



Summary

This report describes the wetland values of the arid southern part of the Northern Territory; defined as south of twenty degrees of latitude (20°-26° S & 129°-138° E).

This vast and remote area, measuring about 900km by 650km and covering over 612,000km², has a predominately arid climate and there is a common perception that it has very few wetlands. This is far from the truth. A diverse array of wetland types are described here, including permanent, temporary, saline and fresh water wetlands. The vast majority of arid NT wetlands are episodic, filling occasionally and with water derived from rainfall within the region. Isolated in vast dry surrounding landscapes, these wetlands have a significant biological, economic and visual impact when inundated.

The information in this report is based on a two year inventory that was carried out with assistance from the Commonwealth Government through the Natural Heritage Trust, under the National Wetlands Program. The overall purpose of the inventory was to investigate and document the biological conservation values of wetlands in the study area and assess their national significance.

There has been no previous systematic wetland inventory of this area, or any of the essentially desert parts of Australia. This inventory has combined ground and aerial survey with remote (satellite) sensing and geographic information systems to define and describe the types of wetlands that exist, assess their general biological attributes, and to improve mapping of their distribution. One of the important outcomes has been the development of a functional classification that is relevant to local conditions and reflects local terminology whilst also being compatible with the international classification defined under the Ramsar Convention. The overall value of arid NT wetlands has been assessed for three key biotic groups: birds, plants and fish.

The significance of individual wetlands for conserving biodiversity is difficult to assess quantitatively. Individual wetlands have been assessed against the criteria for inclusion in *A Directory of Important Wetlands in Australia* and a subset have been assessed against the Ramsar criteria for internationally significant wetlands.

Four wetlands in the study area are described in *A Directory of Important Wetlands in Australia*. In this study, a further 47 wetlands of regional or national significance for the conservation of biodiversity have been identified. In some cases descriptions are of a wetland aggregation rather than an individual wetland. The identified significance of the described wetlands ranges greatly. About 30 are good examples of a wetland type in the region and are important elements in the regional wetland 'estate'; providing important habitat for wetland species of plants and animals. Many other wetlands in addition to those identified, are also important as elements in a network of scattered wetland habitat. About twenty of the newly identified important wetlands meet more objective criteria for conservation significance, such as supporting abundant waterbird life or providing core habitat for endemic or threatened species. Of these twenty, eleven wetlands have been identified as potentially meeting the Ramsar criteria for international significance. Subjective interpretation is required in applying some of the Ramsar criteria and so the assessments are not clear-cut.

None of the wetlands have been nominated for inclusion in *A Directory of Important Wetlands in Australia*, or for Ramsar listing. A process of consultation with landholders about possible nominations is proposed. For ten important wetlands, comprehensive descriptions have been prepared in the format used in *A Directory of Important Wetlands in Australia*.

Mapping of wetlands was carried out at a reconnaissance level using remote sensing techniques to analyse satellite images from 2 years of high rainfall. A great many previously unrecorded wetlands have been mapped and a small subset of these allocated to a wetland type. Some wetlands that were already mapped have had their boundaries revised and information recorded about inundation patterns. It was not possible

to obtain information about or map the outline of every wetland, and not possible to allocate every mapped wetland to a wetland type. Consequently it is likely that not all important wetlands have been identified.

The mapping component of the study also included a review of the extent of rivers where they flood out into deserts and the connectivity of river channels that flood out towards other rivers or waterbodies. This has resulted in a new understanding of drainage connectivity which is more coordinated than pre-existing mapping indicates. The boundaries of the nationally defined river basins were reviewed in the light of new information on drainage systems. Some minor changes and one major change are proposed to the existing boundaries, adding significantly to the size of the Lake Eyre Drainage Division.

The study included a review of wetland classification issues and proposes a classification system that will be effective for summarising and documenting the variety of wetland types in the arid NT. The system is semi-hierarchical and is suitable for adoption in any future, more detailed mapping of arid NT wetlands.

The occurrence and increasing infestation of exotic plant species has been confirmed as the major threat to natural values of wetlands in the study area. Human alterations to hydrological regimes such as water diversions and draining appear to be having little impact at present. The long-term impact of introduced herbivores is impossible to assess from a rapid reconnaissance level survey. A number of instances of landholders fencing wetland areas of their own volition is indicative of the high value that is often placed on natural and aesthetic values along with importance for domestic stock. Nevertheless, fresh water wetlands of virtually all types are focal points for domestic stock, for both food and water, and some adverse impact is inevitable.

Wetlands form a relatively small proportion of the landscape of the study area and most of them are dry most of the time. Nevertheless they support a diverse and distinctive range of plants and animals. The survey component of the inventory benefited greatly from being carried out in a period of extremely high rainfall across much of the study area. This resulted in most of the wetlands that were surveyed being observed whilst they were either inundated or whilst the effects of inundation were still evident in the vegetation.

Survey work was focused on defining wetland types and allocating individual wetlands to types, as well as assessing significance for biodiversity, condition and threats. The range of wetland types was sampled across most of the geographic spread of the study area. Survey work included counting wetland birds, recording plants species present, sampling aquatic invertebrates and fish and describing the soils, landform and vegetation structure.

Vegetation was the most consistently sampled part of wetland biota because it persists beyond periods of inundation and accordingly, has a key role in determining wetland types. A large amount of data has been collected for wetland plant species, adding to both distributional and ecological knowledge. Confirmed species records were obtained for 321 sites, including 269 threatened, rare or poorly known (data deficient) taxa. Over 800 voucher specimens have been lodged with the NT Herbarium, contributing to current and future taxonomic investigations.

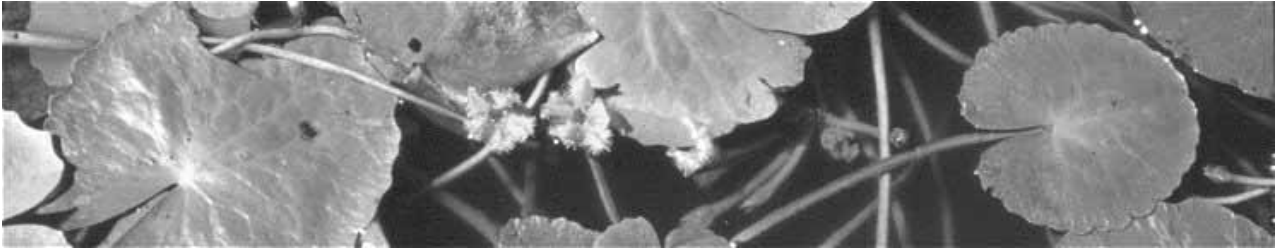
A preliminary list of wetland plants has been produced for the study area. A variety of nationally rare wetland plants grow in the study area, including some that are nationally vulnerable. Furthermore, there are populations of wetland plants that are significantly disjunct from their main populations and these may have distinct genetic compositions. This report also includes a summary of the major groups of wetland plants, providing an introduction to new workers in the area.

Waterbirds were recorded from ground, boat or aerial observation, at a total of 115 wetlands, contributing to both the NT Fauna Atlas and the national bird atlas (created by Birds Australia). Both new and pre-existing data were used to review current knowledge about wetland birds in the arid NT. New observations include significant records from areas that have been rarely-surveyed or never previously surveyed for waterbirds, including Lake Mackay and the inter-dune lakes of Snake Creek on the eastern floodout of the Finke River. The vast salt lakes in the west and south west of the study area have been confirmed as having national and international importance for wetland birds, with detailed counts at Lake Mackay and Lake Lewis. While many of these lakes only fill infrequently, when they are full they support many thousands of waterbirds and significant breeding events. Other wetland types have confirmed values for waterbirds, although, none support the vast populations of the salt lakes. However, compared to salt lakes, they are generally more frequently filled. They include waterholes in rivers, river

floodout swamps, Bluebush (*Chenopodium auricomum*) swamps, Coolabah swamps and various types of claypans, grassy, herbaceous and samphire swamps.

Fish and aquatic invertebrates were sampled opportunistically, however, a review of new and pre-existing data was conducted to summarise the distribution of species in the study area. This is combined with a review of the abundance and distribution of permanent waterbodies. Fish and invertebrate specimens have been lodged at museums or with other researchers. Fish were collected from several river systems for which no vouchered museum records previously existed. The first vouchered records were obtained of *Porochilus argenteus* in the Sandover River system and *Neosilurus hyrtili* in Kurundi Creek. Fish samples from the survey are contributing to genetic taxonomic-distribution work by Deakin University and the South Australian Museum. Aquatic invertebrates were collected at 85 sites and fishes collected at 53 sites. There are fish that are significantly disjunct from their main populations and these may have distinct genetic compositions. Indeed there are 3 species of fish which are endemic to the study area. At least one other fish is recognised as possibly distinct but has not been formally described. The aquatic invertebrate fauna of the study area is for the most part poorly known. Waterholes of the West MacDonnell Ranges and those of the George Gill Ranges have been previously surveyed for aquatic fauna and both areas have distinctive species assemblages, reflecting their geographic isolation and the presence of permanent pools or semi-permanent permanent pools and springs.

This report is in two volumes. Volume one is the main part and is for general public access. Volume 2 contains information collated about individual wetlands. It includes descriptions of important wetlands in the format required for inclusion in *A Directory of Important Wetlands in Australia*. Negotiations with landholders are ongoing for some sites and these are not to be included in the Directory without landholder permission. Accordingly Volume 2 is not for public access.



Acknowledgments

A great many people from a variety of professions and occupations have contributed to the work reported here. Peter Latz conducted survey work and assisted with plant identification. More importantly he generously shared his insights into arid NT wetlands, particularly in prioritising survey areas and in interpreting results. Roger Jaensch of Wetlands International played a valuable role in refining the scope of the project and the methodology to be employed. Roger provided a national and international wetland perspective to the task and also assisted with creating a working classification. Roger also provided valuable comments on a draft of this report. Graham Ride and Robert Read provided advice on aspects of hydrology. Robert Read also assisted with some of the survey work, and bird counts in particular and also assisted with descriptions of some wetlands that were not formally surveyed. The contributions of various museums in providing specimen records of fishes and aquatic invertebrates is acknowledged and particularly Helen Larson of the Northern Territory Museum. Dr. Mark Adams and Terry Sim of the South Australian Museum gave particular advice and encouragement regarding sampling of fishes. Dr. Jim Puckridge and Peter Hudson of Adelaide University advised on wetland sampling methodology. Rachel Paltridge undertook some of the survey work, identified invertebrate samples and conducted liaison with some traditional Aboriginal owners. Virginia Garner assisted with the laboratory testing of water samples for pH and conductivity. Ray Chatto was the bird observer for the Lake Mackay aerial survey. Various members of the feral camel aerial survey program assisted in recording wetlands but the roles of Keith Saalfeld and Dr. Glenn Edwards in allowing the feral camel survey to record valuable wetland data are particularly acknowledged. Ross Brian and Stephen Eldridge advised on the existence and condition of various tracks. Grant Allan provided advice on satellite imagery. Robert Henderson provided information on waterbodies and fish in the Alice Springs area. Dawn Morgan volunteered for a month of fieldwork and undertook the bulk of the data entry task. Bernadette Bostock and Stephen Ryan of Deakin University participated in some of the fieldwork with an emphasis on fish sampling and undertook identification of invertebrates. Stephen Ryan also assisted with obtaining museum fish records. The following people also took part in field survey work: John Westaway, Naomi Briggs, Michael Hewett, Michael Reiff, Robert Reiff, Greg O'Neil, Bernie Shakeshaft, Paddy Lewis Japanangka, Alice Michaels Nampitjinpa, Lindsay Turner Jampitjinpa, Mitjili Gibson Napanangka, Cindy Gibson Nakamarra and Letitia Bartlett Nungarrayi. Catherine Nano, Jeff Cole, Don Langford and their Finke Bioregion Survey team provided data and various services and information. Alison Kennedy, Mandy Bowman and Diana Whitehouse provided information on land unit mapping and Alison also advised on soil survey and analysis. Di Wade and Will Dobbie provided contact details for cattle stations. Jeff Turpin and Naomi Briggs assisted with soils analysis and Naomi Briggs assisted with data entry. Bradley Nott and colleagues at the Central Land Council assisted with consultation with traditional Aboriginal owners. Several property owners plus the Avon Downs police, provided the use of accommodation facilities. Sue Cawood provided office support including typing and data entry. Penny Johnston helped with proof reading. Kathy McConnell assisted with document production. Jodie Mason did the layout of the photographic wetland guide. Mark Harris determined the elevation data for the summary of major drainage lines. Dr Greg Leach, Dr Helen Neave and Dr Anthony Bowland provided managerial oversight of the project. Mark Richardson and Graham Phelps made staff from the Alice Springs Desert Park available for some survey trips and approved the secondment of Jason Barnetson to the project for 9 months. Hillary Coulson assisted in the Alice Springs Herbarium. Darren Schunke provided local knowledge of aquatic environments in the George Gill Range and Palm Valley area and Dennis Matthews provided additional information on the longevity of waterholes in the Palm Valley area. Various members of the PWCNT staff provided information on particular wetlands including Chris Day, Tim Hall and Michael Barritt.

A great many landholders and managers provided invaluable information about wetlands on their properties and advice about access routes and conditions.

Many other people provided information about particular areas or assisted in other ways. Their input is gratefully acknowledged.

Roles of the Authors

All of the authors were members of staff in the Scientific Services Division of the Parks and Wildlife Commission of the Northern Territory (now called the Biodiversity Conservation Unit of the Parks and Wildlife Service of the NT, under the Department of Natural Resources, Environment and the Arts).

Angus Duguid was the project leader, with responsibility for project design, implementing the field program, data analysis and writing the report.

Jason Barnetson took part in a majority of survey trips, taking a lead role in bird observation and sampling aquatic life and soils. He had a major role in logistic support for the survey program as well as assisting in a great many other aspects, including data management and reporting of fish survey methods. Jason was on secondment from the Alice Springs Desert Park.

Dr. Bretan Clifford had a major role in extending the mapping of wetlands, using satellite imagery and geographic information systems, including the review of drainage connectivity and the boundaries of national drainage basins. He also took part in aerial survey and preparation of climatic data, maps and tables in the report.

Dr. Christoph Pavey had a major role in the review of wetland birds in the study area.

David Albrecht is the botanist at the Alice Springs Herbarium. He was involved in designing the botanical aspects of the field survey program, assisted with some wetlands specific field trips as well as surveying wetlands opportunistically whilst on general botanical field trips. He had the lead role in creating the list of wetland plants for the study area and in identifying pressed plant specimens.

Jennifer Risler took part in the field program as a botanist and in plant identification in the Herbarium.

Megan McNellie was involved in the early part of the study, collating and preparing satellite imagery and other geographical data as well as participating in preliminary field trips.