WETLANDS

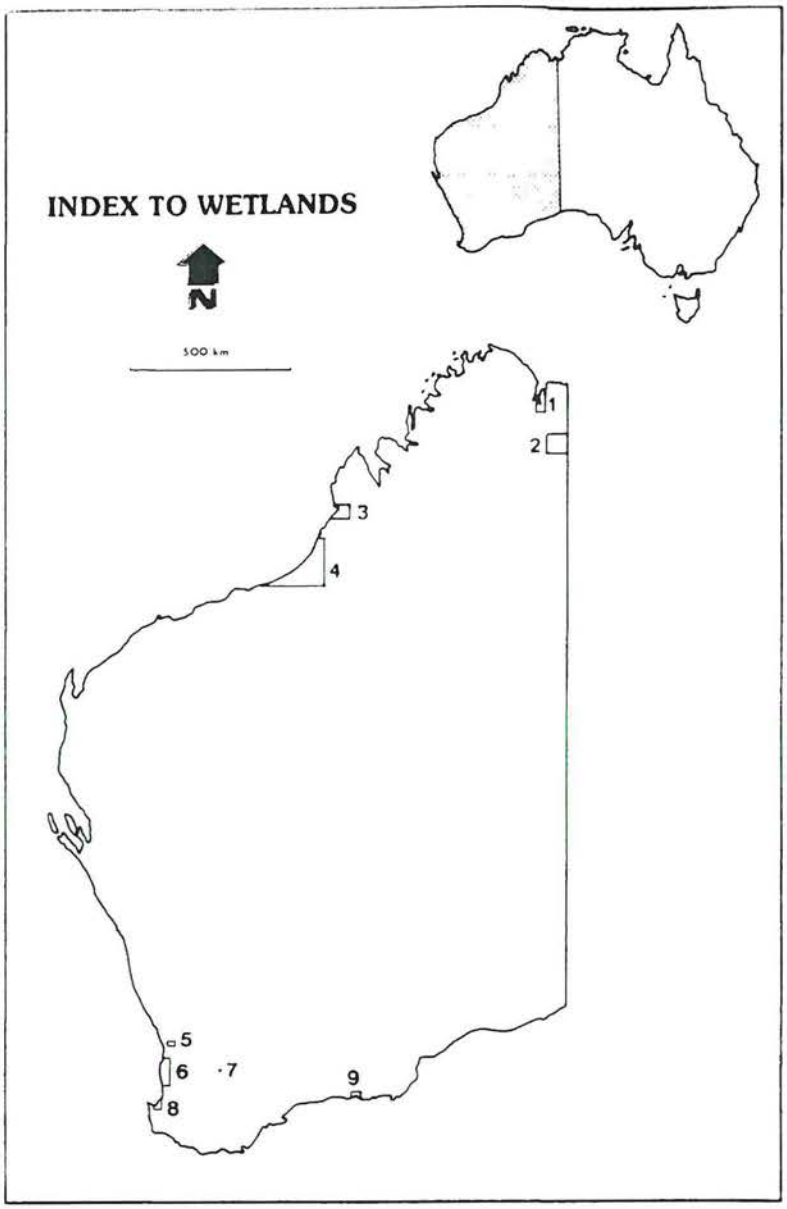
NOMINATED BY THE

STATE OF WESTERN AUSTRALIA
AUSTRALIA

FOR INCLUSION
ON THE

LIST OF WETLANDS
OF INTERNATIONAL IMPORTANCE

JANUARY 25TH 1990



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Note: **The wetlands nominated herein do not include any privately owned land except where owners have requested its inclusion.**

NAME: ORD RIVER FLOODPLAIN

LOCATION: (a) Latitude (approx.) - 14°51'S to 15°39'S
Longitude (approx.) - 128°12'E to 128°33'E

(b) Description - the mangroves and mudflats on the eastern side of Cambridge Gulf, Kimberley, and along the east arm of the Ord River as well as the seasonal wetlands to the south, including Parry Lagoons and Jobalong Flat, and permanent waterholes such as Alligator Hole and Palm Spring. The proposed Wetland of International Importance is contained in existing and proposed nature reserves.

(c) Map - Medusa Banks SD52-10 and Cambridge Gulf SD52-14, Series R502, 1st edn - AAS. (Australia 1:250 000, Royal Australian Survey Corps, 1959).

AREA: The proposed Wetland of International Importance is contained in an area of approximately 102 000 ha.

RESERVATION STATUS: The wetland area consists of Nature Reserves ↑30866, ↑1058, ↑1059, ↑31636, ↑3197 and the proposed northwards extension of ↑3197, which will include the False Mouths of the Ord. The reserves are vested in the National Parks & Nature Conservation Authority of Western Australia and managed by the Department of Conservation & Land Management.

There is a small freehold area around Twenty-mile Lagoon, within Nature Reserve ↑31636, which is not included in the proposed Wetland of International Importance.

PHYSICAL DESCRIPTION: The seasonal wetlands south of the river are fresh and sometimes fringed by low shrubs or trees. They are surrounded by a flat, grass-covered plain. The mud flats along the river and the eastern side of Cambridge Gulf support patches of Sporobolus grassland and samphire. They are incised by numerous creeks and channels, along which mangroves grow. Mangroves also grow along the Ord River and the seaward side of the mudflats.

VEGETATION: The grassland around the seasonal wetlands is dominated by cane-grass Oryza australiense. Parry Lagoons is surrounded by mudflats

containing the samphires Halosarcia indica leiostachya and Tecticornia verrucosa and grasses. At the edge of the water the sedge Eleocharis brassii and a low shrub Aeschynomena indica occur. In the water a taller shrub, Sesbania cannabina, grows seasonally and a variety of water lilies and other aquatics occur, including Ipomoea diamantinensis, Nymphaea gigantea, Nymphoides sp., Utricularia sp. and Ceratophyllum sp. A few Terminalia sp. trees grow in some areas.

Seasonal wetlands occurring on black soil plains, including Jobalong Flat, are dominated by sedges, principally Eleocharis sp. However, in some cases Terminalia sp. trees also occur, together with low shrubs, water lilies (Nymphaea gigantea, Nymphoides indica and Nymphoides crenata) and other aquatics.

Permanent waterholes are fringed with a variety of trees, including Barringtonia acutangula, Melaleuca argentea and Terminalia platyphylla. Pandanus spiralis occurs around Palm Spring.

In the northern part of the Wetland of International Importance zonation is evident in the mangrove community fronting onto Cambridge Gulf. Mangrove species in the seaward zone, a woodland about 8 m high, include Sonneratia alba, Avicennia marina and Aegiceras corniculatum. Behind this, in a woodland 10 m high, grow Bruguiera parviflora, Avicennia marina and Aegiceras corniculatum, then there is a belt of Rhizophora stylosa 12-15 m high. On the landward edge is a 4 m high thicket of Avicennia marina, Ceriops tagal and Aegialitis annulata. Patches of Sporobolus virginicus grassland and samphire grow on the mudflats behind the mangroves.

Other species of mangrove occur occasionally in the northern section or along the creeks and the Ord River. These include: Xylocarpus moluccensis, Excoecaria agallocha and Camptostemon schultzii.

WATERBIRD CONSERVATION VALUES:

The seasonal wetlands on the Ord River floodplain support large numbers of waterbirds : totals of 13 000 in May 1979, 20 000 in March 1980, 15 000 in January 1981 and 27 000 in May 1986 have been recorded. They regularly contain more than 10 000 ducks : in May 1986 18 400 ducks were recorded

there, including 6 500 Hardheads Aythya australis and 6 000 Grey Teal Anas gibberifrons, and in November 1968 15 000 Plumed Whistling Duck Dendrocygna eytoni were seen in the Parry Lagoons. The lagoons are also an important site for waders: several thousand Little Curlews Numenius minutus and Oriental Pratincoles Glareola maldivarum and hundreds of Wood Sandpipers Tringa glareola have been counted. The Parry Lagoons are probably the most important site in Australia for Wood Sandpipers and Marsh Sandpipers Tringa stagnatilis. In years when local rainfall is good the lagoons and other seasonal wetlands constitute one of the major breeding areas for waterbirds in the Kimberley and an enormous number and diversity can be seen. Fifty-four species were recorded in May 1986.

GENERAL CONSERVATION VALUE:

The eastern side of Cambridge Gulf has some of the best areas of mangroves in the Kimberley in terms of species diversity, structural complexity, and massiveness of the stands. Besides being of great conservation value in their own right, the mangroves contain a number of species of terrestrial bird which are restricted to this type of habitat or rainforest: the Black Butcherbird Cracticus quoyi is an example whose population in the Kimberley is limited to the area around Cambridge Gulf. The mangroves support at least six species of insectivorous bat, Black Flying-foxes Pteropus alecto and an undescribed species of mozaic-tailed rat Melomys.

The lower Ord River contains a high density of Salt-water Crocodiles Crocodylus porosus, a species declared "in need of special protection" under the Western Australian Wildlife Conservation Act, and the surrounding grasslands form the only area in Western Australia where Zitting Cisticolas Cisticola juncidis occur.

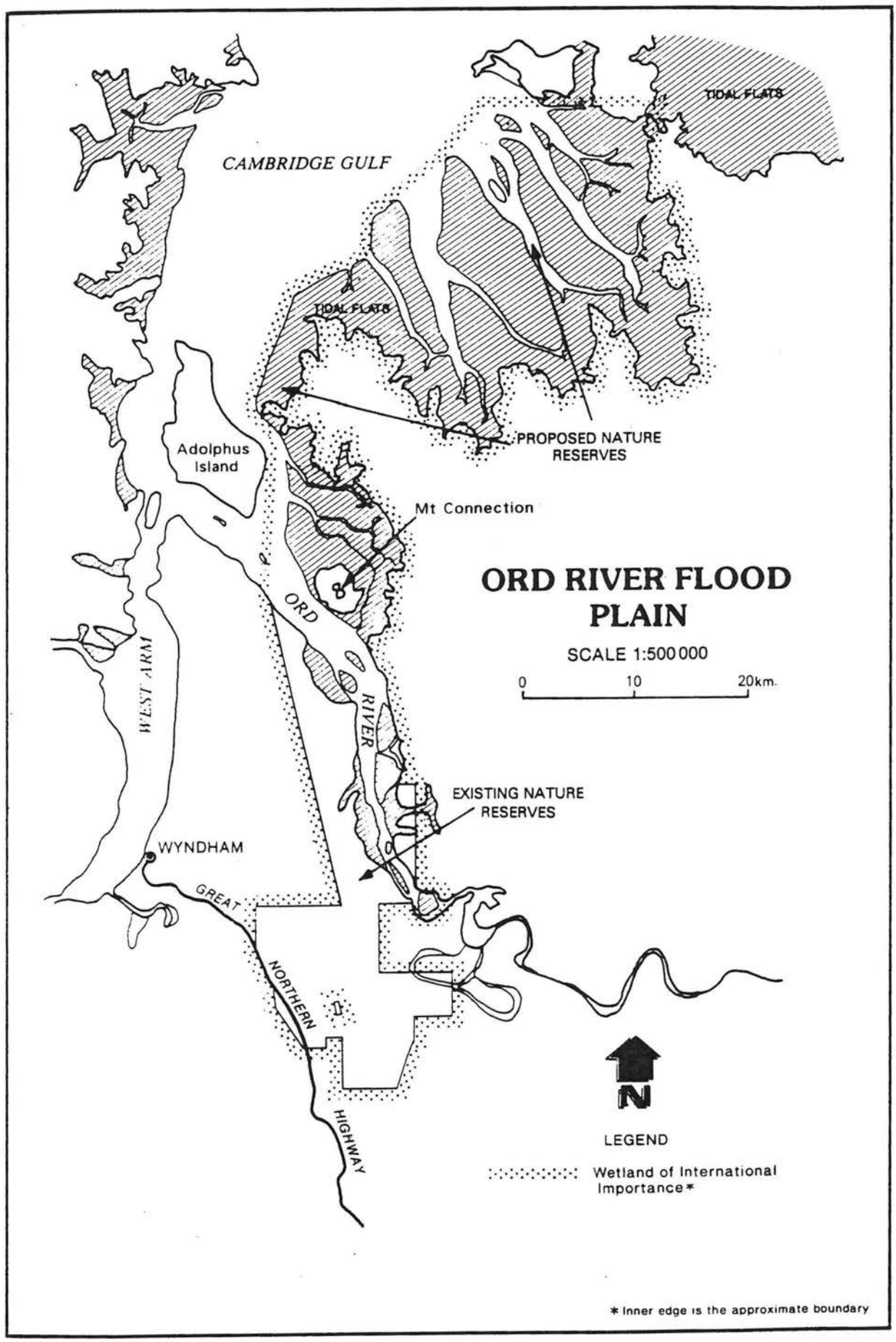
LAND USE:

The seasonal wetlands are visited regularly by tourists from Wyndham, which is about 15 km west of Parry Lagoons. The remainder of the reserve area attracts little human usage but the surrounding land is leased for the grazing of cattle, which frequently stray onto the reserves and cause great damage to the seasonal wetlands, especially in ↑1059.

Mining tenements are held over the majority of the area and exploration for alluvial diamonds is in progress.

MANAGEMENT: Continuing efforts must be made to ensure cattle do not stray into the wetland area and that infestations of Nugurra Burr Xanthium pungens, an exotic plant, do not spread. These efforts constitute part of the normal management of nature reserves by the Department of Conservation & Land Management. Trees of Parkinsonia sp., another exotic plant, occur around some wetlands near Wild Goose Creek and will need to be eradicated. Exploration for diamonds will be allowed to continue, subject to environmental constraints imposed to minimize disturbance and to maintain wetland ecology and habitat. The question of mining will be assessed by the appropriate State authorities in the event of the discovery of commercial diamonds.

SELECTION CRITERIA: Of the recommended criteria to be used in identifying Wetlands of International Importance, the Ord River Floodplain meets criteria 1, 2(a), 2(b) and 3(b).


CAMBRIDGE GULF
TIDAL FLATS
TIDAL FLATS
PROPOSED NATURE RESERVES
Adolphus Island
Mt Connection
ORD RIVER FLOOD PLAIN
SCALE 1:500 000
0 10 20km.
WEST ARM
ORD
RIVER
EXISTING NATURE RESERVES
WYNDHAM
GREAT
NORTHERN
HIGHWAY
N
LEGEND
Wetland of International Importance*
* Inner edge is the approximate boundary

NAME: LAKES ARGYLE & KUNUNURRA

LOCATION: (a) Latitude (approx.) - 15°48'S to 16°50'S
Longitude (approx.) - 128°28'E to 129°00'E

(b) Description - Lakes Argyle and Kununurra and surrounding wetlands, extending southwards from Bandicoot Bar at Kununurra, Kimberley. Wetlands associated with Lake Kununurra include East and West Packsaddle Swamps, Lily Creek Swamp, Emu Creek Swamp, Everglades Swamp and several seasonal wetlands, one of which is Racecourse Swamp. Wetlands associated with Lake Argyle include those on the Ord River south of the lake.

(c) Map - Kununurra 4666, Argyle Downs 4665, Lissadell 4664 and Bow 4564, Series R611, 1st edn - AAS. (Australia 1:100 000, Royal Australian Survey Corps 1971, 1972).
- Wyndham SD 52-W and Halls Creek SE 52-W, Series R412, 2nd edn - AAS. (Western Australia 1:500 000, Department of Lands & Surveys, Western Australia, 1972).

AREA: The proposed Wetland of International Importance covers an area of approximately 150 000 ha.

RESERVATION STATUS: Lake Argyle, Lake Kununurra and wetlands directly connected to them have been proposed as reserves for the purpose of water management, except in the case of the Packsaddle Swamps (and the seasonal wetlands south of them) which will be reserved for nature conservation as well. All reserves except that containing Packsaddle Swamps and seasonal wetlands to the south will be vested in the Water Authority of Western Australia; the latter reserve will be vested in the Water Authority and the National Parks & Nature Conservation Authority of Western Australia. The reserves will be managed by either the Water Authority or the Water Authority and Department of Conservation & Land Management, according to vesting.

PHYSICAL DESCRIPTION: The lakes were formed by the damming of the Ord River. Many of the associated wetlands, which are connected to the lakes and are permanent, were seasonal prior to damming. Water levels in Lake Argyle have an annual fluctuation of about 3 m but those in Lake Kununurra and associated wetlands are kept constant except for about two weeks once or

twice a year when they are drained to control weed growth. In some years there is no drawdown but, nevertheless, the regular drying out results in the wetlands being highly productive. Water is fresh throughout the system.

The lakes are quite deep and there are large areas of open water devoid of aquatic plants. The large fluctuation in water levels has prevented the establishment of much vegetation on most of the shore of Lake Argyle, although in some sections dense belts of trees have grown. However, many aquatic plants grow in shallow water at the edge of the lake. There are dead trees throughout the wetland system as a result of trees which previously grew in seasonally-inundated or dry areas now being permanently flooded. Because water levels are stable in Lake Kununurra and the wetlands associated with it, they have well developed fringing vegetation consisting of grassland, Typha and other "rushes", or woodland. Particularly in the wetlands there is lush growth of aquatic plants. Savannah woodland grows around the wetland complex.

VEGETATION: The aquatic vegetation consists of Nymphoides indica, Nymphaea gigantea, Najas graminea, Hydrilla verticillata, Potamogeton tricarinatus, Myriophyllum verrucosum, Valisneria spiralis and Chara sp. The main "rushes" are Typha domingensis and Eleocharis spp. Tree species growing on the shores of the lakes and wetlands are Melaleuca viridiflora, Eucalyptus microtheca, E. camaldulensis, Nauclea orientalis, Sesbania formosa and Lophostemon grandiflorus. The main species in the fringing grassland are Eriachne sulcata, Echinochloa kimberleyensis, Oryza australiensis and a large number of ephemeral herbs. The savannah woodland is dominated by Eucalyptus spp. and Lysiphyllum cunninghamii.

WATERBIRD CONSERVATION VALUE: Lakes Argyle and Kununurra are most important as dry-season refuges although 18 species have been recorded breeding in the Lake Kununurra wetlands. Very large numbers of waterbirds occur in the system, which regularly supports more than 20 000 waterbirds. Lake Kununurra and surrounding wetlands contained about 12 000 waterbirds in September 1978 and October 1979 and about 7 000 in November 1980. Lake Argyle contains

some of the largest aggregation of waterbirds in northern Australia; 181 400 were counted in August 1986. Records for abundant species include:

Glossy Ibis	Plegadis falcinellus	6 000	Aug 1979
Magpie Geese	Anseranas semipalmata	10 500	Aug 1986
Wandering Whistling Duck	Dendrocygna arcuata	11 000	Aug 1986
Plumed Whistling Duck	D. eytoni	4 300	Jul 1981
Radjah Shelduck	Tadorna radjah	900	May 1980
Pacific Black Duck	Anas superciliosa	16 000	Nov 1979
Grey Teal	A. gibberifrons	17 200	Aug 1986
Pink-eared Duck	Malacorhynchus membranaceus	1 800	Sep 1980
Hardhead	Aythya australis	51 400	Aug 1986
Green Pygmy Goose	Nettapus pulchellus	1 524	Aug 1986
Eurasian Coot	Fulica atra	50 756	Aug 1986

The two lakes are the stronghold of the Comb-crested Jacana Irediparra gallinacea in Western Australia; 120 were counted along a small section of the shore of Lake Kununurra in May 1986 and large numbers of birds with young were recorded in March 1988.

GENERAL CONSERVATION VALUE:

Some of the wetlands associated with the lakes support lush growth of aquatic plants and several endemic species of herbs have been found on their periphery, particularly in the case of the seasonal wetlands. Besides containing a diverse array of waterbirds the area supports a large number of terrestrial species; a total of 202 terrestrial and aquatic bird species have been recorded in the Ord River Irrigation Area (i.e. Lakes Argyle, Kununurra and environs). The area supports several species of insectivorous bat, flying foxes (both Pteropus scapulatus and P. alecto), Water Rats Hydromys chrysogaster and large numbers of Freshwater Crocodiles Crocodylus johnstoni.

LAND USE:

The lakes provide water for the Ord River Irrigation Scheme and their levels are managed for this purpose, which means Lake Kununurra and associated wetlands have a constant level while that in Lake Arygle (the primary water source) fluctuates according to the balance between catchment, evaporation and requirements for irrigation.

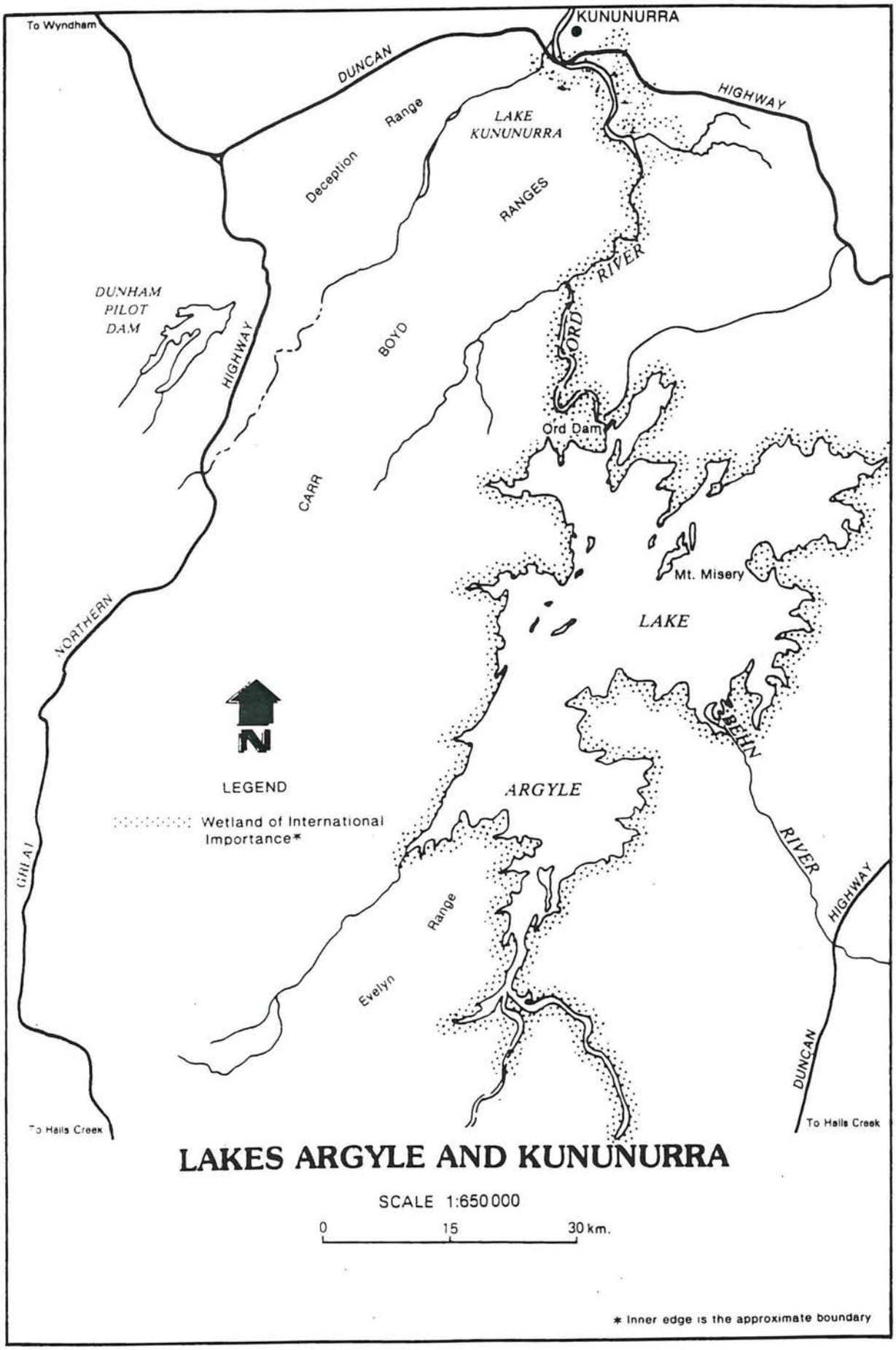
There is recreational boating and a professional and amateur fishery in the lakes, which are increasingly being used for tourism. A float 'plane is based on Lake Kununurra and there are boat tours of both lakes.

Diamond mining currently occurs within the wetland boundary (Bow River Project) and there are other tenements around the southern part of Lake Argyle and between the dam wall of Lake Argyle and Kununurra. Argyle Diamond Mine draws water from the lake near Smoke Creek.

MANAGEMENT: The existing type of management of water levels has proved highly beneficial to waterbirds and should continue. However, it creates a eutrophic system in the wetlands which will probably result in continuing changes in floral composition, some of which may be undesirable. Some active management of the vegetation may be necessary.

Exploration and mining for diamonds will continue, subject to appropriate environmental constraints that are consistent with maintenance of the ecological character of the wetland area.

SELECTION CRITERION: Of the recommended criteria to be used in identifying Wetlands of International Importance, Lakes Argyle and Kununurra meet criteria 2(a) and 3(a).



LAKES ARGYLE AND KUNUNURRA

SCALE 1:650000

0 15 30 km.

* Inner edge is the approximate boundary

NAME: ROEBUCK BAY

LOCATION: (a) Latitude (approx.) - 17°58'S to 18°16'S
Longitude (approx.) - 122°08'E to 122°27'E

(b) Description - Roebuck Bay from Fisherman's Bend, east of Broome, to south of Sandy Point, north-western Australia. The area includes the beach and cliff west of Fall Point and the tidal flats and mangrove communities in Roebuck Bay.

(c) Map - Broome SE 51-6 and La Grange SE 51-10, Series R502, 1st edn - AAS. (Australia 1:250 000, Royal Australian Survey Corps 1963, 1964).

AREA: The wetland is contained in an area of approximately 55 000 ha.

RESERVATION STATUS: It is proposed that two additional Nature Reserves will be gazetted within the Wetland of International Importance. One will cover the area around Fall Point and contain within it an existing smaller reserve housing a Bird Observatory. The other reserve will extend south from Fall Point to opposite Goldwyer Well but will be restricted more-or-less to the area between high and low tide-marks.

PHYSICAL DESCRIPTION: Between Fisherman's Bend and Fall Point there is a narrow beach of pindan red sand with mudflats to seaward and a 2-5 m high red sand cliff on the landward side. Pindan shrubland grows behind the cliff. South of Fall Point there are extensive mudflats, on which a belt of mangroves grows. Above the high tide-mark the Sporobolus grasslands of the Roebuck Plains occur.

VEGETATION: The dominant species in the pindan vegetation is Acacia eriopoda. The major mangrove species are Avicennia marina, Rhizophora stylosa, Ceriops tagal and Bruguiera exaristata. Sporobolus virginicus is the principal species in the grasslands of the Roebuck Plains.

WATERBIRD CONSERVATION VALUE:

North-western Australia is the most important region for waders on the continent, regularly supporting over 500 000 birds and with up to 850 000 birds using it annually. The major sites in the region are Eighty-mile Beach and Roebuck Bay. The largest number of waders counted at Roebuck Bay is 170 000 in October 1983 and it regularly supports over 100 000 birds, being the fourth most important wader site in Australia. It is one of the best places in the world for viewing waders because of the unique combination of accessibility, high species diversity and very high density. Numbers are highest in the austral spring when Palaearctic migrants stop there to feed on their southwards migration but the area supports about 10 000 birds during winter and considerably larger numbers over summer, because many migrating birds remain in northern Australia rather than continuing south. Fewer birds stop on the north-western coast to feed on the northwards migration but, nevertheless, numbers in autumn are very high.

Based on counts made between 1981-85 the most numerous species at Roebuck Bay are:

Large Sand Plover	Charadrius leschenaultii	26 900
Oriental Plover	C. veredus	8 755
Red-capped Plover	C. ruficapillus	3 300
Grey-tailed Tattler	Tringa brevipes	3 185
Bar-tailed Godwit	Limosa lapponica	65 000
Red Knot	Calidris canutus	11 230
Great Knot	C. tenuirostris	22 670
Red-necked Stint	C. ruficollis	19 800
Curlew Sandpiper	C. ferruginea	6 000

Some species that are rarely seen in Australia occur regularly at Roebuck Bay, e.g. Asian Dowitchers Limnodromus semipalmatus and Redshanks, Tringa totanus.

The development of the Royal Australasian Ornithologists Union Bird Observatory near Fall Point has considerably enhanced the waterbird conservation value of the area.

GENERAL CONSERVATION VALUE:

The Sporobolus grasslands behind the tidal mudflats are an interesting and unusual vegetation association. The mangrove vegetation is also interesting but the principal non-avian conservation value of Roebuck Bay is that it represents a superb example of a tropical marine embayment.

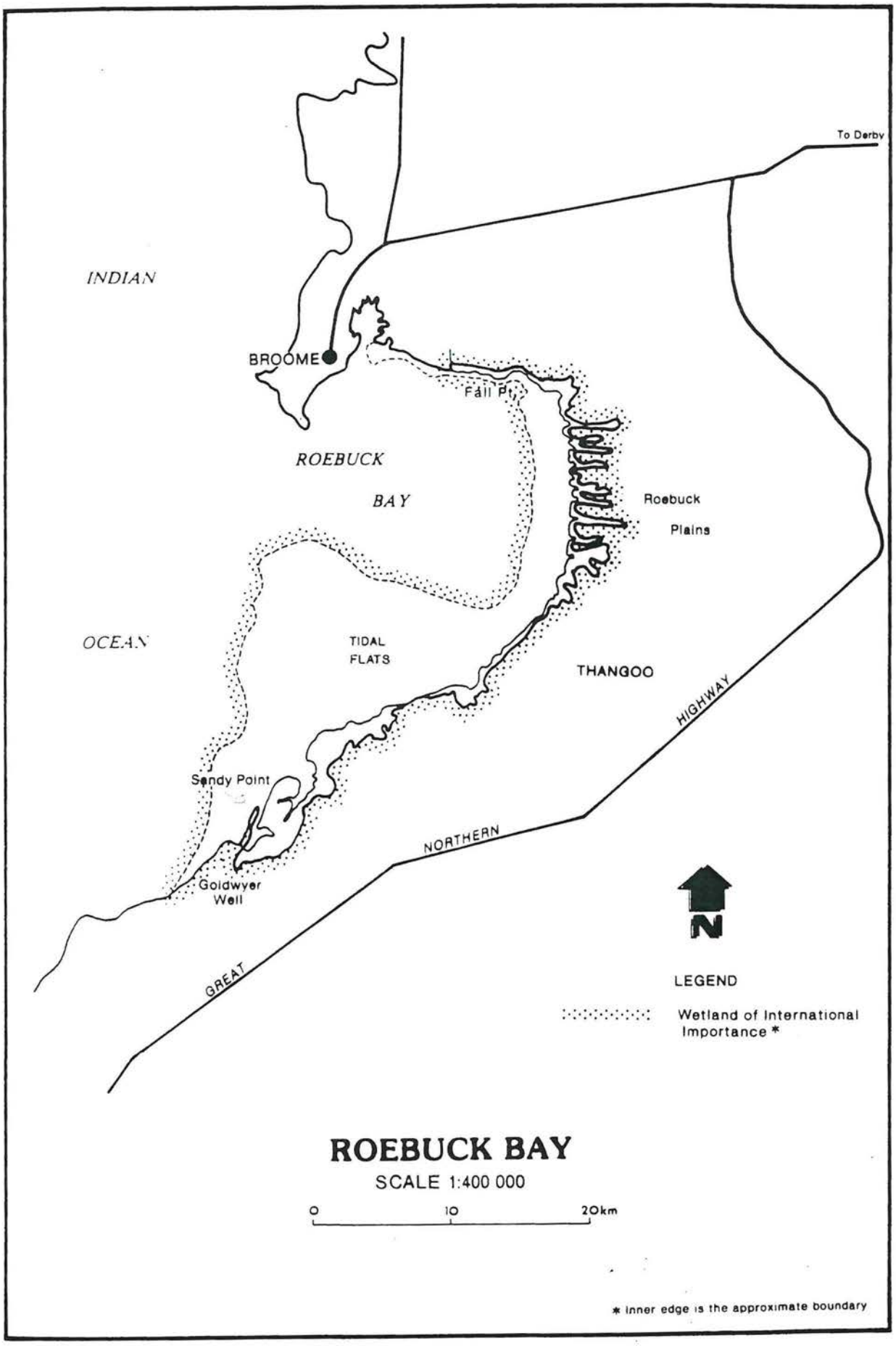
LAND USE: At present there is light recreational use of the northern part of Roebuck Bay, principally fishing. The presence of the Bird Observatory will result in more people using the area.

There is mining for gravel in †35493, which is to the west of the Wetland of International Importance. Exploration permits for petroleum are held over the wetland area.

MANAGEMENT: The existing and foreseeable land uses are compatible with Roebuck Bay remaining an important site for waders. In particular, present levels of stocking on the cattle stations behind the Wetland of International Importance appear to have had no adverse effect on waders.

Petroleum exploration may occur in future and, subject to appropriate environmental safeguards to maintain the ecological character of the wetland and habitat for waterbirds using it, will be compatible with the status of a Wetland of International Importance.

SELECTION CRITERIA: Of the recommended criteria to be used in identifying Wetlands of International Importance, Roebuck Bay meets criteria 1, 2(c), 3(a) and 3(c).


To Derby
INDIAN
OCEAN
BROOME
Fall Pt
ROEBUCK
BAY
Roebuck
Plains
TIDAL
FLATS
THANGOO
HIGHWAY
Sandy Point
NORTHERN
Goldwyer
Well
GREAT
N
LEGEND
Wetland of International
Importance *
ROEBUCK BAY
SCALE 1:400 000
0
10
20km
* Inner edge is the approximate boundary

NAME: EIGHTY-MILE BEACH

LOCATION: (a) Latitude (approx.) - 19°02'S to 20°00'S
Longitude (approx.) - 119°48'E to 121°32'E

(b) Description - Eighty-mile Beach from Cape Missiessy to Cape Keraudren and Mandora Salt Marsh, which includes Salt Creek, Grant Spring and the Eil Eil Springs.

(c) Map - Bedout Island SE 50-16, Mandora SE 51-13 and Munro SE 51-14, Series R502, 1st edn-AAS. (Australia 1 : 250 000, Royal Australian Survey Corps, 1967).
- Broome SE 51-W and De Grey SF 50-E, Series R412, 2nd edn. (Western Australia 1 : 500 000, Department of Lands & Surveys, Western Australia 1971, 1973).

AREA: The proposed Wetland of International Importance is contained within an area of approximately 125 000 ha.

RESERVATION STATUS: The western part of the nominated area extends only 40 m above high-tide mark and consists of Crown land. The area to the east is contained in the Anna Plains Pastoral Lease.

PHYSICAL DESCRIPTION: Almost all the Eighty-mile Beach consists of a white siliceous sand beach about 100 m wide with a 0.5 m drop to tidal mudflats on the western side. Sand dunes occur behind the beach. However, there are a few small bays where mud collects and mangroves have become established. In Mandora Salt Marsh there are a number of permanent or almost permanent fresh-water swamps supplied by springs. The most spectacular of these is Mandora Soak, one of the Eil Eil Springs, which is a classical raised peat bog. Salt Creek, an old watercourse lined with mangroves that is about 20 m wide and 5 km long, is possibly connected to the sea by an aquifer.

VEGETATION: The dominant species on the sand-dunes are Crotalaria cunninghamii and Spinifex longifolius. The most common species of mangrove is Avicennia marina. Mandora Soak supports Melaleuca argentea, Sesbania formosa, sedges, bullrushes and ferns. The marshy areas contain samphire vegetation and Sporobolus virginicus grassland.

WATERBIRD CONSERVATION VALUE: In terms of numbers, Eighty-mile Beach is the most important area for waders in north-western Australia; 336 000 birds were recorded there in November 1982. It is especially important as a landfall for southwards-migrating birds. Based on counts in August and November 1981-83, the most abundant species are:

Large Sand Plover	Charadrius leschenaultii	41 170
Oriental Plover	C. veredus	18 410
Red-capped Plover	C. ruficapillus	15 182
Grey-tailed Tattler	Tringa brevipes	8 466
Greenshank	T. nebularia	5 296
Terek Sandpiper	T. terek	3 000
Bar-tailed Godwit	Limosa lapponica	34 267
Red Knot	Calidris canutus	80 700
Great Knot	C. tenuirostris	161 068
Red-necked Stint	C. ruficollis	60 035
Curlew Sandpiper	C. ferruginea	60 510

GENERAL CONSERVATION VALUE: The principal conservation value of area is the presence of so many waders. However, Mandora Salt Marsh is part of a palaeo-drainage system extending from the eastern Kimberley, through Lake Gregory, to Eighty-mile Beach. Thus the springs in the salt marsh date from the Holocene. The peat deposit in Mandora Soak is 7 000 years old. The springs also support interesting and unusual plant assemblages. Salt Creek contains the most inland mangroves (40 km from the coast) in Western Australia.

LAND USE: There is little human activity on Eighty-mile Beach although a Caravan Park has been established on Wallal Downs, just behind the dunes, and another is proposed at Cape Keraudren. Cattle grazing occurs on the Mandora Salt Marsh.

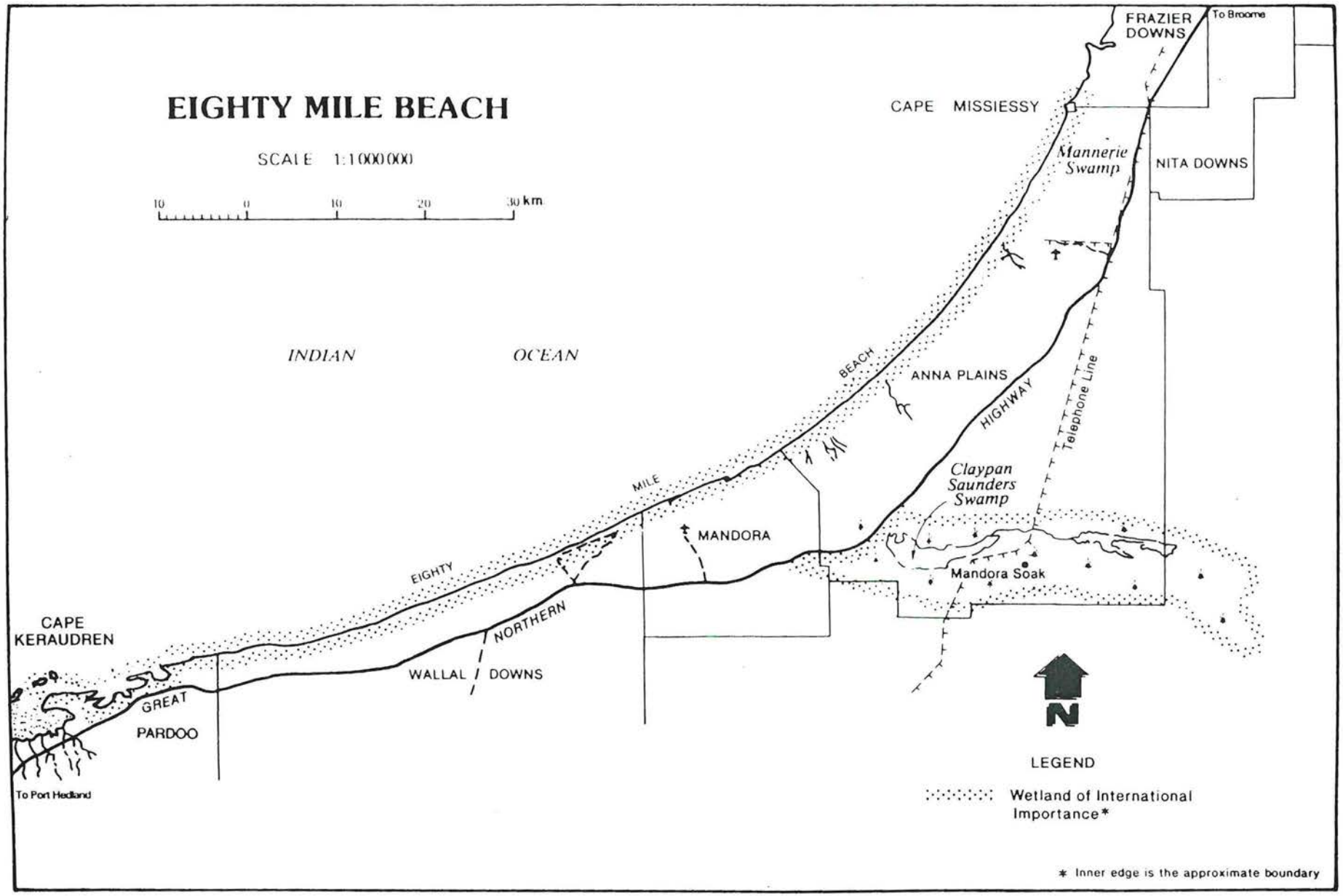
Petroleum exploration permits are held over the area.

MANAGEMENT: Cattle grazing has probably had little or no detrimental effect on the samphire areas of Mandora Salt Marsh with respect to waterbird usage but has caused substantial deterioration in the vegetation and physical environment of the springs and Salt Creek. An investigation of ways of reducing the impact of grazing in these areas, especially around Mandora Soak, is desirable.

Exploration for petroleum may occur in future and, provided it is subject to environmental safeguards to maintain the ecological character of the wetland and habitat for the

waterbirds using it, will be compatible with status as a Wetland of International Importance.

SELECTION CRITERIA: Of the recommended criteria to be used in identifying Wetlands of International Importance, Eighty-mile Beach meets criteria 1, 2(c) 3(a) and 3(c).


EIGHTY MILE BEACH
SCALE 1:1000000
10 0 10 20 30 km
INDIAN OCEAN
CAPE MISSIESSY
FRAZIER DOWNS
To Broome
Mannerie Swamp
NITA DOWNS
ANNA PLAINS
HIGHWAY
Telephone Line
Claypan Saunders Swamp
Mandora Soak
MANDORA
EIGHTY MILE BEACH
CAPE KERAUDREN
GREAT PARDOO
NORTHERN WALLAL / DOWNS
To Port Hedland
N
LEGEND
Wetland of International Importance*
* Inner edge is the approximate boundary

NAME: FORRESTDALE & THOMSONS LAKES

LOCATION: (a) Forrestdale Lake
- latitude (approx.) - 32°10'S
- longitude (approx.) - 115°56'E

Thomsons Lake
- latitude (approx.) - 32°09'S
- longitude (approx.) - 115°50'E

(b) Description - Forrestdale Lake and the surrounding bushland in Nature Reserves †24781 and †37016. Thomsons Lake and the surrounding bushland in Nature Reserve †15556, southern outskirts of Perth metropolitan area, south-western Australia.

(c) Map - Fremantle 2033, National Topographic Map Series, 1st edn. (Australia 1:100 000, Department of National Development, 1976).
- Pinjarra SI 50-2, Series R502, 1st edn - AAS. (Australia 1:250 000, Royal Australian Survey Corps, 1968).

AREA: The proposed Wetland of International Importance covers an area of approximately 245 ha at Forrestdale Lake and 509 ha at Thomsons Lake.

RESERVATION STATUS: The wetland area at Forrestdale Lake is in Nature Reserves †24781 and †37016 vested in the National Parks & Nature Conservation Authority of Western Australia and managed by the Department of Conservation & Land Management. The area at Thomsons Lake is in Nature Reserve †15556, which has the same vesting and management.

PHYSICAL DESCRIPTION: Forrestdale and Thomsons Lakes are fresh/brackish, seasonal wetlands: Forrestdale usually dries out by mid-summer although Thomsons retains water longer and in some years does not dry completely. Both are groundwater lakes and surface run-off probably had little effect on their depth when they were in an undisturbed condition. The lakes contain open water but are fringed by rushes and bulrushes, behind which are belts of trees tolerant of water-logging. The higher ground around the lakes supports open woodland.

VEGETATION: There is a dense mat of Chara sp. and Ruppia polycarpa in the water at Lake Forrestdale.

Around the edge there is an almost continuous belt of Typha orientalis, behind which Baumea articulata, B. juncea, Juncus pallidus and Cyperus congestus sometimes grow. Beyond these is a belt of trees, principally Melaleuca rhaphiophylla, but Acacia saligna and Eucalyptus rudis also occur on the landward side of this zone. The higher sandy ground on the eastern side of Forrestdale Lake supports open woodland dominated by Banksia attenuata.

Myriophyllum sp. grows prolifically in the water at Thomsons Lake. Typha orientalis and Baumea articulata grow around the edge of the lake. As water levels drop, Bolboschoenus caldwellii becomes established on the newly exposed mudflats inside the fringing zone. Behind the fringing zone is a belt of Baumea juncea and B. articulata with emergent Viminaria juncea and Acacia saligna shrubs. This gives way to a belt of trees, Eucalyptus rudis and Melaleuca preissiana, and the shrub Jacksonia furcellata. As the ground rises these are replaced by open forest or woodland dominated by Eucalyptus marginata, Banksia menziesii and B. attenuata.

WATERBIRD CONSERVATION VALUE:

The lakes provide important habitat for waterbirds on the Swan coastal plain with a maximum of 17 484 birds having been counted in Forrestdale Lake in January 1983 and 14 675 in Thomsons Lake in March 1985. Forrestdale supports more than 10 000 ducks every year with the following species being particularly abundant:

Australian Shelduck	Tadorna tadornoides	1 650	Jan 1985
Pacific Black Duck	Anas superciliosa	3 500	Dec 1982
Grey Teal	A. gibberifrons	4 500	Jul 1982
Australasian Shoveler	A. rhynchotis	2 000	Jan 1984
Hardhead	Aythya australis	1 053	Oct 1982

Thomsons Lake often supports 10 000 ducks with particularly abundant species being:

Australian Shelduck	Tadorna tadornoides	1 600	Nov 1982
Pacific Black Duck	Anas superciliosa	3 500	Apr 1985
Grey Teal	A. gibberifrons	4 000	Jan 1983
Australasian Shoveler	A. rhynchotis	2 000	Mar 1982

Other species occurring in significant numbers at Forrestdale Lake are:

Eurasian Coot	Fulica atra	4 200	Mar 1982
Red-capped Plover	Charadrius ruficapillus	1 283	Apr 1982
Black-winged Stilt	Himantopus himantopus	2 621	Feb 1985
Red-necked Stint	Calidris ruficollis	3 000	Mar 1982
Long-toed Stint	C. subminuta	80	summer 1980
Curlew Sandpiper	C. ferruginea	2 000	Jan 1983
Clamorous Reed-warbler	Acrocephalus stentoreus	77	Nov 1982

Other species occurring in significant numbers at Thomsons Lake are:

Hoary-headed Grebe	Poliocephalus poliocephalus	1 500	Nov 1985
Australian Crake	Porzana fluminea	20	Jan 1983
Eurasian Coot	Fulica atra	5 200	Mar 1985
Purple Swamphen	Porphyrio porphyrio	100	Feb 1985
Red-necked Avocet	Recurvirostra novaehollandiae	2 000	Mar 1983
Curlew Sandpiper	Calidris ferruginea	2 500	Mar 1983

Seventy species of waterbird occur at the two lakes with 21 of them breeding. Forrestdale is an important area for the Long-toed Stint in south-western Australia and supports well over 1% of the regional population; the total Australian population is only a few hundred.

GENERAL CONSERVATION VALUE: Although waterbirds are the main feature of both lakes, they also represent some of the best surviving examples of the once numerous wetlands on the Swan Coastal Plain and as such are geologically and botanically interesting. In addition, the margins of the lakes support a large number of terrestrial bird, and other vertebrate, species including the rare skink Lerista lineata.

LAND USE: The area to the north-east of Forrestdale Lake is urban and, in fact, houses occur within 50 m of the lake. The whole western side of the lake has been developed for agricultural or housing purposes to within about 100 m of the water. There is a substantial area of natural open woodland on the eastern side of the lake, which is used for horse-riding and general recreation by nearby residents.

Thomsons Lake Nature Reserve is fenced so that access is limited and it is used principally for bird-watching and nature walks. There is a much larger area of bush around Thomsons than Forrestdale Lake. However, both lakes are islands of natural vegetation in a sea of agricultural and urban or semi-urban land.

MANAGEMENT: Management plans for Thomsons Lake and Forrestdale Lake were published in 1981 and 1987, respectively. The major management problems are:

(a) maintenance of water quality. Nutrient levels in the lakes are fairly high, especially in Forrestdale (presumably because of fertilisers and sewage leaching into them), and water levels may change because of groundwater extraction for domestic and agricultural purposes or increased drainage discharge from nearby urban areas.

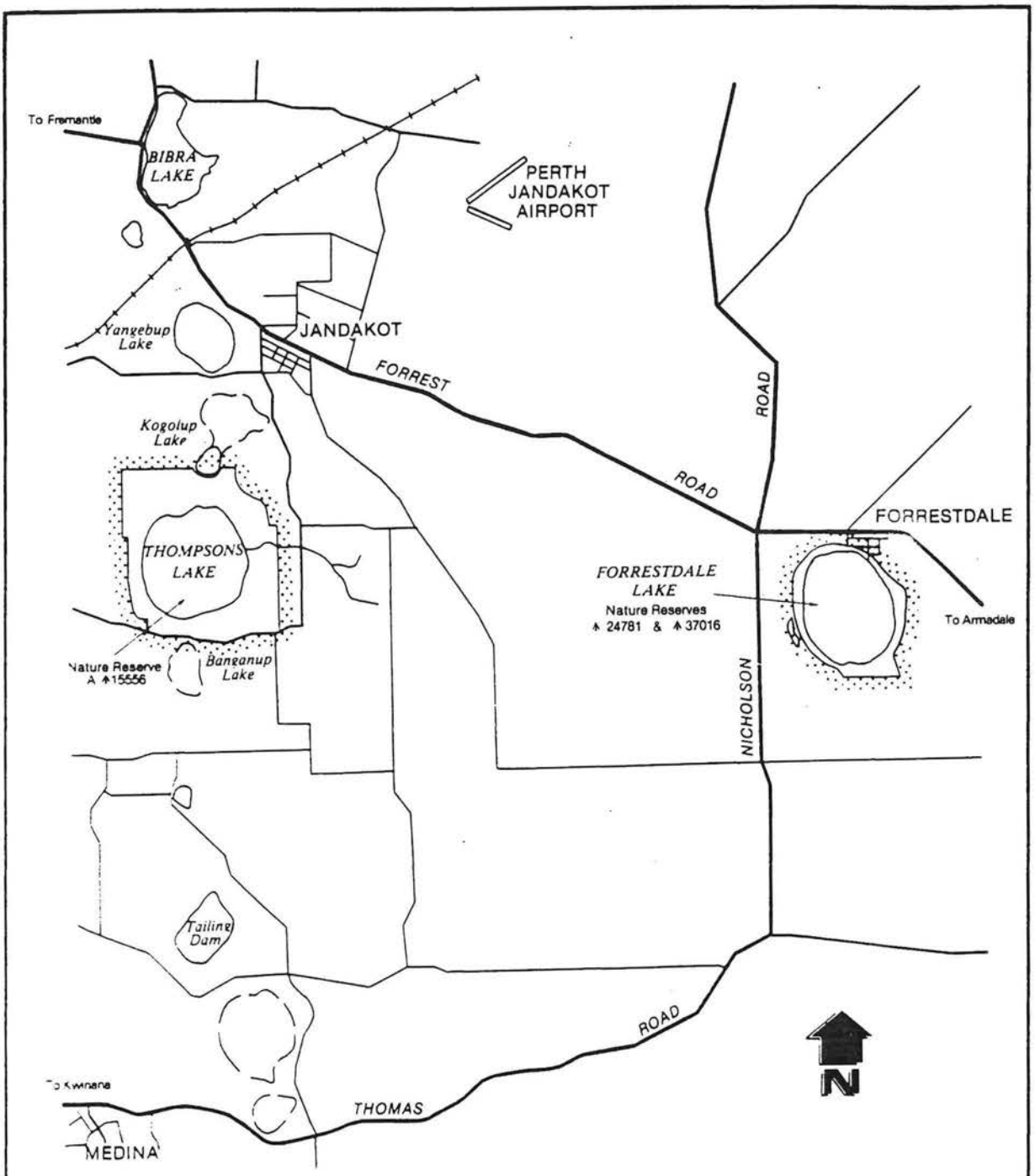
(b) preventing spread of Typha orientalis through the lakes.

(c) the need to control chironomid numbers in Forrestdale because they are an extreme nuisance to nearby residents.

(d) the deterioration of the wetland and woodland vegetation at Forrestdale because of over-use by residents.

Management of these problems is part of normal wetland management by the Department of Conservation & Land Management.

SELECTION CRITERIA: Of the recommended criteria to be used in identifying Wetlands of International Importance, Forrestdale and Thomsons Lakes meet criteria 1, 2(b), 3(a) and 3(c).



FORRESTDALE AND THOMSONS LAKES

SCALE 1:100 000

1 0 1 2 3 4 km

LEGEND

Wetland of International Importance*

* Inner edge is the approximate boundary

NAME: PEEL-YALGORUP SYSTEM

LOCATION: (a) Latitude (approx.) - 32°32'S to 33°06'S
Longitude (approx.) - 115°38'E to 115°46'E

(b) Description - Peel Inlet south of the Mandurah Traffic Bridge, Harvey Estuary including the delta at the southern end, Lakes Mealup and McLarty, and the Yalgorup lakes which include Lake Clifton, Lake Preston, Duck Pond, Boundary Lake, Lake Pollard, Martins Tank, Lake Yalgorup, Lake Hayward, North and South Newnham Lake. The wetland area extends southwards along the coast from Mandurah, south-western Australia.

(c) Map - Pingarra SI 50-2, Series R502, 1st edn-AAS, Collie SI 50-6, Series R502, 2nd edn-AAS. (Australia 1 : 250 000, Royal Australasian Survey Corps 1968, 1975).

AREA: The wetlands are contained in an area of approximately 21 000 ha.

RESERVATION STATUS: The wetland area in Peel Inlet and Harvey Estuary extends to high water mark and mostly falls within the Shire of Murray; the southern tip of Harvey Estuary is in the Shire of Waroona. Various State Government agencies, including the Peel Inlet Management Authority, Waterways Commission and Marine and Harbours Department, have statutory powers in the waters of Peel Inlet and Harvey Estuary. There is a series of small Nature Reserves at the southern end of Harvey Estuary and along the eastern shore of the Estuary and Inlet (↑2990, ↑23756, ↑24739, ↑2738, ↑2707, ↑2436, ↑4990), some of which are included in the wetland area. There is also an aquatic Nature Reserve (↑28087) in the south-eastern corner of Inlet. Yunderup National Park is located in the delta where the Murray River enters Peel Inlet.

Lake McLarty is a proposed Nature Reserve. Most of Lake Mealup is either Nature Reserve or is owned by the Lake Mealup Preservation Society. These areas are included in the proposed Wetland of International Importance.

The Yalgorup lakes are contained in Yalgorup National Park but in many cases only a very thin band of riparian land has been included in the Park. All Nature Reserves in the wetland area and Yalgorup National Park are

vested in the National Parks & Nature Conservation Authority of Western Australia; Yunderup National Park is vested in the Murray Shire. The reserves and Yalgorup National Park are managed by the Department of Conservation & Land Management; Yunderup National Park is managed by the Murray Shire.

PHYSICAL DESCRIPTION:

Peel Inlet and Harvey Estuary form a shallow estuarine system connected to the sea via a narrow channel at the northern end of the Inlet. The Murray and Serpentine Rivers drain into the north-eastern corner of the Inlet; the Harvey River enters the Estuary at its southern end. Several major drains from agricultural land empty into the eastern side of the Estuary and Inlet.

A large proportion of the Peel Inlet and southern end of the Harvey Estuary contains water less than 0.5 m deep; the maximum depth of water is only about 2 m. Salinity varies according to season and location in the system but, in general terms, varies from 10 ppt in winter to 45 ppt TDS in summer. Tidal flushing in summer is not great enough to prevent evaporation making the water slightly more concentrated than seawater.

The Yalgorup lakes vary from about 1-4 m in depth and are saline (although they are principally supplied by fresh groundwater and precipitation) because of long-term concentration of salt by evaporation; they never overflow. The salinity regime in particular lakes varies according to their hydrology. Lake Clifton has very extensive areas of groundwater seepage, which result in pronounced horizontal salinity gradients; away from the shoreline the water varies from about 10 ppt in winter to 40 ppt TDS in summer. Large quantities of calcium carbonate precipitate out of seepage water as it enters Lake Clifton and Lake Pollard. Lake Hayward reaches about 200 ppt TDS in summer but is remarkable for exhibiting vertical stratification of salinity in winter when it is only about 2 m deep. Surface water contains about 70 ppt, that on the bottom contains 180 ppt. This results in an inverse thermal stratification with water at the bottom of the lake reaching 35°C and, because of prolific growth of cyanophyta, being about 2 000% saturated with oxygen.

Parts of Peel Inlet and Harvey Estuary and some of the lakes in the Yalgorup chain are

fringed by samphire flats. Behind the samphire, or sometimes adjacent to the water where samphire is absent, rushes and sedges occur. Outside this is a zone of trees tolerant of water-logging while the higher ground away from the lake supports open forest. Large parts of the shoreline throughout the Peel-Yalgorup system have been cleared, usually for agriculture, thus altering or eliminating the tree zones.

VEGETATION: Samphire vegetation around Peel Inlet and Harvey Estuary is dominated by Halosarcia halocnemoides. The dominant species of sedge is Bolboschoenus caldwellii, which grows both behind samphire and to the water's edge where samphire is absent. Behind this is a zone of low trees of Melaleuca rhaphiophylla and M. hamulosa around the eastern side of the Inlet or M. cuticularis and M. rhaphiophylla along the Estuary. Melaleuca is sometimes replaced by Acacia saligna and Eucalyptus rudis farther from the water. As the ground begins to rise the vegetation changes to open forest dominated by Eucalyptus gomphocephala and Agonis flexuosa on the western side of the system or E. marginata and E. calophylla on the eastern side.

The vegetation around the Yalgorup lakes is virtually the same. Around hypersaline lakes there is a narrow belt of samphire, behind which clumps of Juncus kraussii and Gahnia trifida occur. Hyposaline lakes lack samphire but have a dense belt of Baumea juncea growing to the water's edge. Rushes are replaced by a belt of Melaleuca cuticularis and M. rhaphiophylla in the case of hyposaline lakes; samphire and rushes are replaced by M. cuticularis and Acacia cyclops in the case of hypersaline ones. The surrounding woodland is dominated by Eucalyptus gomphocephala and Agonis flexuosa.

WATERBIRD CONSERVATION VALUE: In terms of total numbers, Peel Inlet and Harvey Estuary comprise the most important area for waterbirds in south-western Australia: over 150 000 were recorded in February 1977. It was conservatively estimated that 12 000-15 000 ducks and swans used the area each year between 1981-85; much higher usage occurred in 1976-77. Particularly abundant species of duck are:

Black Swan	Cygnus atratus	5 422	Aug 1976
Australian Shelduck	Tadorna tadornoides	5 644	Dec 1984
Pacific Black Duck	Anas superciliosus	3 000	Feb 1982
Grey Teal	A. gibberifrons	>20 000	Dec 1976
Australasian Shoveler	A. rhynchotis	1 500	Feb 1982
Blue-billed Duck	Oxyura australis	1 200	Jul 1983

Highest numbers of many species in south-western Australia have been recorded in the Inlet and Estuary system, including the Little Egret Egretta garzetta and Royal Spoonbill Platalea regia, which are uncommon in the region. Species recorded in large numbers include:

Hoary-headed Grebe	Poliocephalus poliocephalus	1 000s	Jun 1977
Australian Pelican	Pelecanus conspicillatus	2 102	Dec 1976
Black-winged Stilt	Himantopus himantopus	2 703	Nov 1977
Banded Stilt	Cladorhynchus leucocephalus	>60 000	Feb 1977
Red-necked Avocet	Recurvirostra novaehollandiae	>1 100	Apr 1977
Red Knot	Calidris canutus	>1 000	Oct 1976
Sharp-tailed Sandpiper	C. acuminata	2 119	Jan 1983
Red-necked Stint	C. ruficollis	8 063	Mar 1985
Curlew Sandpiper	C. ferruginea	1 000s	Dec 1976

A total of 67 species of waterbird has been recorded in Peel Inlet and Harvey Estuary. Many species also occur in the Yalgorup lakes, including large numbers of ducks, swans and waders. Over 2 200 Musk Duck Biziura lobata were counted in Lake Clifton in March 1986 and 11 000 Australian Shelduck were recorded there in November 1986.

GENERAL CONSERVATION VALUE:

Peel Inlet and Harvey Estuary contain large numbers of fish, Blue Manna Crabs Portunus pelagicus and Greasy-back Prawns Metapeneas dalli. The area supports the biggest professional and amateur estuarine fishery in Western Australia.

Lake Clifton is one of only two sites known in the world where "stromatolite-like" structures occur in hyposaline water. They are formed by calcium carbonate precipitating out of freshwater seepage and being incorporated in the mucilage secreted by the cyanophyta growing on the bottom of the lake. The hydrology of the Yalgorup lakes is extremely interesting: several types of

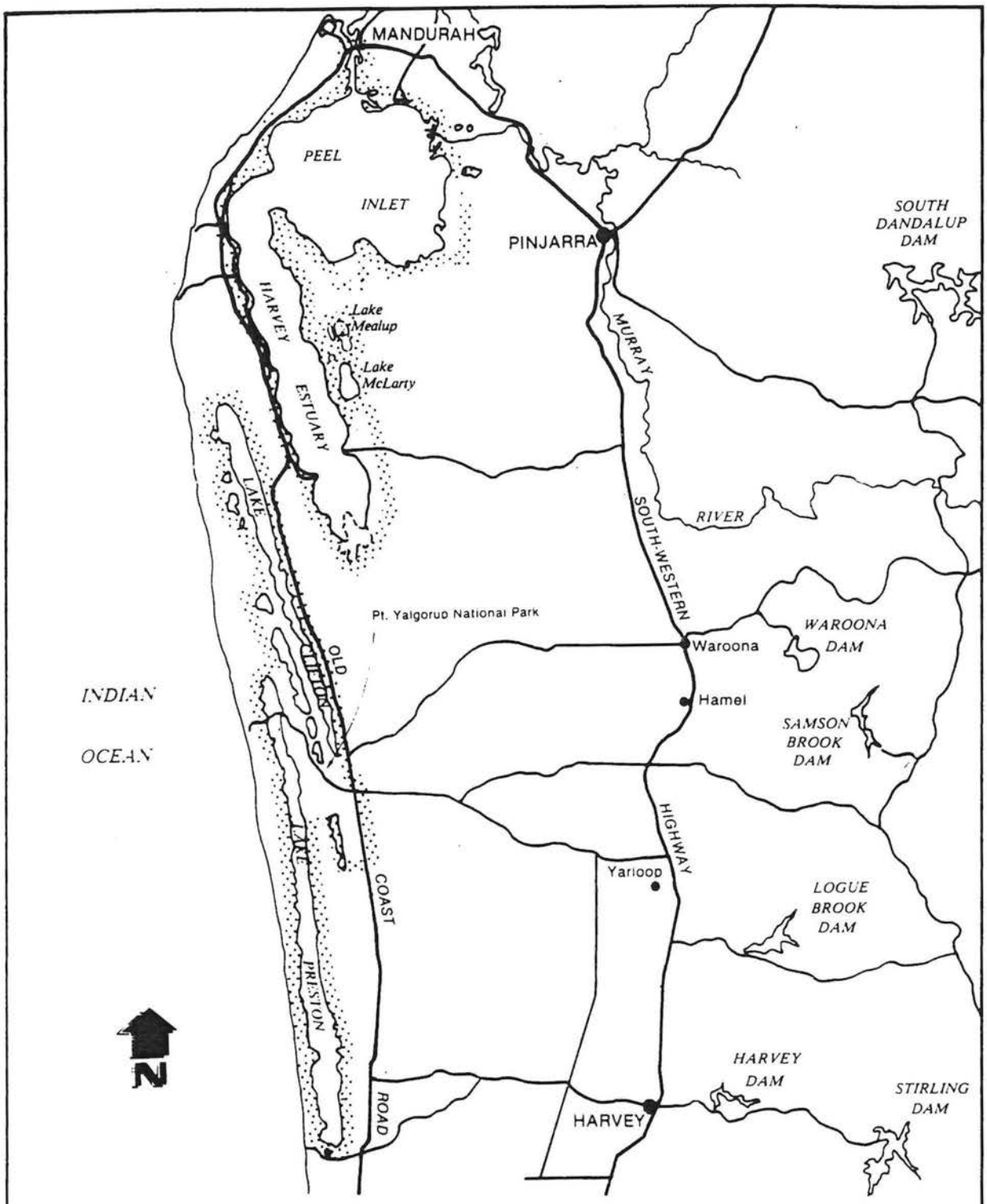
salinity regime occur in lakes with similar physiognomy that are supplied by the same underground aquifer.

LAND USE: Peel Inlet and Harvey Estuary are used extensively for public recreation, especially fishing. The town of Mandurah is on the northern edge of the Inlet and there are several small housing developments along the shores of the Inlet and the north-western part of the Estuary. The area to the east is used principally for cattle farming and there are many farmlets and holiday homes on the western side of the Estuary.

The Yalgorup lakes are in a National Park and are used only for passive recreation associated with their natural values. However, much of the surrounding land has been cleared for cattle farming and an area on the north-eastern shore of Lake Clifton has recently been sub-divided for housing.

MANAGEMENT: A major management problem exists in Peel Inlet and Harvey Estuary. Large amounts of phosphate leached from surrounding agricultural land into the estuarine system have caused it to become eutrophic and there is massive production of benthic and planktonic algae, which causes a variety of biological problems. There has been intensive investigation into ways of managing the system and the Peel Inlet Management Authority is implementing a management plan produced in 1982. As far as waterbirds are concerned, any further development around the deltas where rivers enter the Inlet and Estuary should be carefully controlled. Similarly, urban development around the Yalgorup lakes should be approached cautiously, especially in the case of Lake Clifton where it may interfere with the groundwater seepages producing the "stromatolites". Furthermore, intensive human activity on the shore of Lake Clifton would result in severe damage to these comparatively delicate structures.

SELECTION CRITERIA: Of the recommended criteria to be used in identifying Wetlands of International Importance, the Peel-Yalgorup system meets 1, 2(d), 3(a) and 3(c).



PEEL-YALGORUP SYSTEM

SCALE 1:350 000

NAME: LAKE TOOLIBIN

LOCATION: (a) Latitude (approx.) - 32°55'S
Longitude (approx.) - 117°36'E

(b) Description - Lake Toolibin and the surrounding bushland in Nature Reserve ↑24556 and Game Reserve ↑9617 south of the Wickepin-Harrismith road.

(c) Map - Yealering 2432, National Topographic Map Series, 1st edn. (Australia 1 : 100 000, Department of Minerals & Energy, 1973).
- Corrigin SI 50-3, National Topographic Map Series, 1st edn. (Australia 1 : 250 000, Department of National Resources, 1977).

AREA: The proposed Wetland of International Importance is contained in an area of approximately 437 ha.

RESERVATION STATUS: Lake Toolibin and adjacent land are contained in Nature Reserve ↑24556 and part of Game Reserve ↑9617. The reserves are vested in the National Parks & Nature Conservation Authority of Western Australia and managed by the Department of Conservation & Land Management.

PHYSICAL DESCRIPTION: Lake Toolibin is a fresh-brackish wetland that fills from surface run-off. It is almost permanent, containing at least 1 m of water about 70% of the time but it occasionally dries out and may receive no inflow for a year or two. The maximum depth of water is about 2 m after which the lake overflows into other wetlands at the headwaters of the Arthur River. Most of the lake is covered in thickets or woodlands of water-tolerant tree species although there is a large open area on the eastern side. The higher ground around the lake supports open eucalypt woodland. There are pronounced undulations or 'gilgai mounds' on the floor of the lake and the trees tend to occur on the mounds.

VEGETATION: Two aquatic macrophytes Potamogeton sp. and Lepilaena sp. grow in the lake. The trees in the thickets and woodlands there are principally Casuarina obesa although Melaleuca strobophylla is common and M. laterifolia, M. viminea and Eucalyptus rudis

also occur. The E. rudis trees are found only in open woodlands. The sedge Chorizandra endodis is common in parts of the lake.

The fringing woodland around the waterbody consists of Allocasuarina huegeliana, M. uncinata, E. rudis and Acacia accuminata. Eucalyptus loxophleba forms the open woodland on higher ground.

WATERBIRD CONSERVATION VALUE:

Lake Toolibin supports 24 species of breeding waterbird, which is the greatest number for any wetland in south-western Australia. Altogether 41 species of waterbird have been recorded there, which is the highest species richness amongst inland wetlands in the south-west.

In particular, Lake Toolibin is important as a breeding area for Freckled Ducks Stictonetta naevosa, which are gazetted 'rare and endangered' under the Western Australian Wildlife Conservation Act, and for large wading birds - Pacific Herons Ardea pacifica, White-faced Herons A. novaehollandiae, Great Egrets Egretta alba, Rufous Night Herons Nycticorax caledonicus and Yellow-billed Spoonbills Platalea flavipes all breed there. In addition, Lake Toolibin is an important breeding area in south-western Australia for Great Cormorants Phalacrocorax carbo, Little Black Cormorants P. sulcirostris, Little Pied Cormorants P. melanoleucos and Blue-billed Ducks Oxyura australis.

GENERAL CONSERVATION VALUE:

Lake Toolibin is the only remaining example in south western Australia of a wetland with extensive thickets of living Casuarina obesa. This used to be one of the main types of inland freshwater wetland in the south-west before clearing for agriculture resulted in most inland wetlands becoming saline with the concomitant death of emergent vegetation. In addition, the lake supports extensive stands of M. strobophylla, which has a restricted distribution.

LAND USE:

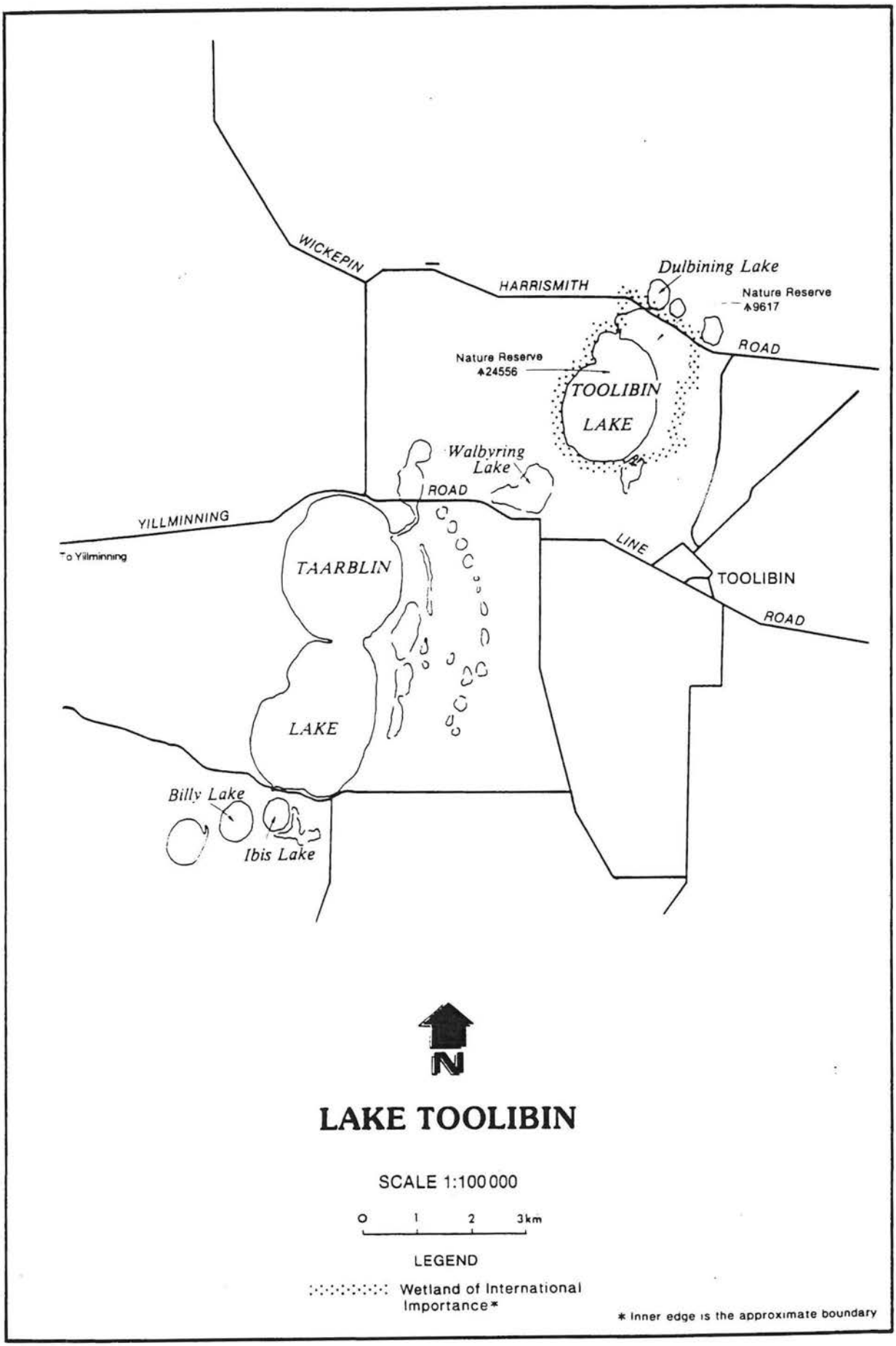
Two other reserves, the northern part of Game Reserve ↑9617 and Nature Reserve ↑27285, abut the proposed Wetland of International Importance on the northern side and these contain wetlands (suffering from varying degrees of salinization) and native vegetation. The reserves are used for conservation and duck-shooting. Otherwise, the surrounding land has all been cleared and

is used to grow pasture for sheep or is cropped.

MANAGEMENT: The salinity of the water in the lake has increased over the past two decades as a result of the catchment area being affected by salinization. The groundwater in the area is saline and the water table (as a result of clearing native vegetation) has risen to within 1-2 m of the lake bed. The high, saline water table and the saline run-off into the lake from the salt-affected catchment area have had a markedly detrimental effect on the trees in the lake; many have died on the western side.

To prevent this fate overtaking all trees in the lake some urgent remedial management is required. A series of pumps has been installed on the western side of the lake to lower the water table. A tree-planting programme is under way in the catchment area. A strip of land has recently been acquired along the western side of the lake from the adjacent farmer and this strip is being planted with trees to help lower the water table through transpiration and reduce the salinity of surface run-off from this side.

SELECTION CRITERIA: Of the recommended criteria to be used in identifying Wetlands of International Importance, Lake Toolibin meets criteria 1, 2(b) and 2(c).



LAKE TOOLIBIN

SCALE 1:100 000

0 1 2 3km

LEGEND

Wetland of International Importance*

* Inner edge is the approximate boundary

NAME: VASSE-WONNERUP SYSTEM

LOCATION: (a) Latitude (approx.) - 33°35'S to 33°39'S
Longitude (approx.) - 115°22'E to 115°28'E

(b) Description - the Vasse-Wonnerup wetlands between Forrest Beach Road and the southern extension of Ford Road near Busselton, south-western Australia, consisting of Wonnerup Estuary, Vasse Estuary and Wonnerup Inlet. The Ludlow, Sabina, Abba and Vasse Rivers and The Deadwater do not constitute part of the Wetland of International Importance.

(c) Map - Busselton 1930, Series R611, 1st edn-AAS. (Australia 1 : 100 000, Royal Australian Survey Corps, 1969).

AREA: The proposed Wetland of International Importance covers an area of approximately 740 ha.

RESERVATION STATUS: The proposed Wetland of International Importance consists of all non-freehold land within the boundaries of the two estuaries; dryland parts of Nature Reserve †31188, Tuart Forest National Park and the 23 blocks of vacant Crown land that extend into the Estuaries are not included.

PHYSICAL DESCRIPTION: The Wonnerup and Vasse Estuaries are no longer true estuaries because inflow of seawater is prevented by weirs across the two arms of Wonnerup Inlet. The Estuaries now act as compensating basins for water discharging from the Ludlow, Sabina, Abba and Vasse Rivers. When the water level in the Estuaries rises above sea level, hydrostatic pressure opens valves in the weirs and allows water to flow out to Wonnerup Inlet and the sea. When the level drops the valves close, thereby preventing ingress of seawater. Water in the Estuaries is fresh in winter and becomes brackish in summer. Wonnerup Estuary was mined in the 1950s for mineral sands.

The Vasse-Wonnerup system is shallow; almost all the wetland area has a maximum water depth of less than 1 m and dries out in late summer. Small sections of the Estuaries near Wonnerup Inlet retain water because a limited amount of seawater seeps around the weirs.

The system consists of broad expanses of open water (except when dry) with fringing samphire and rushes. In some areas Melaleuca woodlands occur behind the samphire and eucalypt woodlands are found on higher ground. However all the area has been severely disturbed at various times in the past 50 years and much of it is currently cleared for agriculture.

VEGETATION: The natural vegetation of the system is fairly uniform. The samphire belt is dominated by Sarcocornia blackiana and Halosarcia pergranulata. The rush and sedge zone is dominated by Juncus kraussii but Lepidosperma cf. leptostachyum and Carex divisa are also common. The tree zone behind the rushes comprises Melaleuca rhaphiophylla, M. hamulosa and M. cuticularis in either single-species or mixed stands. Gahnia trifida and Juncus pallidus occur in the understorey. Melaleuca woodlands often give way to an open woodland of Eucalyptus rudis.

WATERBIRD CONSERVATION VALUE: The Vasse-Wonnerup system provides an important coastal habitat for waterbirds : 33 000 were counted there in January 1986. The wetlands supported 10 056 ducks and swans in 1984-85 and over 12 000 in 1985-86 The following species are particularly abundant:

Black Swan	Cygnus atratus	3 460	Nov 1976
Australian Shelduck	Tadorna tadornoides	1 873	Feb 1985
Pacific Black Duck	Anas superciliosa	2 768	Feb 1985
Grey Teal	A. gibberifrons	7 000	Jan 1986

Other species occurring in significant numbers include:

Australian Pelican	Pelecanus conspicillatus	750	Feb 1986
Great Egret	Egretta alba	237	Feb 1985
Yellow-billed Spoonbill	Platalea flavipes	120	Jan 1986
Eurasian Coot	Fulica atra	4 000	Jan 1986
Black-winged Stilt	Himantopus himantopus	5 000	Jan 1986
Red-necked Avocet	Recurvirostra novaehollandiae	4 000	Jan 1986
Wood Sandpiper	Tringa glareola	61	Jan 1986
Sharp-tailed Sandpiper	Calidris acuminata	>2 300	Jan 1986
Long-toed Stint	C. subminuta	44	Jan 1986
Curlew Sandpiper	C. ferruginea	1 200	Jan 1986

Sixty-eight species of waterbird have been recorded in the Vasse-Wonnerup system with numbers of six of them being higher than elsewhere in south-western Australia.

The system is important for breeding of Black Swans, particularly as an open-water refuge for their cygnets, and frequently supports >1% of the regional (and Australian) population of Red-necked Avocets and Black-winged Stilts.

GENERAL CONSERVATION VALUE: The principal conservation value of the Vasse-Wonnerup system is as habitat for waterbirds.

LAND USE: There is urban development along the south-eastern end of Vasse Estuary. The remainder of Vasse Estuary and Wonnerup Estuary are surrounded by farmland used principally for cattle grazing. There is little recreational use of the wetlands.

At present there is a mineral sands mining operation west of Layman Road, part of the purpose of which is removing a radiation hazard left by earlier mining operations. However, the entire operation is occurring outside the Wetland of International Importance.

MANAGEMENT: There is continual pressure to allow land developments that may impact on the Vasse-Wonnerup wetlands. The production of a management plan for the area was recommended in the System 1 Red Book to prevent degradation due to unco-ordinated development.

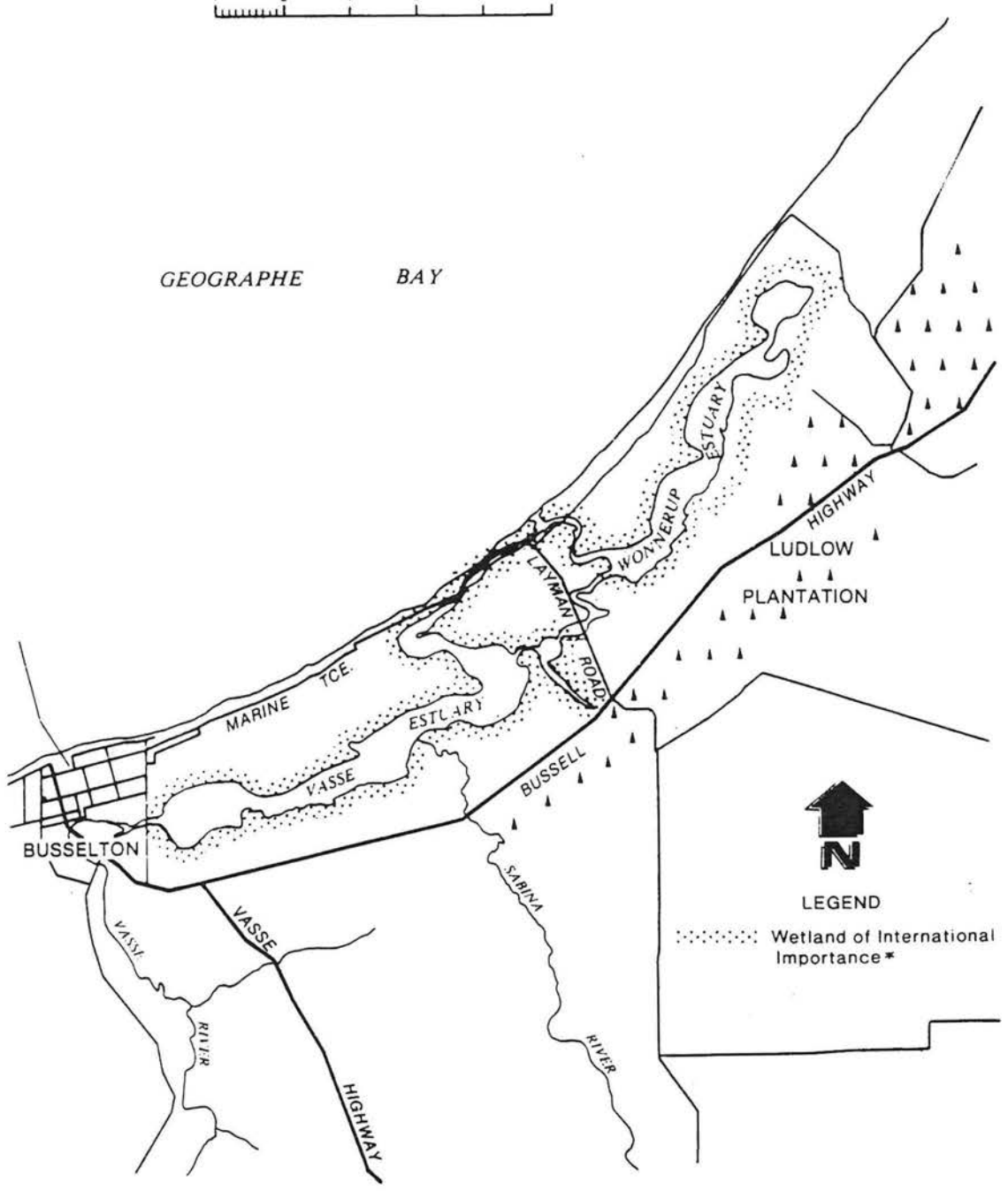
Existing management of water levels in the system has proved satisfactory for waterbirds but the potential for altering the water regime slightly to enhance waterbird usage of the area has not been explored fully.

SELECTION CRITERIA: Of the recommended criteria to be used in identifying Wetlands of International Importance, the Vasse-Wonnerup system meets criteria 3(a) and 3(c).

VASSE-WONNERUP SYSTEM

SCALE 1:100 000

1 0 1 2 3 4 km



* Inner edge is the approximate boundary

NAME: LAKE WARDEN SYSTEM

LOCATION: (a) Latitude (approx.) - 33°47'S to 33°50'S
Longitude (approx.) - 121°51'E to 122°01'E

(b) Description - the Lake Warden wetlands consist of a chain of lakes on the northern boundary of the Esperance townsite, south coast of Western Australia. There are eight major water bodies: Lake Warden, part of Windabout Lake, Wheatfield Lake, Racecourse Lake, Woody Lake, Mullet Lake, Station Lake and Ewan's Lake.

(c) Map - Esperance 3230-II (1:50 000, Department of Lands & Surveys, Western Australia).
- Esperance SI 51-6, Series R502, 1st edn - AAS. (Australia 1:250 000, Royal Australian Survey Corps, 1968).

AREA: The wetlands are contained in an area approximately 2 300 ha.

RESERVATION STATUS: The proposed Wetland of International Importance is contained in Lake Warden Nature Reserve (↑32257), Woody Lake Game Reserve (↑15231) and part of Mullet Lake Game Reserve (↑23825), which are vested in the National Parks & Nature Conservation Authority of Western Australia and managed by the Department of Conservation & Land Management. No freehold land is included in the proposed wetland area.

PHYSICAL DESCRIPTION: Water in the lakes ranges from moderately to very saline; water regimes range from almost permanent (only drying out occasionally at the end of summer) to ephemeral. There are also some springs which give rise to small, shallow, brackish wetlands such as that at the eastern end of the wetland area. The lakes contain either completely open water or dead trees around the periphery: there is no emergent vegetation although trees and rushes grow on the shorelines around the lakes. The lakes are probably supplied by a mixture of groundwater and surface run-off. Coramup Creek drains into Wheatfield Lake and thus into lakes to the west of it, since they are interconnected in winter.

Mullet Lake and wetlands to the east of it are located in a large samphire marsh. Wheatfield Lake and wetlands westwards occur

in stabilized sand-dunes which support low woodland on the higher ground between the lakes. Station and Mullet Lakes are occasionally connected to the sea via Bandy Creek and a species of mullet sometimes swims into them and other lakes in the system.

VEGETATION: Melaleuca cuticularis trees grow down to the water in all the wetlands although in some places there are narrow zones of rushes, principally Baumea juncea. Other rushes and sedges, including Juncus kraussii, Isolepis nodosa and Gahnia trifida, also grow around the shoreline in the tree zone. In some wetlands towards the eastern end of the system, Melaleuca preissiana grows in the fringing tree zone as well as M. cuticularis. At the western end Acacia cyclops frequently grows behind Melaleuca cuticularis as the land rises, before it is replaced by low woodland of Banksia speciosa or by mallee and scrub. At the eastern end of the system, which is predominantly samphire marsh, the fringing tree vegetation gives way to samphire species, especially Halosarcia pterygosperma, H. pergranulata and Sarcocornia blackiana, as the ground drops away from the embankment around the wetland. In higher parts of the marsh the grass Stipa juncifolia grows profusely and in areas fed by springs Suaeda australis occurs.

WATERBIRD CONSERVATION VALUE: The chain of lakes provides important habitat for waterbirds: 16 719 were counted in Lake Warden in November 1982, 6 775 in Windabout Lake in May 1985 and 2 680 in Station Lake in January 1983. The Lake Warden wetlands regularly support more than 10 000 ducks: 5 500 Australian Shelducks Tadorna tadornoides and 3 500 Black Swans Cygnus atratus were counted in Lake Warden in November 1982 and 5 500 Grey Teal Anas gibberifrons in Windabout Lake in May 1985. Up to 10 000 Banded Stilts Cladorhynchus leucocephalus have been recorded in Lake Warden.

In terms of numbers of birds occurring there, the Lake Warden wetlands are among the most important sites in south-Western Australia for Chestnut Teal Anas castanea. They are also an extremely important site for Hooded Plovers Charadrius rubicollis (240 birds in Lake Warden in February 1985), a rare species restricted to southern Australia. Hooded Plovers breed regularly at Station Lake and

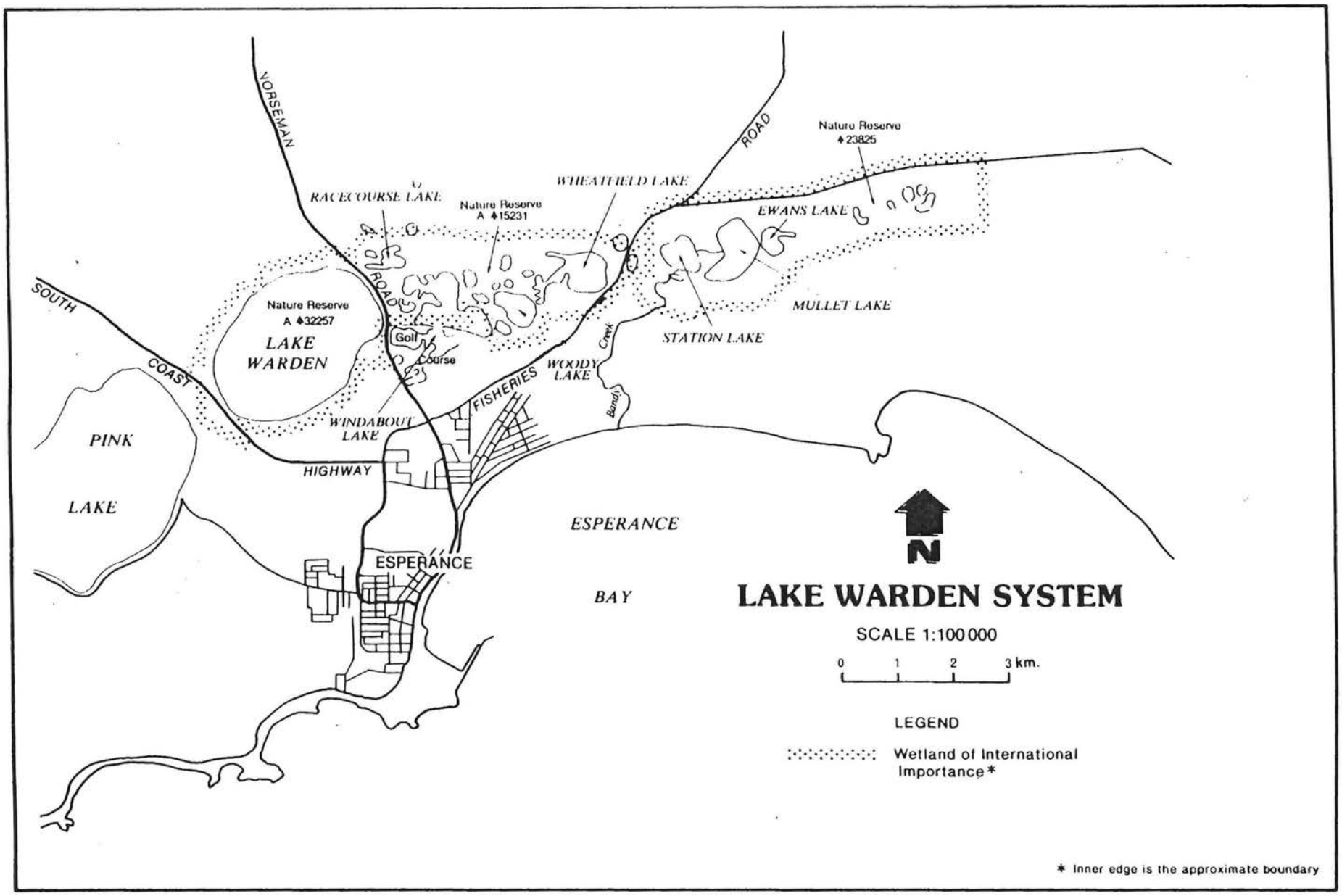
the Lake Warden wetlands support well over 1% of the population of this species in south-Western Australia; the entire Australian population is less than 2 000 birds.

GENERAL CONSERVATION VALUE: The principal conservation value of the Lake Warden wetlands is as habitat for waterbirds although they are also typical examples of saline coastal lakes on the south coast of Western Australia.

LAND USE: Duck-shooting occurs in all the Lake Warden wetlands except Lake Warden itself. Windabout and Woody Lakes are used for water-skiing and sailing. The area around the lakes is used for horse-riding and there is an extensive network of vehicle tracks.

MANAGEMENT: The extensive vehicular use around the wetlands and frequent fires are leading to degradation of the environment and an effort should be made to restrict access. Water-skiing and, to a lesser extent, sailing may have an adverse effect on the use of the lakes by birds. The Department of Conservation and Land Management should continue to monitor these activities, which should be restricted to Woody and Windabout Lakes.

SELECTION CRITERIA: Of the recommended criteria to be used in identifying Wetlands of International Importance, the Lake Warden wetlands meet criteria 1, 3(a) and 3(c).


VORSEMAN
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RACECOURSE LAKE
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SOUTH
COAST
Nature Reserve
A ♦32257
LAKE
WARDEN
ROAD
Golf
Course
MULLET LAKE
STATION LAKE
Creek
WOODY
LAKE
FISHERIES
Bandy
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LEGEND
Wetland of International
Importance*
* Inner edge is the approximate boundary