I INTRODUCTION TO EAST YUNA AND BINDOO HILL NATURE RESERVES

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Location and History

East Yuna and Bindoo Hill Nature Reserves are approximately 65 km east-north-east of Geraldton near the northern extremity of the Western Australian wheatbelt. East Yuna Nature Reserve consists of two contiguous reserves (No. C28415 and C29231) with a total area of 1740 ha. Bindoo Hill Nature Reserve (No. C30844) has 740 ha, and is 6 km south of the former reserve. The intervening land is uncleared on account of a rugged escarpment of Tumblagooda sandstone which renders it unfit for agriculture. The Greenough River flows between the two reserves. On the Greenough at the southern end of Reserve 29231 is Noondamurra Well Reserve (A265), a water reserve vested with the Minister for Water Supply. This reserve of 80.9 ha was first vested on 15 March 1918 for water and stocking.

East Yuna and Bindoo Hill Nature Reserves came into being after seven years of representation by a local farmer-naturalist Mr D.J. McGauran. Reserve 29231 was gazetted on 22 November 1971 and vested with the Western Australian Wildlife Authority; reserves 28415 and 30844 were gazetted on 14 April 1972 and vested with the same authority.

Physiography and Basic Geology

East Yuna and Bindoo Hill Nature Reserves fall within the Greenough Natural Region of Clarke (1926). Playford *et al.* (1970) have described and mapped the geology of the area. Both reserves are located on the Victoria Plateau where the Greenough River has heavily dissected the otherwise gently undulating sandplain.

Most of the Victoria Plateau around East Yuna and Bindoo Hill Nature Reserves is Pleistocene and/or Late Tertiary laterite with overlying quartz sand and underlying weathered rocks. Because of faulting two major geological formations are exposed on the surface.

Both reserves lie just east of the Urella Fault. This fault has a maximum throw of 6095 m at its southern end but declines rapidly to the north until the displacement dies out completely just north of the Greenough River (Playford *et al.* 1970). Several shorter faults associated with the Urella Fault occur between East Yuna and Bindoo Hill Nature Reserves. These expose Silurian (Tumblagooda) sandstones as sharp, in places, knife-back ridges.

Tumblagooda Sandstone is exposed at the southern end of East Yuna Nature Reserve and continues into Bindoo Hill Nature Reserve. This is presumed to be of Silurian origin and consists of red, brown, yellow and

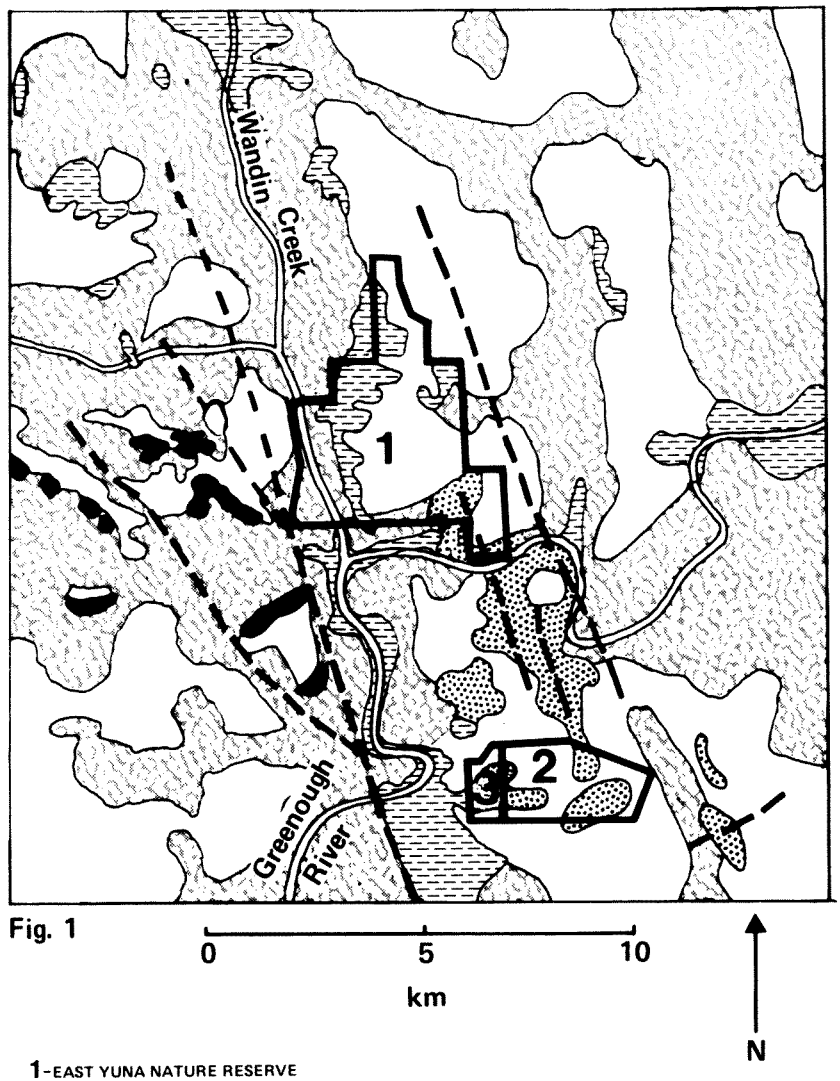

Fig. 1

Fig. 1: Map of East Yuna and Bindoo Hill Nature Reserves and surrounding areas showing geology, major drainage systems and contour lines. Geology details are redrawn from Playford *et al.* (1970).

white quartz, and feldspathic sandstone and conglomerate containing thin beds of red and white siltstone (Playford *et al.* 1970).

Permian rocks belonging to the Nangetty Formation are exposed along the western edge of East Yuna Reserve and in a band southwards along the Greenough River. They reach their greatest width immediatley west of Bindoo Hill Nature Reserve. The Nangetty Formation consists of tillite shale, and poorly sorted tillitic sandstone and conglomerate. The best exposures of Nangetty Sandstone are in a cliff section of the Greenough River 0.4 km west of Bindoo Spring.

Fig. 1 (drawn from Playford *et al.* 1970) shows the boundaries of the main geological formations and the fault lines of East Yuna and Bindoo Hill Nature Reserves. **Fig. 4** (in Muir this report) indicates that, in general, the vegetation boundaries closely conform to geological boundaries. This had also been shown previously by the broad vegetation divisions of Beard and Burns (1976).

Little information is available on the elevation range of East Yuna and Bindoo Hill Nature Reserves. Trig WS near the north end of East Yuna Nature Reserve is 295.6 m above sea level and the trig on the top of Bindoo Hill in the centre of that reserve is 292.8 m above sea level. Trig WS is the highest part of East Yuna Nature Reserve; from here the reserve slopes southwards to the Greenough River. Probably the elevation range is around 100 m. The elevation range of Bindoo Hill Nature Reserve is considerably less, probably in the vicinity of 50 m; it also lacks the extensive system of breakaways which are a notable feature of East Yuna Nature Reserve.

Fire History

The only information on fire history of East Yuna Nature Reserve is obtained from D.J. McGauran (pers. comm.) and from 1962 and 1977 aerial photographs. This information is presented in **Fig. 2.** Most of the reserve has not been burnt for more than 35 years and some considerably longer (55 years). A small section in the centre is older than 55 years. Two areas have been burnt relatively recently, one, *ca* 7 years and another, 10-20 years ago. Two other areas have been chained or rolled in preparation for agriculture but only a small part along Wandin Creek was cropped (1934-1938). These areas are now regenerating (see Muir this report for vegetation stage at 1976).

Bindoo Hill Nature Reserve has little available information. In his descriptions of the vegetation, Muir (this report) comments on the lack of any indication of fire. It is reasonably comparable to East Yuna Nature Reserve where most of the vegetation is older than 35 years.

Isolation

Aerial photographs covering these reserves were taken on 7 September 1962 and 20 September 1977. The 1962 photographs (11 years before our

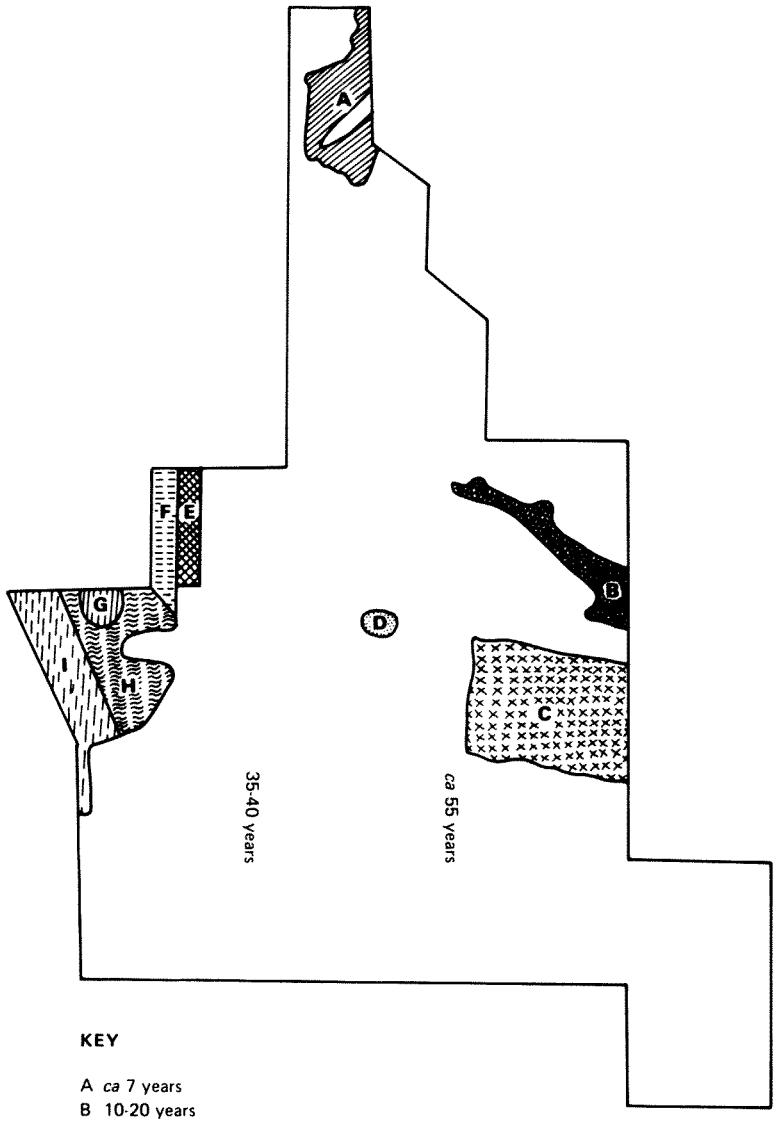

Fig. 2: East Yuna Nature Reserve showing ages of burnt areas and approximate dates of clearing of regrowth areas.

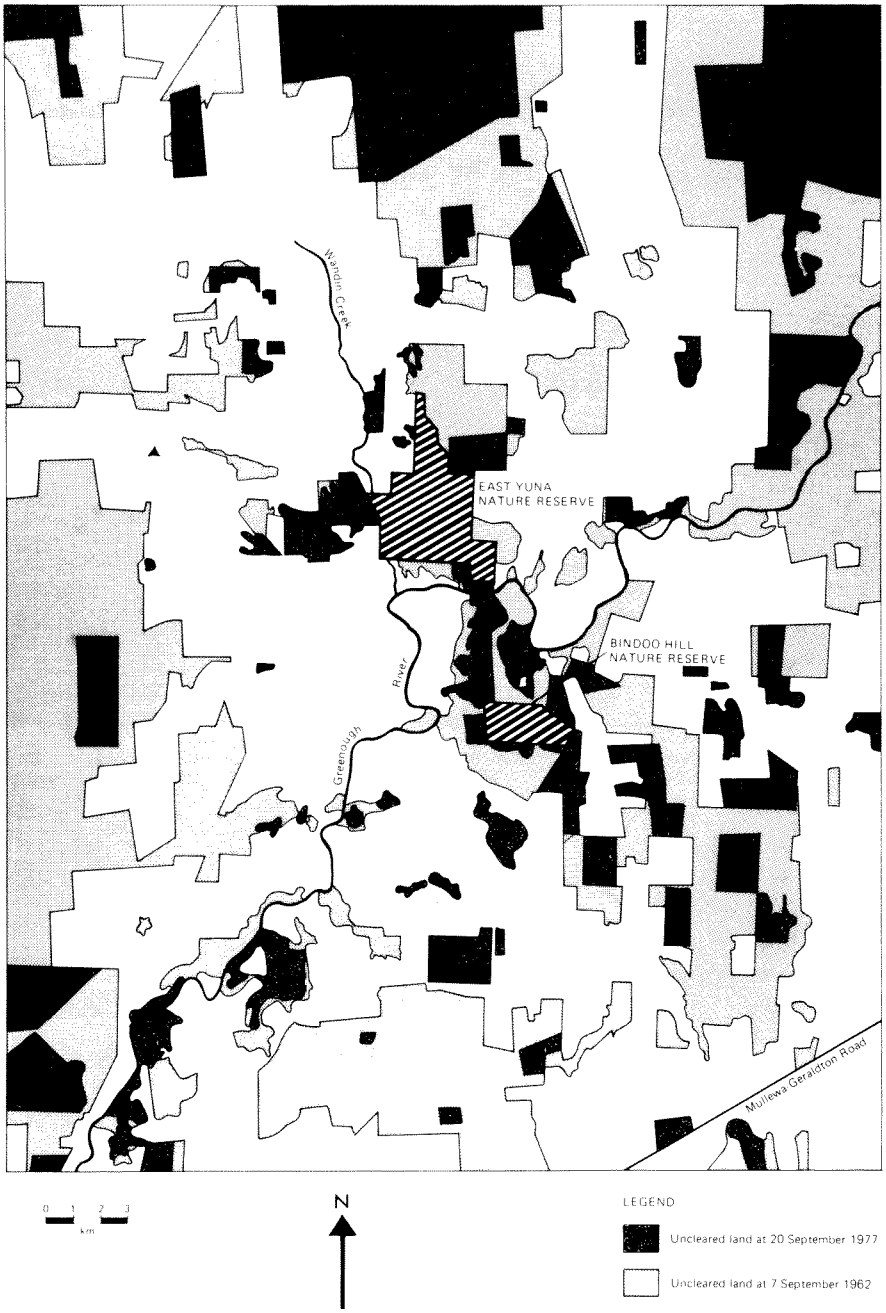

Fig. 3: Map of East Yuna and Bindoo Hill Nature Reserves and surrounds showing land cleared between 1962 and 1977. Blank areas were cleared prior to 1962.

1973 survey) show that East Yuna and Bindoo Hill Nature Reserves were part of a continuous area of uncleared land (**Fig. 3**). In a radius of 10 km from Bindoo Hill Nature Reserve there were *ca* 18,277 ha of uncleared land. This represented 36.1% of the 50,580 ha included in this calculation. In comparison at East Yuna Nature Reserve there were *ca* 20,227 ha or 30.30% of the 66,735 ha being considered.

The aerial photographs of 1977 show that between 1962 and 1977 there was considerable clearing in the area. Figures for 1977 show that around Bindoo Hill Nature Reserve there were only 8748 ha or 17.1% of the area uncleared, and around East Yuna Nature Reserve there were only 7,227 ha or 10.8% uncleared.

In addition to the uncleared areas shown in **Fig. 3** there are a number of areas too small to be mapped, in addition to vegetation along roads, fences and major watercourses. Many bird species undoubtedly use these corridors to move between the various blocks of uncleared land.

Climate

Rainfall figures for Bunya Bunya (*ca* 3 km west of East Yuna Nature Reserve) have been compiled by D.J. McGauran since 1923 for the Bureau of Meteorology. These rainfall figures (1923-1976) are summarized in **Table 1.**

TABLE 1

Rainfall figures for Bunya Bunya compiled between 1923 and 1976.

	J	F	M	A	M	J	J	A	S	O	N	D	Total
Mean rainfall	10	13	23	24	64	67	60	37	17	12	7	7	341
% of total	2.9	3.8	6.7	7.0	18.7	19.6	17.5	10.8	4.9	3.5	2.0	2.0	
Median rainfall	3	3	5	12	36	65	53	33	15	9	3	4	319
Mean no. of rain days	2	2	3	5	8	12	12	10	7	5	3	2	71

The lowest annual total was 154 mm in 1948 and the highest was 517 mm in 1963. The figures show that 191 mm or 56% of rainfall falls in 3 months May to July and that a further 18% falls in April and August.

Anon. (1975) shows that Mullewa (the nearest station recording humidity readings) at 1500 hr has only 2 months (June and July) when the mean relative humidity is over 50% and that during 6 months (October to March) the figure is less than 30%. The annual mean is 32%.

Anon. (1959) indicates that evaporation is lowest in winter and highest in January. The only evaporimeter in the region is at Nabawa, but Anon. (1959) estimates figures for the region from saturation deficit data modified by reference to actual evaporation records. Their chart shows that East Yuna Nature Reserve is midway between the 340 and 360 mm evaporation lines.

Temperature figures for Mullewa are extracted from Anon. (1959) for 23 years preceding 1959. They are presented below.

TABLE 2

Temperature averages for Mullewa (23 year average preceding 1959).

	J	F	M	A	M	J	J	A	S	O	N	D	Year
Average maximum	36.5	36.3	33.5	28.6	23.2	19.6	18.4	20.1	23.7	26.6	30.6	34.1	27.6
Average minimum	19.3	19.8	18.3	14.8	10.7	8.1	6.6	7.1	8.5	10.9	14.3	16.8	13.0
Highest recorded	47.3	45.5	43.3	41.6	32.2	29.4	28.8	30.5	35.7	40.4	41.2	43.3	47.3
Lowest recorded	11.3	10	10.1	5	1.3	−0.2	−1.0	−1.4	1.2	3.8	7.7	7.2	−1.4

The average frequency of frost (2.2°) at Mullewa is 2.3 per year. These occur from June to August. The earliest recorded frost is 24 May and the latest 18 September. The average frost free period is 310 days.

Biological Survey

Apart from McGauran's manuscript information on birds of the area little was known of the biota of East Yuna and Bindoo Hill Nature Reserves. The Museum survey of these reserves was undertaken by A. Chapman, J. Dell and D.J. Kitchener during 7-18 May 1973, A. Chapman and G. Harold during 18-30 September 1973; and J. Dell and B.G. Muir during 12-18 October 1976. A few reptiles were collected by T. Evans during firebreak construction by the Department of Fisheries and Wildlife during February 1975.

Results of the above surveys are included in this report as separate papers by Muir, Chapman and Kitchener, Dell and McGauran, and Dell and Chapman respectively.