 2016) are associated with the loss of some types of cultural knowledge among younger generations. However, despite significant lifestyle changes Bardi Jawi, Nyul Nyul and other Indigenous groups have embraced new opportunities to share and maintain knowledge about wetlands. Economic activities that foster continued application of cultural skills can facilitate knowledge maintenance (Goodall, 2008). Indigenous NRM offers opportunities for Indigenous people to engage with, apply and revitalise IKS as it relates to wetland management (e.g. McGregor et al., 2010; Dobbs et al., 2016). However, many projects fail to engage with the full complexity of IKS and, instead, perpetuate conventional knowledge systems (Howitt and Suchet-Pearson, 2006; Barbour and Schlesinger, 2012; Muller, 2012). Maintaining IKS can benefit Indigenous knowledge-holders
(Reyes-García et al., 2010), but also has important potential environmental benefits (Ens et al., 2016b). Evident through the Bardi Jawi and Nyul Nyul conceptual framework is that wetlands not only support ecosystem services of importance to Traditional Owners, but that those groups also shape ecosystem characteristics, providing “services to ecosystems” (Comberti et al., 2015).

3.5.4 From wetland management to “services to ecosystems”

Ecosystems, including wetlands, provide vital services, or benefits, to humans (Boulton et al., 2014; Bark et al., 2015); however, Comberti et al. (2015) argue that of equal importance are the services provided by humans to ecosystems, or “services to ecosystems”. Similarly, the Ramsar Convention on Wetlands (Ramsar Convention) recognises that Indigenous people’s practices and activities can contribute positively (and also negatively) to maintaining wetland ecological character, including ecosystem services (Pritchard et al., 2016). The Bardi Jawi and Nyul Nyul framework exemplifies both ecosystem services and services to ecosystems. For example, wetlands provide ecosystem services such as drinking water, valued food species and materials, and places and species that are central to cultural beliefs and identity. In turn, Bardi Jawi and Nyul Nyul people’s interactions with and management of wetlands potentially enhance the availability of surface water sources, improve freshwater quality, and enhance aquatic heterogeneity and productivity.

Both services to ecosystems and the quality of ecosystem services have important implications for conservation and human well-being. Ecosystem services include those that sustain biophysical systems necessary for human life (provisioning, regulating and supporting services) and those that sustain nonmaterial benefits (cultural ecosystem services) including: cultural identity; aesthetic, heritage and spiritual values or experiences; inspiration; recreation and tourism; social relations; and knowledge systems (Millennium Ecosystem Assessment, 2005; Chan et al., 2011). Cultural ecosystem services are sometimes valued more highly than other ecosystem services, provide justification for conservation, and motivate environmentally responsible behaviour (Sagie et al., 2013; Comberti et al., 2015). Also, Indigenous people’s management of, or services to, wetlands can contribute to sustaining biophysical ecosystem services that contribute to conventional NRM
objectives such as biodiversity conservation (McGregor et al., 2010; Hankins, 2013). Encouraging or supporting Indigenous groups to enact or revitalise services to ecosystems and enhance ecosystem services may strengthen these associated benefits (Moritz et al., 2013).

Maintaining the ‘health’, integrity and continuity of IKS, including embedded social structures and systems of governance, therefore becomes central to ecosystem condition (Comberti et al., 2015; Pert et al., 2015). For example, formal governance structures can enable Indigenous groups to strategically engage with issues like water management (Hemming et al., 2017). The IPA and Indigenous ranger program facilitate governance and administrative arrangements required for Australian Indigenous groups to determine and implement objectives and strategies for managing their Country. With this research we sought approval from Bardi Jawi and Nyul Nyul governing bodies (the Bardi Jawi Prescribed Body Corporate and Nyul Nyul Ranger Cultural Advisory Committee, respectively), with the project received favourably as it aligned with local objectives. Strengthening Indigenous decision-making in part relies on a commitment by external stakeholders to work through local governance structures. The conceptual framework also offers other ideas for supporting the integrity of IKS.

Bardi Jawi and Nyul Nyul people’s ways of managing wetlands, as highlighted through the four principles in the conceptual framework (Figure 3.1), constitute a system that differs from, and “co-exists” alongside, conventional perspectives (see Nursey-Bray and Arabana Aboriginal Corporation, 2015). Cross-cultural activities that engage with the expression of these integrated principles will better support the integrity of IKS and contribute to ecosystem management. For example, wetland research and management should explicitly engage with systems of custodial governance and related protocols (e.g. Rea and the Anmatyerr Water Project Team, 2008; Moorcroft et al., 2012; Ens et al., 2016a). Active maintenance practices should also be encouraged, aided by empirical research to assess (integrated) cultural and ecological outcomes using both standard quantitative measures as well as appropriate qualitative methods (e.g. Tipa and Teirney, 2006; Tipa and Nelson, 2008; McGregor et al., 2010). Maintaining knowledge could involve generating and actively using a shared language that involves Indigenous terminology for aquatic species, places and
other ecological phenomena, as well as local concepts of wetland management (see Rea and the Anmatyerr Water Project Team, 2008; Muller, 2012; Londono et al., 2016). All of these efforts would benefit from ethnographic studies to provide a foundation for communication between Indigenous and non-Indigenous project partners (Jackson and Douglas, 2015). Further research could also inform how respectful use of wetlands fosters the continuation of other wetland management principles (Figure 3.1) and services to ecosystems. In this regard, others have found that customary use of natural resources is directly linked to maintaining cultural knowledge, social institutions and biodiversity (e.g. Singh et al., 2013; Ligtermoet, 2016; Paniagua-Zambrana et al., 2016). All research that seeks full engagement with IKS therefore requires a significant investment in collaborative efforts and a potential transformation of standard research methods (see Hill et al., 2012; Moorcroft et al., 2012; Muller, 2012; Howitt et al., 2013; Jackson and Douglas, 2015; Woodward and Marrfurra Mctaggart, 2015).

The holistic, active and integrated nature of IKS and associated practices must be recognised and respectfully adapted within ecosystem management (Turner et al., 2000; Horstman and Wightman, 2001; Bark et al., 2015). To focus on the opposite, perpetuating conventional environmental management structures and perspectives, risks further eroding cultural and biological diversity (Strang, 1997; Howitt and Suchet-Pearson, 2006; Comberti et al., 2015). As argued by Strang (1997, p. 183), “[o]ver time, the incorporation of new forms of classifying and describing the environment and a constant dialogue with the dominant European culture may create vital changes in [Aboriginal peoples’] ways of thinking about and evaluating the land”.

3.6 Summary

Substantial research that involved the Bardi Jawi and Nyul Nyul peoples demonstrate that these two groups, as with many other Indigenous groups, engage in culturally specific systems of wetland management. Similarities in the purpose, organisation and ways of learning about wetland management exist among Indigenous groups worldwide, although specific expressions (practices, norms, cultural institutions etc.) differ. IKS, manifested in this example as a system of wetland management, should be viewed as complex conceptual and active paradigms in which physical, social and
metaphysical realms are highly integrated, and which influence ecosystems. Through such active and reciprocal relationships, Indigenous people benefit from wetlands and contribute to shaping and potentially enhancing those ecosystems and associated beneficial services.

Cross-cultural wetland research and management should endeavor to respectfully engage with the full complexity of Indigenous systems of wetland management. The Bardi Jawi and Nyul Nyul conceptual framework provides a visual tool for communicating to scientists and NRM practitioners how IKS relate to managing wetlands. The framework may also assist Bardi Jawi and Nyul Nyul people to negotiate for their own interests, perspectives and strategies in managing wetlands, and, through its application, could be further refined and adapted by these, and other, Aboriginal groups. Better engagement with Indigenous ways of managing wetlands would benefit from further research into: how Indigenous peoples’ culturally-guided practices influence wetland ecological character and how this relates to Indigenous or conventionally-defined management objectives (Chapter 4), and the effectiveness of methods for documenting and communicating complex cultural information within cross-cultural contexts (Chapter 5).

3.7 References


CHAPTER 3 - Maintaining traditional water places: a framework for understanding Australian Aboriginal approaches to managing wetlands


[http://dx.doi.org/10.1002/j.1834-4461.1933.tb00087.x](http://dx.doi.org/10.1002/j.1834-4461.1933.tb00087.x)

[http://dx.doi.org/10.1007/s00267-010-9452-z](http://dx.doi.org/10.1007/s00267-010-9452-z)

[http://dx.doi.org/10.1016/j.biocon.2014.11.008](http://dx.doi.org/10.1016/j.biocon.2014.11.008)

[http://dx.doi.org/10.1016/j.biocon.2016.03.007](http://dx.doi.org/10.1016/j.biocon.2016.03.007)

[http://dx.doi.org/10.1007/s10531-016-1207-6](http://dx.doi.org/10.1007/s10531-016-1207-6)

[http://dx.doi.org/10.1111/issj.12038](http://dx.doi.org/10.1111/issj.12038)


[http://dx.doi.org/10.3197/096734008x333563](http://dx.doi.org/10.3197/096734008x333563)


CHAPTER 3 - Maintaining traditional water places: a framework for understanding Australian Aboriginal approaches to managing wetlands


Chapter 4  Wetlands that need people: the inter-dependence of Australian Aboriginal use, management and wetland condition

Michelle Pyke, Paul Close, Rebecca Dobbs, Sandy Toussaint, Brendan Smith, Zynal Cox, Devena Cox, Kevin George, Phillip McCarthy, Bernadette Angus (Jnr), Elaine Riley and Julian Clifton.

4.1  Abstract

Many Australian Aboriginal groups are committed to managing wetlands on their traditional lands, or Country. Evidence demonstrates that Aboriginal peoples’ management practices can enhance wetland extent, expand aquatic habitat and increase aquatic species abundance. Despite such evidence-based research, conventional (scientific or government policy-based) wetland management tends to overlook Indigenous knowledge, practices and ideas. Primarily relying on the recording and analysis of oral history data, this article investigates wetland management practices focusing on two Kimberley Aboriginal groups in north-western Australia. Both groups historically managed small wetlands to maintain drinking water supplies, protect important aquatic species, and satisfy metaphysical dimensions of sites. Wetland ecological character has altered with a change or absence of Aboriginal management and use of wetlands post colonisation of the region. At certain wetlands the values and opportunities historically existing at sites are now unavailable or compromised, even where the sites appear intact from a conventional perspective. The findings support the Ramsar Convention on Wetlands’ recommendations that Indigenous knowledge systems inform wetland management regimes through an understanding of both: the link between wetland ecological character and related opportunities and preferences (ecosystem services) of benefit to Indigenous people, and how Indigenous peoples’ practices have shaped, or continue to shape, wetland ecological character.
4.2 Introduction

Wetland environments have been a focus of human life throughout pre- and modern history (Lourandos, 1980; Nicholas, 1998). On mainland Australia, early sites of Aboriginal occupation were adjacent to rivers and lakes (Allen and O'Connell, 2014). Wetlands continue to be centres of cultural, spiritual and economic importance (Toussaint et al., 2005; Langton, 2006). Historically, and in some regions today, Aboriginal people have maintained practices that modify wetlands to provide resources or satisfy obligations associated with cultural systems and beliefs (Yu, 1999; Toussaint et al., 2001; Humphries, 2007; Rose et al., 2016).

Examples of intentional modification of wetlands illuminate how Aboriginal people influenced, or continue to influence, the ecological characteristics of these ecosystems (Table 4.1). Examples include the enhancement and control of populations of valued aquatic biota like fish and eels; the control of vegetation through fire; sediment and debris removal from waterholes; and the subsequent maintenance of hydrological conditions that support a variety of plants, animals and drinking water sources. Collectively these activities are often referred to as “cleaning” (Head, 1994; Rose, 1995; Walsh, 2008). The cultural effect of Aboriginal peoples’ practices has been to satisfy material, social and spiritual needs; the ecological effect has been to extend or enhance the natural biophysical characteristics of wetlands.

Colonisation resulted in major changes to Australian Aboriginal peoples’ ways of life, including wetland interactions (Goodall, 2008). Despite these changes, many Aboriginal groups retain complex ways of interacting with and managing wetlands that are guided by beliefs, practices and knowledge (Chapter 3 and Langton, 2002; Goodall, 2008; Toussaint, 2014), or Indigenous knowledge systems. Also, Aboriginal people have continued to participate in the protection and management of wetlands on their traditional lands or Country (e.g. Jackson et al., 2005).
### Table 4.1 Examples of ways that Aboriginal people modified (or modify) wetlands and the intended or potential effect on ecosystem components or processes.

<table>
<thead>
<tr>
<th>Region</th>
<th>Processes of modification</th>
<th>Outcomes of modification</th>
<th>References</th>
</tr>
</thead>
</table>
| South-west Victoria           | Lake Condah and Darlots Creek: construction of channels, weirs and pens to augment and control populations of short-finned eel (*Anguilla australis*). | - Maintained lake water levels  
                                | - Increased eel habitat and biomass above ‘natural’ levels  
                                | - Facilitated regular harvesting of eels, which supported trade and allowed permanent or semi-permanent settlement | Builth et al. (2008); Rose et al. (2016) |
|                               | Mount William and Toolondo Swamp: construction of channels and drains to artificially enhance and manipulate water flow across wetland areas to attract *A. australis*. | - Regulated floods and extended periods of inundation through dry/drought periods  
                                | - Extended eel habitat and range  
                                | - Facilitated harvesting of eels | Lourandos (1980) |
| Murray-Darling River system   | Construction of weirs, rock walls, fish traps and channels along small and large rivers.   | - Altered local river hydrology potentially influencing river morphology and duration of inundation  
                                | - Expanded fish habitat  
                                | - Facilitated fish hunting | Humphries (2007) |
| Northern Territory (northern part) | Upper Roper River: construction of temporary weirs to artificially maintain shallow wetlands. | - Encouraged water retention in the riparian landscape and shallow wetlands post wet season flooding  
                                | - Expanded riparian vegetation communities and habitat available for aquatic fauna  
                                | - Facilitated a reliable supply of aquatic food resources | Barber and Jackson (2014) |
|                               | West Arnhem Land and Kakadu National Park: targeted burning within and around floodplain wetlands. | - Promotes riparian vegetation and habitat diversity, and populations of important food resources such as long-necked turtle (*Chelodina rugosa*)  
                                | - Facilitates hunting of preferred aquatic plants and animals | Russell-Smith et al. (1997); McGregor et al. (2010) |
### Region

<table>
<thead>
<tr>
<th>Region</th>
<th>Processes of modification</th>
<th>Outcomes of modification</th>
<th>References</th>
</tr>
</thead>
</table>
| Savanna landscapes of northern Australia | Maintenance of groundwater wells and modification of waterholes. | - Potential increase in surface water supplies and refugial habitat available for fauna  
- Extended human occupation of some areas during dry periods and subsequent resource use and management practices | Preece (2013)                                   |
| Arid and semi-arid zone (<350mm average rainfall) | Construction of water storages (small dams), maintenance of groundwater wells and cleaning/augmenting of granite gnammas (depressions and holes in rocks). | - Potential increase in surface water supplies and refugial habitat available for fauna  
- Extended human occupation of some areas during dry periods and subsequent resource use and management practices | Bindon (1997); Bayly (1999); Pillman et al. (2003); Rea and the Anmatyerr Water Project Team (2008); Walsh (2008); Jenkin et al. (2009) |
Australian legislation and government-funded programs, such as the Indigenous Protected Area and Indigenous ranger programs, encourage Aboriginal people to contribute to environmental challenges such as biodiversity conservation. Aboriginal groups are working with scientists to research, manage and monitor wetlands based on standard scientific approaches (Ens et al., 2010; Jackson et al., 2014; Dobbs et al., 2016; Ens et al., 2016). In certain cases, scientists acknowledge the contribution of Aboriginal peoples’ practices in enhancing biophysical wetland characteristics and condition (e.g. McGregor et al., 2010; Barber and Jackson, 2014; Rose et al., 2016). Overall, however, science or government policy-based (conventional) wetland management in Australia focuses on ameliorating perceived anthropogenic drivers of wetland degradation (Finlayson et al., 2005; Close et al., 2012; Pittock et al., 2015). Despite recommendations of the Ramsar Convention on Wetlands (Ramsar Convention), the potential for Aboriginal people to contribute to wetland management remains largely unexplored (Humphries, 2007; Ens et al., 2015; Noble et al., 2016).

The Ramsar Convention provides wetland management advice, coining the concept of “wise use”. “Wise use of wetlands is the maintenance of their ecological character, achieved through the implementation of ecosystem approaches, within the context of sustainable development” (Ramsar Convention, 2008, p. 3). Ecological character is defined as “…the combination of the ecosystem components, processes and benefits/services that characterise the wetland at a given point in time” (Ramsar Convention Secretariat, 2010, p. 14). The Ramsar Convention recognises that Indigenous people and wetlands are interconnected in two ways. Wetlands provide ecosystem services that benefit Indigenous people who, in turn, help to maintain the ecological character of wetlands (Pritchard et al., 2016). As such, the Ramsar Convention recommends understanding how Indigenous peoples’ practices influence wetland ecological character and how this should influence management regimes (e.g. Pritchard et al., 2016).

Operationalising the Ramsar Convention’s recommendations requires an understanding of the nature and extent of Indigenous peoples’ wetland management practices, and how such practices support desired ecological character and associated cultural systems or values (benefits or services). Similarly, understanding how
practices have changed and the resulting impact on both wetland ecological character and cultural associations is important. Oral histories can provide information on Indigenous people’s cultural practices and relationships associated with wetlands, and evidence of associated ecological change (Finlayson and Brizga, 1995; Robertson et al., 2000; Semken et al., 2011). In northern Australia, where many Aboriginal people have a continuing history of living on and using their ancestral lands, oral histories are a particularly important source of information.

This research investigates the management of wetlands by the Bardi Jawi and Nyul Nyul peoples, two Aboriginal groups of the Dampier Peninsula, Kimberley region of Western Australia. Oral history accounts by Aboriginal people familiar with these wetlands were investigated to provide insight into three main themes: 1) if and how Aboriginal people intentionally modify (historically) or continue to modify wetlands; 2) if and how wetlands have changed in living memory, and whether an absence of Aboriginal wetland management has contributed to that change; and 3) how Aboriginal perspectives are similar or different to conventional perspectives of wetland condition (or health) and management, reflecting on interrelated cultural and ecological concerns.

4.3 Study area and site locations

Bardi Jawi and Nyul Nyul peoples’ Country are centred on the Dampier Peninsula (Figure 1.1 and Figure 2.3). Bardi Jawi Country extends north from Pender Bay and encompasses islands east of the community of Ardiyooloon (One Arm Point), including Iwany or Sunday Island (Oades and Meister, 2013). Nyul Nyul Country extends south from Bardi Jawi Country to just south of Beagle Bay. By the early 1900s many Bardi Jawi and Nyul Nyul people came to live within missions established at Beagle Bay, Lombadina and Sunday Island, which restricted cultural practices to different extents (see Choo, 1997; Glaskin, 2007). Now, the main population centres for Bardi Jawi and Nyul Nyul people on the Dampier Peninsula include One Arm Point, Djarindjin/Lombadina and Beagle Bay (Figure 2.3). Others live in small family settlements along the coast.

The Dampier Peninsula’s tropical semi-arid climate is characterised by a hot, wet season from November to April and a warm, dry season from May to September,
although Bardi Jawi people recognise six seasons (Smith, 1987). Annual rainfall in the northern part of the Dampier Peninsula ranges from 650 to 1200 mm (Searle, 2012). The northern Dampier Peninsula hosts seasonally inundated wetlands, dune swamps and freshwater seepages, or soaks, along the coastal zone (Mathews et al., 2011). Further south, including around Nyul Nyul Country, permanent and ephemeral wetlands dominate, including numerous shallow lake-like or lacustrine waterbodies, riverine water holes, springs (including mound springs), and coastal freshwater seepages (Searle, 2012; Dobbs et al., 2016; Pettit et al., 2016).

Six surface water sites were investigated including a small creek and large, shallow lake on Bardi Jawi Country, and a marsh, springs and several lakes on Nyul Nyul Country (Table 4.2). Bardi Jawi and Nyul Nyul people likely used all of these wetlands prior to European settlement and all continued to be used post settlement. For example, several cattle industries operated across the Dampier Peninsula throughout the 1900s, and local Aboriginal men and women visited lakes while mustering. Areas around lakes are favoured hunting ground for baarni (goanna) and feral cattle. Goorrnganggoon is a reliable source of fresh drinking water that was used by Bardi Jawi people prior to European presence in the region, throughout the Sunday Island mission period and is still visited today. Historically, Nyul Nyul people visited a nearby creek for swimming and springs to access drinking water, fish for the culturally important nigilbuninj (freshwater eel or Anguilla bicolor) or visit culturally important sites; some wetlands are still visited.
Table 4.2 Description of wetlands investigated; the number, gender and age range of participants interviewed about each site; and the length of time each site was observed.

<table>
<thead>
<tr>
<th>Site name</th>
<th>Description</th>
<th>Bardi Jawi and Nyul Nyul people interviewed (f-female, m-male, age range)</th>
<th>Site observation time frame (yrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goornganggoon</td>
<td>Freshwater flow from a rocky hillside into a small rock-lined coastal inlet, forming a pool and mangrove tree-lined creek line</td>
<td>Two Traditional Owners (f,m,65-75) Five elders (f,75+)</td>
<td>70+</td>
</tr>
<tr>
<td>Yakki</td>
<td>Shallow, densely vegetated, lake-like wetland</td>
<td>One Traditional Owner (m,45-65)</td>
<td>50+</td>
</tr>
<tr>
<td>The Causeway marsh and adjacent springs area</td>
<td>Marsh with tidal influence, heavily vegetated with sedges. Surrounding the marsh are multiple springs that are generally small, circular, and encased by trees, grass and other vegetation</td>
<td>Two Traditional Owners (f,45-65 &amp; m,75+) Young and senior men and women (25 – 65)</td>
<td>~60</td>
</tr>
<tr>
<td>Weedong</td>
<td>Very large, shallow, lake-like open coastal wetland</td>
<td>Two men (25-45 &amp; 75+)</td>
<td>50+</td>
</tr>
<tr>
<td>Gunnamirrd</td>
<td>Large, shallow, lake-like wetland surrounded by trees</td>
<td>One Traditional Owner (m,65-75)</td>
<td>50+</td>
</tr>
<tr>
<td>Gidjalok</td>
<td>Large, shallow, open lake-like wetland</td>
<td>Younger men and women (25-45)</td>
<td>~20</td>
</tr>
</tbody>
</table>

4.4 Methods

Knowledge of the two Kimberley Aboriginal groups was investigated using interviews and participant observation. The collaborative research occurred between the primary researcher and author, Michelle Pyke (MP), and the local ranger groups including the Nyul Nyul Rangers, Bardi Jawi Rangers (men’s team) and Bardi Jawi Oorany (BJO) Rangers (women’s team). Ranger teams assisted in carrying out the research, including assisting to recruit interview participants and arranging field trips to wetlands. The BJO Rangers were mentored to conduct interviews, with MP always present. Participants included Traditional Owners who have recognised cultural affiliations and responsibility for particular places, and other Bardi Jawi and Nyul Nyul individuals familiar with wetlands (see Huntington, 2005).

Interviews were held, where possible, at a wetland chosen by the participant, or otherwise at a participant’s home or the local ranger base. Wetland visits and interviews took place between October 2013 and November 2015, with three visits to
CHAPTER 4 - Wetlands that need people: the inter-dependence of Australian Aboriginal use, management and wetland condition

Goorrnganggoon and the Causeway area, and one each to Weedong, Yakki, Gunmamirrd and Gidjalok. Participants included young (25-45), middle aged (45-65), senior (65-75) and elderly (75+) men and women (Table 4.2). Semi-structured interviews enquired about: the meaning of a site; historical and present day site use; past practices used to maintain a site; historical site change; the presence of cultural stories or songs; and what a site generally requires to remain in good health. The site visit to Weedong took place during a separate study (involving a similar set of interview questions) that also involved the authors and is described elsewhere (Dobbs et al., 2016).

Interviews were audio recorded where permission was granted, with verbatim transcriptions or detailed notes coded in NVivo. Initial codes used predetermined themes considered relevant to informing wetland management, including: beliefs; ecological wetland attributes; values; wetland management practices; environmental change; changing perceptions; management ideas, preferences or concerns; and research questions. Through iterative analysis additional themes emerged and were added to coding including: custodial ownership; cultural rules and respect; specific uses of wetlands; and wetland management practices including cleaning and references to nigilbuninj. The research received ethics approval from the University of Western Australia (RA/4/1/6504), the Kimberley Land Council and the participating Aboriginal groups.

4.5 Results

Results are presented at a site level to demonstrate associations between perspectives of ecological change and wetland condition with cultural relationships and ways of life. Aboriginal respondents identified three of the six sites as having undergone substantial ecological change in the past 30 - 50 years (Table 4.3). Two of these sites, Goorrnganggoon and the Causeway and springs area, were perceived to have declined in health and required rehabilitation; Weedong had improved its condition, with no intervention required.
Table 4.3 Perceptions held by Bardi Jawi and Nyul Nyul respondents of changes to study sites. The nature and timing of change, and whether rehabilitation is required, are also identified.

<table>
<thead>
<tr>
<th>Country</th>
<th>Wetland type</th>
<th>Site name</th>
<th>Site change</th>
<th>Site rehabilitation required</th>
<th>When change began</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bardi Jawi</td>
<td>Small creek</td>
<td>Goorrnganggoon</td>
<td>Substantial</td>
<td>Yes</td>
<td>After the 1970s</td>
</tr>
<tr>
<td></td>
<td>Lacustrine</td>
<td>Yakki</td>
<td>Minimal or none</td>
<td>No</td>
<td>n/a</td>
</tr>
<tr>
<td>Nyul Nyul</td>
<td>Marsh / springs</td>
<td>The Causeway and adjacent</td>
<td>Substantial</td>
<td>Yes</td>
<td>1980s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>springs area</td>
<td></td>
<td>No</td>
<td>After the 1970s</td>
</tr>
<tr>
<td></td>
<td>Lacustrine</td>
<td>Weedong</td>
<td>Substantial</td>
<td>No</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td>Lacustrine</td>
<td>Gunnamirrd</td>
<td>Minimal or none</td>
<td>No</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td>Lacustrine</td>
<td>Gidjalok</td>
<td>Minimal or none</td>
<td>No</td>
<td>n/a</td>
</tr>
</tbody>
</table>

4.5.1 Goorrnganggoon

The Traditional Owners and other Bardi Jawi elders agreed that plant life within Goorrnganggoon had changed substantially since Bardi Jawi people were permanently moved away from the Sunday Island Mission in the 1960s. Prior to the 1970s, the freshwater pool was fairly clear of vegetation and the surrounding mangrove trees were sparse. Today, the freshwater pool is surrounded by thick vegetation (Figure 4.1) and the creek is lined with dense mangrove trees. One elderly woman who has visited Goorrnganggoon since early childhood described changes to vegetation and how this has impacted freshwater flows:

When I was young it was a good place. The place was really clear, the water was just open…wasn’t trees in front of it…Oh it was really nice water. Before like more [water] comin’. But now it’s like it’s blocked with all those things, that what I was telling [the head ranger]. [Need to] clean them all those grasses, weeds thing or whatever they call it, clean them out and the water will just running down and fill this hole.

Overgrown vegetation, whether native or non-native, was perceived to be a problem by some elders. One senior Traditional Owner highlighted an introduced plant, passion vine (*Passiflora foetida*), as particularly troublesome; however, others did
not distinguish between non-native and native species. In addition, introduced banana trees were planted at Goorrnganggoon by a Bardi man many years ago and are now highly valued by some Bardi Jawi people (Figure 4.1).

![Figure 4.1 Zac Ejai (Bardi Jawi Ranger) standing in the pool of Goorrnganggoon and tasting freshwater flowing into the pool. Also depicting thick enclosing vegetation including banana trees, introduced passion vine (*Passiflora foetida*) and native species. (Source: Michelle Pyke)](image)

The Traditional Owners of Goorrnganggoon also observed other biophysical changes and related these to cultural changes or breaches of cultural protocol. On approaching Goorrnganggoon by boat for the first time in many years, one senior Traditional Owner was shocked to see that erosion had narrowed the beach and created a steep bank. She attributed the erosion to changes in her family’s relationship with Goorrnganggoon through the passing of senior family members:

My eldest brother passed away, [my sister’s] Dad passed away, my Dad passed away, Grandfather passed away; that whole place is completely different. That last one when my brother passed away, that's when all that trees started to grow, roots going everywhere, and that beach area got very small. It was very big, [a] very big beach.
Another senior Traditional Owner attributed site condition decline to improper use of the site by Bardi Jawi people, including burning and cutting down tree branches without permission of the Traditional Owners. Several participants thought that changes to Bardi Jawi people’s use or management of Goorrnganggoon had contributed to biophysical change. For example a senior male Traditional Owner described how he would clean the freshwater pool in his younger days:

We used to rake away all the dead plants inside the pool, rake away what we could get out. I might have been the last person to do that in 1969.

A female elder who grew up at the Sunday Island Mission suggested that vegetation on the hill surrounding the site (which has also thickened) was maintained not as a specific activity but as a consequence of people using and walking around the site.

All of the Traditional Owners and elders interviewed considered human intervention necessary to rehabilitate or ‘clean up’ the site. Cleaning would seek to enhance freshwater flow into and out of the pool by removing some vegetation and sediment from within the pool and burning the surrounding hillside to reduce the thickness of vegetation and improve freshwater inflows. Cleaning would seek to maximise water quality, as described by one senior Traditional Owner:

MP: What does the Country need here to stay healthy in the future?

Just keep it clean, clean up here, water keep flowing, so freshwater keep on coming...making freshwater to drink today, make tea and things like that. Or if they camp over there they can have freshwater, drink it. [Need to] clear the path just for the flow, so it will flow better then. Trim this part here too...just for that water to flow properly...People will come and drink water if there [is] clean water.

Participants also preferred to see the site returned to a state closer to its historical form, with another senior Traditional Owner appealing with emotion to the ancestors of Goorrnganggoon (also her ancestors) that this would happen:

I'll be back with kids, I'll bring them back. We never come here for long...We forgot about you guys. I'll come back with them one long weekend and we'll stay here with you guys for holiday. Clean him up place here, make him look like what he was before...Only because I got sick I never come here. But I will.
4.5.2 The ‘Causeway’ and the springs area

Nyul Nyul people believe the vegetation surrounding the springs and Causeway area has substantially changed in the past few decades. Around thirty years ago the Causeway, known as the “creek”, offered open water and was a popular swimming spot. The creek was separated from the Beagle Bay community by woodland, with community members able to see through the woodland to the creek where children were swimming. Now the Causeway appears more like a marsh, with thick macrophytes and no open water (Figure 4.2). The adjacent woodland has thickened (either through the growth of more trees or the increased height of the understory) meaning it is no longer possible to see through the woodland, as described by a younger Nyul Nyul woman:

From the school you could see right down to the creek. There were trees but not as thick and there weren’t the bushes and bulrushes.

![Figure 4.2 Thick sedges covering the wetland north of Beagle Bay community at what was formerly a large open freshwater pool. (Source: Michelle Pyke)](image)

Participants also described how some nearby springs have been “covered up” by plants, as depicted by an elderly male Traditional Owner:
Big spring in there is my dreaming, my family dreaming place…Now there is all vegetation choking up the place. It was covered in ferns and had paperbark trees but you could still see right through it.

Also of concern to Nyul Nyul people was how the perceived excessive growth of vegetation was impeding the flow of freshwater in and out of wetlands.

Nyul Nyul people noted several possible factors contributing to the changes in vegetation around the Causeway and springs. A road across the Causeway, constructed to assist Nyul Nyul people to access outstations to the north of Beagle Bay, was identified by participants as having changed the local flow of water, both upstream tidal flows and downstream flow of freshwater. Nyul Nyul people also thought that donkeys and cattle could be encouraging vegetation growth around springs. Donkeys were introduced by Beagle Bay missionaries and have since increased in number, whereas feral cattle remain from past pastoral activities. Change was also attributed to an absence of Nyul Nyul ancestors actively living on, using and maintaining Country, as explained by a male elder:

MP: Were there any ways that the old people looked after this place in the past?
Yeah there were. Used to clean it out, so the water would be running out. Would pull out the grass and reeds. Keep the waterholes clean. Old people used to keep it real clean in those days. Every waterhole was alright to swim in. Used to do burning, they’d know how to burn.

At least some cleaning and burning were likely associated with daily life activities such as fishing for nigilbuninj, swimming or hunting and harvesting resources in and around wetlands. As such, “management” activities may have been an artefact of daily life, as suggested by one elderly male participant:

MP: Do you think there were ways, or can you remember ways, that people were maybe looking after the bush back then?
Well people always looking after the bush because they used to eat the bush tucker you know. Even gim [sap] no good now, you know you got gim.
MP: …For water places, did people...
Too late, too late you come… All finished. The good old days are finished…
MP: Did you see people like cleaning water places when you were young?...
No they just keep it clean all the time. The old people used to keep it neat.
MP: How did they do that?
…It'd be automatically for me you know. You come now too late.
Nyul Nyul people also believe that *nigilbuninj* are responsible for the creation and maintenance of springs. Senior men and women recall learning from their elders that overfishing of *nigilbuninj* in individual springs was strictly prohibited in order to maintain eel populations and ensure the continued reproduction of springs and spring water, as described by one senior male Traditional Owner:

MP: And *nigilbuninj* are also associated with freshwater?
Oh yeah most certainly. That's right…without *nigilbuninj*, you would have no springs. Because they are the maintenance providers to the springs. They occupy the spring you see? They keep the ground turning, they keep the water moving through the Country, inside those particular different springs….

MP: And then with the *nigilbuninj* were there ways to make sure they weren't over hunted or that they were looked after?
Yes well they were. They were not only a species that we used as in our delicacy, 'cause we eat *nigilbuninj* too, but it is also part of our heritage, it is part of our dreaming. So you know there were certain times that you'd go and get it, you'd catch it, and there were a certain amount that you could eat. You could never fish those things out, you know, there was a law against that, and we'd respect and understand that.

Daily life no longer depends on customary use of wetlands, although Nyul Nyul people still visit wetlands. Both children and adults continue to visit and use wetlands for swimming, picnics, catching baitfish and hunting *baarni* and cattle. However, small or site-scale vegetation cleaning and burning around wetlands have largely stopped. The Nyul Nyul community wishes to restore the Causeway to an open water wetland and Nyul Nyul elders wish to see several springs cleaned to enable easy access and encourage safe access and use by community members.

### 4.5.3 Shallow freshwater lakes

Not all wetlands appear to have changed or rely on cleaning or other fine-scale management techniques used by Bardi Jawi and Nyul Nyul people. Participants suggested that Yakki on Bardi Jawi Country, and Gunmamirrd and Gidjalok on Nyul Nyul Country, had changed little over the past 20 years or so, remaining in fairly good condition and not requiring any particular management other than protection from uncontrolled hot fires and development. Weedong lake on Nyul Nyul Country differed in that it had substantially changed. Once a dry, dusty flat surface experiencing seasonal flooding and across which cattle were driven, Weedong is now
permanently full with water. This was considered a positive change and the cause attributed was environmental rather than related to the activities of Nyul Nyul people or an absence of activity.

4.6 Discussion and analysis

4.6.1 Associating Aboriginal management and use with wetland characteristics

Oral accounts demonstrate that historically Bardi Jawi and Nyul Nyul people intentionally managed wetlands to produce certain perceived beneficial characteristics. Both groups maintained particular riparian and aquatic plant assemblages by physically removing wetland plants and controlling vegetation through fire. Nyul Nyul people regulated the fishing of nigilbuninj to ensure the species’ population was maintained. Both groups also removed sediment from small pools and springs to maintain water quality. Similarly, Mayala people, who’s Country includes islands to the east of Bardi Jawi Country, maintained open freshwater and water flow within coastal wetlands by removing mangroves, vegetation and sediment\(^1\) (Vigilante et al., 2013). These activities enhance evidence that Aboriginal peoples’ intentional management of wetlands was widespread, although site-specific, across Australia (see Table 4.1 and also Gammage, 2011).

It is also possible that historical use of wetlands indirectly affected wetland characteristics. For example, use of waterhole and spring banks for cooking and fishing could have encouraged a stable bank crust that resisted erosion and protected large trees from fire (see Lindner, 1999). Conversely, intensive site-management activities were not associated with the ephemeral lake-like waterbodies (Table 4.2), which appeared less inclined towards the dynamic vegetation change exhibited by permanent springs and waterholes. Both Ranger groups do, however, conduct an annual burning program that in part aims to protect riparian zones from hot fires. Also, the lakes Yakki and Gunmamirrd are located in areas that are semi-permanently occupied and managed by Traditional Owner families.

\(^1\) One Bardi Jawi elder explained to me that mangrove shoots must be removed to stop them expanding across open beaches. Her concern was demonstrated by pulling out young, establishing mangrove shoots.
Against a likely backdrop of broad, European-induced environmental change (Davis et al., 2015), oral history accounts link specific wetland changes to an alteration or absence of Aboriginal management practices and use. The Causeway and springs area and Goorrnganggoon have experienced vegetation encroachment over the past few decades that may in part be explained by a change in Aboriginal wetland management or site use. Nyul Nyul people’s management of wetlands likely declined throughout the Beagle Bay mission period when cultural life and activities were highly restricted (Choo, 1997). Until it closed in the 1990s, cattle from the Beagle Bay station may have helped to maintain some wetland characteristics similar to those generated by Nyul Nyul management. In particular, cattle may have limited vegetation growth as has occurred in other parts of northern Australia (McGregor et al., 2010). The expansion of macrophytes within the Causeway marsh is likely to have been encouraged by changes to water flow from the adjacent road construction. However, macrophyte growth and nearby vegetation thickening may also relate to a lack of Nyul Nyul people’s burning or cleaning, as similarly other Aboriginal peoples’ use or management have controlled (or continue to control) aquatic and riparian vegetation (Gott, 1982; Head, 1987, 1989; Bickford and Gell, 2005; McGregor et al., 2010). At Goorrnganggoon, mangrove encroachment may be associated with a decline in site use and management, or alternatively, could be related to broader climatic changes (see Williamson et al., 2011). Vegetation changes have also been observed on other Kimberley islands after the decline of Aboriginal burning (Vigilante et al., 2013). In both cases, Bardi Jawi and Nyul Nyul people are confronted with some wetlands that have changed to the extent that they no longer satisfy cultural values, use and custodial obligations associated with each site.

4.6.2 Relating Aboriginal and conventional perspectives of wetland condition and management

Bardi Jawi and Nyul Nyul people’s perceptions of wetland health differ from conventional perspectives. In Australia, conventional assessments of wetland health emphasise the natural values of wetlands that are a combination of biological, physical and chemical (biophysical) characteristics and indicators, where management ameliorates threats to these characteristics (Department of Environment and Conservation, 2012; Boulton et al., 2014). Aboriginal peoples’ perspectives of wetland health also concern the natural environment, but as it is related to values
(resources, historical, recreation and so on), custodial obligations and associated use and management of a particular site or place. For example, the Traditional Owners wish to clean up Goornganggoon to increase the production and quality of freshwater for drinking and to satisfy the spirits of ancestors. Nyul Nyul people wish to restore the Causeway to an open water wetland that facilitates recreational use and recreates an important historical site. The two groups therefore associate good wetland health with the capacity to satisfy cultural responsibilities and engage in valued activities and experiences, what Tipa and Nelson (2008) refer to as “cultural opportunities”.

While Aboriginal people may identify biophysical indicators of wetland health that align with conventional indicators (Townsend et al., 2004; Nursey-Bray and Arabana Aboriginal Corporation, 2015; Gratani et al., 2016), their standards or judgments of these indicators may differ. For example, Bardi Jawi, Nyul Nyul and other Indigenous groups prefer a level of water quality that may exceed conventional environmental standards (Tipa and Nelson, 2008), value some introduced plant species (Bach, 2015), and may accept a level of wetland impact caused by feral species, such as cattle, that are economically valuable (Ens et al., 2016). Another difference is that Aboriginal people may be more concerned with a specific site’s health rather than regional values or threats. Recognising these differences is important in allowing Aboriginal perspectives to inform wetland management, and also relate to how Aboriginal people conceptualise management.

Conventional wetland management generally assumes that the natural values of wetlands are enhanced where human impacts, or even efforts to enhance wetlands, are minimised (e.g. Department of Environment and Conservation, 2012). In contrast, Aboriginal people see human activity as crucial to the maintenance of wetland characteristics that support valued use, experiences, resources and cultural obligations (Rose, 1995; Jenkin et al., 2009; McGregor et al., 2010). Cleaning wetlands provides an example of these different perspectives; while Traditional Owners consider it a critical activity to maintain valued wetland characteristics, cleaning involves disturbance that ecologists generally recommend avoiding (e.g. Pettit et al., 2016). For Bardi Jawi, Nyul Nyul and other Aboriginal groups, respectful human behaviour is also important for ensuring wetland health. Respectful
human behaviour can include continuing to visit places, speaking to spirits, avoiding culturally-prohibited activities and ensuring Traditional Owners provide permission to access, use or manage sites (Wunambal-Gaambera Aboriginal Corporation, 2010; Vigilante et al., 2013). In addition, as suggested by one Nyul Nyul man, ongoing use of sites is important as it provides opportunities for observing and maintaining site condition, activities which once may have been ‘automatic’ as an integrated part of daily life. Scientists commonly acknowledge Indigenous protocols relating to custodial permission and cultural restrictions, and incorporate Indigenous knowledge within standard wetland management approaches (e.g. Ens et al., 2010; Jackson et al., 2014; Dobbs et al., 2016). Less influence has been afforded to how Aboriginal wetland management practices may contribute novel ideas for ecosystem management and conservation outcomes (Humphries, 2007; Ens et al., 2015). This claim is made despite the Ramsar Convention recommending and providing guidance for integrating Indigenous values and practices in wetland management (Pritchard et al., 2016).

Given that the wise use of wetlands requires maintaining ecological character, two cultural dimensions become important: 1) understanding how ecosystem services underpin cultural values and opportunities, and 2) understanding how cultural practices influence a wetland’s ecological status (Pritchard et al., 2016). Research that informs the first dimension includes accounts of Indigenous peoples’ cultural water values (e.g. Yu, 1999; Toussaint et al., 2001), empirical research that associates specific values with ecosystem characteristics and processes (Liedloff et al., 2013; Dobbs et al., 2016; Ens et al., 2016), and frameworks that assist Indigenous people to assess wetland condition based on their own values (Townsend et al., 2004; Tipa and Nelson, 2008). While some evidence linking Indigenous practices to ecological character exists (e.g. Table 4.1, Gammage, 2011; Verzijl and Quispe, 2013), more research is required to understand how these practices have influenced historical wetland condition and how these practices can positively contribute to contemporary wise use.

Adopting the Ramsar Convention’s definition of and guidance for the wise use of wetlands means accepting that healthy wetlands have both a natural and cultural dimension. At least at some wetlands, Indigenous peoples’ practices have influenced,
or continue to influence, their ecological character and therefore comprise an important component of management (e.g. McGregor et al., 2010; Verzijl and Quispe, 2013). Conventional assessments of wetland condition have broadened to encompass human health and well-being (Horwitz and Finlayson, 2011), and indicators of biophysical condition that link to Indigenous knowledge systems (Gratani et al., 2011; Nursey-Bray and Arabana Aboriginal Corporation, 2015). Horwitz and Finlayson (2011) recommend making assessments of wetland ecosystem services routine (also see Pert et al., 2015). Similarly, investigating how Indigenous peoples’ past (or ongoing) practices have or can influence wetland ecological character and long-term ecosystem behaviour, and how such practices can inform management, should also be made routine. The integrated nature of IKS, however, should also be acknowledged and accounted for when investigating practices (Chapter 3). Incorporating IKS will likely require a re-thinking of wetland management, from terminology to ideas, processes and practices (Howitt and Suchet-Pearson, 2006; Noble et al., 2016), facilitated by the mutual learning of Indigenous and non-Indigenous partners (Gratani et al., 2011), and Indigenous project leadership (Hill et al., 2012).

Understanding how and the degree to which Indigenous peoples’ historical practices influenced (or influence) the environment, particularly at a regional scale, is difficult (Head, 1989; Verzijl and Quispe, 2013). Subsequently, within the natural sciences Head (1987, 1989) recommends that archeological and paleoecological environmental reconstructions include a local, or place-based, perspective. Within the social sciences historical ecology also has a local focus by emphasising particular places and events (Szabó, 2010). Similarly, Bardi Jawi, Nyul Nyul and other Indigenous people express concern for specific wetland places and describe preferred wetland condition by referring to particular past time periods (e.g. Toussaint et al., 2001). Also, due to custodial relationships or the specific combination of ecological characteristics, opportunities afforded to an Aboriginal person, family or group at one wetland cannot necessarily be transferred to another. As such, research methods that investigate local place-based historical (and continuing) Indigenous wetland management within a region are both culturally and scientifically appropriate. Similarly, within a region, wetland management can include a focus on specific
CHAPTER 4 - Wetlands that need people: the inter-dependence of Australian Aboriginal use, management and wetland condition

water places to facilitate a diversity of ecological outcomes rather than managing for a “…biodiversity ‘common denominator’” (see Andersen et al., 2005:162).

4.7 Summary

Via analysis of oral history accounts, this study has shown how Bardi Jawi and Nyul Nyul people conceptualise and manage (or aspire to manage) wetlands of importance to them. While oral accounts provide one data set only (Tibby et al., 2008), research has also shown descriptive behavioural accounts. Aboriginal people’s preferences for site restoration and management are motivated by a desire to reinstate the full suite of values and opportunities possible at each site; these can also influence wetland ecological character. Further research is required to understand how these preferences and wetland management practices relate to conservation and other conventional NRM objectives. Conducting such research embodies strong promise to contribute further to achieving recommendations set by the Ramsar Convention, with potential benefits for improving wetland condition and human well-being.

4.8 References

http://dx.doi.org/10.1080/03122417.2014.11682025

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