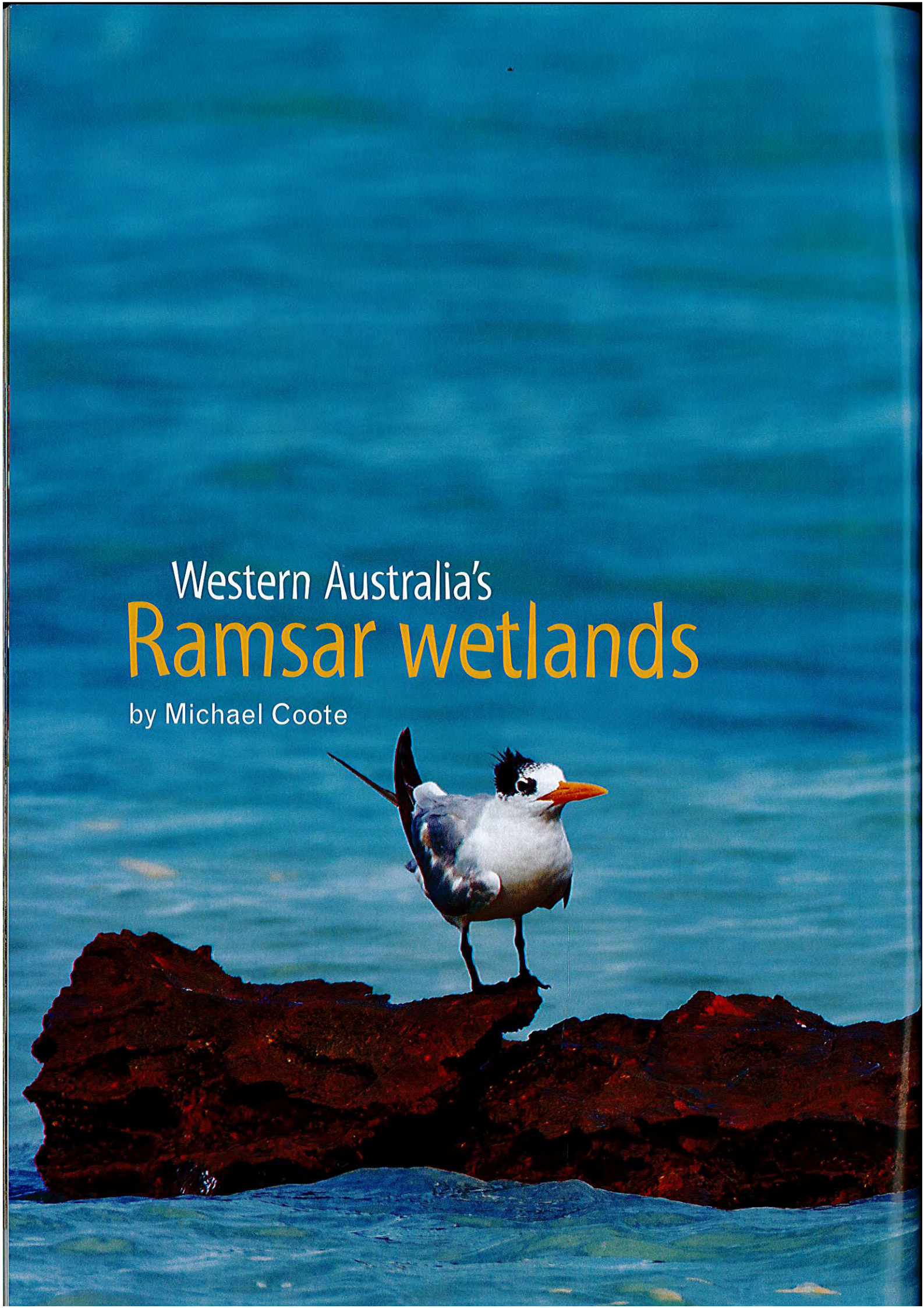
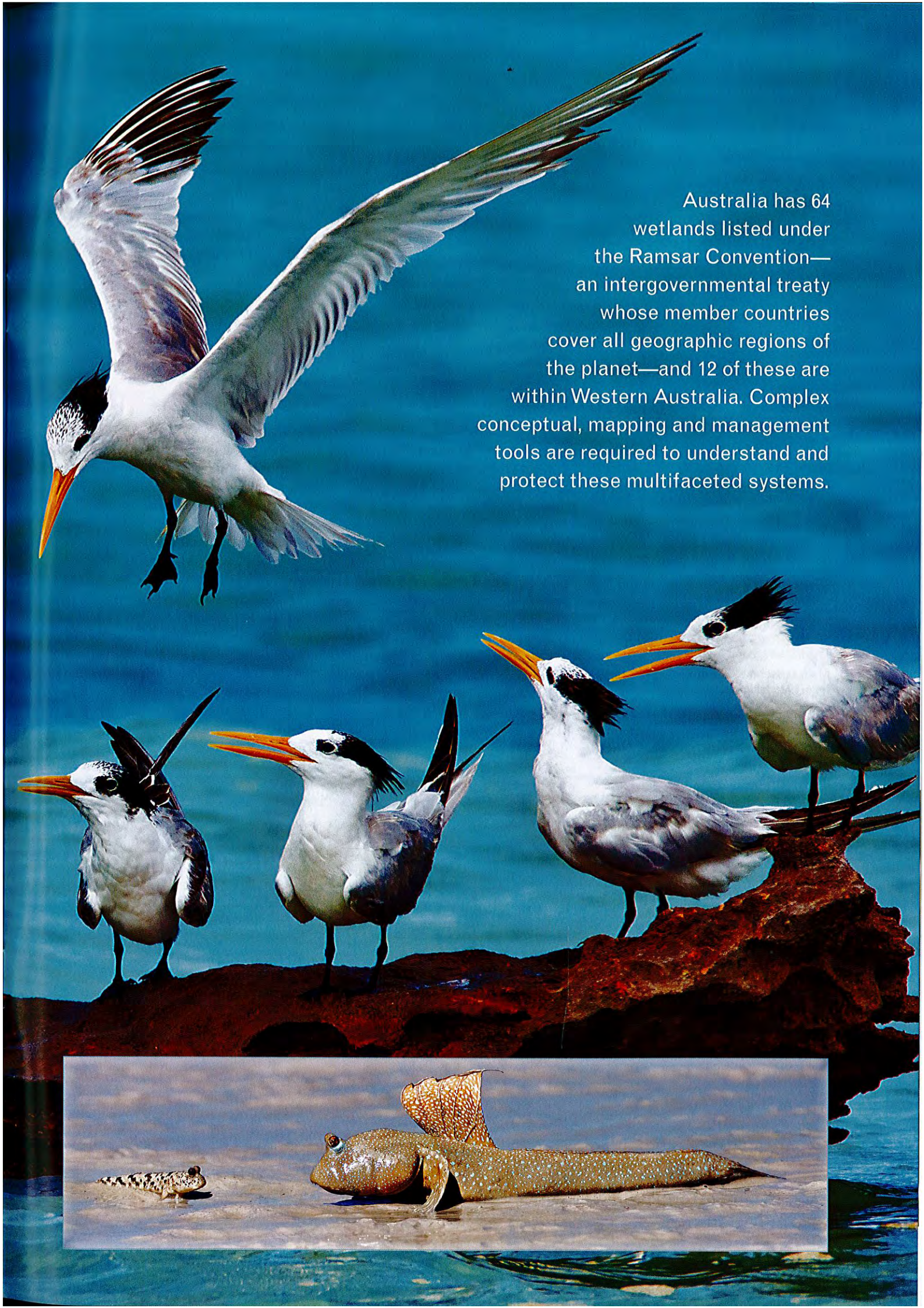
Western Australia's Ramsar wetlands

by Michael Coote





Australia has 64 wetlands listed under the Ramsar Convention—an intergovernmental treaty whose member countries cover all geographic regions of the planet—and 12 of these are within Western Australia. Complex conceptual, mapping and management tools are required to understand and protect these multifaceted systems.

Wetlands—once seen as swampy places of little aesthetic or conservation value—are now recognised as some of the most biologically diverse of all ecosystems. Wetlands can indeed be swamps (and there is a diverse range of these) as well as marshes, ponds, lakes, saltmarshes, fens, creeks and rivers. These areas provide habitats for a wide range of animals, from the waterbirds which are probably the most well recognised and studied wetland species, to equally important but perhaps less charismatic animals including species of amphibians, reptiles, insects and mammals. As well as creating habitat for fauna, our wetlands provide a range of important ecosystem services including storing and naturally purifying water and absorbing carbon. They are worthy of our protection and conservation.

Australia is one of 160 countries that is party to the Ramsar Convention on Wetlands, which was signed in Ramsar, Iran in 1971. This treaty, officially known as *The Convention on Wetlands of International Importance, especially as Waterfowl Habitat*, currently lists more than 1,906 wetlands worldwide covering some 186.5 million hectares. The Ramsar Convention aims to provide the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.

Australia has a great tradition of identifying important wetlands across the breadth of the continent. It was the first to nominate a site in 1974—Cobourg Peninsula in the Northern Territory—and now has 64 wetlands listed under the Ramsar Convention. Twelve of these sites occur in Western Australia, covering a total area of 514.8 thousand hectares.

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Main Lesser crested terns.
Insert Mudskippers, Roebuck Bay.

Above right Waders in Roebuck Bay.
Photos – David Bettini

Ramsar wetlands in WA

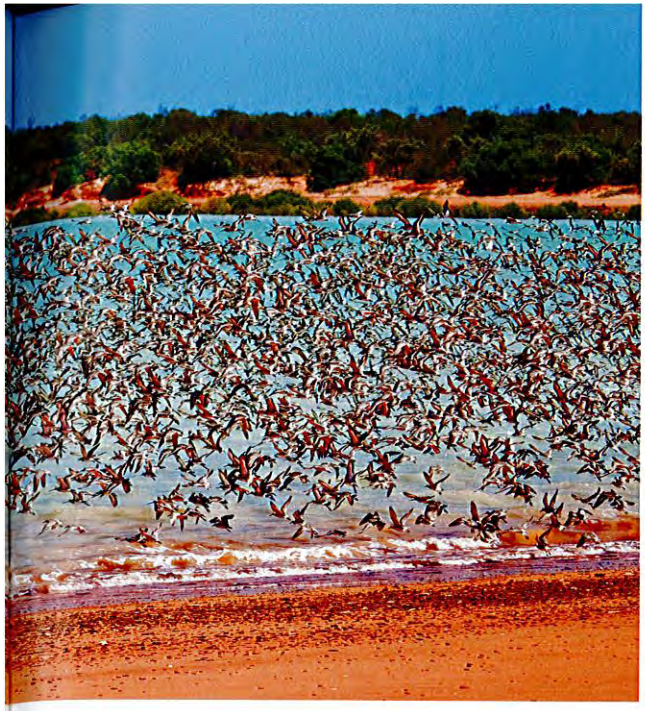
The 12 WA wetlands included on the Ramsar list are spread across the state. Four are in the Kimberley region: the Ord River Floodplain, near Wyndham (see 'Wetland wonders in the far north: protecting Parry Lagoons and Ord River nature reserves' on

What makes a wetland internationally important?

The Ramsar Convention recognises wetlands under nine conditions. Listed wetlands can meet any one of these, however, in practice, they normally have to meet one other criterion besides Criterion 1 (known as group A—'Sites containing representative, rare or unique wetland types'). Criterion 1 is: A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.

Group B—'Sites of international importance for conserving biological diversity'—includes three criteria based on species and ecological communities. These are: Criterion 2—A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities; Criterion 3—A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region; and Criterion 4—A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.

There are also two specific criteria based on waterbirds: Criterion 5—A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds; and Criterion 6—A wetland should be considered internationally important if it regularly supports one per cent of the individuals in a population of one species or subspecies of waterbird. The specific criteria based on fish are Criterion 7—A wetland should be considered internationally important if it supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity; and Criterion 8—A wetland should be considered internationally important if it is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend. Criterion 9, which is based on other taxa, is: A wetland should be considered internationally important if it regularly supports one per cent of the individuals in a population of one species or subspecies of wetland-dependent non-avian animal species.



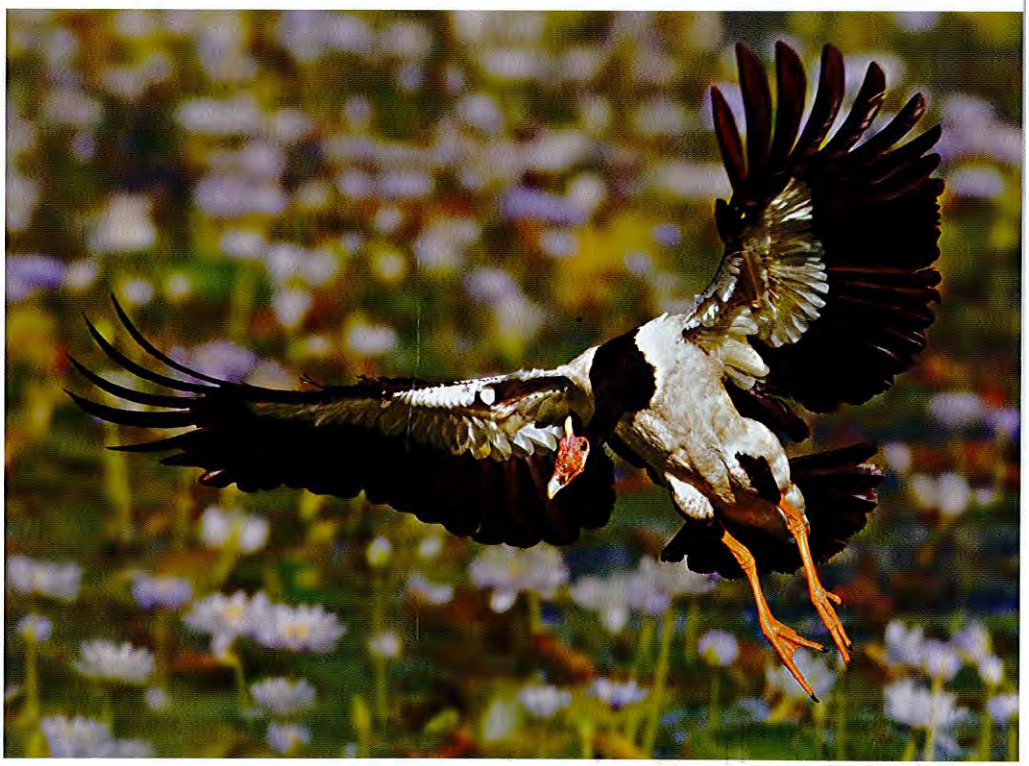
page 32); lakes Argyle and Kununurra, near Kununurra; Roebuck Bay, near Broome; and—the largest in the state at 175,487 hectares—Eighty Mile Beach, south of Broome. Each of these wetland sites is listed for at least five of the nine Ramsar criteria, with lakes Argyle and Kununurra and Roebuck Bay listed for eight—every criterion except the last.

There is one Ramsar site in the Perth metropolitan area—Forrestdale and Thomsons lakes, with an area of 784 hectares—while nearby Becher Point, at Rockingham, is 677 hectares. The state has two Ramsar-listed wetlands in the South Coast Region—the Lake Warden system and Lake Gore—both near Esperance, and one in the Warren Region, the Muir-Byenup system, near Manjimup. There is also the Peel-Yalgorup system, near Mandurah, the Vasse-Wonnerup system near Busselton and Lake Toolibin near Wickepin.

These important wetlands are recognised internationally as having particular biodiversity significance. Roebuck Bay and Eighty Mile Beach in the West Kimberley have international recognition because of the migratory wader birds that fly many thousands of kilometres to take advantage of the rich feeding grounds of the mudflats of these near-shore tropical embayments.

Other Ramsar sites are important for resident waterbirds that use the habitat in part of their life cycle. The Peel-Yalgorup system and the Vasse-Wonnerup system support high numbers of many resident waterbirds including black swans (*Cygnus atratus*) and pelicans (*Pelecanus conspicillatus*) that rely on the permanent estuarine conditions with highly productive sediments (see 'Wetland wonders', *LANDSCOPE*, Winter 2010).

Many of these systems are also vestiges of threatened ecological communities such as Toolibin Lake in the southern wheatbelt—the last, large, sheoak (*Casuarina obesa*) dominated wetland in the inland agricultural area of south-western Australia. Wetlands of this type were formerly widespread; however, most have now become severely degraded by secondary salinisation. Toolibin Lake is listed as a threatened ecological community under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. The listing is recorded as 'Perched wetlands of the Wheatbelt region with extensive stands of living sheoak and paperbark across the lake floor—Toolibin Lake' (see 'Triple test: recovering natural biodiversity at Toolibin Lake and Lake Bryde', *LANDSCOPE*, Winter 2010).



Above right The location of Ramsar-listed wetlands in Western Australia.

Right Magpie geese are a migratory species found in the northern Ramsar wetlands.
Photo – David Bettini

Ecological character

Designating a wetland as a Ramsar site carries with it certain obligations, including managing the site to retain its 'ecological character' and having monitoring and evaluation in place to detect if any threatening processes are likely to, or have altered, that character. Thus, understanding and describing the ecological character of a Ramsar site is a fundamental management tool which should form the baseline or benchmark for management planning and action, including site monitoring to detect negative impacts.

Australia has been a leader in developing policy to identify the ecological importance of wetlands in the landscape and many of the initiatives in wetland conservation policy have been developed by a collaborative team of state agency-based aquatic ecologists and the federal Department of Sustainability, Environment, Water, Population and Communities. One of these initiatives has been the development of technical descriptions of the ecological character of listed sites.

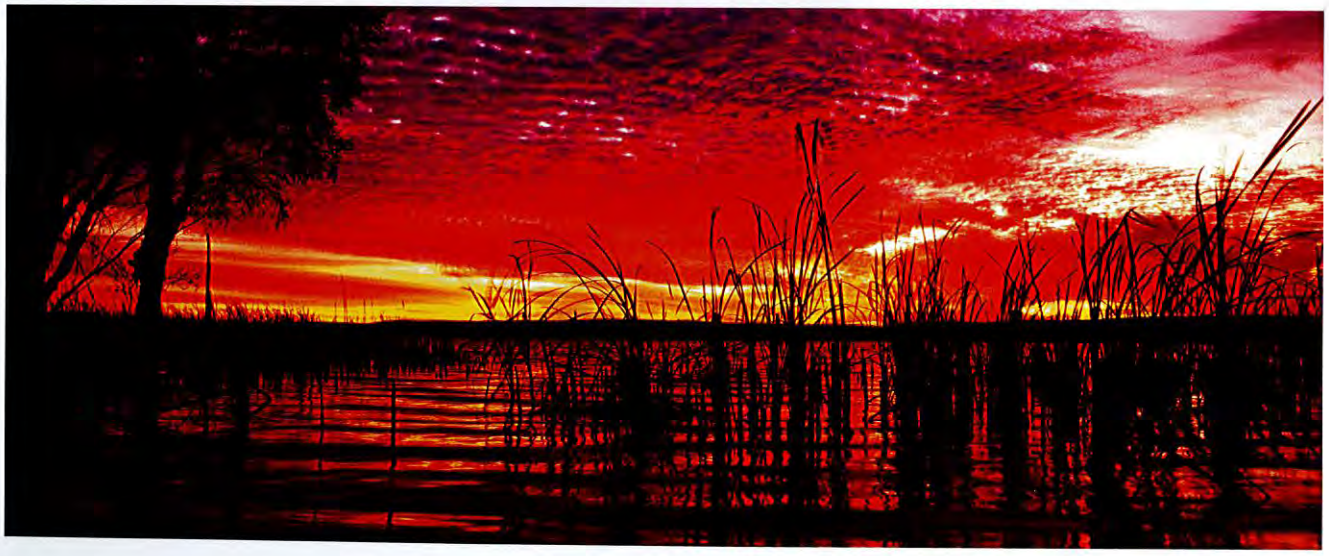
The core of an ecological character description, or ECD, is the description of the components, processes, benefits and services of the wetland and how they are linked at the time of listing. The components and processes of the wetland influence and determine the habitats, ecological communities and species that are found at a site and the criteria for which it was listed. These, in turn, influence the benefits and services provided by the wetland site. Mapping out and understanding ecological character can be challenging. One tool to assist in this process is the use of conceptual models. Each ecological character description has a conceptual diagram indicating the broad relationships that exist between components and processes and how they interact to provide the critical supporting services of the site.

Below A wetland near Perth.
Photo – Marie Lochman

Bottom Forrestdale Lake.
Photo – Jiri Lochman

Threats to ecological character

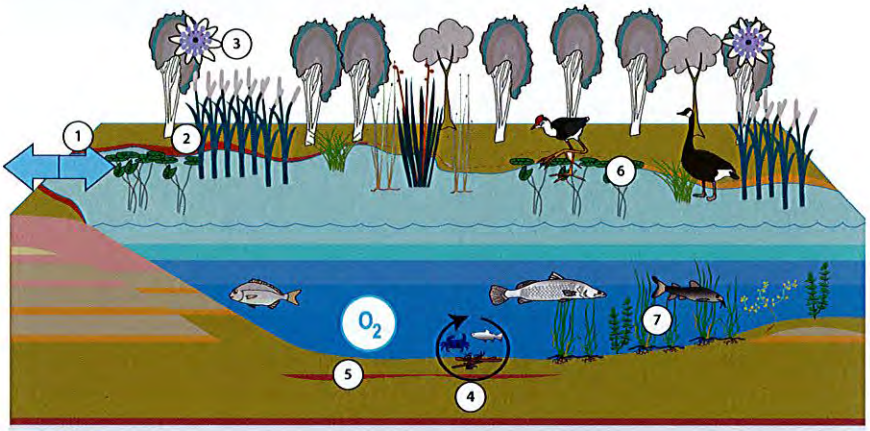
Wetlands are complex systems and an understanding of their components and processes and the interactions or linkages between them is necessary to describe ecological character. Similarly, threats to ecological character need to be described not just in terms of their potential effects, but the interactions between them. One mechanism for exploring these relationships is the use of stressor models. Stressors are defined as 'physical, chemical, or biological perturbations to a system that are either foreign to that system or natural to the system but applied at an excessive (or deficient) level'.



Above Frogs are an important indicator of a heathy wetland system.
Photo – David Bettini

Above right Mangrove on tidal flats in the Kimberley.
Photo – Dennis Sarson/Lochman Transparencies

Right A simple conceptual model of Lake Kununurra showing the major interactions between components, processes and services, both positive and negative.



1. Controlled, sustained releases from Lake Argyle keep water levels constant.
2. Constant water levels enable the establishment of riparian and submerged vegetation.
3. Riparian vegetation has a high density of weeds.
4. Stable water levels and temperature year round result in high primary and secondary productivity.
5. Constant flow-through mixes the water column which remains oxygenated.
6. Diversity and density of vegetation provides feeding, roosting and nesting habitat for waterbirds.
7. Diversity of vegetation and density of submerged vegetation provides habitat for native fish.

In evaluating threats it is useful (in terms of management) to separate the driver or threatening activity from the stressor, as this helps to clearly determine the causes of impacts to natural assets. This provides clarity for the management of natural resources by focusing management actions on threatening activities that cause the stressors. For example, increased turbidity may be identified as a threat for seagrasses in Roebuck Bay. However, management actions cannot be targeted at increased turbidity without some understanding of why the increase is taking place. By identifying the threatening activities that could contribute to increased nutrients (for example, stormwater inflows or dredging), management actions can be targeted at these threatening activities and reduce their impact.

The Ramsar Convention has defined a 'change in ecological character' as the human-induced adverse alteration of any ecosystem component, process and or ecosystem benefit or service. To detect change, it is necessary to establish a benchmark for management and planning purposes. Ecological character descriptions form the foundation for a site management plan and associated monitoring and evaluation activities.

Limits of acceptable change

The description of the ecological character of Ramsar sites includes guidance for managers on the extent to which changes in a particular measure or feature are considered acceptable. This could be changes in the population of certain species, changes in the number of hectares covered by a particular wetland type or the range of a certain water quality parameter. The inference is that if the particular measure or parameter moves outside the 'limits of acceptable change', this may indicate a change in ecological character that could lead to a reduction in or loss of the values for which the site was Ramsar listed.

Top right Yellow-spotted goanna.
Photo – David Bettini

Top left Lake Kununurra.
Photo – Col Roberts/Lochman Transparencies

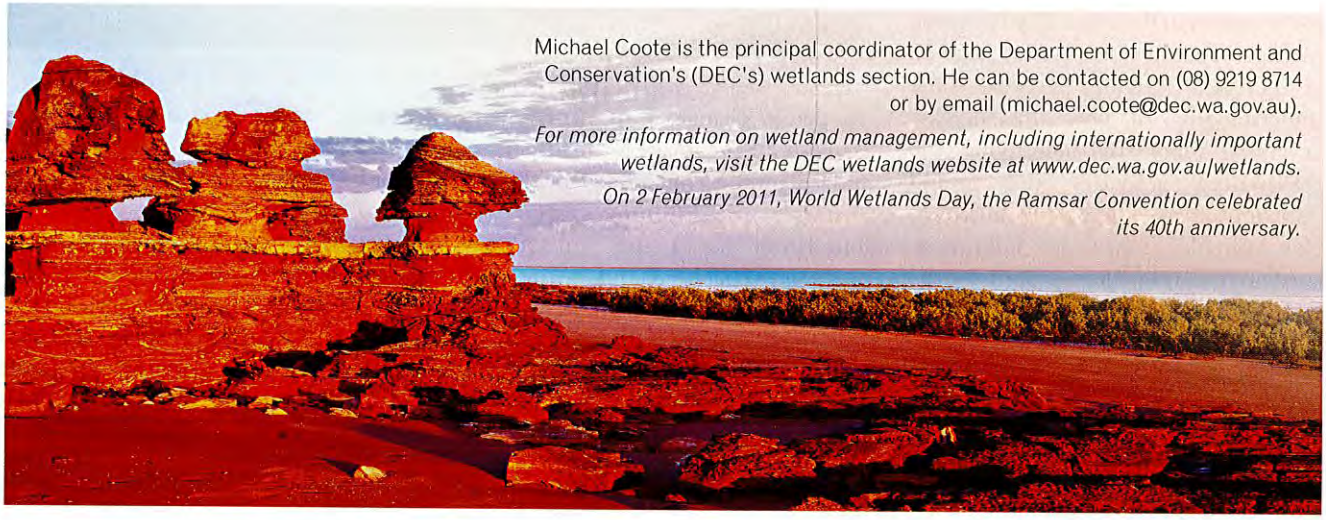
Above Black swan and cygnets.
Photo – Stuart Millar/Lochman Transparencies

Below Roebuck Bay.
Photo – David Bettini

Managing these limits requires a monitoring and evaluation system for detecting a trend that, if left unchecked, may move beyond natural variability. This may mean accounting for changes in the frequency and magnitude of extreme events such as cyclones, changes in the temporal or seasonal patterns of rainfall and changes in spatial variability of habitat condition, as well as changes in the mean or median conditions of, for instance, the salinity of a wetland.

In a perfect world with complete scientific and ecological knowledge, limits of acceptable change could be set to match the tolerances or optimum conditions for the key biological components and processes for which the wetland site was listed. In this manner, limits could be set to guarantee that ecological character is maintained. However, this information is rarely available for the most well-studied species, let alone the more cryptic organisms. In the absence of this complete knowledge, a conservative approach is most often adopted.

The role of wetland management is to detect change with sufficient time to plan and take management actions before an irreversible change in the ecological character happens. The management plan for a site must develop and implement a set of management triggers that sends a clear message to site managers that management has to be adapted in order to mitigate the early warning trends. It is hoped that by adopting adaptive management styles, the WA sites listed under the Ramsar Convention will retain their biodiversity values for future generations to appreciate as much as we can today.



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For more information on wetland management, including internationally important wetlands, visit the DEC wetlands website at www.dec.wa.gov.au/wetlands.

On 2 February 2011, World Wetlands Day, the Ramsar Convention celebrated its 40th anniversary.

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