DRAFT MANAGEMENT PLAN

number 2

'Thompson Lake' Nature Reserve No. 15556

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DEPARTMENT OF
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PERTH
1980

Department of Fisheries and Wildlife

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THOMPSON LAKE NATURE RESERVE
(CLASS A RESERVE No. 15556)

BY

IAN G. CROOK AND TREVOR EVANS

1980

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PREFACE

Thompson Lake is one of a series of over one thousand Nature Reserves which perpetuate areas of the natural and semi-natural vegetation and wildlife of Western Australia.

Thompson Lake was set aside as a Nature Reserve because it represents several of the varied duneland habitats of the Swan Coastal Plain, and because it is a particularly important breeding and feeding area for waterfowl. It is also a most scenic lake set amongst natural bush in easy reach of the Perth Metropolotan Area, and is much-used by people as a result.

It is important that a Nature Reserve such as Thompson Lake should be used, particularly by those who wish to observe and enjoy the riches of the wildlife it supports. Equally important, all use must safeguard its natural values.

These dual objectives of perpetuation and use can be achieved by management, and the draft management plan which follows is one of a series for the Nature Reserves of the Perth Metropolitan Area and environs based on these aims. The management plan also has a wider purpose. With others of the series it begins to draw the Metropolitan Nature Reserves together: a system within a system which provides a patchwork of dedicated wildlife habitats close to the city, and opportunities for many people to study, learn about or just contemplate the intricate patterns of nature.

This plan is now open for comment from all interested people and organisations. It is only through the participation of the community in their management that Nature Reserves can best serve the interests of the people for whom they were set aside.

B. K. BOWEN
Director,
Department of Fisheries and Wildlife.

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ACKNOWLEDGEMENTS

The part played by Mrs Pauline Clay in the preparation of this draft management plan through her "Field Study of Thompson Lake", a report commissioned by the Department of Fisheries and Wildlife in 1976, has been invaluable. We are also grateful to the Conservator of Forests for providing the comments and management advice of Dr E. Hopkins, Forests Department, based on the "Field Study". The comments and assistance of the Superintendent, Bush Fires Board and the Bush Fires Advisory Committee of the Cockburn City Council, including Mr C.D. Wellings, Councillor; Mr J.T. Duggan, Councillor; Messrs B. Gilliland and F. Massey, Fire Control Officers, South Coogee Volunteer Bush Fire Brigade; Mr K. Stanley, Captain, Jandakot Volunteer Bush Fire Brigade; Mr D. Evans, W.A. Fire Brigades Board; Mr R. Place, Liaison Officer, Bush Fires Board; Mr E. Duffy, Ranger, City of Cockburn; Mr T. Ashworth, Fire Control Officer, City of Cockburn; Mr R.W. Brown, Deputy Chief Fire Control Officer, City of Cockburn; and Mr B. Clay, Ranger, University of Western Australia Marsupial Breeding Station; in the preparation of proposals for fire protection management in this Plan are also gratefully acknowledged. We also wish to thank Dr A.A. Burbidge and Mr J. Lane, Wildlife Research Centre, Department of Fisheries and Wildlife, for their advice and very helpful comments during the course of preparation of this management plan.

THE RESERVE

Thompson Lake Nature Reserve (Class A* Reserve No. 15556, 509 ha Fig. 1) is named for the lake it contains, an important breeding site and refuge for waterfowl and the largest and one of the less developed of a chain of freshwater wetlands in the City of Cockburn.

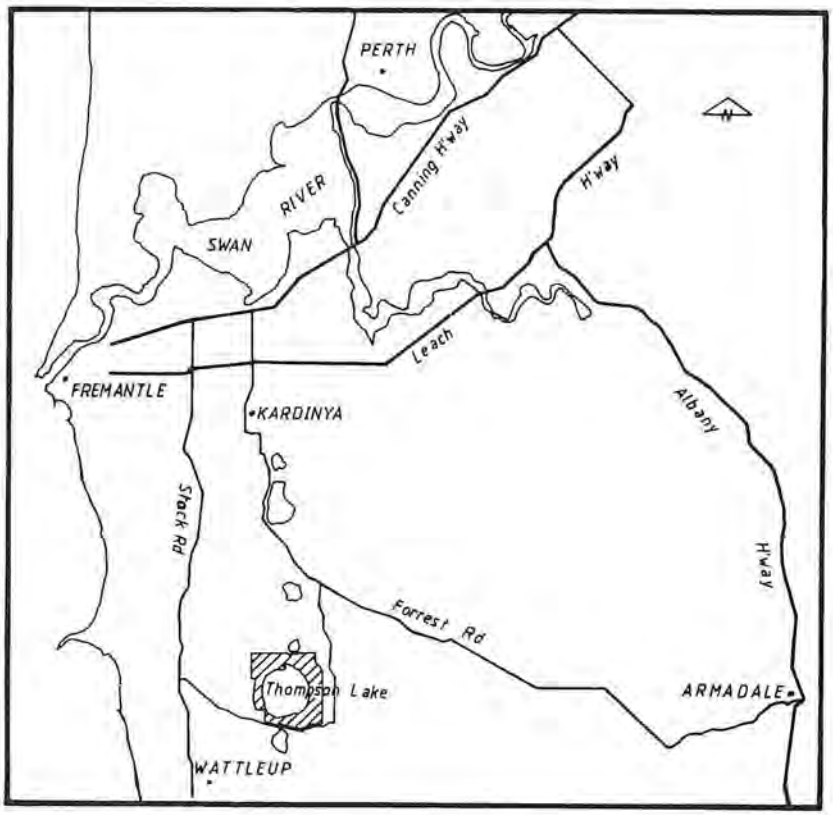

Figure 1. Location of Thompson Lake Nature Reserve.

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* Class A in terms of the Land Act 1933.

The Reserve is about 34 km south-west of Perth near the junction of Hammond and Russell Roads and lies between the smaller Kogolup and Banganup Lakes. It is bounded to the east and west by rural small holdings, to the south by Russell Road and the University of Western Australia Marsupial Breeding Station and to the north by uncleared bushland zoned Rural and owned by the State Housing Commission (Fig. 2).

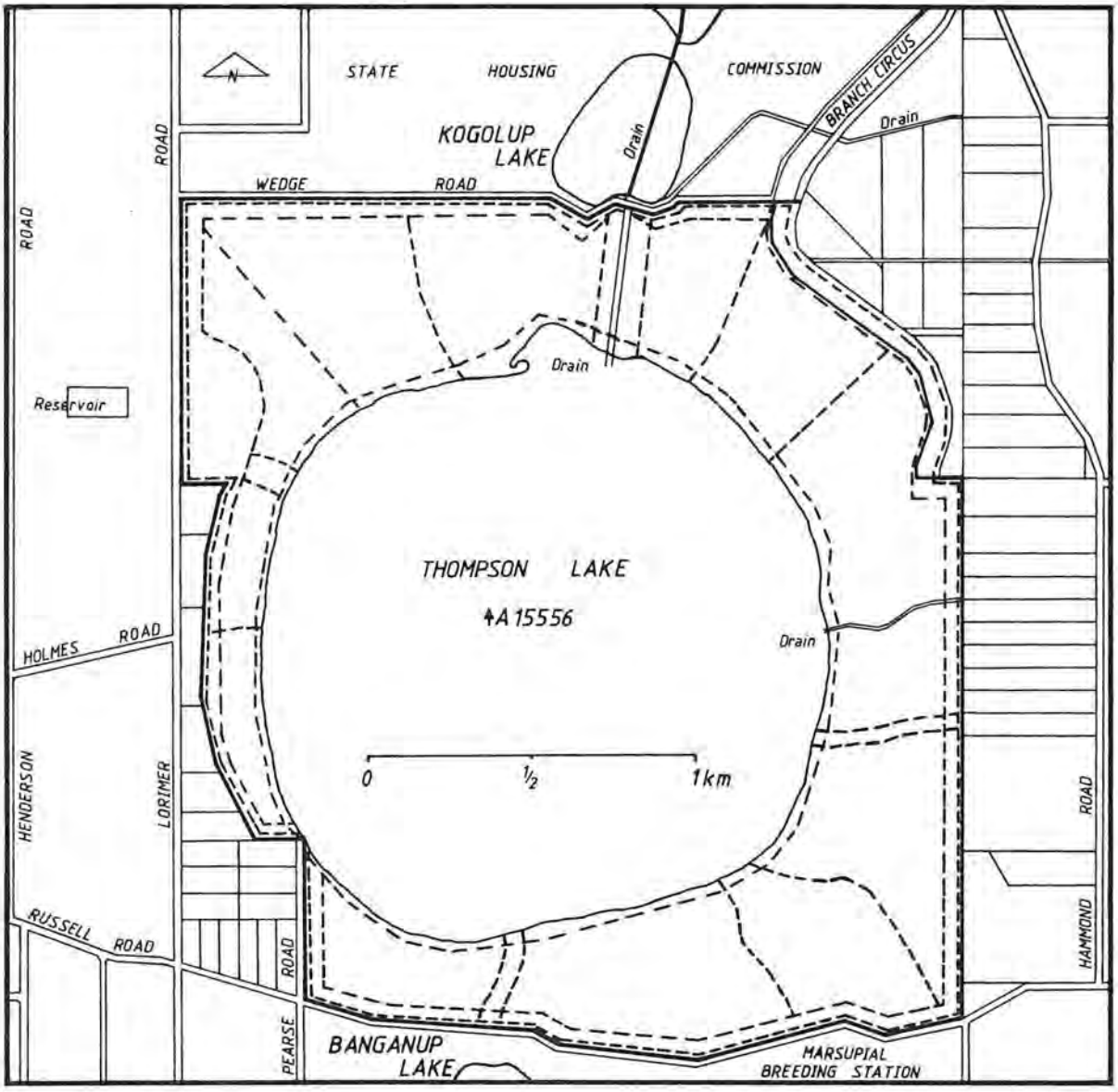

Figure 2. Thompson Lake Nature Reserve showing present network of firebreaks (dashed lines).

The Reserve also includes some 300 ha of mainly woodland and open forest in a buffer 100 - 400 m in depth around the centrally placed lake. This vegetation has developed on two dune systems of Pleistocene age (Spearwood and Bassendean dune systems) and includes a variety of plant associations dominated by Flooded Gum *(Eucalyptus rudis)*, Jarrah *(E. marginata)*, Pricklybark *(E. todtiana)*, Swamp Paperbark *(Melaleuca preissiana)* and various *Banksia* species.

The Reserve supports a diverse range of the vegetation and flora characteristic of the older dune systems of the Swan Coastal Plain, and it has the additional value to wildlife of preserving one of the most important freshwater lakes in the region complete with an undeveloped foreshore.

1. INTRODUCTION AND HISTORY OF THE RESERVE

The attention of the Department of Fisheries and Wildlife was formally drawn to Thompson Lake in 1954 by Mr Waverney Ford of Hamilton Hill, who prepared the first recorded fauna list for the area. At that time the Reserve (Fig. 3a) included areas north and south of Russell Road. It was reserved for the purpose of Drainage and was unvested.

At the same time there was a proposal to lease the southern part of the Reserve for the grazing of sheep and cattle. On the basis of Mr Ford's report and general knowledge of the area the Department objected to the grazing proposal:

> "The land to the south of the lake has often been reported to harbour brush kangaroos and other small marsupials and it is ideally suited for zoologists attending the University. There is no doubt the raising of cattle or sheep would cause the complete elimination of most, if not all, of the species of marsupials there, and therefore I must lodge a protest against the leasing of the reserve for such a purpose."
>
> (Mr A.J. Fraser, Chief Warden of Fauna, *in litt.* to the Under Secretary for Lands, 13 December 1954).

As a result of this and further correspondence the proposal for a grazing lease was dropped, and to better protect the Reserve from alienation its purpose was changed to "Drainage and Conservation of Fauna" in July 1955.

The value of the Reserve to wildlife was further confirmed by Fauna Warden G.C. Jeffrey in May 1956:

> "...Mr W. Ford certainly put us onto a good area for a sanctuary. The birdlife there at the moment is marvellous ... I have never observed birds so tame. The blue wrens and thornbills came within ten feet of me as did the robins and grey fantails."
>
> (Extract from the diary of Mr G.C. Jeffrey, Fauna Warden, Department of Fisheries and Fauna, May 1956).

The Conservator of Forests was equally impressed with the area:

> "...this reserve contains, for a single compact area, probably the greatest number of native plant species once common to the metropolitan area and coastal plain.

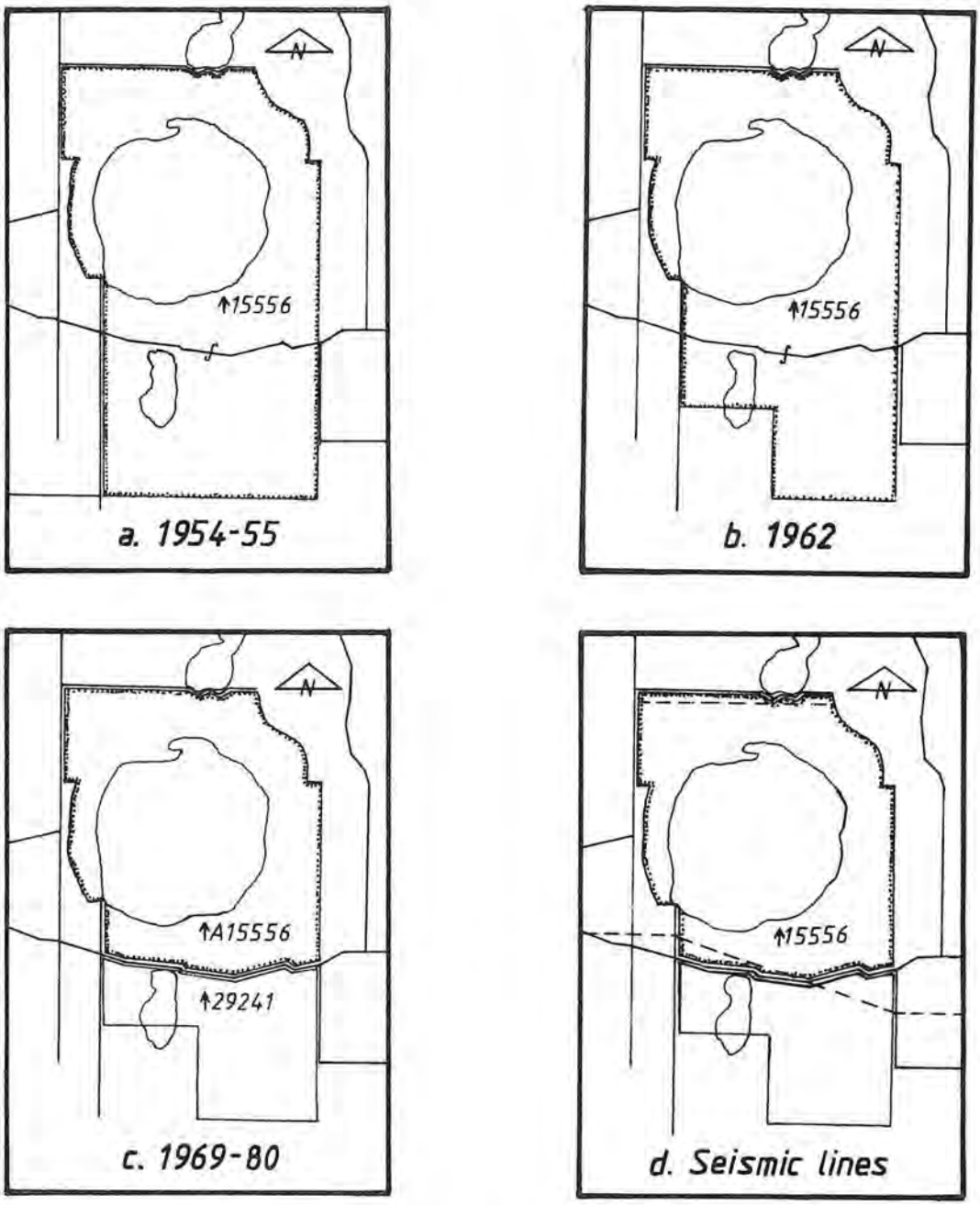

Figure 3. History of Thompson Lake Nature Reserve.
(a) 1955. Purpose changed to include Conservation of Fauna.
(b) 1962. Reserve for Prison Site excised from south-western corner.
(c) 1969. Reserve 29241 excised and leased to the University of Western Australia as a Marsupial Breeding Station.
(d) 1966 & 1972. Seismic lines cut for petroleum exploration purposes.

> This year's spring flowering, particularly in the area of Russell Road, is reported to have been "simply breath-taking..."
>
> (Conservator of Forests, *in litt.* to the Under Secretary for Lands, 30 November 1960).

At this time, during the late 1950's and early '60's, however, the Reserve was being ill-used by nearby landowners for grazing their cattle. Wood was being cut illegally and wildfires were causing some damage to the vegetation. Cattle grazing, particularly, was seen as a major management problem:

> "If this trespassing of cattle continues, the native flora will eventually be replaced with exotic grasses, such as veldt grass, and the native fauna will eventually disappear."
>
> (Conservator of Forests, *loc. cit.*)

Being an unvested Reserve, the Department was not able to control trespass by cattle or prevent such things as timber-poaching. A Vesting Order for the Reserve was therefore sought in favour of the Fauna Protection Advisory Committee (FPAC), the forerunner to the Western Australian Wildlife Authority (WAWA) and the vesting authority for most of the Nature Reserves now managed by the Department of Fisheries and Wildlife.

This proposal was agreed to by the Under Secretary for Works on the proviso that the lake could continue to be used if required for drainage purposes:

> "...Thompson Lake is a natural sump to receive drainage from the east, if and when drainage of this area is put in hand. Furthermore, the Lake Thompson Reservoir Reserve [Fig. 2] and associated pipeline controlled by the Metropolitan Water Supply are outside Reserve 15556, but its continued use as the Reservoir overflow drain is essential."
>
> (Under Secretary for Works, *in litt.* to the Under Secretary for Lands, 28 February 1961).

The FPAC agreed to the continued use of the Lake for this earlier designated purpose to the satisfaction of the Under Secretary for Works and the proposal for vesting the Reserve in the FPAC gained further support from the Conservator of Forests. However, granting of the Vesting Order was delayed by a proposal from the Cockburn Shire Council* to develop the area south of Russell Road as a golf course and a request from the Chief Secretary's Department to have part of the southern portion reserved as a Prison Site.

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* Now the City of Cockburn.

The Director of the Department conveyed his own and the FPAC views on these suggestions to the Under Secretary for Lands on 3 September 1962:

> "I agree with the Fauna Protection Advisory Committee (to whom this matter was referred) that, in principle, it is not possible to agree to excisions from the already inadequate reserves for the conservation of flora and fauna. The Thompson Lake area is an important one in our system of sanctuaries and research work is being conducted there by the University.* We are already experiencing trouble with illegal grazing of cattle on the Reserve and illegal firewood cutting and action is constantly in hand to prevent these activities. It is most disturbing to receive in addition to the illegal attempts to interfere with the habitat, requests from local authorities and other Government Departments for the excision of sections of existing sanctuaries.
>
> From our point of view, it can be said that the area selected for the prison site is in a section which perhaps is less vital to our needs than are other parts of the reserve."
>
> (Director, Department of Fisheries and Fauna, *in litt.* to the Under Secretary for Lands, 3 September 1962).

At about the same time (May 1963) the Forests Department formally proposed establishment of a pine plantation over the southern part of the Reserve. The Department and the FPAC, however, resolved to persevere and retain the area as a Nature Reserve on the basis of its established wildlife values. Their course was strongly supported by Dr D.L. Serventy, then Officer in Charge of the W.A. Field Station of the Division of Wildlife Research of the CSIRO and member of the FPAC:

> "This part of the reserve [proposed as a pine plantation] remains a good representation of the Jarrah - banksia country of the coastal plain. ...There are many fine Jarrahs, healthy looking flooded gums, very good stands of big paper barks nearer the lake and no sign of exotic plants...
>
> I recommend therefore that the whole of Thompson Lake Reserve be retained intact as a fauna and flora reserve."
>
> (Dr D.L. Serventy, *in litt.* to the Director, Department of Fisheries, 3 May 1963).

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* The interest of the University of Western Australia in the Nature Reserve as a research area, a possibility foreshadowed as early as 1954 by the Chief Warden of Fauna, stems from work done there initially by Professor A.R. Main and one of his research students, Dr W. Lane, beginning in 1960.

The matter was resolved by a portion of the Reserve at the south-western corner being reserved as a "Prison Site" in 1962 (Fig. 3b) and by the vesting of the remainder in the FPAC in June 1967. Shortly thereafter arrangements were made for lease of the rest of the southern portion as a new Reserve (29241) to serve as a research station for the University of Western Australia (Fig. 3c).

In January 1969 and August 1970 the role of the Reserve for nature conservation was further strengthened by a change of Purpose to "Fauna Conservation, Research and Drainage" and its elevation to Class A under the Land Act, respectively.

Most of the development of privately owned land around the Reserve occurred during the 1960's. Aerial photographs taken in 1959 show there was a large market garden at the corner of Hammond Road and Russell Road and a number of smaller properties (8-10) had been cleared on the western side of the lake on Russell Road, Henderson Road and Holmes Road. The remainder of the land in the vicinity was uncleared. By 1968 most of the private land to the east and south-west of the Reserve had been subdivided and variously improved, some of the last lots to be cleared being those on Pearse Road in the early 1970's.

With the fencing and development of surrounding land the problem of straying cattle abated, being replaced by rubbish dumping, wildfires of increasing frequency and extent* and pressures from various sources to develop and use the Reserve in a number of different ways.

Seismic lines were cut for prospecting purposes in the south of the Reserve in 1966 and across the north of the Reserve in 1972 (Fig. 3d). A system of firebreaks was installed and improved by the Department between 1971 and 1974 (Fig. 2) in an effort to control the severity of fires.

The firebreaks, however, provided ideal sandy tracks for horses. There are riding and racing stables in the area and smaller numbers of horses are run on a number of properties adjacent to the Reserve. Despite Departmental efforts at control the Reserve has become a very popular riding area. The same tracks have also been increasingly used by off-road vehicles of various kinds.

Serious wildfires have become a nearly annual occurrence and with them have come invasions of weeds and grasses and the opening up of the ground cover vegetation to further damage by horse-riders and drivers of off-road vehicles intent on making their own paths through the bush. Easy access to the

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* Details of the fire history of the Reserve are given in Section 5: 'Fire History'.

edges of the Reserve has also encouraged rubbish-dumping. These mis-uses of the Reserve, which are beginning to prejudice its biological values, also detract from the enjoyment of those who wish to use the Reserve in the ways for which it was intended.

During the early period of its management there were a number of competing claims for the use and development of the Thompson Lake Nature Reserve. These have either been resisted or corrected before irrevocable changes occurred. As development of the region has proceeded, however, the potential of such a Nature Reserve on the outskirts of Perth has become increasingly apparent.

In 1974 the Department conducted a survey of landowners around the Reserve which revealed a high level of interest in the Reserve itself and its development. The City of Cockburn responded with a proposal for development of the Reserve for the public to better enjoy its natural values.

School parties have used the Reserve on several occasions and the possibility of developing the Reserve for principally environmental education purposes was mooted within the Department at about the same time as the development proposal advanced by the City of Cockburn. A field study of the Reserve was subsequently commissioned (Clay, P. (1976). 'Field Study of Thompson Lake Nature Reserve'. Unpublished Report to the Department of Fisheries and Wildlife.) to provide information as a basis for future management.

Since then management problems associated with increased use and development of surrounding land have not abated. The conservative management of the past has served its purpose in firmly establishing Thompson Lake as a Nature Reserve representing some of the original habitats of this part of the Swan Coastal Plain. The need now is for its careful development to perpetuate and where necessary restore these natural values and to realise its potential for environmental education and the quiet enjoyment of all sections of the community.

2. LOCATION AND PHYSICAL FEATURES

The Thompson Lake Nature Reserve, totalling 509 ha and consisting of a centrally placed lake (172 ha) and surrounding land, is in the City of Cockburn, 19 km south of Fremantle and approximately 34 km south-west of Perth. The lake, which varies from being dry to 3.3 m in depth, depending on season and rainfall, occupied a depression between two series of sanddunes, aeolian deposits of Pleistocene origin, the Bassendean and younger Spearwood dune systems.

The junction between these dune systems is marked by a chain of wetlands in this area between Kardinya in the north and Wattleup in the south (Fig. 1). Thompson Lake is the largest of these wetlands. It has a lake bed 11.79 m above sea level and the surrounding dunes rise to approximately 45 m above sea level.

The two dune systems have distinct origins, landforms, drainage patterns and characteristics as soils which have been described by Seddon, G. (1972) in 'A Sense of Place' published by the University of Western Australia Press.

The Bassendean dunes are highly leached grey quartz sands of early Pleistocene origin characterised by excessively drained ridges and very poorly drained interdunal swales. As soils they are very poor in quality but nevertheless support a very diverse native flora based on woodlands of mixed Banksia species including Slender Banksia *(Banksia attenuata)* and Menzies Banksia *(Banksia menziesii)*.

The Spearwood dunes are younger than the Bassendean, less leached and with higher, more rolling relief. The soils are yellow to brown and at Thompson Lake correspond with the soils of the Karrakatta soil/landform unit mapped by Churchward and McArthur (1978) 'Landform and Soils of the Darling Region (System 6)' published in Perth by the Environmental Protection Authority. Churchward and McArthur describe the Karrakatta soil/landform unit as: "...Undulating landscape with deep yellow sands over limestone".

Some leaching has taken place in these soils, a substantial proportion of the calcium carbonate they contain having been washed down by slightly acid rains to form a deep limestone layer. Their history of deposition and later erosion, however, is complex and the reader is directed to Seddon (1972) for a full account of their development. The deep sands of the Karrakatta soil association naturally support tall open forest of Tuart *(Eucalyptus gomphocephala)*, Jarrah *(E. marginata)* and Marri *(E. calophylla)*.

3. LAKE THOMPSON

Thompson Lake forms part of the "southern lakes drainage scheme" proposed by the Metropolitan Water Supply, Sewerage and Drainage Board and the water level of the lake might also be inadvertently affected by systematic development of groundwater in the Jandakot area. The Purposes of the Reserve under the Land Act include "Drainage" and close liaison is maintained with the Board to ensure that compatibility of uses of the lake is maintained.

The lake was approximately 1 700 m in diameter and one metre deep on average at the time of the 1976 field study. In the following years for which aerial photography is available (1977 and '78) the winter diameter of the lake was 2 000 and 1 700 m respectively.

The amount of water in the lake varies widely, however. Metropolitan Water Board data show the lake to have dried in the summer of 1961, '62 and '63 and to have reached its greatest recorded depth of 3.6 m above the lake bed at the

Board well site in October 1968. Lake level varies both with season and annual rainfall.

Under the existing drainage regime water drains into the lake from the north, from Lake Kogolup, and from agricultural land to the east (Fig. 2). Blooms of the blue green alga *Microsystus aeruginosa* occur from time to time indicating that significant amounts of mineral nutrients, nitrogen and phosphorus, may be entering the lake. There is also a possibility that drainage water may be contaminated with Coliform and *Salmonella* bacteria potentially pathogenic to man.

Since 1971 the Enteric Diseases Unit of the State Health Laboratories has maintained a regular sampling programme to monitor the occurrence of *Salmonella* and faecal and non-faecal Coliform bacteria from Thompson Lake and other wetlands in the Cockburn chain. The results have consistently shown Thompson Lake water to have very low levels of contamination with potentially harmful bacteria. This monitoring programme is a continuing one.

Professor D. O'Connor and others (1976 - The Cockburn Wetlands - An Environmental Study) reported Thompson Lake to be increasingly enriched by nitrogen and phosphorus draining into the lake, particularly from agricultural land to the east:

> "The increased nutrient levels are probably responsible for the large algal blooms observed on Thompson Lake recently. The impact of this man-induced eutrophication on the wildlife of the reserve could be considerable. A measurement of the B.O.D. (biological oxygen demand) taken in February of last year (1975) was 10.3 ppm. This indicates a dangerously low level of oxygen."
>
> (Professor D. O'Connor *et al. loc. cit.*)

Excessive enrichment leads to algal blooms, the possibility of algal poisoning among waterfowl and eutrophication and deoxygenation, firstly of the bottom sediments (leading to the possibility of increased occurrence of botulism in water birds) and finally of the whole lake. Consideration will be given to establishing a programme to monitor phosphorus and nitrogen contents of the lake water and drainage water entering the lake as part of this management plan.

Thompson Lake supports a variety of invertebrate animals which are an important food source for waterfowl and amphibians. The Pink-eared duck *(Malacorhynchus membranaceus)*, for example, regularly recorded on the lake, relies almost entirely on aquatic insects and other invertebrates for its food. The invertebrates are equally important to the frogs, of which there are a variety present around the lake (Appendix II), and the frogs in turn are eaten by reptiles and possibly mammals. However, one of the most common invertebrates, a midge *(Polypedilum nubifera)*, which is widely distributed in wetlands of the Perth region, also causes problems for neighbouring householders.

The larvae of the midge live in shallow water and around wetland margins where they are preyed upon by birds and frogs alike. The adults fly, however, and when they emerge, sometimes in very large numbers, they hover over the water to mate after which the females lay their eggs in the water, thus laying the foundation for a new generation of larvae.

The lifespan of the flying adult phase is 24 to 36 hours, but in this time dense clouds of them may drift on the lightest breeze and concentrate in sheltered places like verandahs and sheds. They are also attracted to light and can cause considerable nuisance to people who live close to Perth wetlands. Thompson Lake is no exception but the possibility of minimising the problem here is better than in most other places because of the area of trees and thick bush around the lake margins. Dr D.H. Edward of the Department of Zoology, University of Western Australia has found that the problem of winddrift of the adult midges is reduced where there is a buffer zone of bush between a lake and any residential development.

Mrs Pauline Clay reported on her personal experience of this in her Field Study:

> "...The first year we were here /at the University of Western Australia Marsupial Breeding Station/, 1971, there had been a severe fire on the north-eastern edge of Lake Banganup destroying much of the vegetation. The midges always came with a westerly wind and were 4" - 6" deep on the window sills. On some nights they were so bad we had to switch off the lights, but five years later, with no fires, we have no midge problem."
>
> (Clay, P. 1976. 'A Field Study of Thompson Lake', *ibid.*)

Complaints about midges from Thompson Lake have been occasionally received in recent years and it is possible that frequent fires in the bush around the lake may have made the problem worse. From Mrs Clay's experience any midge problem in the area is likely to abate quickly if the bush is kept free of too-frequent fire.

4. VEGETATION AND FLORA

The vegetation of the Reserve was described and mapped and a list of plants compiled as part of the 1976 Field Study. Mrs Clay recorded a list of more than 200 positively identified plant species from the Reserve (Appendix I) and pointed to the richness of the flora by noting, for example, that the Reserve supports 13 of the 23 tree species known from the Swan Coastal Plain as a whole.

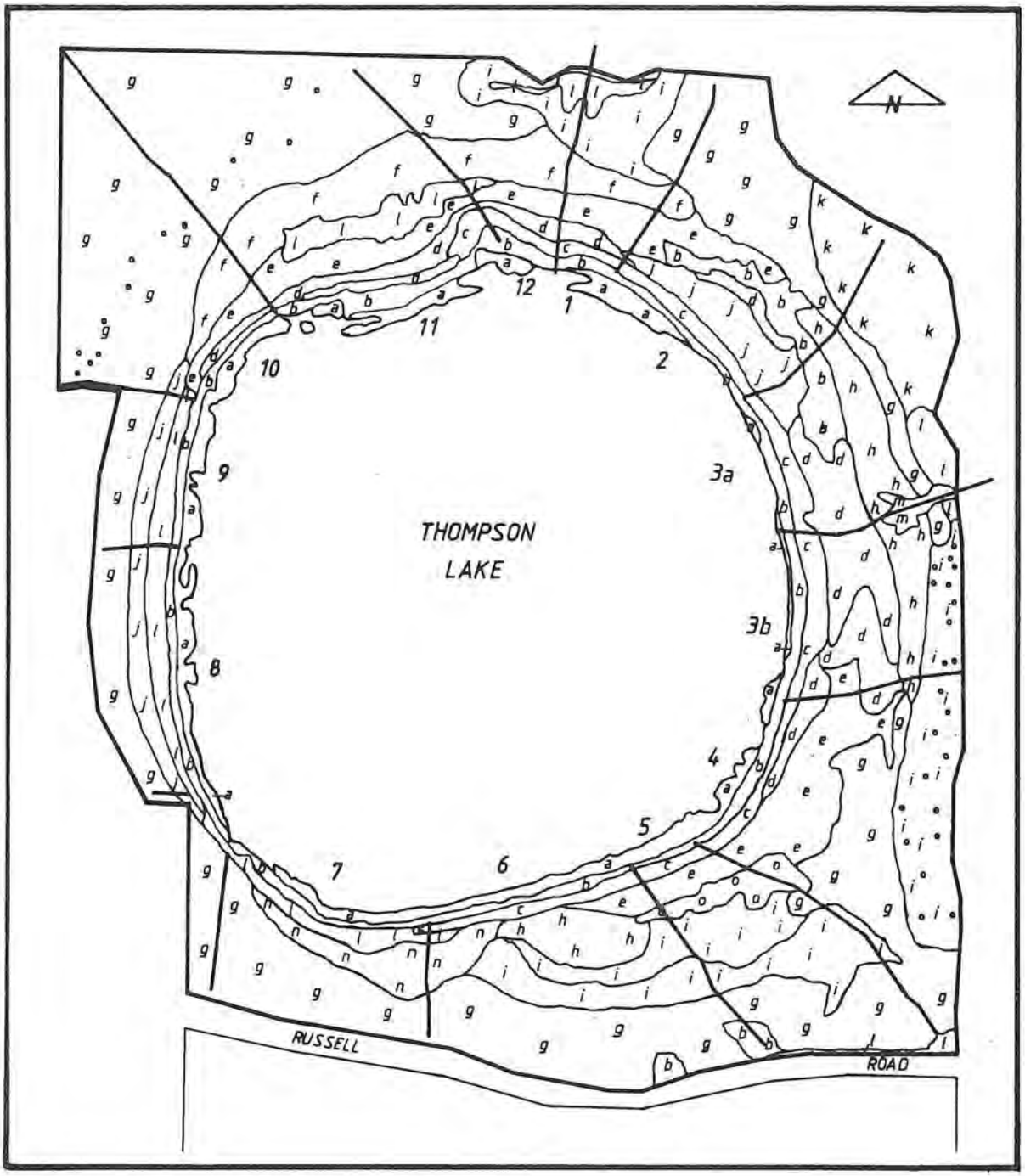

Figure 4. Vegetation of Thompson Lake. The vegetation zones are identified by letters as in the text descriptions. Heavy radial lines and accompanying numbers mark the compartments referred to in the vegetation descriptions.

Mrs Clay recognised 15 vegetation "zones" on the Reserve (Fig. 4), the description of which is as follows:

a. *Baumea articulata* zone: An almost continuous band of reeds, predominantly *Baumea articulata* with patches of bullrushes *(Typha domingensis)* and pampas grass *(Cortaderia argentea)*. Other species of Baumea and Cladium are well represented. On the eastern shore in the region of Compartment 3* the reeds are not so dense. (As the water receded during the course of the Field Study mud flats in the more open parts of the '*Baumea articulata* zone' were covered with *Polygonum minus* and *Amaranthus* sp.).

b. Cyperaceae zone: Species of this family are well represented between the reeds at the water edge and taller woodland and forest vegetation behind. During the summer of the Field Study there was a very lush growth of couch grasses *(Cynodon dactylon* and *Sporobolus virginicus)* with some clovers *(Trifolium* spp.). A band of the exotic daisy *Aster subulatus* extended from the south-west to the north-west of the lake. (This plant had not been in evidence in previous years and it was Mrs Clay's opinion that it entered by means of the agricultural drain on the eastern side (Fig. 2) and drifted across the lake to establish on the western shore.) Other common plants are *Mesomelaena stygia, Scirpus nodosus, Lepidosperma* spp. and *Baumea* spp. A few flooded gums *(Eucalyptus rudis)* are found on the south-west and western edge. Compartment 5 has a patch of *Melaleuca teretifolia.*

c. *Viminaria juncea, Acacia saligna* zone: An almost continuous belt of these species extends along the eastern edge of the lake. There are a few young *E. rudis* and in Compartment 3 is a patch of *Melaleuca teretifolia.*

d. *Eucalyptus rudis* zone: These areas are predominantly flooded gums with a few mature trees and many young specimens. *Acacia saligna, A. pulchella* and native grasses occur in the understorey.

e. *Eucalyptus rudis, Melaleuca preissiana* zone: Low open forest of these flooded gums and paperbarks with a variable understorey of young *Viminerea juncea, Acacia saligna, Dodonea attentuata* and *E. rudis* alternating with patches of denser growth of *Acacia pulchella, Jacksonia furcellata* and *Pimelea rosea* and open areas of native grasses.

f. *Melaleuca preissiana* mixed *Banksia* zone: Low open forest of *Banksia menziesii, B. ilicifolia* and *B. attentuata* with *Melaleuca preissiana.* Some dense patches of *Jacksonia furcellata* in the understorey are interspersed with open

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* The compartments referred to are formed by the radial firebreaks and are numbered on Fig. 4.

areas where the ground cover includes *Conostylis* spp., *Cladium* spp., *Phlebocarya ciliata*, *Hibbertia* spp., *Lepidosperma* spp. and native grasses.

g. *Eucalyptus marginata* mixed *Banksia* zone: Open forest to woodland of mixed Jarrah *(E. marginata)*, with Tuart *(E. gomphocephala)* and *Banksia menziesii*, *B. attenuata*, *B. ilicifolia*, *B. grandis* and *Casuarina fraserana* forming a lower canopy, Christmas Trees *(Nuytsia floribunda)* occur on the fringes of this zone.

The understorey is mainly *Jacksonia furcellata*, *J. sternbergiana*, *Macrozamia reidlei*, *Xanthorrhoea preissii*, *Hardenbergia comptoniana*, *Acacia pulchella* and *A. rostellifera* (in Compartment 10).

h. *Melaleuca preissiana* zone: Low open forest predominantly of paperbarks *(M. preissiana)* with an open understorey of *Viminaria juncea*, *Acacia pulchella*, *Jacksonia furcellata* and *Astartea fascicularis*. Large *Xanthorrhoea preissii* occur in the more open areas where plants from the families Cyperaceae and Restionaceae are represented.

i. Mixed *Banksia* zone: Open forest - woodland similar to zone (g) except that Jarrah is absent. *Banksia attenuata*, *B. menziesii*, and *B. ilicifolia* predominate with *Casuarina fraserana* and *Nuytsia floribunda* being present. Tuarts *(E. gomphocephala)* and *E. todtiana* occur on the higher ridge on the eastern side of the lake where the understorey is sparse and introduced grasses have replaced much of the native flora as a result of frequent burning. The remainder of the understorey in this zone has plants such as *Hibbertia* spp., *Hovea* spp., *Adenanthos sericea*, *Scholtzia involucrata*, *Jacksonia* spp., and *Daviesia* spp., interspersed with *Carpobrotus* spp., *Conostylis* spp., *Phlebocarya ciliata* and *Hemiandra pungens*.

j. *Banksia littoralis*, *Melaleuca preissiana* zone: Low open forest similar to zone (e) except for the absence of *E. rudis*. The place of the flooded gums is taken by large specimens of *Banksia littoralis*. The understorey and ground cover are also similar in composition to those of zone (e) with Cyperaceae growing under thick *Acacia pulchella* and *Astartea fascicularis*. Some *Boronia crenulata* and *Hypocalymma angustifolium* occur in the more open areas.

k. Mixed *Banksia*, *Eucalyptus todtiana* zone: Low open forest - woodland with common *E. todtiana* and occasional flooded gum *(E. rudis)*. The understorey is similar to other *Banksia*-dominated zones except that *Adenanthos cygnorum*, *Casuarina humilis* and *Stirlingia latifolia* are better represented.

l. Open grassland zone: Open areas without shrub or tree canopy, the ground surface being sandy and badly disturbed by horse riders. The plants are mainly clumps of *Lyginia tenax*, *Hypolaena exsulca*, *Scirpus nodosus*, interspersed

with grasses such as *Briza* spp., *Bromus* spp., and *Stipa* spp. *Carpobrotus* occurs in the loose sandy areas.

m. Bracken zone: There is a thick patch of braken *(Pteridium esculentum)* bordering the eastern agricultural drain and round the northern drain.

n. *Eucalyptus rudis* mixed *Banksia* zone: Open forest of flooded gums and mixed *Banksia* species with understorey badly affected by fire at the time of the Field Study. The flooded gums, however, are of spectacular size and *Kennedia prostrata* and *Macrozamia reidlei* appear to thrive in this area.

o. Cyperaceae, *Acacia pulchella* zone: Thick *Acacia pulchella* with Cyperaceae, *Hypocalymma angustifolium, Daviesia* spp. and *Boronia crenulata*.

In addition to these "zones" Mrs Clay noted the distribution of Tuarts *(E. gomphocephala)* on the Reserve, shown as dots in Fig. 4, and observed that most are found on the higher ridges scattered through the Jarrah and Banksia open forest and woodland areas.

In the same year as the Field Study was carried out the root-rot fungus *(Phytopthora cinnamomi)* was isolated from an area of small Banksias close to the southern boundary of the Reserve. There is no evidence of the *Phytopthora* having spread at this time.

5. FIRE HISTORY

The vegetation of Thompson Lake Nature Reserve has been severely damaged by frequent fires in recent years (Figs. 5 and 6). The first fires recorded in Departmental files occurred in 1965 and 1966 and mainly affected the area south of Thompson Lake. Extensive areas of what is now the Marsupial Breeding Station were also burned in these fires.

A minor fire occurred in the south-eastern corner of the Reserve in 1968 and between 1970 and 1972 a series of particularly extensive and hot fires again burned the southern part of the Reserve between then developing subdivisions to the east and west and Russell Road to the south (Fig. 5b).

It was a result of these fires that a system of firebreaks was upgraded to divide the Reserve into 12 compartments around the lake, a 100 m perimeter buffer strip and four radial buffer strips of similar width on the northern, eastern, southern and western side of the lake. A track was also installed around the whole lake edge. The firebreak and buffer system is illustrated in Figure 2 (See also Fig. 6).

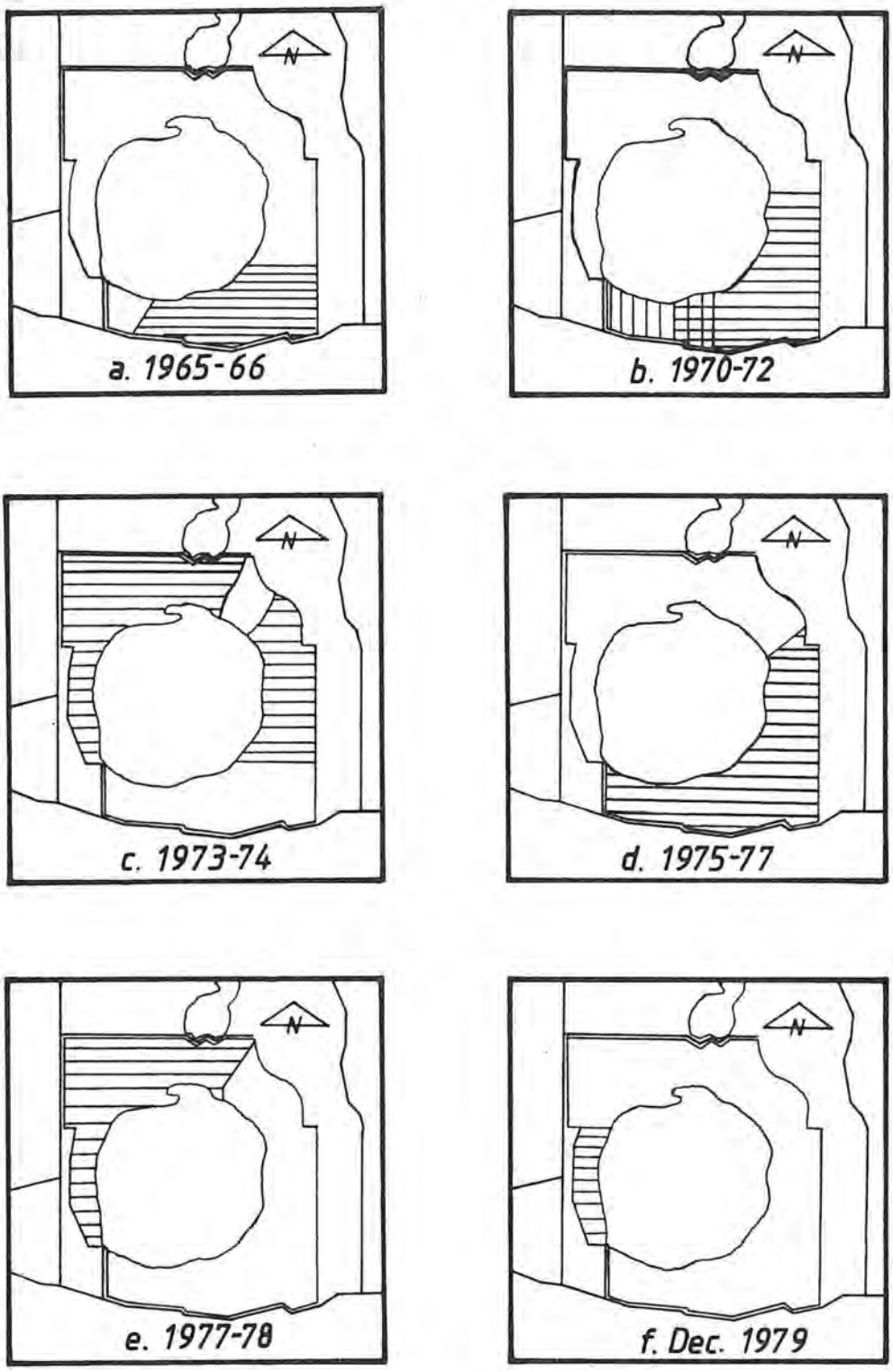

Figure 5. Fire history of Thompson Lake Nature Reserve. 1965-1979. Hatched areas denote approximate areas burned in the various fires recorded.

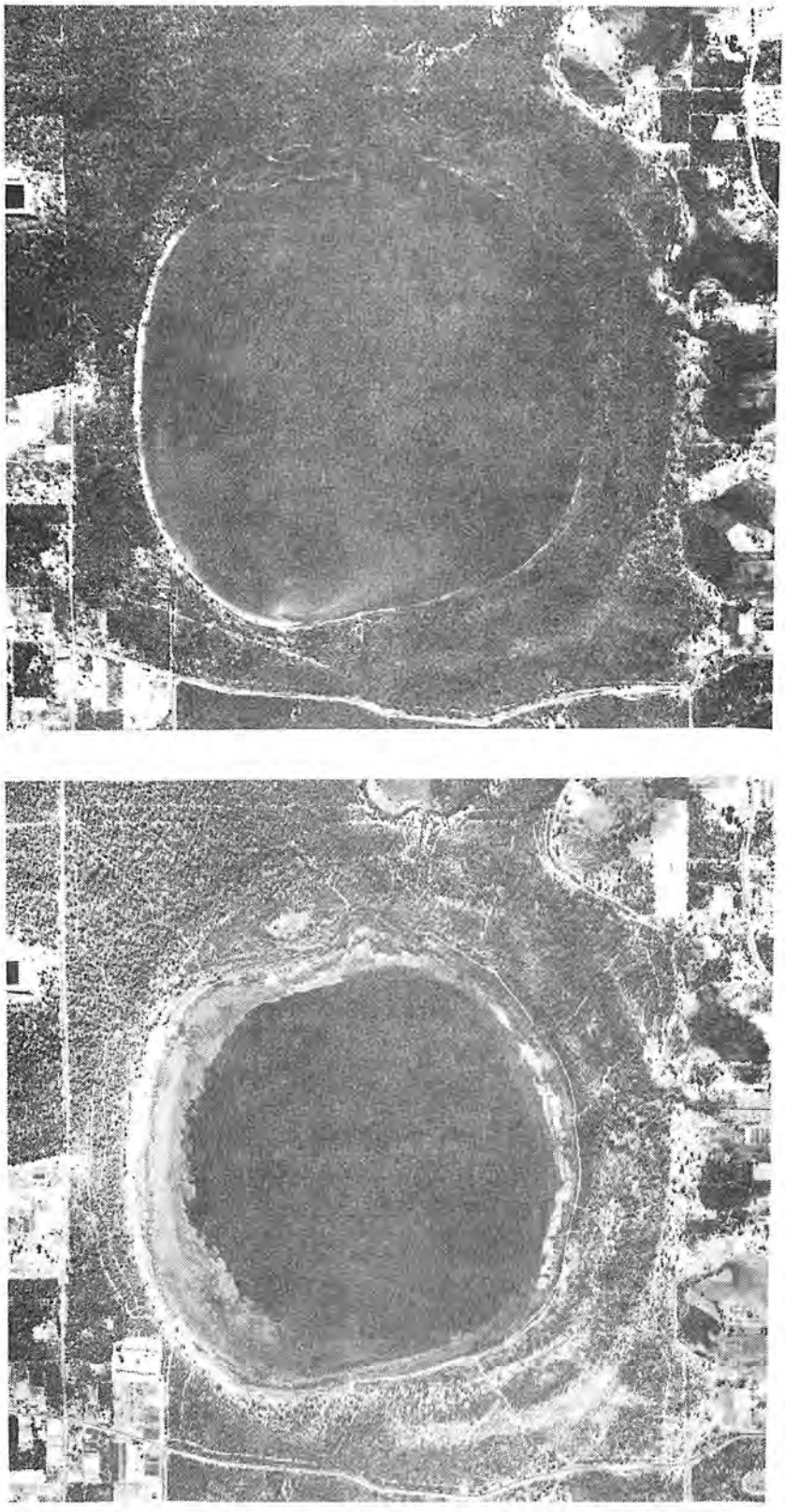

Figure 6. Thompson Lake Nature Reserve, July 1970 (above) and June 1977 (below). The lighter tones of the vegetation in the lower photograph are indicative of the degeneration of the canopy cover. This is especially evident in the southern and eastern parts of the Reserve. Photographs reproduced by kind permission of the Under Secretary for Lands.

With these firebreaks as its basis a plan was instituted to begin in 1973 to burn the compartments at six year intervals and the buffer strips every three years.

The plan was not put into effect because, in December 1973 and January 1974, the Reserve suffered its worst ever series of wildfires with nearly all of the eastern, northern and western sides of the Reserve being burnt (Fig. 5c).

Again, between 1975 and 1977, all of the bush on the southern and most of that on the western sides of the lake was burned (Fig. 5d), and in December 1977 and January 1978 fire units from the Department attended 10 fires which burned all the western and most of the northern bushland areas (Fig. 5e). In December 1979 the western area was burned again (Fig. 5f). Thus, over the past 15 years, nearly all of the Reserve has been burned at least twice and at roughly five-year intervals. The summer of 1978 - '79 is the only one since 1970 in which no fires were recorded on the Reserve.

The fires have had three main origins: from the uncleared bushland to the north of the Reserve, from or adjacent to subdivided land to the west and east of the southern part of the Reserve and from Russell Road. Most have started either from burning-off or rubbish burning on nearby properties.

This frequent burning has resulted in thinning and damage to woodland canopies, death of some trees, especially Banksias, and replacement of understorey shrubs in many places with grasses and weeds. This degeneration is clearly evident in aerial photographs (Fig. 6) and Mrs Clay's description of the vegetation; and, if continued, it will lead to the progressive loss of trees and shrubs and their replacement by fire-prone, highly inflammable grasses. If unchecked the end result of this process would be the replacement of the present woodland and open forest vegetation with the grassland savannah and grasslands already apparent in limited areas of the Reserve, and it is clear that prevention of further frequent fires is of highest priority in the management of the Reserve.

6. FAUNA

The first fauna list for Thompson Lake Nature Reserve was compiled in 1954, prior to its change of Purpose to include the Protection of Fauna, from sight records by Mr Waverney Ford of Hamilton Hill. A number of further lists of sight records have been made since then by Wildlife Officers. A list of fauna was compiled by Mrs Pauline Clay as part of her Field Study. This included the results of trapping and analysis of mammal tracks as well as sight records. Mrs Clay recorded seven species of Amphibia, 12 reptiles (three snakes and nine lizards), 96 bird species, four marsupials and about six feral mammals. A list of 67 birds (23 waterbirds and 44 terrestrial species) was also published in 1976 for Thompson Lake by

Professor D. O'Connor and others in "The Cockburn Wetlands - An Environmental Study". A summary of these fauna lists is given in Appendix II.

6.1. BIRDS

The lists show that Thompson Lake continues to support a remarkably diverse bird fauna, there being few indications of species having been lost from the Reserve since observations began.

Being based on six months of observations Mrs Clay's data are the most comprehensive available. As well as indicating species occurrence they provide some information on habitat preferences and seasonal movements of land birds. Honeyeaters, in particular, move from place to place with the flowering seasons of important, nectar-producing plants. Mrs Clay also recorded decidedly higher concentrations and more diverse assemblages of land-birds from parts of the Reserve with well-established forest and woodland vegetation than from areas which had been recently burned.

Even greater variations in numbers and occurrence were evident among the waterbirds over the six months of the study. Mrs Clay made observations on several lakes in the Cockburn area and these suggest that, as a group, the Cockburn wetlands provide a more complete range of habitats for waterbirds than Thompson Lake or any other single lake in the chain. Professor O'Connor *et al.* came to a similar conclusion in their study of the Cockburn wetlands.

For example, Red-necked Avocets *(Recurvirostris novaehollandiae)* occurred in far greater numbers in the shallow water of Bibra Lake than elsewhere, whereas White-faced Herons *(Ardea novaehollandiae)*, White Egrets *(Egretta alba)*, and Yellow-bellied Spoonbills *(Platalea flavipes)* preferred the sheltered waters of Thompson and Kogolup Lakes with their natural bush surrounds. Several small waders such as Greenshanks *(Tringa nebularis)* and Red-necked Stints *(Calidris ruficollis)* also showed a preference for the shelter provided by reeds around the Thompson Lake shore, whereas Pink-eared Ducks, which feed almost entirely on aquatic invertebrates in greatest numbers on the productive Yangebup Lake during a period of falling water levels.

In addition to the decided preferences of waterbirds for one place or another, these very mobile birds also come and go, from lake to lake, in response to interference and changes in things like food supply, lake water levels and their own biological requirements for places to feed, breed and moult.

Water levels and changes in water levels are an

especially critical factor in the habitat of these birds. Black Swans *(Cygnus atratus)* which largely feed on aquatic vegetation growing within one metre of the surface, move readily between wetlands throughout the south-west as conditions change. Numbers of Black Swans on Thompson Lake in 1976 fell from 95, counted in March, to four in April and stayed low through the winter. The diving ducks (such as the Musk Duck *(Biziura lobata)*, the most common member of this group on Thompson Lake) require deeper water and will leave an area if the water table falls sharply. The largest numbers of diving ducks on Thompson Lake were recorded in late winter when water was deepest.

Other species, like the dabbling ducks, which are particularly abundant on Thompson Lake and on other wetlands in the Cockburn area, are tied to shallower water, and some waterfowl and waders show special preferences for recently exposed or newly inundated mudflats and shallows.

Much of the movement which is so characteristic of water birds as a group is tied to changes in water levels in different places and Mrs Clay's observations emphasise how waterbirds may use several wetlands at different times as their condition becomes favourable: as water levels rise or fall, mud banks are exposed or inundated or as weedbanks come within just the right distance of the surface. Thompson Lake should therefore be seen as part of a system of waterbird habitats. It has the added value, attributable to its size, variation in depth from shore to centre and the shelter offered by reed banks on its shoreline, of supporting the most diverse fauna in the chain and of being a major breeding site for a number of species. Monitoring of water levels, and changes in water levels and water quality is therefore a most important facet of management of the Reserve.

6.2. MAMMALS

Studies of mammals, done as part of Mrs Clay's Field Study, shows the marsupial fauna of the Reserve to be restricted to the Grey Kangaroo *(Macropus fuliginosus)*, Brush Wallaby *(Macropus irma)*, Brush-tailed Possum *(Trichosurus vulpecula)* and the Short-nosed Bandicoot *(Isoodon obesulus)*. Small marsupials and native rodents were not recorded, their places apparently having been taken by the House Mouse *(Mus musculus)* and Black Rat *(Rattus rattus)*. Foxes, feral and domestic cats, dogs and rabbits were also frequently recorded.

The mammal fauna of the Reserve is therefore not of major significance in itself and there is little chance of eradicating introduced species. Some control may need to be exercised over rabbit populations which reach very high levels from time to time on the Reserve.

7. NATURE CONSERVATION VALUE

Thompson Lake Nature Reserve, including the lake itself, contains a compact representation of the landforms, soils and biota of the major dune formations of the Swan Coastal Plain in the Fremantle-Rockingham area. As such the Reserve deserves the status of a key site representing these duneland habitats. In addition the lake provides feeding and nesting habitats for a wide variety of waterbirds. The Reserve is therefore also regarded as a key site in the series of wetland Nature Reserves in the south-west of the State.

The value of the Reserve is not limited by its purely ecological features and wildlife, however. Being situated less than 35 km from Perth and 20 km from Fremantle it is easily accessible to the public. It consists of a most attractive balance of wetland, lake foreshore and bush environments which present the best potential for development for public use of all the Metropolitan wetland Nature Reserves.

8. MANAGEMENT OBJECTIVES

8.1. PROTECTION AND REHABILITATION OF NATURE CONSERVATION VALUES

8.1.1. Fire Protection

Consistent with the need to protect the assets of adjacent landholders, to prevent the occurrence of fires on the Reserve for such period as may be necessary to permit recovery of fire-damaged vegetation.

8.1.2. Prevention of Mis-use

To take such measures as may be necessary to curtail practices such as rubbish-dumping, the use of off-road vehicles and such other activities which are not in keeping with the status of the site as a Nature Reserve.

8.1.3. Water and Water Quality

To maintain Lake Thompson as a waterbird habitat, continuing to monitor lake levels and changes in lake levels, in co-operation with the Metropolitan Water Supply, Sewerage and Drainage Board and encouraging the continued monitoring of bacterial contamination of the lake water.

8.1.4. Rehabilitation

To encourage the re-growth of fire-damaged and

trampled vegetation and the re-vegetation of access tracks and firebreaks no longer necessary for fire protection purposes.

8.2. USE OF THE RESERVE - RECREATION

8.2.1. General Recreational Use

To encourage use of the Reserve for passive recreational activities and to continue to prevent its use and development for active recreational pursuits (such as water skiing and power-boat racing) with the exception of horse riding.

8.2.2. Horse-riding

Inasmuch as there is an established need for a place in this region for the public to ride, drive and exercise horses, to make provision on the Reserve for equestrian activity in such a way as not to prejudice conservation values.

8.3. USE OF THE RESERVE - ENVIRONMENTAL EDUCATION

To institute a programme for the development of the Reserve as an environmental education facility for the benefit of all members of the public and particularly for school students.

9. MANAGEMENT - FIRE PROTECTION

9.1. SUMMARY OF RATIONALE

The frequent fires on Thompson Lake Nature Reserve have shown that destructive wildfires can occur in woodland and open forest vegetation at intervals considerably shorter than those which may be prescribed for a programme of fuel-reduction burning. Short rotation fuel-reduction burning is therefore of little value as a means of preventing serious fires on a Nature Reserve such as Thompson Lake. Experience of Volunteer Brigades and Departmental fire teams also indicates that frequent burning does little to ameliorate the severity of subsequent wildfires when they do occur. Frequent burning, therefore, can now be seen as being of little value in fire control for this Nature Reserve and an unfavourable factor affecting vegetation composition and structure. The alternative and favoured approach to fire protection is to prevent fire on the Reserve, an approach which has the additional advantage of encouraging recovery of the vegetation from earlier fire damage.

9.2. FIRE BREAKS AND ACCESS TRACKS

To give effect to the objective of fire prevention a ploughed firebreak 20 m in width and located 10 m inside the boundary will be installed around the whole perimeter of the Reserve.

A system of internal tracks 3 m in width, derived from the present system of internal firebreaks, will be maintained in condition adequate to provide access to four wheel drive vehicles for normal management and firefighting purposes.

A further four internal firebreaks, 6 m in width and radiating out from the lakeshore to the boundary firebreak near the middle of the north, south and west sides of the Reserve will be maintained to provide lines from which to fight wildfires should these occur.

The remainder of the existing tracks and firebreaks on the Reserve will be closed.

9.3. PRESCRIBED BURNING

No fuel reduction burning is programmed for the Reserve, but provision will be maintained for irregular prescribed burning of all or parts of the Reserve as necessary to safeguard life and surrounding property and where indicated to protect the Nature Conservation values of the Reserve.

9.4. FIRE ON SURROUNDING PROPERTY

9.4.1. Notifiable Authority

The Department of Fisheries and Wildlife shall be regarded as a Notifiable Authority in respect of Thompson Lake Nature Reserve in terms of the Bush Fires Act and Regulations.

9.4.2. Liaison with Authorities and Landowners

Close liaison will be maintained with the Fire Control Officer of the City of Cockburn, the Bush Fires Board, Volunteer Bush Fire Brigades in the City of Cockburn and the owners of land in the vicinity of the Reserve to minimise the risk of fires entering the Reserve from surrounding properties.

9.4.3. Fire Units Available to Adjacent Landowners

Fire units from the Department of Fisheries and Wildlife (or units contracted from Volunteer Bush Fire Brigades on an *ex gratia* basis for the purpose) shall be made available when

landowners adjacent to the Reserve or to bushland contiguous with the Reserve are burning off bush which may involve risk of fire entering the Nature Reserve. This provision shall also apply to the burning of large accumulations of rubbish near the boundaries of the Reserve.

9.5. ADEQUACY OF FIRE PROTECTION MEASURES

Owners of land adjacent to the Reserve or to bushland contiguous with the Reserve are invited to draw the attention of the Director of the Department of Fisheries and Wildlife to what they consider to be inadequacies of fire protection for the Nature Reserve which may develop during the period of currency of this Plan. On receipt of such a complaint the Director shall organise a joint inspection of the Reserve with the landowner and take whatever measures may be necessary to correct any inadequacy in fire protection arrangements which is revealed.

9.6. FIRE SUPPRESSION

9.6.1. Notification of Wildfires

The Department of Fisheries and Wildlife shall maintain a network of informants from among the Reserve neighbours to provide notice of wildfires as they occur.

9.6.2. Fire Units to Attend Wildfires

Fire units from the Department of Fisheries and Wildlife shall attend all wildfires as may occur on the Reserve and, if available, units will attend wildfires on land in the vicinity which may threaten the Reserve.

10. MANAGEMENT - REHABILITATION

10.1. CLOSURE OF TRACKS AND FIREBREAKS

All firebreaks and access tracks not needed under the provisions of this plan for fire protection or general management purposes shall be closed and allowed to re-vegetate.

10.2. PLANTING OF TREES AND SHRUBS

Provision will be made under this management plan for the collection and propagation of seeds and cuttings from trees and shrubs on the Reserve, the object being to re-introduce the plants to accelerate re-vegetation of tracks and firebreaks and areas damaged by horses.

10.3. *Phytopthora cinnamomi*

All work proposed and carried out under this Plan shall take into account the possible presence of *Phytopthora cinnamomi* on the Reserve. Hygiene measures to prevent spread of the fungus shall be instituted according to guidelines issued by the Forests Department.

11. MANAGEMENT - LAKE THOMPSON

11.1. LIAISON WITH THE METROPOLITAN WATER SUPPLY, SEWERAGE AND DRAINAGE BOARD

Close liaison will be maintained with the Board to ensure that future use of the Reserve for Drainage or any development of groundwater in the area has minimal affect on the value of the lake as a waterfowl breeding and refuge area.

11.2. MONITORING OF DEPTH, MINERAL NUTRIENTS AND BACTERIA

A Department of Fisheries and Wildlife depth gauge maintained on the lake will continue to be read at two-monthly intervals and calibrated with depth records obtained by the MWSS & DB at Well No. 609 in the Southern Lakes Groundwater Scheme area which is located on Thompson Lake.

Liaison will be maintained with the Enteric Diseases Unit of the State Health Laboratories, which Unit regularly samples water from Thompson Lake for bacteriological analysis.

A programme to monitor the biological oxygen demand of the lake water and phosphorus and nitrogen concentration in the lake and in drainage water entering the lake will be considered.

12. MANAGEMENT - PUBLIC ACCESS AND USE

12.1. SUMMARY OF RATIONALE

Past management experience has shown that a moderate level of passive recreational activity on the Reserve is not prejudicial to its biological values. In addition, by virtue of its features and location, the Reserve is admirably suited to use by the public. The Department of Fisheries and Wildlife recognises the desirability of facilitating environmental education on suitable Nature Reserves in the vicinity of major areas of population. For these reasons explicit provision is made in this Plan for some forms of public use and for development of the Reserve as a facility for structured environmental

education.

12.2. FENCE TO BE ERECTED

To control public access to the Reserve a fence of wooden posts, wire and a wooden top rail, the whole structure being about 1.5 m high, shall be erected around the whole Reserve near the outside edge of the perimeter firebreak provided for in Paragraph 9.2. above and about 10 m inside the Reserve boundary.

Gates in the fence will be provided for access by management and firefighting personnel and gates or stiles or both will be provided for access by the public on foot. Provision may be made for car-parking at strategic locations around the Reserve by aligning the fence an appropriate distance further inside the Reserve boundary at those locations.

12.3. CLASSIFICATION (SECTION 12A WILDLIFE CONSERVATION ACT)

All of the Nature Reserve except a perimeter strip approximately 10 m in width, i.e. all the area inside the fence provided for in Paragraph 12.2. of this Plan, shall be declared a Limited Access Area under Section 12A of the Wildlife Conservation Act. This means that all the Nature Reserve inside the fence will be accessible to the public on foot but not in vehicles of any kind or on horseback. Special provision may be made for access by vehicle by organised parties of handicapped and elderly people. Use of this part of the Reserve shall be otherwise controlled under the provisions of Regulation 46 of the Wildlife Conservation Act.

The perimeter strip of the Reserve approximately 10 m wide and outside the fence shall not be classified under Section 12A of the Wildlife Conservation Act. This area may be used as a trail for horses and horse-drawn vehicles and this Plan will include provision for its development for this purpose.

In other respects public use of the Nature Reserve shall be managed as provided by Regulation 46 of the Wildlife Conservation Regulations.

12.4. PART TIME WILDLIFE OFFICER

This Plan shall include provision for the appointment of a part-time Wildlife Officer for the Nature Reserve on a retainer or contract basis. The person shall be appointed an Honorary Wildlife Officer under the Wildlife Conservation Act and shall have responsibility for controlling the public use provisions of the Management Plan.

12.5. INFORMATION CENTRE AND FACILITIES

This Plan shall include provision for the erection on the Reserve of an information centre, signposted walking tracks, facilities for public use as required and the publication of maps, guides and display material to facilitate use of the Nature Reserve for environmental education purposes. The Education Department and the Education Section of the Western Australian Museum shall be invited to participate in the development of an environmental education programme for the Nature Reserve.

12.6. CAR PARKING

Car parks may be developed as required at the locations provided for by the fence alignment.

13. MANAGEMENT - GENERAL

13.1. TERM OF THE MANAGEMENT PLAN

Unless superseded earlier the term of this Plan shall be ten years.

13.2. OTHER PROVISIONS

During the currency of this Plan the Department of Fisheries and Wildlife may, with the approval of the Chairman of the Western Australian Wildlife Authority, undertake any other work or research or institute any other provisions for management which may become necessary to properly promote the objectives of management stated in Section 8 of this Plan.

APPENDIX I.

PLANTS FOUND IN THE THOMPSON LAKE NATURE RESERVE

POLYPODIACEAE

* *Pteridium esculentum*

ZAMIACEAE

* *Macrozamia reidlei*

TYPHACEAE

* *Typha domingensis*

JUNCAGINACEAE

* *Cycnogeton procerum*
* *Triglochin procera*

POACEAE

* *Amphipogon laguroides*
* *Amphipogon turbinatus*
* *Avena barbata*
* *Briza maxima*
* *Briza minor*
Bromus gussonii
* *Bromus madritensis*
Bromus sp.
* *Cortaderia argentea*
* *Cynodon dactylon*
* *Danthonia occidentalis*
Deyeuxia quadriseta
Ehrharta calycina
* *Ehrharta longiflora*
Hemarthria uncinata
* *Lagurus ovatus*
Lolium perenne
Microlaena stipoides
* *Paspalum vaginatum*
Poa drummondiana
* *Poa monspeliensis*
* *Sporobolus virginious*
* *Stenotaphrum secundatum*
* *Stipa compressa*
* *Stipa eremophila*
* *Stipa semibarbata*
* *Stipa variabilis*
Vulpia bromoides

CYPERACEAE

* *Baumea articulata*
* *Baumea juncea*
Baumea laxa
Baumea rubiginosa
Cladium arthrophyllum
* *Cladium preissii*
* *Cladium riparium*
* *Cyperus congestus*
* *Cyperus polystachyus*
Cyperus tenellus
* *Lepidosperma costale*
* *Lepidosperma longitudinale*
* *Lepidosperma scabrum*
* *Lepidosperma striatum*
* *Mesomelaena stygia*
Schoenus brevifolius
* *Schoenus curvifolius*
* *Schoenus grandiflorus*
* *Schoenus sublaxus*
Scirpus antarcticus
Scirpus congruus
Scirpus maritimus
* *Scirpus nodosus*

RESTIONACEAE

* *Hypolaena exsulca*
* *Lepyrodia muirii*
* *Loxocarya pubescens*
* *Lyginia barbata*
* *Lyginia tenax*
* *Restio stenostachyus*

CENTROLEPIDACEAE

Centrolepis drummondii

COMMELINACEAE

Cartonema philydroides

JUNCACEAE

Juncus bufonius
Juncus pallidus
Luzula meridionalis

* Denotes positive identification.

LILIACEAE

* *Acanthocarpus preissii*
* *Arnocrinum preissii*
  Asphodelus fistulosus
* *Burchardia umbellata*
  Caesia parviflora
* *Calectasia cynea*
  Chamaescilla corymbosa
* *Corynotheca micrantha*
* *Dasypogon bromeliaefolius*
* *Dianella revoluta*
* *Dichopogon strictus*
  Laxmannia squarrosa
* *Lomandra endlicheri*
* *Sowerbaea laxiflora*
* *Thysanotus patersonii*
* *Thysanotus sparteus*
* *Tricoryne elatoir*
* *Xanthorrhoae preissii*

HAEMODAROCEAE

* *Anigozanthos humilis*
* *Anigozanthos manglesii*
* *Anigozanthos viridis*
  Conostylis aculeata
* *Conostylis candicans*
* *Conostylis juncea*
* *Conostylis setigera*
  Haemodorum paniculatum
  Haemodorum spicatum
* *Phlebocarya ciliata*

AMARYLLIDACEAE

* *Narcissus* sp.

IRIDACEAE

* *Gladiolus caryophyllaceus*
* *? Gladiolus* sp.
* *Patersonia occidentalis*
* *Romulea rosea*
* *Watsonia* sp.

ORCHIDACEAE

  Caladenia deformis
  Caladenia discoidea
  Caladenia filamentosa
* *Caladenia flava*
  Caladenia gemmata
  Caladenia huegelii
* *Caladenia latifolia*
* *Caladenia patersonii*

ORCHIDACEAE (continued)

* *Diuris emarginata*
* *Diuris longifolia*
* *Elythranthera brunonis*
  Microtis unifolia
  Prasophyllum ovale
  Prasophyllum parviflorum
  Thelymitra campanulata

CASUARINACEAE

* *Casuarina fraseriana*
* *Casuarina humilis*

PROTEACEAE

* *Adenanthos sericea*
* *Banksia attenuata*
* *Banksia grandis*
* *Banksia ilicifolia*
* *Banksia littoralis*
* *Banksia menziesii*
* *Conospermum triplinervium*
* *Dryandra nivea*
  Dryandra sessilis
* *Grevillea* sp.
* *Hakea prostrata*
* *Persoonia saccata*
* *Petrophile linearis*
* *Stirlingia latifolia*
* *Synaphea polymorpha*

SANTALACEAE

* *Exocarpos sparteus*
* *Leptomeria empetriformis*

LORANTHACEAE

* *Nuytsia floribunda*

POLYGONACEAE

* *Meuhlenbeckia polybotrya*
* *Rumex acetosella*
* *Rumex crispus*
* *Polygonum minus*

CHENOPODIACEAE

* *Atriplex patula*
* *Chenopodium ambrosioides*

AMARANTHACEAE

* *Amaranthus* sp.
* *Ptilotus drummondii*

AIZOACEAE

* *Carpobrotus aequilaterus*
* *Carpobrotus edulis*
  Macarthuria australis

PORTULACACEAE

  Calandrinia corrigioloides
* *Calandrinia* sp.

CARYOPHYLLACEAE

  Silene gallica
  Petrorhagia prolifera

RANUNCULACEAE

* *Clematis pubescens*
* *Ranunculus muricatus*

LAURACEAE

* *Cassytha racemosa*

FUMARIACEAE

  Fumaria capreolata
* *Fumaria muralis*

BRASSICACEAE

  Nasturtium officinale

DROSERACEAE

* *Drosera erythrorrhiza*
  Drosera glanduligera
* *Drosera macrantha*
* *Drosera menziesii*

MIMOSACEAE

* *Acacia cochlearis*
* *Acacia cyclops*
* *Acacia pulchella*
* *Acacia rostellifera*
* *Acacia saligna*
* *Acacia stenoptera*
* *Acacia willdenowiana*

PAPILIONACEAE

* *Aotus ericoides*
* *Bossiaea eriocarpa*
* *Daviesia incrassata*
* *Daviesia juncea*
* *Daviesia nudiflora*
* *Daviesia polyphylla*
* *Euchilopsis linearis*
* *Gompholobium tomentosum*
* *Hardenbergia comptoniana*
* *Hovea pungens*
* *Hovea trisperma*
* *Isotropis cuneifolia*
* *Jacksonia furcellata*
* *Jacksonia sternbergiana*
* *Kennedia prostrata*
* *Lupinus cosentinii*
  Medicago polymorpha
  Melitous indica
* *Oxylobium capitatum*
  Pultenaea ochreata
* *Pultenaea reticulata*
* *Trifolium campestre*
* *Trifolium dubium*
* *Trifolium pratense*
* *Vicia hirsuta*
* *Vicia sativa*
* *Viminaria juncea*

GERANIACEAE

  Erodium botrys
  Erodium circutarium
  Geranium molle
* *Pelargonium australe*

OXALIDACEAE

* *Oxalis pes-caprae*
  Oxalis papparea

RUTACEAE

* *Boronia crenulata*
* *Eriostemon spicatus*

TREMANDRACEAE

* *Platytheca verticillata*

POLYGALACEAE

* *Comesperma calymega*
* *Comesperma virgatum*

EUPHORBIACEAE

Euphorbia peplus
* *Phyllanthus calycinus*

STACKHOUSIACEAE

* *Stackhousia huegelii*

SAPINDACEAE

* *Dodonaea attenuata*

DILLENIACEAE

* *Hibbertia huegelii*
* *Hibbertia hypericoides*
* *Hibbertia racemosa*
* *Hibbertia subvaginata*
* *Hibbertia* sp.

VIOLACEAE

Hybanthus calycinus

THYMELAEACEAE

Pimelea angustifolia
* *Pimelea rosea*

MYRTACEAE

* *Astartea fascicularis*
* *Baeckea camphorosmae*
Calytrix angulata
* *Calytrix flavescens*
* *Calytrix fraseri*
* *Eremaea fimbriata*
* *Eremaea pauciflora*
* *Eucalyptus gomphocephala*
* *Eucalyptus marginata*
* *Eucalyptus rudis*
* *Eucalyptus todtiana*
* *Hypocalymma angustifolium*
* *Hypocalymma robustum*
* *Kunzea ericifolia*
Melaleuca lanceolata
* *Melaleuca nesophila*
* *Melaleuca preissiana*
* *Melaleuca teretifolia*
Melaleuca thymoides
* *Scholtzia involucrata*
* *Verticordia drummondii*

APIACEAE

Centella asiatica
* *Centella cordifolia*
Eryngium pinnatifidum
* *Foeniculum vulgare*
Platysace compressa

EPACRIDACEAE

Astroloma pallidum
* *Conostephium pendulum*
* *Conostephium preissii*
* *Leucopogon conostephioides*
* *Leucopogon propinquus*
* *Lysinema ciliatum*

GENTIANACEAE

* *Villarsia violifolia*

LAMIACEAE

* *Hemiandra pungens*

SOLANACEA

* *Solanum nigrum*

SCROPHULARIACEAE

* *Verbascum virgatum*

LOBELIACEAE

Lobelia alata
* *Lobelia tenuior*

GOODENIACEAE

* *Dampiera linearis*
Goodenia filiformis
* *Lechenaultia expansa*
* *Scaevola canescens*

STYLIDIACEAE

* *Stylidium brunonianum*
Stylidium junceum
* *Stylidium piliferum*
Stylidium repens
* *Stylidium schoenoides*

ASTERACEAE

Arctotheca calendula
* *Aster subulatus*
* *Cirsium vulgare*
Erigeron bonariensis
Gnaphalium luteoalbum
Helipterum cotula
* *Olearia axillaris*
Podolepis canescens
Podolepis gracilis
Podotheca chrysanthum
Senecio hispidulus
Senecio lautus
* *Sonchus asper*
Waitzia citrina

APPENDIX II

FAUNA OF THOMPSON LAKE NATURE RESERVE

1. BIRDS

NON-PASSERINES	1954-59	1960-69	1970-79	Largest numbers sighted
Grebes (PODICIPEDIDAE)				
Great-crested Grebe *Podiceps cristatus*			X	
Hoary-headed Grebe *Podiceps poliocephalus*			X	
Little Grebe *Podiceps novaehollandiae*	X	X	X	30
Pelicans (PELECANIDAE)				
Australian Pelican *Pelecanus conspicillatus*	X	X	X	200
Cormorants (PHALACROCORACIDAE)				
Black Cormorant *Phalacrocorax carbo*			X	12
Little Pied Cormorant *Phalacrocorax melanoleucos*		X	X	
Little Black Cormorant *Phalacrocorax sulcirostris*		X	X	4
Herons (ARDEIDAE)				
White-necked Heron *Ardea pacifica*	X		X	20
White-faced Heron *Ardea novaehollandiae*	X		X	12
White Egret *Egretta alba*	X	X	X	8
Night Heron *Nycticorax caledonicus*	X	X	X	3
Little Bittern *Ixobrychus minutus*	X			
Black Bittern *Ixobrychus flavicollis*	X			
Brown Bittern *Botaurus stellaris*	X			

Ibis/Spoonbills (THRESKIORNITHIDAE)	1954-59	1960-69	1970-79	Largest numbers sighted
White Ibis *Threskiornis aethiopicus*			X	
Straw-necked Ibis *Threskiornis spinicollis*			X	
Yellow-billed Spoonbill *Platalea flavipes*			X	6
Ducks (ANATIDAE)				
Black Swan *Cygnus atratus*	X	X	X	50
Mountain Duck *Tadorna tadornoides*	X	X	X	15
Black Duck *Anas superciliosa*	X	X	X	1,000
Mallard *Anas platyrhynchos*			X	
Grey Teal *Anas gibberifrons*	X	X	X	40
Chestnut Teal *Anas castanea*	X			
Blue-winged Shoveller *Anas rhynchotis*			X	20
Pink-eared Duck *Malacorhynchus membranaceus*	X		X	2
White-eyed Duck *Aythya australis*	X		X	1
Wood Duck *Chenonetta jubata*			X	10
Blue-billed Duck *Oxyura australis*	X	X	X	50
Musk Duck *Biziura lobata*	X	X	X	30
Large Raptores (ACCIPITRIDAE)				
Black-shouldered Kite *Elanus caeruleus*			X	1
Square-tailed Kite *Lophoictinia isura*			X	
Whistling Kite *Haliastur sphenurus*			X	3
Brown Goshawk *Accipiter fasciatus*	X		X	
White-breasted Sea-eagle *Haliaetus leucogaster*			X	1

Large Raptores (ACCIPITRIDAE) cont'd..	1954-59	1960-69	1970-79	Largest numbers sighted
Wedge-tailed Eagle *Aquila audax*			X	
Little Eagle *Aquila morphnoides*			X	
Swamp Harrier *Circus aeruginosus*			X	
Falcons (FALCONIDAE)				
Little Falcon *Falco longipennis*	X		X	
Brown Falcon *Falco berigora*	X			
Nankeen Kestrel *Falco cenchroides*	X		X	1
Button Quails (TURNICIDAE)				
Painted Button-quail *Turnix varia*			X	
Rails (RALLIDAE)				
Spotted Crake *Porzana fluminea*			X	
Spotless Crake *Porzana tabuensis*	X		X	
Black-tailed Native-Hen *Gallinula ventralis*	X		X	
Dusky Moorhen *Gallinula tenebrosa*	X		X	
Swamphen *Porphyrio porphyrio*	X	X	X	25
Coot *Fulica atra*	X	X	X	200
Plover/Dotterel (CHARADRIIDAE)				
Red-kneed Dotterel *Charadrius cinctus*	X			
Black-fronted Dotterel *Charadrius melanops*	X		X	5
Double-banded Dotterel *Charadrius bicinctus*		X	X	
Stilts (RECURVIROSTRIDAE)				
Pied Stilt *Himantopus himantopus*	X	X	X	400
Banded Stilt *Cladorhynchus leucocephala*		X	X	20

Stilts (RECURVIROSTRIDAE) cont'd..	1954-59	1960-69	1970-79	Largest numbers sighted
Red-necked Avocet *Recurvirostra novaehollandiae*	X		X	6
Sandpiper/Curlew/Godwit (SCOLOPACIDAE)				
Greenshank *Tringa nebularia*		X	X	30
Bar-tailed Godwit *Limosa lapponica*			X	2
Red-necked Stint *Calidris ruficollis*			X	
Long-toed Stint *Calidris subminuta*			X	500
Gulls (LARIDAE)				
Silver Gull *Larus novaehollandiae*			X	
Pigeons/Doves (COLUMBIDAE)				
Spotted Dove *Streptopelia chinensis*	X		X	
Laughing Dove *Streptopelia senegalensis*	X		X	
Common Bronzewing *Phaps chalcoptera*	X	X	X	3
Brush Bronzewing *Phaps elegans*	X	X	X	3
Cockatoos (PSITTACIDAE)				
Red-tailed Black Cockatoo *Calyptorhynchus magnificus*			X	
White-tailed Black Cockatoo *Calyptorhynchus funereus baudinii*	X		X	
Galah *Cacatua roseicapilla*			X	
Purple-crowned Lorikeet *Glossopsitta porphyrocephala*	X		X	
Regent Parrot *Polytelis anthopeplus*	X			
Red-capped Parrot *Platycercus spurius*	X	X	X	14
Western Rosella *Platycercus icterotis*			X	

Cockatoos (PSITTACIDAE) cont'd..	1954-59	1960-69	1970-79	Largest numbers sighted
Port Lincoln Parrot *Platycercus zonarius*	X	X	X	3
Multi-coloured Parrot *Phsephotus various*			X	
Parasitic Cuckoo (CUCULIDAE)				
Pallid Cuckoo *Cuculus pallidus*	X		X	
Fan-tailed Cuckoo *Cuculus flabelliformis*	X	X		
Rufous-tailed Bronze Cuckoo *Chysococcyx basalis*			X	
Shining Bronze Cuckoo *Chysococcyx lucidus*		X		
Owls (STRIGIDAE)				
Boobook Owl *Ninox novaeseelandiae*	X			
Barn Owl *Tyfo alba*	X		X	
Frogmouths (PODARGIDAE)				
Tawny Frogmouth *Podargus strigoides*	X		X	
Tree Kingfishers (ALCEDINIDAE)				
Laughing Kookaburra *Dacelo gigas*	X	X	X	1
Sacred Kingfisher *Halcyon sancta*	X	X	X	2
Bee Eater (MEROPIDAE)				
Merops ornatus	X	X	X	
PASSERINES				
Swallows (HIRUNDINIDAE)				
Welcome Swallow *Hirundo neoxena*	X		X	
Tree Martin *Hirundo nigricans*	X		X	

Swallows (HIRUNDINIDAE) cont'd..	1954-59	1960-69	1970-79	Largest Numbers sighted
Richard's Pipit (MOTACILLIDAE)				
Anthus novaeseelandiae	X			
Cuckoo-Shrike (CAMPEPHAGIDAE)				
Black-faced Cuckoo-shrike *Coracina novaehollandiae*	X	X	X	8
Robin/Whistler (PACHYCEPHALIDAE)				
Scarlet Robin *Petroica multicolor*	X	X	X	
Red-capped Robin *Petroica goodenovii*	X			
Western Yellow Robin *Eopsaltria australis*	X		X	
Golden Whistler *Pachycephala pectoralis*	X		X	
Rufous Whistler *Pachycephala rufiventris*	X		X	2
Grey Shrike-Thrush *Colluricincla harmonica*	X	X	X	
Jacky Winter *Microeca leucophaea*			X	
Monarch/Fantail (MONARCHIDAE)				
Grey Fantail *Rhipidura fuliginosa*	X	X	X	1
Willie Wagtail *Rhipidura leucophrys*	X	X	X	4
Old World Warbler (SYLVIIDAE)				
Clamorous Reed Warbler *Acrocephalus stentoreus*	X		X	
Little Grassbird *Megalurus gramineus*			X	
Australian-Papuan Wren (MALURIDAE)				
Splendid Wren *Malurus splendens*	X	X	X	3
Southern Emu-wren *Stipiturus malachurus*	X			
Australian Warbler (ACANTHIZIDAE)				
Weebill *Smicrornis brevirostris*	X		X	

Australian Warbler (ACANTHIZIDAE) cont'd..	1954-59	1960-69	1970-79	Largest numbers sighted
Western Warbler *Gerygone fusca*	X		X	
Broad-tailed Thornbill *Acanthiza apicalis*	X	X	X	
Western Thornbill *Acanthiza inornata*	X		X	
Yellow-rumped Thornbill *Acanthiza chrysorrhoa*	X		X	
Varied Sittella (DAPHOENOSITTIDAE)				
Australian Sittella *Daphoenositta chrysoptera*	X		X	
Tree-Creeper (CLIMACTERIDAE)				
Rufous Tree-creeper *Climacteris rufa*			X	
Honeyeaters (MELIPHAGIDAE)				
Red-wattle Bird *Anthochaera carunculata*	X	X	X	
Little-wattle Bird *Anthochaera chrysoptera*	X	X	X	
Noisy Miner *Manorina melanocephala*	X			
Yellow-throated Miner *Manorina flavigula*	X		X	
Singing Honeyeater *Meliphaga virescens*	X		X	
White-eared Honeyeater *Meliphaga leucotis*			X	
White-naped Honeyeater *Melithreptus lunatus*		X		
Brown Honeyeater *Lichmera indistincta*	X		X	
New Holland Honeyeater *Phylidonyris novaehollandiae*	X	X	X	
Western Spinebill *Acanthorhychus superciliosus*	X		X	
Chats (EPHTHIANURIDAE)				
White-fronted Chat *Ephthianura albifrons*			X	12

	1954-59	1960-69	1970-79	Largest numbers sighted
Pardalote (PARDALOTIDAE)				
Spotted Pardalote *Pardalotus punctatus*	X		X	
Striated Pardalote *Pardalotus striatus*	X	X	X	
White Eye (ZOSTEROPIDAE)				
Silver Eye *Zosterops lateralis*	X	X	X	
Magpie Lark (GRALLINIDAE) *Grallina cyanoleuca*	X		X	4
Woodswallows (ARTAMIDAE)				
Masked Woodswallow *Artamus personatus*			X	
Black-faced Woodswallow *Artamus cinereus*			X	
Butcherbirds (CRACTICIDAE)				
Grey Butcherbird *Cracticus torquantus*	X		X	2
Pied Butcherbird *Cracticus nigrogularis*			X	3
Australian Magpie *Cracticus tibicen*	X	X	X	8
Grey Currawong *Strepera versicolor*	X			
Crows (CORVIDAE)				
Australian Crow *Corvus orru*	X		X	2
Little Crow *Corvus bennetti*			X	
Australian Raven *Corvus coronoides*	X			

2. AMPHIBIA

Hyla moorei			X	
Hyla adelaidensis			X	
Limnodynastes doralis			X	
Crinia insignifera			X	
Crina georgiana			X	

AMPHIBIA - cont'd..	1954-59	1960-69	1970-79	Largest numbers sighted
Myobatrachus gouldii			X	
Helèioporus eyrei			X	
3. REPTILES				
Tiger Snake *Notechis scutatus occidentalis*			X	
Dugite *Demonsia nuelialis affinis*			X	
Little Whip-snake *Denisonia gouldii*			X	
Common Snake Lizard *Lialis burtonii*			X	
Western Jew Lizard *Amphibolurus barbatus*			X	
Bobtail *Trachyssurus rugosus*			X	
Lesuarus Skink *Lygosonia (sphenomorphus) lesueuriia*			X	
Gray's Skink *Lygosoma (sphenomorphus) labillardieri*			X	
Western Blue-tongue *Tiliqua occipitalis occipitalis*			X	
Racehorse Goanna *Varanus tristus*			X	
Bungarra *Varanus gouldii*			X	
Slender Snake Lizard *Pletholax gracilis*			X	
Long-neck Tortoise *Chelodina oblonga*			X	
4. MAMMALS				
Western Brush-wallaby *Macropus irma*	X	X	X	
Western Grey Kangaroo *Macropus fuliginosis*	X	X	X	
Brush-tailed Possum *Trichosurus vulpecula*	X	X	X	
Short-nosed Bandicoot *Isoodon obesulus*	X	X	X	