N McKenzie

PART 1

SOME NATURE RESERVES OF THE TAMMIN SHIRE

B.G. MUIR

1978

SOME NATURE RESERVES OF THE WESTERN AUSTRALIAN WHEATBELT

PART 1 : TAMMIN SHIRE

B.G. MUIR

1978

Department of Fisheries and Wildlife unpublished report

SOME NATURE RESERVES OF THE TAMMIN SHIRE

B.G. MUIR

Preamble

Tammin Shire lies in the central wheatbelt and has an area of about 1087 square km. There are 9 Nature Reserves within the Shire, totalling about 13.85 square km or 1.3% of the area of the Shire.

Only one of the Nature Reserves within the Shire has an "A" classification (Charles Gardner Reserve, A20041). The remainder enjoy no particular protection and have variable vestings. Two of the Reserves have been studied extensively by the Western Australian Museum (Chapman et al. in prep) and another (Charles Gardner Reserve) by the National Parks Authority (unpublished report).

The current survey took place in February 1978 and consisted of brief examinations of 6 Reserves: 4667, 10313, 23566, 24831, 28289 and 33990. Reports on these Reserves are presented. Methodology of survey is presented in Appendix 7.

Overview

Of the 6 Reserves examined, 2 were mostly salt flats, 1 was a non-arable lake and 2 were granite outcrops. The remaining Reserve was arable land which fortuitously escaped clearing. It is thus clear that the Reserves can in no way be considered typical of the wheatbelt vegetation prior to European settlement, but are rather remnants left after all arable land was cleared. Nonetheless their significance for conservation of flora and fauna is considerable and the need for their preservation great.

Having examined all the Nature Reserves in the Tammin Shire I conclude that all are of great importance as representative of at least the non-arable parts of the wheatbelt. Four Reserves, 17732 (North Bungulla), A20041 (Charles Gardner), 23566 (Tammin Reserve) and 23586 (Yorkrakine Rock) are in excellent condition (compared to many in the wheatbelt) and will prove in the future to be extremely valuable.

Reference

CHAPMAN, A., DELL, J., KITCHENER, D.J. & MUIR, B.G. (in prep.) Biological survey of the Western Australian Wheatbelt. Pt II. Yorkrakine, East Yorkrakine and North Bungulla Nature Reserves. Rec. West. Aust. Mus. Suppl. II.

Reserve 4667

Located ca 11 km N Tammin and shown on lithograph 2334-1, C1.

Background

Reserve 4667 was gazetted for "Conservation of Flora" on 14 August 1954. Immediately to the E of Reserve 4667 is another smaller Reserve 25410,"Shire Purposes". Reserve 25410 is about 7·3 ha in extent and is all bushland. In this report the majority of comments are confined to 4667 although 25410 must be considered as a natural extension of this Reserve.

Physical characteristics

Reserve 4667 is 33.1842 ha in area and Reserve 25410, ca 7.3 in extent, making a total bushland area of ca 40.5 ha. The two Reserves combined form a square area of bushland with a total perimeter of about 2.5 km. The highest point on the Reserve is probably near a Bench Mark (UH6) with an altitude of 256.5 m above sea level (ASL). The Reserve slopes down in all directions from this point, but mostly towards the northern boundary which is at about 245 m ASL. The topography is a result of the geology of the Reserve, which is the top of a low granite dome.

Vegetation

There are about 8 distinct associations on Reserve 4667, and these are listed below.

1. Granite outcrop -
   Bare granite rock with a few lichens and mosses.

2. Tamma shrubland - Casuarina campestris
   Tamma Thicket over Very Open Low Sedges. Yellow, sandy, gravelly soil.

3. Acacia shrubland.
   Acacia affin. linophylla Scrub over Baeckea crispiflora Open Dwarf Scrub C over Herbs. Soil is yellow gravelly sand.

4. Mallee area - south side
   Eucalyptus redunca (Black Marlock). Very Open Tree Mallee over scattered shrubs. Soil was very pale brown, sandy loam.

5. Mallee - NW corner
   Similar to '4' above but with scattered Acacia acuminata (Jam) trees and some Eucalyptus loxophleba (York Gum).

6. York Gum - Jam

York Gum - Jam Open Low Woodland B with grassy understory. Growing on shallow soils over granite.

7. Gimlet area.

Partially cleared Eucalyptus salubris (Gimlet) and E. salmonophloia (Salmon Gum) Open Low Woodland A. Soil light reddish brown, sandy clay loam.

8. Dense runoff area.

Casuarina huegeliana (She-oak) Open Woodland over Leptospermum erubescens (Ti-tree) Dense Low Forest B. In area of excessive runoff from granite outcrop.

Plant species

A total of 40 species were recorded, the richest association being the "mallee area-south side" with 15 species and the poorest being granite outcrop with 1 species of flowering plant.

Twenty-one (about 50%) of the recorded species were found in only 1 associationl hence there would be a considerable decrease in species diversity with the loss of any single association.

Weeds

Grass is common throughout the Reserve, Avena fatua sativa (Wild-oat) being commonest. There are abundant small weeds present in the area immediately surrounding the rubbish dumps and these are gradually spreading into the rest of the Reserve.

Fire history

No evidence of fire for a very long time.

Fauna

As the weather was very hot and still, very few species of birds were recorded. Those positively identified were as follows:

Port Lincoln Parrot (Platycercus zonarius zonarius), Galah (Cacatua roseicapilla), Black-faced Cuckoo-shrike (Coracina novaehollandiae), White-browed Babbler (Pomatostomus superciliosus), Weebill (Smicrornis brevirostris), Magpie-lark (Grallina cyanoleuca) and Western Magpie (Cracticus tibicen dorsalis).

Exotic fauna

Rabbit scats noted in every association. A single fox burrow seen in the gravel pit on the N side of Reserve.

Firebreaks and fences

None except where adjacent to farmland.

Human usage

Rubbish dumping has been extensive and over a long period. Although distributed throughout the Reserve, most is concentrated in the middle of the Reserve or on the southern edge of the granite outcrop. The rubbish consists of car bodies, farm and household refuse, cardboard, paper, foodstuffs and sheep carcases. Much of the vegetation on the northern boundary of the Reserve has been removed for gravel pits and the NE corner adjacent to the road has been cleared and topsoil piled up.

Adjacent uncleared land

Reserve 25410 is contiguous with Reserve 4667 on its eastern side and is almost entirely Tamma shrubland but with its southern edge a continuation of "Mallee area - south side". There is very little uncleared land elsewhere in the vicinity.

Opinion and recommendations

Reserve 4667 is badly degraded, largely as a result of rubbish dumping. It is, however, one of the few patches of natural bushland remaining in the area, and as such must be preserved as a "stepping stone" of vegetation for migratory birds. Presently the Reserve is a major fire hazard.

I suggest that action be taken to reduce the fire risk and health hazard (there are rotting sheep carcases present) as soon as possible.

The majority of rubbish could be disposed of by burying it in the already disturbed area on the NW corner of the Reserve and in a small pit which could be created just south of the granite outcrop. The worst effected grassy areas could be mown, as understory in these associations is almost absent.

This work could be seen as an investment by the Shire of Tammin in that the Reserve is situated on the main Tammin to Wyalkatchem Road which has a good deal of traffic. There is little reason why the mawn woodland areas could not be developed as barbecue areas as has been done at Yorkrakine Rock. The granite outcrop and Jam woodland areas would provide areas of interest to visitors although perhaps not as spectacular as Yorkrakine.

I recommend that Reserve 4667 be vested in the Western Australian Wildlife Authority, that signs be erected to discourage further dumping and that action be taken promptly to reduce the fire hazard, unsightliness and health hazard of the disturbed areas.

APPENDIX 1
VEGETATION DETAILS OF RESERVE 4667

Granite outcrop

Bare rock exposure with no soil but a few lichens and mosses present. Shallow soil pockets with Borya nitida, 0.1 m tall.

Tamma shrubland

Casuarina campestris shrubs, mature, stratum 1-2.5 m tall, 30-70% canopy cover over Ecdeiocolea monostachya and Lepidosperma gracile sedge, mature, 0.5 m tall, 2-10% canopy cover over Borya nitida herbs 0.1 m tall, 10-30% canopy cover. Soil was yellow, sandy, with some gravel. Well drained but some pooling after rain. Species noted were: Acacia affin. linophylla, Borya nitida, Casuarina acutivalvis, C. campestris, Dianella revoluta, Ecdeiocolea monostachya, Lepidosperma gracile and Melaleuca uncinata.

Acacia shrubland

Acacia affin. linophylla shrubs, mature, 2-4 m tall, 10-30% canopy cover over Baeckea crispiflora shrubs, mature, 0.5-1 m tall, 2-10% canopy cover over Borya nitida herbs, 0.2 m tall, 30-70% canopy cover. Soil similar to that in Tamma shrubland. Species collected were: Acacia affin. linophylla, Baeckea crispiflora, Borya nitida, Casuarina campestris, Dianella revoluta, Ecdeiocolea monostachya, Stipa compressa and Waitzia acuminata.

Mallee area - south side

Eucalyptus redunca tree mallee, mature, 6-10 m tall, 2-10% canopy cover over scattered shrubs of several species. Soil was very pale brown, sandy loam. Well drained. Species recorded were as follows: Acacia acuaria, A. colletioides, A. graffiana, A. mackayana, Borya nitida, Casuarina campestris, Enchylaena georgei, E. tomentosa, Eucalyptus redunca, E. salubris, Exocarpus sparteus, Melaleuca undulata, Olearia muelleri, Rhagodia spinescens, Santalum acuminatum.

Mallee - NW corner

Very similar to mallee area - south side but containing scattered Acacia acuminata trees. Species in this area were: A. acuminata, A. merrallii, Eucalyptus loxophleba, E. redunca, Exocarpus sparteus, Grevillea acuaria, Melaleuca laxiflora, M. uncinata and Santalum spicatum.

York Gum - Jam

Acacia acuminata trees and scattered Eucalyptus loxophleba trees, mature to senescent, 3.5-5 m tall, 2-10% canopy cover. Plant species included A. acuminata, Alyxia buxifolia, Cheiranthera parvifolia, Eucalyptus loxophleba, Grevillea paniculata, Lepidosperma gracile and Santalum spicatum.

Gimlet area

Small area of Eucalyptus salubris and scattered E. salmonophloia trees, mature, 6-15 m tall, less than 5% canopy cover. Partly cleared, no understory except grasses. Soil is light reddish brown, sandy clay loam. Poorly drained. The only species recorded were Eucalyptus redunca, E. salmonophloia, E. salubris, Melaleuca cymbifolia and the grasses Avena sativa fatua and Stipa compressa.

Dense runoff area

Casuarina huegeliana trees, mature, 4-16 m tall, some up to 40 cm diameter at breast height. Canopy cover 2-10% over Leptospermum erubescens trees, mature to senescent, 5 m tall, 70-100% canopy cover. Soil was yellow, sandy, and receives nearly all the runoff from the nearby granite exposure. Plant species recorded were the 2 dominants mentioned above and Lepidosperma tenue and Hibbertia verrucosa.

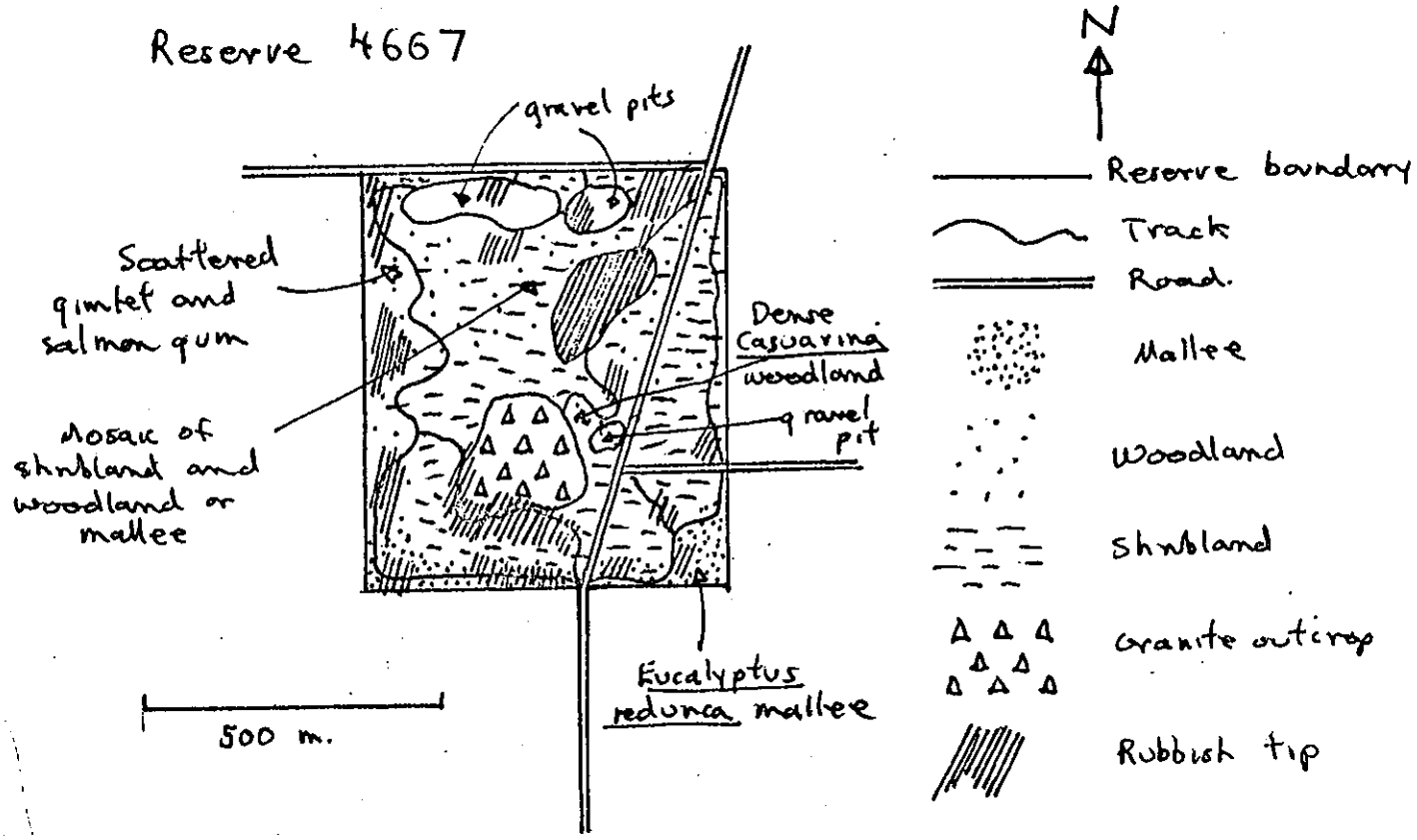

Reserve 4667
gravel pits
Scattered gimlet and salmon gum
Mosaic of shrubland and woodland or mallee
Dense Casuarina woodland
gravel pit
Eucalyptus redunca mallee
500 m.
N
Reserve boundary
Track
Road.
Mallee
Woodland
Shrubland
Granite outcrop
Rubbish tip

Plate 1. Tamma shrubland. Photograph taken on Reserve 25410, immediately E of Reserve 4667. This association is structurally and floristically identical to that on 4667.

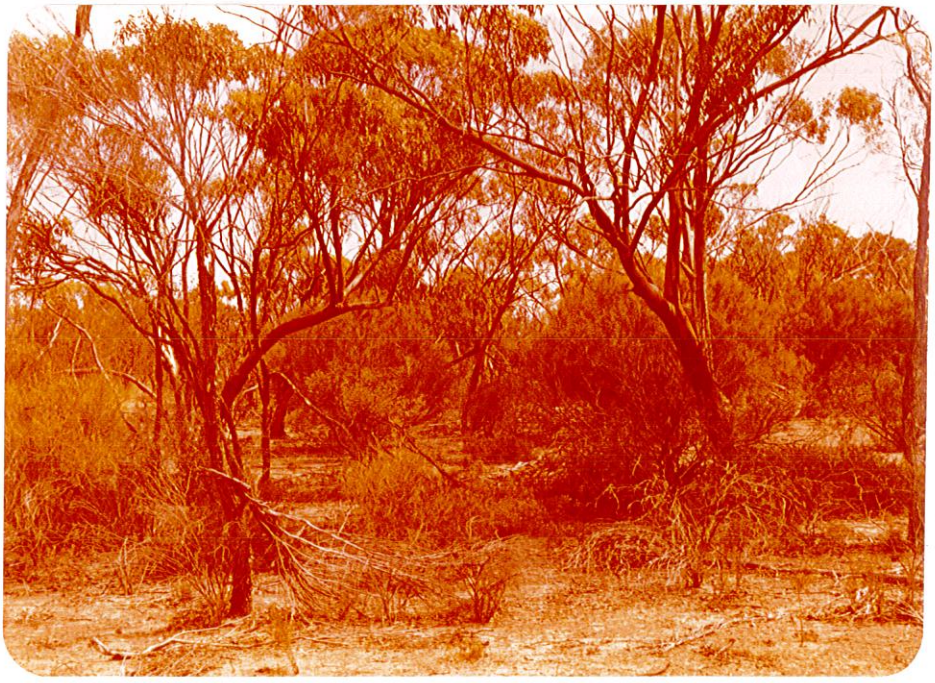


Plate 2. Reserve 4667. Black Marlock mallee stand on S side of Reserve. Photograph illustrates portion where understory is dense.

Plate 3. Reserve 4667. View NE along track through ecotone between York Gum-Jam and Gimlet-Salmon Gum woodlands. Extensive rubbish dumping has promoted weed establishment and created a fire hazard and unsightly area.

Reserve 10313 NOONYING LAKE

Located ca 4 km SW Tammin and shown on lithograph 2334-1, C2/3.

Background

Originally gazetted 19 October 1906 as reserve for "water". Regazetted for "Conservation of Water and Fauna" on 20 February 1959 and made a "Sanctuary" on 20 August 1971.

Physical characteristics

The Reserve is rectangular, has an area of 48.5623 ha, a long (E-W) axis of ca 800 m and a short (N-S) axis of ca 600 m. The total perimeter is thus ca 2.8 km. The edges of the Reserve are probably about 245 m above sea level and the Lake floor about 2 m lower than this. The Lake floor is almost flat and bushland surrounding the lake almost flat. There is thus a fairly sharp decline at the lake edge.

Vegetation

There are 5 basic vegetation types on the Reserve; Banksia scrub, York Gum woodland, Broombush thicket, heath and Lake floor woodland.

Banksia scrub

Banksia prionotes (Acorn Banksia) and numerous other species of shrubs as an Open Scrub formation. Soil is yellow, fine sandy loam.

York Gum Woodland

Eucalyptus loxophleba (York Gum) trees and mallee. Around the Lake fringes this association is Low Forest A and to the S and E of the Lake is Open Low Woodland A. On the Lake fringe, particularly on the W side, there is a dense understory of Eremophila glabra var. viridiflora (Tar Bush) Low Heath D. In the open areas away from the Lake the understory is entirely grass; the soil is pink, sandy clay; well drained.

Broombush thicket

Melaleuca uncinata (Broombush) "trees" to 9 m tall as Thicket or Dense Thicket. There is no understory. Soil is clays and silts with a high salt content.

Heath

Heath on the Reserve is of two types. Firstly Melaleuca scabra, Acacia leptospermoides Low Heath D and secondly Melaleuca uncinata (Broombush) Heath B on sandy soils.

Lake floor woodland

Casuarina obesa (Swamp Oak) Forest with no understory.

In addition to these associations some areas of cleared York Gum woodland on the southern side of the Reserve have stands of Leptospermum erubescens (Ti-tree) to 3 m tall, and patches of Calothamnus villosus (Woolly Net-bush) to 0.5 m tall. There is also a small stand of Eucalyptus albida mallee on the SE corner of the Reserve.

Plant species

A total of 41 plant species were recorded, 20 in Banksia scrub, 15 in York Gum woodland, 1 in Broombush thicket, 6 in heath and 3 in Casuarina woodland. The small mallee stand had 3 species. Seven of these species are exploited by the wildflower seed trade.

Weeds

The only weeds present are grasses which are scattered throughout all formations but are most abundant in the York Gum woodland. The commonest species are Avena sativa fatua (Wild-oat) with some Ehrahta longiflora, Hordeum marinum and Stipa compressa. Weeds are largely restricted to the disturbed areas of semi-cleared woodland.

Fire history

No evidence of fire for a very long time.

Fauna

Weather was hot and still and very little fauna was seen. Species recorded were Port Lincoln Parrot (Platycercus zonarius zonarius), Tree Martins (Hirundo nigricans) and Willie Wagtail (Rhipidura leucophrys). The Tree Martins numbered a hundred or more and were flying above the C. obesa woodland.

A bird's nest, possibly Crested Pigeon (Ocyphaps lophotes) or Tawny Frogmouth (Podargus strigoides) was noted.

Exotic fauna

None seen but old rabbit scats noted. Sheep and possibly cattle have been in the Reserve on occasions and some trampling has occurred.

Firebreaks and fences

No firebreaks except those in adjacent paddocks. Fenced on all sides and fences in good repair but gates sometimes left open, allowing stock to enter Reserve.

Human usage

Extensive disturbances throughout the Reserve. Much of the woodland area has had the understory removed and is now occupied by weeds and grass. Sand has been removed from shallow pits on the southern edge of the Lake. There is scattered rubbish, mostly farm debris, throughout, plus tracks and drains. Drains were put in the heathy areas by the farmer owning the surrounding land to promote drainage into the Lake, which is beginning to show obvious signs of salt effects (see below). The drains are, however, increasing runoff from surrounding land which is cleared, allowing surface salt deposits to be flushed into the Lake rather than pass into the water table. The drains are thus having the opposite effect to that desired by the farmer. Salt buildup has been occurring in the Lake over a long period, as indicated by scattered, very old, Hakea preissii shrubs on the Lake margin. This is to be expected where a Lake (originally freshwater) occupies a depression completely surrounded by totally cleared farmland. The present salting-up could have been avoided by allowing an adequate buffer zone of vegetation around the Lake when the land was cleared.

There is evidence of shooting on the Lake.

Adjacent uncleared land.

None - totally surrounded by farmland.

Remarks - pers. comms. from farmer on N side of Reserve:

1. The salting-up has become conspicuous particularly over the last 2-3 years.
2. The dense stands of Eremophila glabra var. viridiflora have developed since a period of extensive flooding in 1963. Prior to this it only occurred as scattered plants.
3. In winter the Lake harbours extensive populations of Grey Teal (Anas gibberifrons), Mountain Duck (Tadorna tadornoides) and numerous other species of birds.

Opinions and recommendations

Although this Reserve is partly degraded and disturbed, it still forms an important sanctuary for several species of birds, particularly water-birds during the winter months. As well as bird species the Reserve supports an interesting assemblage of plants. A good deal of work is required to restore the Reserve to a better state and this is probably uneconomic considering the pressures imposed on it.

I recommend that Reserve 10313 be vested in the Western Australian Wildlife Authority and that signs be erected around the Lake indicating that the Reserve is a Wildlife Sanctuary and that shooting is not allowed.

APPENDIX 2
VEGETATION DETAILS RESERVE 10313

Banksia scrub

Banksia prionotes and scattered Actinostrobus arenarius and Acacia saligna shrubs, immature, 1-3 m tall, 2-10% canopy cover. An understory of mixed shrubs, 0.4 m tall and ca 2-3% canopy cover is present. Soil is excessively drained, yellow, fine sandy loam. Plant species recorded were as follows: Acacia saligna, Actinostrobus arenarius, Amyema preissii, Anthotroche sp., Baeckea crispiflora, B. sp., Banksia prionotes, Conostylis aculeata, Corynotheca micrantha, Dicrastylis parvifolia, Eremaea pauciflora, Eucalyptus loxophleba, Grevillea pritzellii, Lomandra fimbriata, Lyginea tenax, Melaleuca scabra, Muhlenbeckia adpressa, Plectrachne dielsii, Stipa compressa, Verticordia sp.

York Gum woodland

Eucalyptus loxophleba trees and tree mallee, mature to senescent, 5-12 m tall, 2-10% canopy cover on swamp edge, mostly less than 2% in partly cleared areas to S and E of Lake. Soil is well drained, light reddish brown, sandy loam. Plant species recorded were as follows: Acacia merrallii, A. saligna, Avena sativa fatua, Callistemon phoeniceus, Calothamnus villosus, Dianella revoluta, Ehrahta longiflora, Eremophila glabra var. viridiflora, Eucalyptus loxophleba, Hakea preissii, Hordeum marinum, Leptospermum erubescens, Melaleuca uncinata, M. sp., Stipa compressa.

Broombush thicket

Melaleuca uncinata trees 7.5-9 m tall, 30-70% canopy cover (locally up to ca 90%). No understory present. No other species recorded.

Heath

Type 1 - Melaleuca scabra, Acacia leptospermoides shrubs, immature, 0.5 m tall, 30-70% canopy cover. Soil pale brown, sandy clay loam. Species recorded were: A. leptospermoides, Grevillea pritzellii, M. scabra, Santalum acuminatum, and Stipa compressa.

Type 2 - M. uncinata and some Grevillea pritzellii shrubs, immature, 1.5 m tall, 30-70% canopy cover.

Lake floor woodland

Casuarina obesa trees, immature to senescent, 10-16 m tall, 30-70% canopy cover. Many trees infected by mistletoe, probably *Amyema preissii*. No understory, but signs of recent invasion by *Atriplex semibaccata* in the S end of Lake. Maximum tree girth of the *C. obesa* recorded was *ca* 60 cm diameter at breast height (DBH) and the minimum 5 cm DBH.

Mallee stand (SE corner of Reserve)

Eucalyptus albida shrub and tree mallee, mature, 4-8 m tall, 10-30% canopy cover. Total area of formation about 100 square metres. No understory but scattered shrubs of *Acacia graffiana* and *Melaleuca scabra*.

Reserve 10313

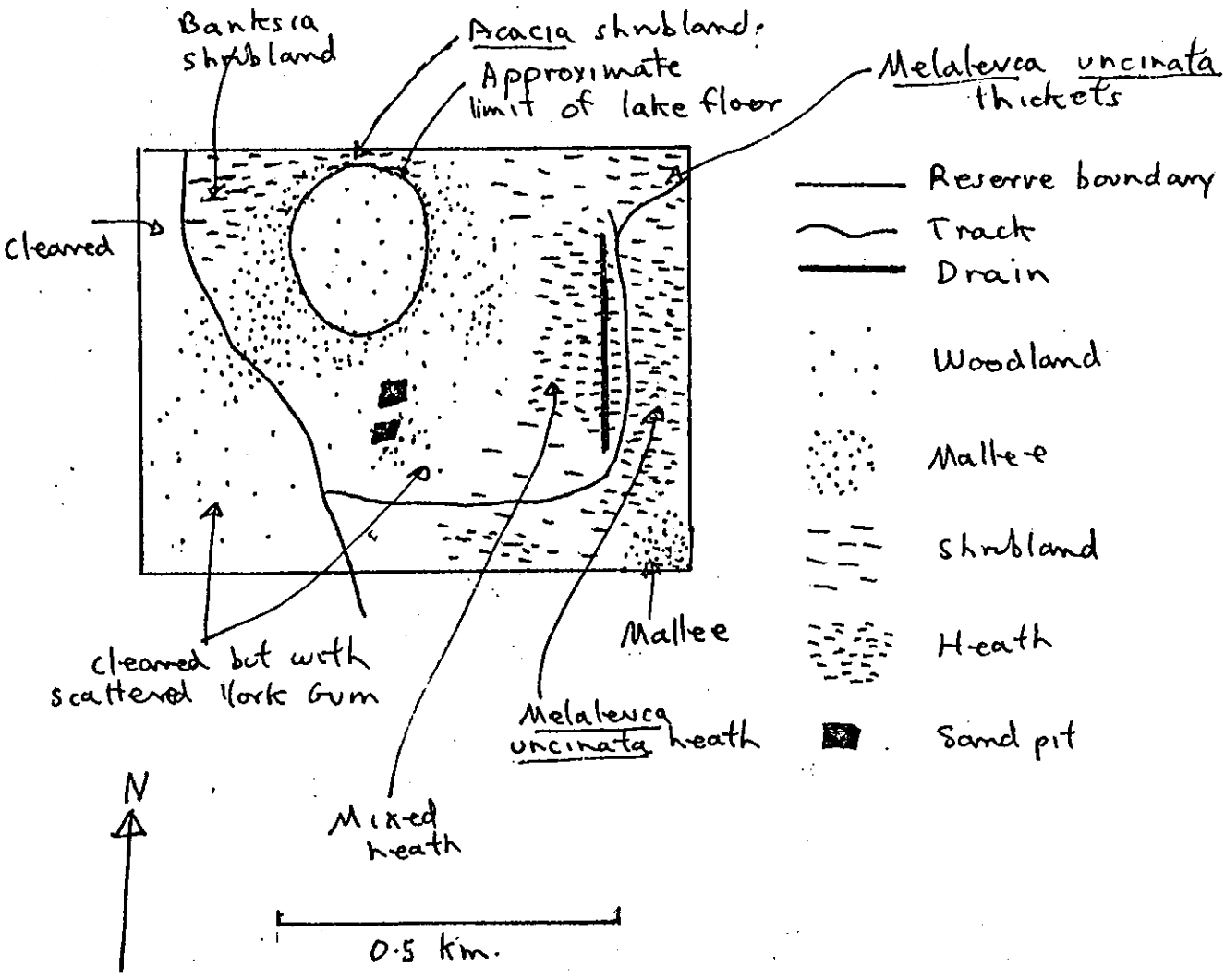


Plate 4. Reserve 10313 showing York Gum trees and tree mallees over Tar Bush heath. Tar Bush of this density is unusual, as are several other plant species in the assemblage. View W on W side of Lake

Plate 5. Reserve 10313. Stand of Ti-tree over Woolly Net-bush. This association is regrowth after clearing of York Gum woodland. View N from S edge Reserve.

Plate 6. Reserve 10313. View across floor of Noonying Lake illustrating forest of Swamp Oak with no understory. Note water stains to about 2 m up the tree trunks and dense tufts in foliage which are Amyema sp. parasites.

Reserve 23566

Located ca 5.5 km SE Tammin and shown on lithograph 2434-IV, A2, 3.

Background

Originally gazetted 1 August 1952 as "Timber for Settlers". This was amended on 26 April 1968 to "Timber for Settlers and Conservation of Fauna".

Physical characteristics

The Reserve is square, 255.8726 ha in area and 6.33 km in perimeter. The highest part of the Reserve is the NE corner, 320 m above sea level (ASL), and slopes down to the W and S to an altitude of ca 280 m ASL.

Highest parts of the Reserve are granite exposures, lower areas being colluvial soils derived from the granite or exposed pallid zone clays.

Vegetation

The Reserve is mostly covered with woodland of 5 associations. There is also a mallee, 2 shrublands and a lithic complex.

Jam Woodland

Acacia acuminata (Jam) Open Low Woodland A over Borya nitida Dense Herbs. Soil variable, sandy, yellow. This association is on deep granitic sands.

York Gum woodland

Eucalyptus loxophleba (York Gum) Low Forest A with an understory of sedges and grass. Soil granitic, pink, sandy clay loam.

Gimlet woodland

Young stand of Eucalyptus salubris (Gimlet) Low Woodland A over mixed shrubs. Soil brown, clayey sand. Association is on a slight rise with clays exposed. The soil is derived from in situ decayed granite.

Wandoo - woodland

Eucalyptus wandoo (Wandoo) and some York Gum and E. salmonophloia (Salmon Gum) Open Low Woodland A. Numerous understory species. Soil grey, sandy clay.

Wandoo on laterite

Wandoo Open Low Woodland A on a small area of laterite. Understory of Melaleuca undulata Low Heath C.

E. redunca mallee

Eucalyptus redunca (Black Marlock) Open Shrub Mallee over Tamma Heath A. Soil gravelly, fine sandy loam. Several other understory species present.

Callitris shrubland

Callitris roei (Roe's Cypress Pine) Open Scrub on gravelly soil.

Tamma thicket

Casuarina campestris (Tamma) Dense Thicket with Very Open Herbs understory. Soil gravelly.

Granite outcrop

Bare granite outcrops surrounded by Dense Low Forest A of Casuarina huegeliana (She-oak). Soil and vegetation very variable according to soil depth and runoff.

Plant species

Eighty plant species were recorded, 6 in Jam woodland, 7 in York Gum woodland, 16 in Gimlet woodland, 38 in Wandoo woodland, 3 in Wandoo on laterite, 19 in E. redunca mallee, 11 in Callitris shrubland, 2 in Tamma thicket and 12 on granite outcrops. It can be seen that by far the majority of plant species are found in the woodland associations. Twenty-five of the plant species recorded are exploited by the wildflower seed trade and one of these, Santalum spicatum (Sandalwood) is becoming rare and endangered in the wheatbelt.

Weeds

Very few, mostly the grasses Avena sativa fatua (Wild-oats) and Stipa compressa in the Jam and York Gum woodlands.

Fire History

Farmer on adjacent property informs me that last fire on Reserve was 30-35 years ago.

Fauna

Fresh scats of Echidna (Tachyglossus aculeatus) were found. Grey Kangaroo (Macropus fuliginosus) were seen in several parts of the Reserve. Birds recorded were as follows: Little Eagle (Aquila morphanoides), a nest on the Reserve is believed by a local farmer to be this species. The nest has been used for the last 3 years; Port Lincoln Parrot (Platycercus zonarius zonarius); Black-tailed Bee-eater (Merops ornatus), dozens of birds throughout Reserve, but particularly in taller woodlands; Black-faced Cuckoo-shrike (Coracina novaehollandiae); Red-capped Robin (Petroica goodenovii); Willy Wagtail (Rhipidura leucophrys); Weebil (Smicrornis brevirostris); Chestnut-rumped Thornbill (Acanthiza uropygialis); Yellow-rumped Thornbill (A. chrysorrhoea); Western Magpie (Cracticus tibicen dorsalis); Australian Raven (Corvus coronoides).

Additionally, the lizards Amphibolurus ornatus (Ornate Dragon) and Gehyra variegata (Common Dtella) were recorded.

Exotic fauna

Rabbit scats are present but there is no evidence of recent occupation. Local farmer has sighted a fox near the Reserve in recent times.

Firebreaks and fences

E, S and W sides with adequate fences, N side unfenced. Firebreaks also on these sides both within the Reserve and in adjacent paddocks.

Human usage

Small gravel pit to 0.5 m deep on NW corner, another about 30 m square on the NE corner. Timber removed from woodland and small granite exfoliated sheets removed from granite outcrop. Occasional sheep trampling, but minimal owing to some Box Poison (Gastrolobium crassifolium) being present. Occasional campsite for Aboriginals. Very small amount of rubbish dumped. The Reserve has been poisoned for foxes in 1960 and 1961, for rabbits in 1961-1969, rabbit warrens ripped in 1970 and poisoned in 1971-1974.

Adjacent uncleared land

None apart from scattered areas, mostly of Jam woodland, in nearby farmland.

Remarks

Thanks are extended to Mr. C. Scarlett and family for their hospitality and for providing valuable information on the recent history and fauna of the Reserve.

Opinion and recommendations

There is little doubt that Reserve 23566 is one of the best in the area and of great conservation value. It is of reasonable area and contains a good variety of association types and plant species. The numbers of birds recorded during this brief survey indicates it is an important area, particularly to migratory species such as the Bee-eater. The Reserve appears to be well protected from fire and pests (the Reserve is regularly visited by the Agricultural Protection Board) and the greatest danger to it is its classification, "Timber for Settlers and Conservation of Fauna". While this classification remains, removal of trees is a possibility. There is a letter on Fisheries and Wildlife files where a survey in 1968 by an officer of the Forests Department suggested that "removal of trees would not effect the fauna". This statement is dubious, as indicated by even the few bird species recorded; 8 of the 11 species utilising woodland extensively.

I recommend that Reserve 23566 be vested in the Western Australian Wildlife Authority, that signs be erected on the Reserve to indicate that it is a Flora Reserve and that rubbish dumping, shooting, etc, is not allowed. I also recommend that its purpose be changed from "Timber for Settlers and Conservation of Fauna" to "Conservation of Flora and Fauna".

APPENDIX 3
VEGETATION DETAILS OF RESERVE 23566

Jam woodland

Acacia acuminata trees, mature, 4-6 m tall, 2-10% canopy cover over Borya nitida herbs, mature, 15 cm tall, 70-100% canopy cover with some Enneapogon caerulescens grass. Soil sandy, yellowish, extremely variable. Other species noted were Hakea decurva and Santalum spicatum. Scattered Eucalyptus loxophleba were sometimes present.

York Gum woodland

Eucalyptus loxophleba trees and some tree mallee, mature to senescent 8-14 m tall, 30-70% canopy cover. Understory of Loxocarya pubescens and grasses, mostly Enneapogon caerulescens and Stipa compressa. Other species noted were Acacia acuminata, Grevillea paniculata and Rhagodia nutans. Soil granitic, pink, sandy, clay loam.

Gimlet woodland

Eucalyptus salubris trees, immature to mature, 6-15 m tall, 10-30% canopy cover over mixed shrubs, particularly Olearia revoluta and Rhagodia preissii to 1 m tall, 2-10% canopy cover. Soil is brown, clayey sand. Poorly drained. Association in on slight rise with exposed pallid zone clays. Other plant species recorded were as follows: Acacia dura, A. erinacea, A. graffiana, A. leptospermoides, A. mackayana, Atriplex paludosa, Beyeria lechenaultii, Eremophila drummondii, Gahnia affin. polyphylla ,Melaleuca uncinata, M. undulata, Olearia muelleri, Wilsonia humilis.

Wandoo woodland

Eucalyptus wandoo trees, mature, with scattered E. loxophleba and E. salmonophloia trees, stratum 8-13 m tall, 2-10% canopy cover. Understory of two trata: Casuarina campestris and scattered Hakea liscocarpha shrubs, immature, 1-2 m tall, 2-10% canopy cover over Borya nitida herbs, 15 cm tall, 70-100% canopy cover. Soil is grey, sandy clay, poorly drained. Other plant species recorded were as follows: Acacia acuaria, A. acuminata, A. merrallii, A. microbotrya, A. sp., Baeckea sp., Bertya cunninghami, Casuarina huegeliana, Dodonaea bursariifolia, D. caespitosa, Enchylaena tomentosa, Enneapogon caerulescens, Eremophila brevifolia, E. glabra var. viridiflora, Exocarpus sparteus, Gastrolobium crassifolium, G. sp., Grevillea paniculata, Guichenotia ledifolia, Lepidosperma drummondii, Lepidosperma pubisquameum, Leptospermum erubescens, Loxocarya pubescens, Melaleuca adnata, M. laxiflora, Olearia muelleri,

Olearia revoluta, Pittosporum phylliraeoides, Pultenaea sp., Rhagodia nutans, R. preissii, Stylobasium australe.

Wandoo on laterite

A very small area of Eucalyptus wandoo trees, 8-14 m tall and probably 2-10% canopy cover is present on a laterite rise on the extreme NE corner of the Reserve. Much of the association has been destroyed by clearing, roads, and a gravel pit. Also present are scattered Casuarina campestris shrubs and an understory of Melaleucaundulata shrubs, mature, 1.0 m tall, 30-70% canopy cover. This association passes abruptly into Callitris shrubland.

E. redunca mallee

Eucalyptus redunca shrub mallee, mature, 5-7 m tall, 10-30% canopy cover over Casuarina campestris and Acacia multispicata shrubs, mature, 1-2 m tall, 30-70% canopy cover over Dodonaea caespitosa shrubs, senescent, 0.5 m tall, 2-10% canopy cover. Soil is grey, gravelly, fine sandy loam. Other plant species collected were as follows: Acacia erinacea, A. fragilis, A. merrallii, Borya nitida, Baeckea heteranthera, Calothamnus gilesii, Ecdeiocolea monostachya, Eucalyptus foecunda, Loxocarya pubescens, Melaleuca radula, M. uncinata, M. undulata, Phebalium tuberculosum, Santalum acuminatum, Stipa elegantissima.

Callitris shrubland

Callitris roei shrubs, mature, to 7 m tall, 2-10% canopy cover and patches of Casuarina campestris to 2 m tall. Understory is Borya nitida to 10 cm tall, 2-10% canopy cover. Soil is highly lateritic, clayey sand. Yellowish brown colour, poorly drained. Other plant species noted were: Calytrix empetrioides, Dodonaea caespitosa, Eucalyptus cylindriflora, E. wandoo, Grevillea petrophiloides, G. sp., Hakea coriacea, Melaleuca radula.

Tamma thicket

Casuarina campestris shrubs, mature, 2-4 m tall, 70-100% canopy cover. Soil yellow, gravelly. Understory absent except for occasional Ecdeiocolea monostachya clumps.

Granite outcrop

Bare granite exposures with some lichens and mosses. Shallow soil deposits with Borya nitida. Runoff areas and deeper soil with Dodonaea attenuata shrubs or Casuarina huegeliana to 6 m tall, 70-100% canopy cover, and no understory. Plant species noted were: Acacia acuminata, Daviesia acanthoclona, Hakea petiolaris, H. scoparia, Lepidosperma gracile, Leptospermum erubescens, Stipa elegantissima, Stypandra imbricata and Waitzia acuminata.

In addition to these associations there occurred a very small patch of yellow sand on the SE corner of the Reserve. Most of it had been cleared by a firebreak but Eucalyptus transcontinentalis, Grevillea excelsior and G. petrophiloides were noted.

Reserve 23566

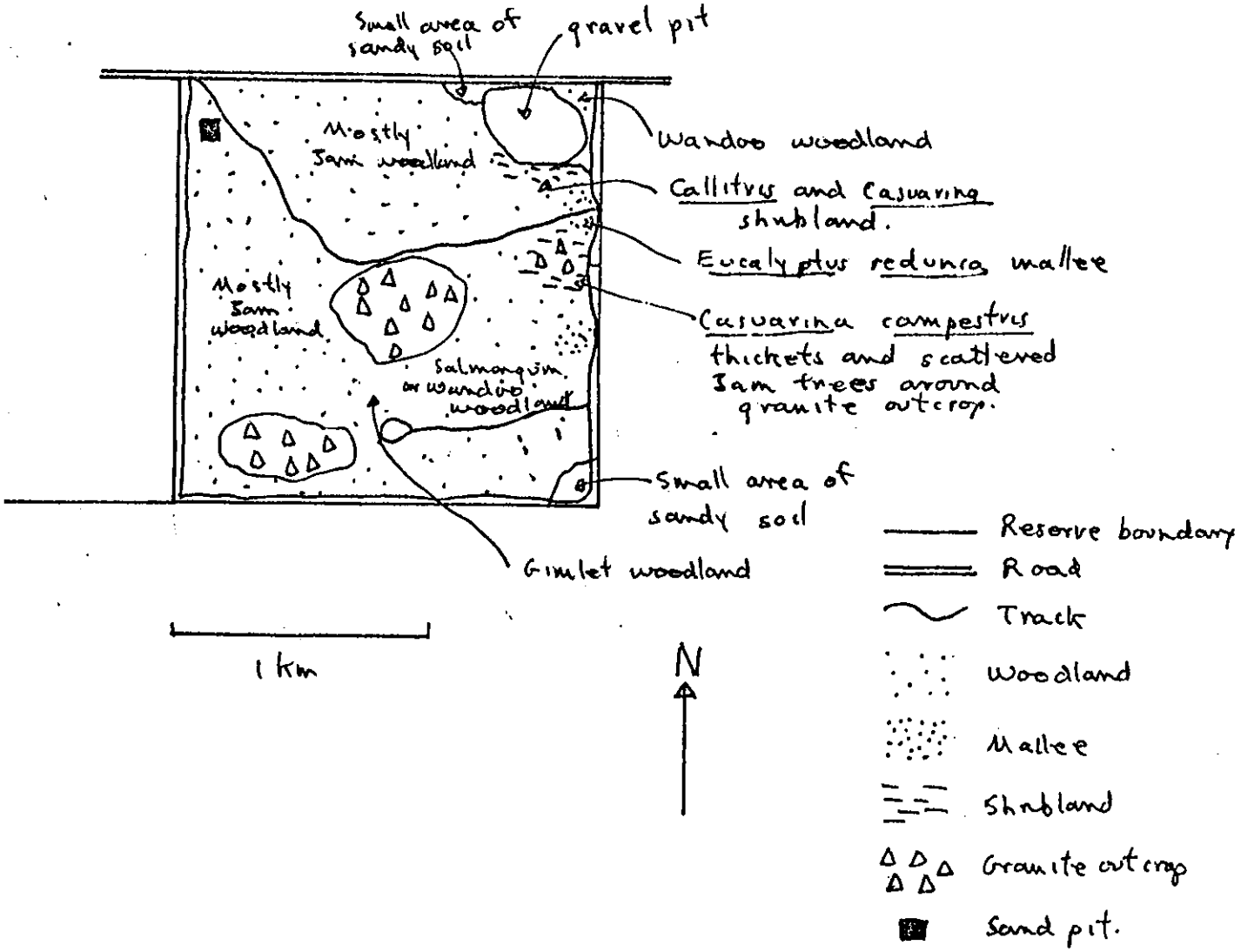


Plate 7. Reserve 23566. Granite outcrop with Borya nitida giving way to Jam woodland with scattered York Gum on deeper soils.

Plate 8. Reserve 23566. York Gum woodland with understory of sedges and grass. Photograph looking N near NW corner of Reserve.

Plate 9. Reserve 23566. Young stand of Gimlet trees regenerating following fire on a small, very clayey, decayed granite outcrop. Association is surrounded on 3 sides by Wandoo woodland and the other by Jam woodland.

Plate 10. Reserve 23566. Wandoo woodland of the type that covers about one-third of the Reserve. Note the sparse but very varied understory.

Reserve 24831

Located ca 11 km W of Tammin on lithograph 2334-1, B2.

Background

Originally gazetted for Conservation of Flora on 25 October 1957.

Physical characteristics

The Reserve is almost rectangular, and has an area of 35.6123 ha The long axis of the Reserve lies E-W and is about 800 m long. The short axis lies N-S and is about 450 m long. The overall perimeter of the Reserve is thus about 2.5 km. The Reserve is very flat and is about 220 m above sea level. The whole Reserve is a salt flat, being part of a large drainage system extending many km to the NE and SW.

Vegetation

The whole area is Arthrocnemum spp. (samphire) salt complex with small areas of scattered Melaleuca uncinata (Broombush) on the northern side. No other associations are present. Soil is all alluvial silt and mud.

Plant species

Only 3 species of plants were recorded on the Reserve, two samphires and Melaleuca uncinata (Broombush).

Weeds

None of importance were noted although levee banks and roadside drains had some small annual weed species present.

Fire history

Due to the nature of the vegetation the Reserve has probably never been burnt.

Fauna

Some man-made ponds on the Reserve had Red-capped Dotterel (Charadrius ruficapillus) and waders, possibly Greenshanks (Tringa nebularia). White-fronted Chats (Epthianura albifrons) were also common.

Exotic fauna

None recorded. It is unlikely any could exist on the Reserve except as transients.

Firebreaks and fences

None except on the northern boundary adjacent to farmland.

Human usage

None except for an area of about 1 ha where soil was removed for use in the construction of the adjacent railway line. No topsoil was replaced after removal, but the area was made self-draining. This work was done between August and November 1964. These man-made ponds are now an important part of the Reserve and provide permanent water for wading birds even in the driest years.

Adjacent uncleared land

Salt complex of the same type extends many km to the NE and SW of the Reserve. Additionally Reserve 6546 (about 35 ha) which is gazetted for Wyola Townsite lies immediately south of Reserve 24831 and is only separated from it by the railway and road. Reserve 6546 is also salt complex.

Opinion and recommendations

This Reserve is of little value in itself, being of poor habitat diversity and part of a much larger, more or less identical, drainage system. Ironically, perhaps, the most important part of the Reserve is the disturbed area, namely the man-made ponds with permanent water. This, together with the necessity of keeping salt effected land as undisturbed as possible make the retention of the Reserve worthwhile.

I recommend Reserve 24831 be vested in the Western Australian Wildlife Authority.

APPENDIX 4
VEGETATION DETAILS RESERVE 24831

Samphire flats

Arthrocnemum halocnemoides pergranulatum and *A. lepidospermum* shrubs, 0.4 m tall, 30-70% canopy cover on silts and clays with very high salt content.

Samphire with Broombush

Melaleuca uncinata shrubs, mature to senescent, 2-4 m tall, 2-10% canopy cover over *A. lepidospermum* and *A. bidens* shrubs, 0.4 m tall, 30-70% canopy cover.

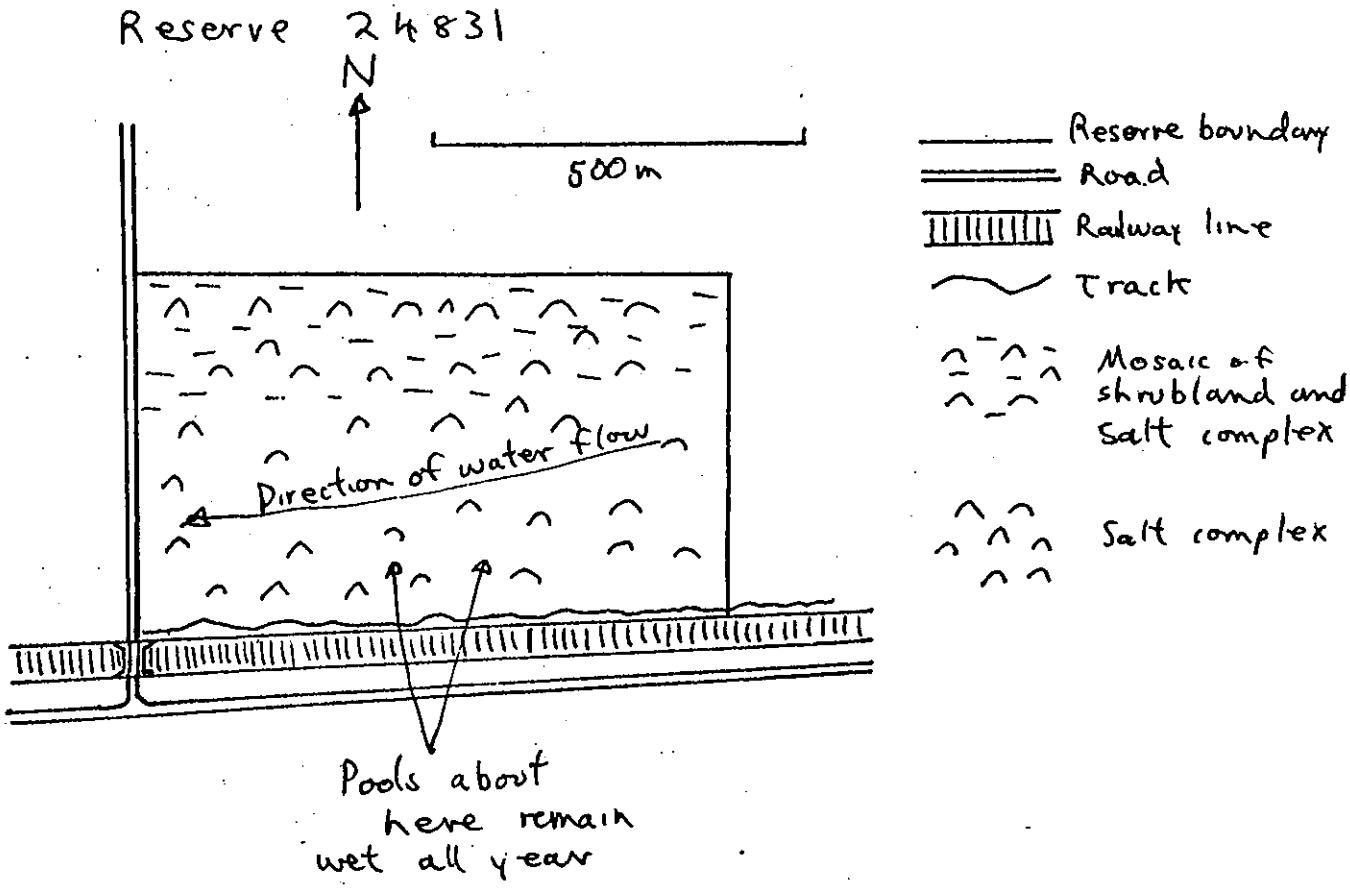

Reserve 24831
N
500 m
Direction of water flow
Pools about here remain wet all year
Reserve boundary
Road
Railway line
Track
Mosaic of shrubland and salt complex
Salt complex

Plate 11. Reserve 24831. Northern edge of Reserve looking E. Scattered Broombush shrubs and trees are emergent over samphire flats. Southern side of Reserve is just samphire.

Reserve 28289

Located ca 19 km due N of Badjaling Siding and shown on lithograph 2434-111, A1, 2.

Background

Originally privately owned land given over as valueless for agriculture. Gazetted for "Conservation of Flora" on 16 September 1966.

Physical characteristics

Reserve 28289 is 153.4745 ha in area and roughly rectangular in shape, being ca 2000 m long (E-W axis) and ca 800 m broad (N-S axis). The total perimeter is about 5.6 km. The Reserve is virtually flat and about 230 m above sea level. The entire Reserve is salt flat with a few low banks of sandy earth raised about 1 m above the watercourse.

Vegetation

Only 2 associations are present on the Reserve. The majority of the area is Arthrocnemum halocnemoides (samphire) flats. Low sandy mounds, mostly on the eastern end of the Reserve, support Templetonia sulcata (Centipede Bush) and scattered Melaleuca uncinata (Broombush) Open Scrub.

Plant species

Fifteen plant species were recorded on the Reserve, 3 on salt flat, the remainder on the sandy mounds.

Weeds

None recorded.

Fire history

The nature of vegetation on this Reserve probably ensures that it has never been burnt.

Fauna

Footprints of Grey Kangaroo (Macropus fuliginosus) were common on the Reserve but almost certainly live in adjacent uncleared bushland for the majority of the time. Only two species of birds were noted, Pipit (Anthus novaeseelandiae) and White-fronted Chat (Epthianura albifrons).

Human usage

A small amount of household rubbish has been dumped near the western boundary of the Reserve.

Adjacent uncleared land

The Reserve is part of a large salt complex which extends several km to the NE and SW. Another Reserve, 30299, lies about 0.5 km SW of Reserve 28289 and contains very similar salt complex as well as some woodland. The two Reserves are joined by uncleared salt complex.

Opinion and recommendations

Although of little value in itself the Reserve is important in allowing salt effected land to remain undisturbed. It also contains some unusual assemblages of plants on the raised mounds, including a Hakea not recorded previously by me.

I recommend that Reserve 28289 be vested in the Western Australian Wildlife Authority.

APPENDIX 5
VEGETATION DETAILS OF RESERVE 28289

Salt flats

Arthrocnemum halocnemoides shrubs, mature, 0.5 m tall, 30-70% canopy cover. Soil is silty mud with high salt content. A. bidens and Disphyma blackii also present. Seasonally flooded.

Raised mounds

Templetonia sulcata shrubs 3 m tall and Melaleuca uncinata 6 m tall, mature to senescent, ca 3% canopy cover. Pink, sandy clay soil; poorly drained. Species recorded were Acacia graffiana, Bassia diacantha, Enchylaena tomentosa, Eucalyptus loxophleba, E. gracilis, Exocarpus sparteus, Hakea preissii, H. sp., Lycium australe, Melaleuca uncinata, Rhagodia spinescens and Templetonia sulcata.

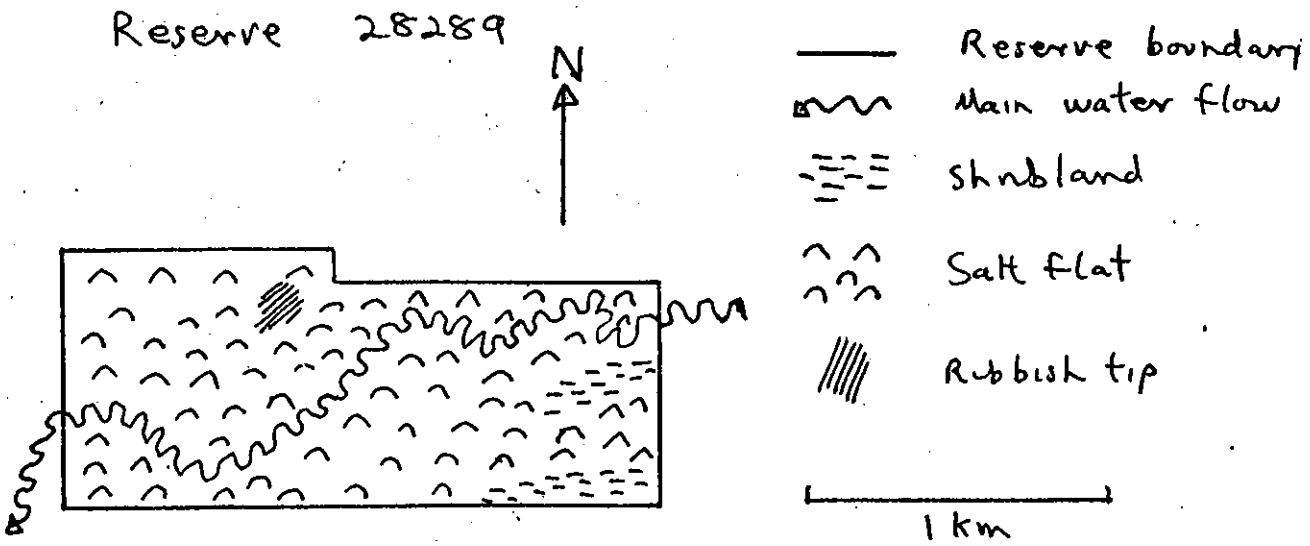

Reserve 28289
N
Reserve boundary
Main water flow
Shrubland
Salt flat
Rubbish tip
1 km

Plate 12. Reserve 28289. View NE from southern edge of Reserve showing Centipede Bush and Broombush shrubland on raised sandy mounds. The mounds with this association are surrounded by samphire salt flats.

Reserve 33990

Located immediately S of Bungulla Siding and shown on lithograph 2434-IV, A, B2.

Background

Originally gazetted 15 April 1976 for Conservation of Flora.

Physical characteristics

The Reserve is almost rectangular, 24.1815 ha in area and about 700 m in E-W axis by 350 m in N-S axis. Total perimeter of the Reserve is about 2.1 km. The Reserve is about 280 m above sea level (ASL) on its eastern side and about 275 m ASL on its western. Soil is similar over its whole area, being of in-situ decayed granite origin.

Vegetation

There are 2 major associations on the Reserve.

Wandoo woodland

Eucalyptus wandoo (Wandoo) Open Low Woodland A over Low Sedges and abundant grass.

Mallee area

Eucalyptus redunca (Black Marlock) Open Shrub Mallee with variable understory and some codominance with E. albida or E. cylindriflora (White Mallee).

Plant species

Thirty-seven plant species were recorded, 17 in Wandoo woodland and 25 in Mallee. Eight species are exploited by the wildflower seed trade.

Weeds

Abundant grasses in Wandoo woodland and around rubbish tip.

Fire history

No evidence of fire for a long time.

Fauna

Conditions at time of survey extremely hot and still. Only fauna noted were Port Lincoln Parrot (Platycercus zonarius zonarius), Weebill (Smicrornis brevirostris) and Australian Raven (Corvus coronoides).

Exotic fauna

Rabbit scats were noted in several places.

Firebreaks and fences

The E and S sides of the Reserve are fenced and have firebreaks in the adjacent paddocks. The N and W sides of the Reserve abutt roads and are unfenced.

Human usage

Rubbish dumped in Mallee association and old pipes from Goldfields Water Supply dumped in wandoo woodland. Scattered rubbish also present throughout the Reserve. A note on Fisheries and Wildlife files indicates the Tammin Shire Clerk was to investigate rubbish dumping in 1974.

Adjacent uncleared land

There is some uncleared shrubland to the N of the Railway Siding and some uncleared mallee to the west.

Opinion and recommendations

Although degraded, Reserve 33990 is probably an important "stepping stone" for migratory birds and carries quite a few plant species in spite of its small size.

I recommend that Reserve 33990 be vested in the Western Australian Wildlife Authority and that action be taken to discourage further rubbish dumping.

APPENDIX 6
VEGETATION DETAILS RESERVE 33990

Wandoo woodland

Eucalyptus wandoo trees, mature to senescent, 8-12 m tall, 2-10% canopy cover over Harperia lateriflora, Loxocarya pubescens and grasses to 30 cm tall, 30-70% canopy cover. Several other species present, including the following: Acacia acuminata, Baeckea crispiflora, Calytrix empetrioides, Casuarina campestris, C. microstachya, Dampiera spicigera, Dianella revoluta, Eremophila glabra var. viridiflora, Gastrolobium affin. hookeri, Lepidosperma gracile, Leptospermum erubescens, Lomandra effusa, L. sp., Rhagodia spinescens.

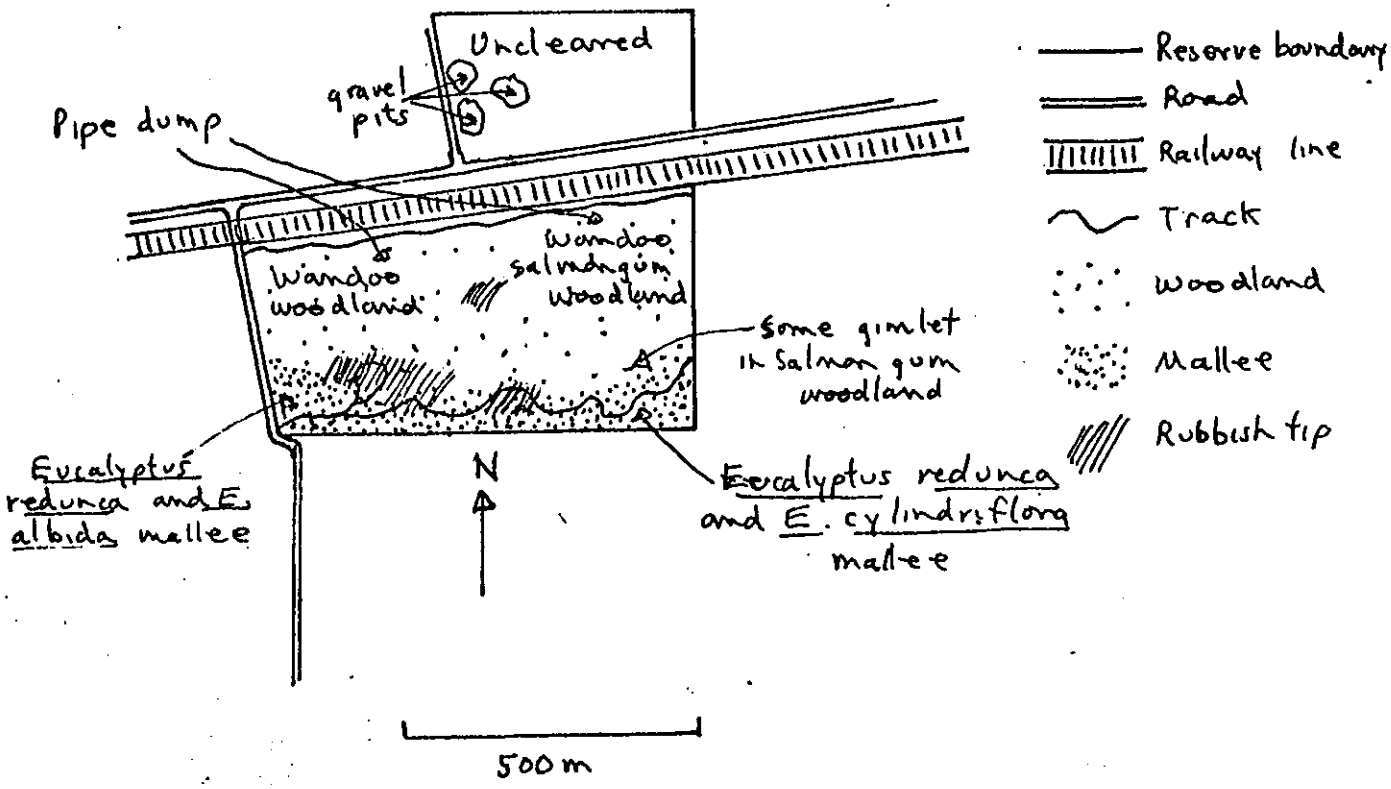
The E end of this association also had scattered Eucalyptus albida, E. cylindriflora and E. salmonophloia.

Mallee area

Association is basically Eucalyptus redunca shrub mallee, mature, 6-8 m tall, 10-30% canopy cover over mixed shrubs, 0.5-2 m tall, 2-10% canopy cover. Western end of the association had some E. albida and eastern end abundant E. cylindriflora as scattered plants or locally as a codominant. Where the wandoo woodland approaches the E. redunca - E. cylindriflora area there are scattered E. salubris trees.

Other species recorded were as follows:Acacia acuminata, A. brachyclada, A. erinacea, A. fragilis, A. graffiana, A. mackayana, A. pulchella var. glaberrima, Borya nitida, Calytrix empetrioides, Dodonaea attenuata, Eremophila clarkii, Grevillea acuaria, G. paniculata, Leptospermum erubescens, Lomandra effusa, Loxocarya pubescens, Melaleuca laxiflora, M. scabra, Micromyrtus imbricata, Santalum acuminatum, Spartochloa scirpoidea.

Reserve 33990



APPENDIX 7
METHODOLOGY OF SURVEY

Physical characteristics were obtained directly from the most recent metric lithographs as published by the Department of Lands and Survey, and interpreted from observations made on the reserve.

Reserves were examined by vehicle where tracks were available, or on foot. Local knowledge and air-photographs were consulted to find areas of particular interest.

Vegetation was classified using Muir's (1977) system (see Table 1) and soils described briefly using Northcote's (1971) texture classification and Munsell (1954) colour terms. Plant species of importance and that were not recognised, were determined from published keys and then checked against specimens in the Western Australian Herbarium.

Fire history was determined by observation on the reserve based on previous experience, by enquiries from nearby farmers and by examination of air-photographs.

Fauna were not specifically sought but some species (usually the more obvious) were encountered while examining vegetation. Scats, footprints, burrows, nests, and other indirect evidence is used only where identification is certain. Observations by farmers are used if considered reliable.

REFERENCES

MUNSELL COLOR COMPANY (1954). Munsell soil color charts. Baltimore, Md., Munsell Color Co.

MUIR, B.G. (1977). Vegetation and habitat of Bendering Reserve. Biological survey of the Western Australian wheatbelt. Pt. 2. Rec. West. Aust. Mus. Suppl. No. 3.

NORTHCOTE, K.H. (1971). A factual key for the recognition of Australian soils. Glenside, S.A., C.S.I.R.O./Rellim.