ASSESSMENT OF THREE GAZETTED RARE PLANTS

-

Daviesia microcarpa

Lepidium catapycnon

Pityrodia scabra

Prepared by: E.M. Mattiske and Associates

Prepared for: Department of Conservation and Land Management

April 1994

CLM001/083/94

TABLE OF CONTENTS

APPENDICES

TABLE OF CONTENTS

TABLE

FIGURES

1. SUMMARY

In 1992, E M Mattiske and Associates were commissioned to search for three critically endangered flora species in Western Australia, namely - *Daviesia microcarpa, Lepidium catapycnon* and *Pityrodia scabra*.

In the study all three species were relocated and additional plants located, although still in very low numbers as indicated below:

Daviesia microcarpa

Daviesia microcarpa (manuscript name) - this species was only known from one site near Norseman. In 1985, the one population was removed following site destruction during roadworks. It was not included in the list of presumed extinct species pending a final effort to regenerate extinct species from soil stored seed.

In November 1992, a new population of eighteen plants of *Daviesia microcarpa* was located by E.M. Mattiske and Associates. Sixteen of the eighteen plants were alive and fruiting at the time of the survey in November, 1992.

Photographic evidence and a voucher specimen were taken in the field and the species identification was confirmed against the specimens in the State Herbarium by E.M. Mattiske and by M.D. Crisp in Canberra (*Daviesia* specialist). The species appears to be a disturbance opportunistic species.

Lepidium catapycnon

Lepidium catapycnon - this species is a short-lived species that grows in the Hamersley Range. The species regenerated after grading of the track and edges of the track near the previously recorded population.

In November 1992 and March 1993, the known population was relocated. In November, a total of 56 plants were recorded, 53 of these were healthy, 2 were stressed and 1 had recently died. Of the 56, 11 were setting seed at the time of the survey in November 1992. In March 1993 a total of 14 plants was relocated, of which most were mature plants (i.e. the seedlings had either grown or died) and 1 of these was flowering and 5 were seeding.

Despite extensive searching in the area no new populations were found. No specimen was taken at the time, as the population is so critical, however photographic evidence was taken of some of the plants. The species appears to be a disturbance opportunistic, although several plants were located in the undisturbed Hummock Grasslands on the slopes above the track.

Pityrodia scabra

Pityrodia scabra - this species is in decline and was known from only one plant in the wild. An Interim Management Guideline is being prepared for this species.

In November 1992, the one known plant was relocated and an additional new plant of *Pityrodia scabra* was located on Railway Reserve in close proximity to some of the individuals of the species which had died in recent years. Therefore two plants are known to occur. The new plant is younger and appeared to be quite healthy at the time of the survey. No specimen was taken at the time, as the population is so critical, however photographic evidence was taken of both plants. The species appears to be a disturbance opportunistic.

2. INTRODUCTION

Endangered flora are protected under amendments to the Wildlife Conservation Act (1980) and include plants deemed to be rare, in danger of extinction, or otherwise in need of special protection. The legislation applies on all lands and to all persons in the State.

In view of the rarity of three of these declared flora species, E M Mattiske and Associates was commissioned in 1992 by the Department of Conservation and Land Management to search for these species. Two of the species were known only from single remaining populations; *Pityrodia scabra* and *Lepidium catapycnon*. The other species, *Daviesia microcarpa*, had not been located in the wild since 1985.

2.1 Objectives

The specific objectives of the project were:

- to attempt to locate new populations of *Daviesia microcarpa*, *Lepidium catapycnon* and *Pityrodia scabra*,
- to research the habitat requirements for each species,
- to liaise with the Department of Conservation and Land Management and research files from the Department to determine previous survey efforts,
- undertake field surveys for each species in areas of likely habitat, and other areas of bushland in the vicinity of known populations, and
- to prepare a report detailing the above information, and showing survey routes and bushland areas surveyed.

3. GENERAL METHODS

The habitat of known populations of the rare flora was examined and was used in conjunction with any available documentary evidence to determine site characteristics likely to be associated with new populations. Obviously in the case of *Daviesia microcarpa* where there were no known populations in the wild, this was not possible and the search was based only on historical documentary evidence of the habitat of the species. This included the belief that the species was a "disturbance opportunistic" (M.D. Crisp, pers. comm.) which was later supported by the findings of E M Mattiske and Associates.

4. RESULTS

4.1 *Daviesia microcarpa*

4.1.1 Background

E.M.Mattiske and Associates were contracted in 1992 by the Department of Conservation and Land Management to search for the Declared Rare Flora (DRF) species - *Daviesia microcarpa* and to provide a report on the findings.

Daviesia microcarpa had not been located since 1985, when the last known population was believed to have been destroyed. At the time it was thought that the plant propagated following disturbance (M.D. Crisp pers comm.) (i.e. the plant is a "disturbance opportunistic").

The only known population of *Daviesia microcarpa* was located 4.2km north-east of the Norseman railway crossing on the northern side of the Eyre Highway by D.Whibley in 1974. The plants were situated in a roadside ditch, demarked by DRF flags located at 4.2km and 4.5km north-east of the Norseman railway crossing. Since this time, three other collections have been made from the same population by M.D. Crisp (February and September 1979) and M.I.H.Brooker (August 1979).

After an unsuccessful investigation in May 1984 by Ian Cooke of the Department of Fisheries and Wildlife (now the Department of Conservation and Land Management) to locate individuals of the species *Daviesia microcarpa*, the species was thought to be extinct. His survey encompassed the northern verge of the Eyre Highway, between 4 and 15 km north-east of Norseman. The original population was thought to have been destroyed due to extensive grading of the road reserve of this area.

In March 1985, P. Collins from the Department of Fisheries and Wildlife reported thirteen plants growing close to the Eyre Highway. Plants were found on both sides of the highway, 4.2 km north-east of the railway crossing at Norseman. The plants inhabited red clay loams with calcrete nodules in association with *Eucalyptus*, *Eremophila* and *Atriplex* species. The reported plants were not positively identified.

4.1.2 Areas Surveyed for *Daviesia microcarpa*

Three persons inspected the following areas for the Declared Rare Flora species, *Daviesia microcarpa* during November, 1992.

Particular attention was given to areas close to the reported population of *Daviesia microcarpa* especially sites disturbed by grading or fire. Emphasis was also placed on localities exhibiting similar soil types and vegetation to those previously reported as occurring with the species. The site numbers in the following text relate to those on Map 1.

1. Eyre Highway

Three persons searched road verges on the Eyre Highway on foot from 2.1 to 7.9km north-east of the Norseman rail crossing (crossing being located 340 metres east of the Norseman Coolgardie Road - Eyre Highway intersection). Both the northern and southern sides of the road were inspected to a width of 10m. Within this area certain sites were studied in greater detail, as follows:

1a. Inspection between DRF flags.

Both the northern and southern sides of the Eyre Highway were thoroughly examined from 4.2km to 4.5km north-east of the rail crossing at Norseman. The northern verge was inspected to a width of 60 metres and the southern verge to a width of 20 metres. The area had been disturbed by digging, grading and by emplacement of underground Telecom lines.

Eucalyptus, *Eremophila* and *Atriplex* species inhabit the red clay loams of soils this area.

- no populations of *Daviesia microcarpa* were located during the search.

1b. The Eyre Highway Road verge from 5.0 to 5.05 km north-east of the Norseman railway crossing.

A population of eighteen plants of *Daviesia microcarpa* was located within the area searched (refer results section).

2. Inspection of recently burnt/regenerating area

Both north and south of the Eyre Highway, 4.65km north-east of the Norseman railway crossing was surveyed on foot to a distance of 200 metres from the road. This area supports *Allocasuarina* sp. over mixed shrubs and *Stipa* species on red brown clay loam with occasional calcrete nodules. This area was investigated in response to the suggestion by Dr M.D. Crisp that fire may stimulate the germination of *Daviesia* species (M.D. Crisp pers. comm.)

- no populations of *Daviesia microcarpa* were located within the area during the search.

3. Drive by inspection of Jimberlana Hill area

South of the Eyre Highway, 3.2km to 5.2km north-east of the Norseman railway crossing.

Numerous tracks on the southern side of Eyre Highway in the Jimberlana Hill area (see attached map) were investigated by drive by searches . The area was surveyed to a distance of 0.8km parallel to the Eyre Highway. The area supported *Allocasuarina*, Mallee *Eucalyptus*, *Melaleuca*, *Triodia* and *Stipa* species on red brown clay loams with occasional calcrete nodules. Much of the area was disturbed.

- no populations of *Daviesia microcarpa* were located within the area during the search.

4. Inspection of calcrete pits in the Jimberlana Hill area.

4a. 4.25km to 4.4km north-east of the Norseman railway crossing, 350 metres to 500 metres east of the Eyre Highway.

4b. 3.65km to 3.77km north-east of the Norseman railway crossing, 400 to 500m east of the Eyre Highway.

The two pits were surveyed on foot. The areas supported sparse mallee shrubs over *Atriplex* species and grasses on calcrete.

- no populations of *Daviesia microcarpa* were located within the areas during the search.

5. Inspection of calcrete pit

North of the Eyre Highway, 7.6 to 7.75km north-east of the Norseman railway crossing.

The pit was examined on foot. This disturbed area supported very sparse Mallee over sparse Chenopodiaceae and *Atriplex* species on calcrete.

- no populations of *Daviesia microcarpa* were located within the area during the search.

6. Inspection of unnamed two wheel drive road

South of the Eyre Highway, 7.9km north-east of the Norseman railway crossing.

Both the east and west sides of the road were inspected on foot to a width of 10m. This area supports an undisturbed shrubland of *Allocasuarina*, *Acacia*, *Melaleuca*, and *Eucalyptus* species over mid dense *Triodia* species on red brown clay loams with occasional calcrete nodules.

- no populations of *Daviesia microcarpa* were located within the area during the search.

4.1.3 Summary of Findings on *Daviesia microcarpa*

A new population of 18 plants was located in November 1992 by E M Mattiske and Associates, see Appendix B. Identification has been confirmed by M.D. Crisp. Two individuals in the population were dead, however the rest appeared relatively healthy. The plants were found growing in dry red clay loams with calcrete nodules in association with *Eucalyptus oleosa var. oleosa*, *Melaleuca pungens*, *Allocasuarina helmsii*, *Acacia hemiteles*, *Westringia dampieri, Aristida contorta* and *Triodia* sp. This population inhabits the disturbed soils of the underground Telecom line and the graded soils between the line and the road. The plants occur within twenty metres of the northern side of Eyre Highway and are protected in general from damage by vehicles by virtue of the fact that the adjoining road reserve is approximately three metres below the level of the Eyre Highway.

The population was located at a single site, spanning an area of approximately 100 by 50 metres. The plants occur some 500 metres from the last reported sighting of the species. The site is believed to have been graded or scraped around 4 or 5 years ago, with no plants being located in the surrounding undisturbed shrubland, thereby lending support to the hypothesis that the species is a "disturbance opportunistic" (M.D. Crisp pers comm.). The population occurs within 50 metres of the Eyre Highway, and none of the plants are located within the present DRF roadside flags or within a Department of Conservation and Land Management reserve area. All the mature plants were in heavy seed at the time of sighting which may provide opportunity for experimentation with propagation, possibly by manipulation of the surrounding habitat.

4.1.4 Recommendations for *Daviesia microcarpa*

The located plants of the species *Daviesia microcarpa* are under immediate threat from destruction due to clearing, as all the plants occur within an area which appears to be occasionally graded and frequently mowed. At the time of the survey A. Napier from the Main Roads Department was notified of this population. There is still an urgent need to fence the site or use other means of protecting the site such as emplacement of DRF flags and providing information regarding the need to manage the site to the local Shire, Main Roads Department, Telecom (an underground Telecom line runs very close if not underneath the site), and any other party deemed likely to disturb the site.

Recommendation 1:

> That all relevant personnel be informed of the approximate location of the newly located population of *Daviesia microcarpa* and of the need to avoid disturbing the site. In addition, physical barriers including DRF flags and/or fencing should be erected at the site.

The level of seeding of the mature plants at the site offers opportunities for experimentation with propagation. This could include disturbing then protecting the surrounding area to encourage germination of the species, given that the species appears to be a "disturbance opportunistic". In particular, seed could be scattered in an area in close proximity to the recently discovered plants (either before or after disturbance), and the site graded, scraped, dug over and/or fired. Following disturbance the site should be left to allow time for propagation. In addition, a Department with experience in plant propagation, such as the King's Park Board could experiment with the seed.

Recommendation 2:

That persons with relevant skills be consulted with regard to possible experimentation with propagation of the available seed and possible topsoil trials. Further trials could be conducted at Kings Park where personnel have developed particular skills in propagation of endangered species.

In view of the lack of other populations this plant should be monitored twice a year by botanists from the Department of Conservation and Land Management or Consultant botanists working in the area.

Recommendation 3:

The population of *Daviesia microcarpa* should be monitored twice a year and a brief report prepared for Departmental records, with a summary of action needed as required to protect this population.

4.2 *Lepidium catapycnon*

4.2.1 Background

E.M.Mattiske and Associates were contracted in 1992 by the Department of Conservation and Land Management to search for the Declared Rare Flora (DRF) species - *Lepidium catapycnon* and to provide a report on the findings.

Lepidium catapycnon was first collected by McGuire in 1972 at Wittenoom. The genus *Lepidium* and more specifically - *Lepidium catapycnon* from the specimen collected by McGuire was described by Hewson (1981) in Brunonia (Volume 4, pages 217-308). *Lepidium catapycnon* was then re-discovered above Wittenoom Gorge in the Pilbara Region on the catwalk as a small population in 1985 (2 plants) and re-surveyed in 1986. T. Start in 1986 relocated the population in September 1986. The species was added to the schedule of declared rare flora under the Wildlife Conservation Act in 1987. In 1988, in response to a request for a further search for the previously known 2 plants, none were relocated in August 1988. At this time this species was recognised as a disturbance opportunistic species (D. Coates, 1989).
In September 1991, S. van Leeuwen recorded 77 seedlings along the catwalk edges.
In November 1991, L. Sweedman, a seed collector from Kings Park, advised the Department of Conservation and Land Management that he had made a small collection of *Lepidium catapycnon* seed from the known site at Wittenoom. It should be noted that at this time 77 seedlings (2cm in height) and 2 semi-mature plants (20cm in height) were present in the area where the 2 known plants had been destroyed by earthworks during upgrading of the track.

4.2.2 Areas Surveyed for *Lepidium catapycnon*

The survey was undertaken on two trips (November 14-16, 1992 and March 26-29, 1993). Ten persons assisted in the search for the Declared Rare Flora species, *Lepidium catapycnon.* In fact a total of 33 person days were spent searching on two trips in November 1992 and March 1993. The first of these trips included Libby Mattiske, Nick Casson, Denise True and Trevor Mattiske. The second of these trips included the botanists Malcolm Trudgen and Libby Mattiske as well as geologists, local environmental officers and mining engineers who volunteered their weekend to assist in the search. It should be noted that some of the geologists have worked in the area for over ten years and are very familiar with many of the native species.

It should be noted that four of these persons have undertaken extensive botanical studies in the Pilbara during the last two decades, namely Libby Mattiske, Malcolm Trudgen, Nick Casson and Denise True. In these years of survey which would accumulate to many months of foot traverses throughout the Pilbara no other populations have been located. In particular, Malcolm Trudgen who has collected extensively in the Pilbara Region confirmed that he had not previously sighted this species in his studies. These observations reinforce the rarity of this species.

All areas were surveyed by foot and road traverses with at times groups walking parallel on the slopes and in the gullies to allow maximum coverage of the areas. Particular attention in the search was given to:

1. areas close to the reported population of *Lepidium catapycnon* along the catwalk above Wittenoom:
   - the catwalk and adjacent slopes (where accessible by foot) were walked by two persons from the Wittenoom Gorge end to the gate at the top of the hill to the west of the main population;
   - the catwalk was driven several times and searching on the sides and slopes was also undertaken.

2. the adjacent gullies and gorges near the catwalk (with a consideration to seed movement by wind and water):
   - Gardner Gorge was traversed by three persons walking along the floor and along the slopes. All upper areas of the Gorge were searched systematically by the team, including climbing several steep areas to access the upper gullies.
   - Wittenoom Gorge was traversed by foot and vehicle up to the old exploration camp and near the old mining area.
   - Bee Gorge was inspected from the vehicle with opportunistic foot traverses in several locations along the gorge.

3. the less disturbed slopes near Wittenoom Gorge:
   - this included extensive walking on most major hills and valley systems near the main population of *Lepidium catapycnon* and the adjacent hills.

4. the areas disturbed by recent exploration drilling activities in the valley and hill systems:
   - this included extensive walking on the areas west of the Wittenoom Gorge and Gardner Gorge.

The areas surveyed are summarized on Map 2 attached. However it should be re-stressed that the four botanists mentioned above have spent many months traversing the Pilbara Region for both recreational and professional reasons and no other populations have been sighted.

4.2.3 Summary of Findings on *Lepidium catapycnon*

In November 1992, the known population was relocated, see Appendix B. A total of 56 plants were recorded, 53 of these were healthy, 2 were stressed and 1 had recently died. Of the 56, 11 were setting seed at the time of the survey in November 1992. In March 1993 a further inspection was undertaken and only 14 of these 56 plants remained, although most of these were mature and a higher proportion were setting seed at this time.

Despite extensive searching in the area no new populations were found. No specimen was taken at the time, as the population is so critical, however photographic evidence was taken of some of the plants. The species appears to be a disturbance opportunistic, although two plants were located in the undisturbed Hummock Grasslands on the slopes above the track. Both of these plants were large (20cm and 35cm in height at the time of the March inspection).

The less disturbed areas near the catwalk support a Hummock Grassland of *Triodia* with emergent *Acacia* and *Eucalyptus* species. Common species in the area include *Triodia wiseana, Eucalyptus gamophylla, Eucalyptus leucophloia, Acacia hilliana, Acacia adoxa, Acacia bivenosa, Acacia stowardii* and *Acacia spondylophylla*. It should be noted that there are extensive populations of the introduced *Rumex vesicarius* in Garden Gorge which may influence any chance of the *Lepidium* establishing in the gorge downslope from the main population on the catwalk.

The results in Figures 1 and 2 summarize the findings on the heights of the plants and the number of plants which were flowering and seeding at the respective inspection times. Although in March 1993, there was a decrease in the total number of plants, a higher proportion of these plants were mature and a higher proportion were setting seed. Therefore there should be a higher probability of seeds remaining in the local environment.

Figure 1: Comparison of Heights and Plant Numbers for Lepidium catapycnon, November 1992 and March 1993.

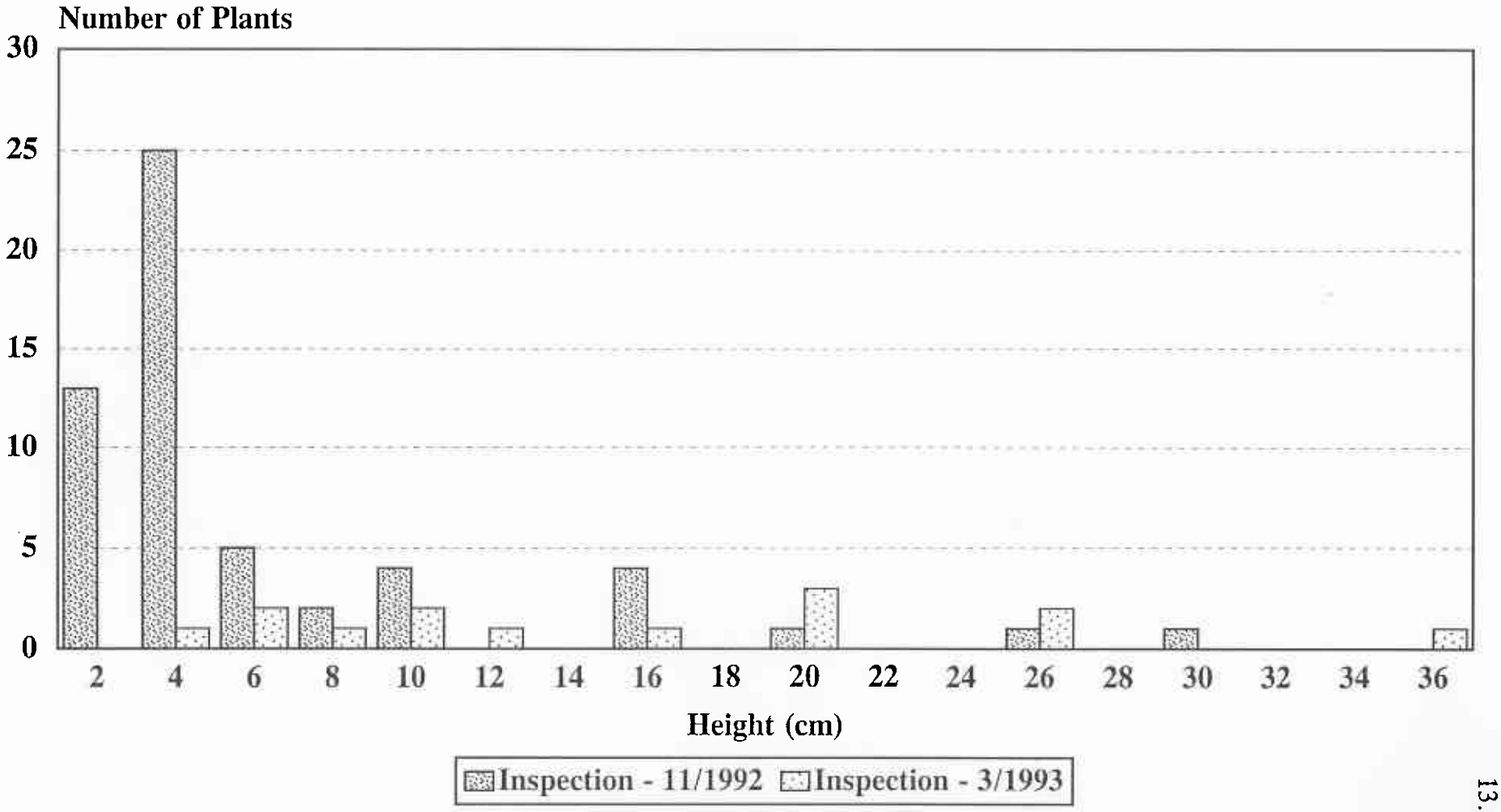
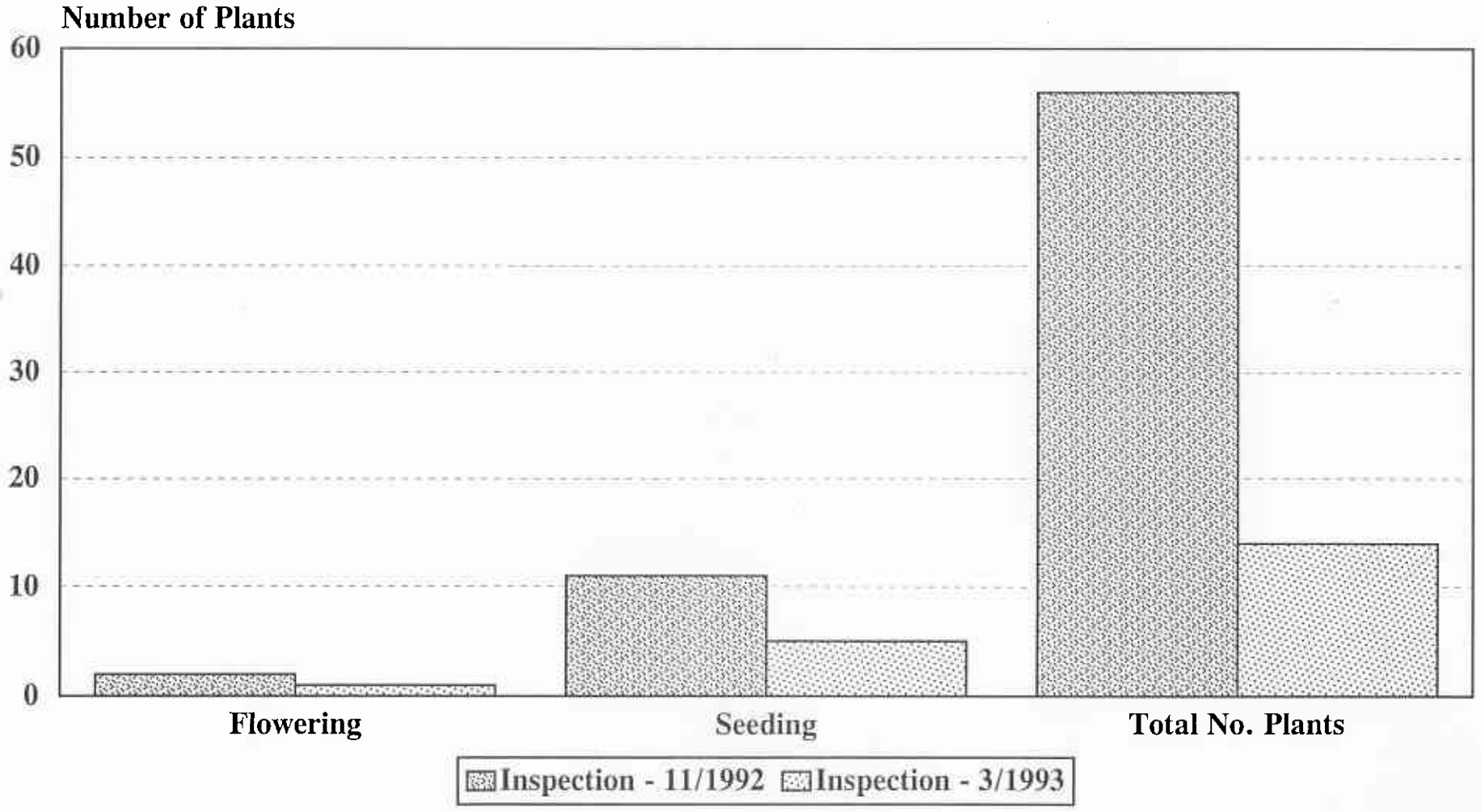


Figure 2: Comparison of Number of Plants of Lepidium catapycnon flowering and seeding, November 1992 and March 1993.



In addition, the location of the plants was discussed with local geologists and soil samples were taken from the scree material and the less disturbed adjacent soils. The results are summarized in Table 1. Although the sampling regime was restricted to two soil samples, the results indicate that some of the differences in Manganese and Calcium and Conductivity may be worth pursing further in relation to geological formations within the wider Pilbara Region. During the survey, similar geological areas east and north of the area were inspected but without success.

Table 1: Summary of Soil Sample Results for the Scree Areas (A) along the Catwalk and the Less Disturbed Areas (B) north of the Catwalk.

Parameters	A	B	Method
pH	7.05	6.40	1:5 Soil Water Extract
Conductivity @ 25°C (mho/cm)	430	35	1:5 Soil Water Extract
Available Phosphorus (Bic P) (mg/kg)	0.75	1.8	1:5 Soil Water Extract
Available Potassium (Bic K) (mg/kg)	45	85	1:5 Soil Water Extract
Total Nitrogen N (mg/kg)	180	260	Kjeldahl Nitrogen
Total Phosphorus P (mg/kg)	240	355	Digest/Fusion ICP
Total Potassium K (mg/kg)	1040	1280	Digest/Fusion ICP
Total Iron Fe (mg/kg)	29.0	37.2	Digest/Fusion ICP
Total Manganese Mn (mg/kg)	5680	3210	Digest/Fusion ICP
Total Copper Cu (mg/kg)	30	25	Digest/Fusion ICP
Total Zinc Zn (mg/kg)	45	35	Digest/Fusion ICP
Total Calcium Ca (mg/kg)	5200	680	Digest/Fusion ICP
Total Aluminium Al (% w/w)	2.50	1.85	Digest/Fusion ICP
Total Boron B (mg/kg)	15	< 10	Digest/Fusion ICP
Total Molybdenum Mo (mg/kg)	< 10	< 10	Digest/Fusion ICP
Total Sulphur S (mg/kg)	0.035	0.020	LECO Induction Furnace

4.2.4 Recommendations for *Lepidium catapycnon*

The located plants of the species *Lepidium catapycnon* are under continual threat from destruction due to earthworks along the catwalk, as most of the plants occur within the edges of the track which is occasionally graded. Although the main population has been pegged there is a need to maintain the pegging and the sign posts. Due to the remote nature of this population the area should be visited twice a year by local Departmental staff or botanists. Some of this work could be undertaken at minimal costs by botanists who regularly visit the Pilbara area; thereby minimizing mobilization costs to site.

Recommendation 1:

> Pegging and sign posts should be maintained at the site and all exploration personnel who may use or maintain the track should be informed of the legal implications associated with rare flora.

The level of seeding of the mature plants at the site offers opportunities for experimentation with propagation. This could include disturbing then protecting the surrounding area to encourage germination of the species, given that the species appears to be mainly a "disturbance opportunistic". In particular, seed could be scattered in an area in close proximity to the recently discovered plants (either before or after disturbance). In addition, a Department with experience in plant propagation, such as the King's Park Board could experiment with the seed.

Recommendation 2:

> That persons with relevant skills be consulted with regard to possible experimentation with propagation of the available seed and possible topsoil trials.

In view of the lack of other populations this plant should be monitored twice a year by botanists from the Department of Conservation and Land Management or other experienced Consultant botanists working in the area.

Recommendation 3:

> The population of *Lepidium catapycnon* should be monitored twice a year and a brief report prepared for Departmental records, with a summary of action needed as required to protect this population.

4.3 *Pityrodia scabra*

4.3.1 Background

As at June 1992, the last known plant of the species *Pityrodia scabra* occurred on private land in the Wyalkatchem Shire. Several other individuals of the species which occurred in close proximity to that plant had died in recent years due to herbicide use and possibly weed invasion or senescence.

The owner of the land immediately adjacent to the (previously) only known *Pityrodia scabra* plant, Kevin Jones believes that the plant is a "disturbance opportunistic", as he identified some individuals of the species some time after deep disturbance of contour banks located on his land (these plants were not relocated during a recent search by E.M. Mattiske and Associates). In addition, the area on which the previously last known individual of the species is found underwent a heavy earthworks programme some 20 years ago, prior to the plant being identified on the site (Kevin Jones, pers. comm.). The fact that the rail reserve in the vicinity of a recently discovered plant of the species appears to have been graded shortly before the observation also lends support to the theory that the species is a disturbance opportunistic. This may influence decisions regarding management to enhance the probability of successfully propagating the species.

Following the location of one more individual of the species by E.M. Mattiske and Associates in November 1992 (refer results section), the site characteristics associated with the two known *Pityrodia scabra* plants were examined in detail to allow identification of sites where other populations of the plant are likely to occur. The sites were characterised by brown loamy sand to a depth of 40cm and by caramel sandy clay loam to 20cm. The sand component of the former soil type was very high.

Species found in association with *Pityrodia scabra* include *Acacia acuminata*, *Acacia resinomarginea*, *Eucalyptus leptopoda*, *Acacia ?stignata*, *Acacia hemiteles*, *Grevillea ?candellabroides* and *Baeckea ?elderiana*. Description of the vegetation using Muir's classification was not appropriate as both sites were very disturbed.

Effort was made to concentrate the search for new populations of the plant at sites which were similar in soil type and vegetation to that found with the known individuals of the species. Other communities were also searched, however, as there is a possibility that the species may occur in association with other vegetation types if it is in fact a disturbance opportunistic.

4.3.2 Areas Surveyed for *Pityrodia scabra*

The following areas have been searched in an attempt to locate new populations of the Declared Rare Flora (DRF) species *Pityrodia scabra*. The areas surveyed are summarized in the attached Maps 3 to 8.

1. Three persons searched in parallel on foot south along the Koorda-Wyalkatchem Road and along the rail reserve, between Clifford Road (northern DRF flag indicating location of Pityrodia) to a point located 2.0 km north of Wallambin Road.

   - 1 plant was located on the eastern side of the rail reserve, 140 metres north of the DRF flag located 2.7 km north of Wallambin road. The plant was within 4 metres of the rails at a site graded frequently (the plant is within the DRF flags located on the Koorda-Wyalkatchem Road, but no flags indicate the plants' location within the rail reserve) (see photograph in Appendix B).

   - 1 plant occurs on private land (owner Msrs O'dea) some 250 metres south of the northern DRF flag at the junction of Clifford Road and the Koorda-Wyalkatchem Road. The location of this plant was known to staff of the Department of Conservation and Land Management (see photograph in Appendix B).

   - no other living plants of the species were located within this area during the search carried out on 30 November and 1 December 1992, however, all the dead plants that had been located during a search conducted by staff of the Department of Conservation and Land Management in 1992 were relocated.

2. Three persons searched in parallel on foot from Cowcowing siding 300 metres south and 500 metres north along the Jennings Road verge and the adjacent rail reserve.

   - no populations of *Pityrodia scabra* were located within this area during the search carried out on 30 November 1992.

3. Three persons walked the central-southern portion of Cowcowing Reserve, (Crown Grant 283) to 200 metres east of the Koorda-Wyalkatchem Road and to 150 metres north of the southern boundary of the reserve.

   - no populations of *Pityrodia scabra* were located within the area during the search carried out on 30 November 1992.

4. A drive by search of the road verges on Clifford Road from the Koorda-Wyalkatchem Road 3.5km east to Lackman Road was conducted on 30 November 1992.

   - no populations of *Pityrodia scabra* were located within the area during the search.

5. A drive by search of the road verges along the 14.5km length of Lachlan Road to determine areas deemed suitable for more thorough searches was carried out on 1 December 1992. The following areas were then searched on foot:

   a) from 3.6 to 4.1 km south of Clifford Road.

   b) from 4.5 to 4.9 km south of Clifford Road.

   c) from 8.4 to 8.8 km south of Clifford Road.

   - no populations of *Pityrodia scabra* were located within the area during the search.

6. A drive by search of road verges on Wyalkatchem North Road was conducted on 1 December 1992, 9.8 km south from Cowcowing West Road to Martin Road.

   - no populations of *Pityrodia scabra* were located within the area during the search.

7. A drive by search of the Martin Road verges was conducted on 1 December 1992, 4.6km east from the corner of Wyalkatchem Road North to the Koorda-Wyalkatchem Road.

   - no populations of *Pityrodia scabra* were located within the area during the search.

8. With the kind permission of the property owner (Kevin Jones) the following areas of private land were searched on foot on 1 December, 1992:

   a) from the junction of the Koorda-Wyalkatchem Road and Clifford Road, 1 km east along the narrow strip of remnant vegetation on the southern side of Clifford Road.

   b) an area 300m south of, and 50 metres east-west from a point located some 500 metres east of the junction of the Koorda-Wyalkatchem Road and Clifford Road.

c) contour banks within 500m south-east of the known individual of the species *Pityrodia scabra*.

- no populations of *Pityrodia scabra* were located within these areas during the search.

9. A drive by search from Holdsworth Road some 10.5km south along the Koorda-Wyalkatchem Road to the Wyalkatchem townsite was conducted on 1 December 1992.

- no populations of *Pityrodia scabra* were located within the area during the search.

10. A drive by search of the road verges 14.6km along Williamson Road from the junction of the Koorda-Wyalkatchem Road to Water Reserve 16913 was conducted on 2 December, 1992.

- no populations of *Pityrodia scabra* were located within the area during the search.

11. The following areas within Water Reserve 16913 were examined on foot on 2 December, 1992:

a) four transects covering an area to some 300m north from the southern boundary of the reserve.

b) one transect in an east-west direction at 600m north of the junction of Nembudding Road and Williamson Road.

c) two gravel pits at the northern end and another in the south-eastern corner of the reserve.

- no populations of *Pityrodia scabra* were located within these areas during the search.

12. A drive by search of the road verges along Holdsworth Road from Lachman Road 5.5km west to the Koorda-Wyalkatchem Road was conducted on December 2 1992.

- no populations of *Pityrodia scabra* were located within the area during the search.

13. With the kind permission of the property owner - Tom Hutchinson, the following areas were searched on foot on December 2 1992:

a) the north-eastern portion of Crown Grant 17130 (east of Lachman Road) to within approximately 500m of the southern boundary of the land parcel adjacent to Reserve 15868 was examined through a series of east-west transects for the width of the remnant (width varied from 250m in the northern end to 750m in the southern end). Transects were located 25 to 50 metres apart, depending on the similarity of the vegetation with that found with the known individuals of *Pityrodia scabra*. The southern portion of the site was considered too dissimilar in vegetation community type to that found with known populations of *Pityrodia scabra* and was not surveyed.

b) a "disturbed remnant", which had been cleared some 20 years previously, from the junction of Turner Road and Lachlan Roads to 750 metres east and 300 metres south was examined on 2 December, 1992 through a series of north-south transects located 50 metres apart.

- no populations of *Pityrodia scabra* were located within these areas during the search.

14. A drive by search of the road verges on Cowcowing West Road from Jennings Road to 4.95 km west to Wyalkatchem North Road was conducted on December 2 1992.

- no populations of *Pityrodia scabra* were located within the area during the search.

15. A drive by survey of the road verges south along Chilman Road from the junction of Cowcowing Road West 5.35 km to the "T" junction at the southern end was conducted on 2 December 1992. The few remnant species in part of this area were indicative of vegetation very similar to that which occurred with the remaining plants of *Pityrodia scabra*. A more thorough search was therefore conducted on foot along the road verge from the junction of Cowcowing West Road and Chilman Road to a point some 300m south of this point.

- no populations of *Pityrodia scabra* were located within the area during the search.

16. A drive by survey of the road verges on Wallambin Road 2.0km east from Chilman Road to the rail line was conducted on December 1 1992.

- no populations of *Pityrodia scabra* were located within the area during the search.

17. The road verge 200m north along Chilman Road from the junction of Cowcowing West Road was examined on foot as the vegetation was extremely similar to that which occurred with the remaining individuals of *Pityrodia scabra*. The remainder of the Chilman Road verge to 600m north of this point to the "T" Junction at the northern end of the road was examined by drive by survey.

- no populations of *Pityrodia scabra* were located within these areas during the search.

18. A drive by search of the road verge on Williamson Road from Water Reserve 16913, to the Conservation Reserve (Crown Grant ?13473) located 5.15km east of this reserve was conducted on December 2, 1992. In addition, 6 north-south transects to the width of the reserve and a currently excavated gravel pit on the southern boundary of the Conservation Reserve were surveyed on foot. The vegetation and soil types found in the reserve were dissimilar to that found with the remaining individuals of *Pityrodia scabra*. Therefore, a more thorough survey was not deemed necessary.

- no populations of *Pityrodia scabra* were located within the area during the search.

19. Reserve 9570 on the western side of the "T" junction at the northern end of Chilman Road was examined on foot as the vegetation at the site very closely resembled that found with the remaining individuals of *Pityrodia scabra*. In addition, an old gravel pit existed at this northern end and it was thought that this disturbance may increase the possibility of the *Pityrodia* propagating at the site. Five east-west transects 25 metres apart were surveyed on foot through the area.

This reserve may prove suitable for reintroduction of *Pityrodia scabra*.

- no populations of *Pityrodia scabra* were located within the area during the search.

Permission to enter farms in the immediate vicinity of the known *Pityrodia scabra* populations was kindly granted on 25 January by Msrs O'dea, B. Jones and K. Jones.

20. Reserve 9570 (area 35ha) on the north-west corner of the junction of Chilman and Cowcowing West Roads was surveyed on foot through a series of east-west transects ranging between 25m and 50m apart on 25 January 1993.

- no populations of *Pityrodia scabra* were located within the area during the search.

21. A drive by search of the road verge on Wyalkatchem North Road, from Chilman Road 4.2km north-east to the railway line was conducted on 25 January 1992.

- no populations of *Pityrodia scabra* were located within the area during the search.

22. A drive by search of the western side of the rail line from Wyalkatchem North Road some 4km north to Dukin West Road was conducted on 25 January 1992.

- no populations of *Pityrodia scabra* were located within the area during the search.

23. A drive by search of the road verges on Dukin West Road 5.3km north-west from the rail line to Remnant Road was conducted on 25 January 1992. Reserve 16867 on Dukin West Road consisted of salt lakes and salt affected land and was not considered suitable for further study.

- no populations of *Pityrodia scabra* were located within the area during the search.

24. A drive by survey of the road verge on Remnant Road 2.3km north-west from Dukin West Road to Inman Road was conducted on 25 January 1992.

- no populations of *Pityrodia scabra* were located within the area during the search.

25. The remnant measuring approximately 300m x 50m located immediately south-west of the junction of Remnant and Inman Roads, consisting of Gravel Reserve 19430 and a very small northerly portion of Crown Grant 21658 was surveyed by three persons on foot on 25 January 1992.

- no populations of *Pityrodia scabra* were located within the area during the search

26. A drive by search of the road verges on Inman Road 1km north from Remnant Road to Reserve 12154 was conducted on 25 January 1992.

- no populations of *Pityrodia scabra* were located within the area during the search.

27. A drive by search of the road verges on Inman Road 1km north from Reserve 12154 to Dowerin-Koorda Road was conducted on 25 January 1992.

- no populations of *Pityrodia scabra* were located within the area during the search.

28. A drive by search of the road verges on Inman Road 2.5km west from Remnant Road was conducted on 25 January 1992.

- no populations of *Pityrodia scabra* were located within the area during the search.

29. A drive by search of the road verges on Dukin West Road 5.7km west from Remnant Road was conducted on 25 January 1992.

- no populations of *Pityrodia scabra* were located within the area during the search.

30. A drive by search of the eastern side of the rail line 3.8km south from Boyne Road was conducted on 25 January 1992.

- no populations of *Pityrodia scabra* were located within the area during the search.

31. A drive by search of the road verges on Boyne Road 3km east from the rail crossing to the Koorda-Wyalkatchem Road was conducted on 25 January 1992.

- no populations of *Pityrodia scabra* were located within the area during the search.

32. Six north-south transects across the unnamed water supply reserve (area 7031 square metres) on the south-eastern side of the junction of the railway and Boyne Roads were surveyed on foot on 25 January 1992.

- no populations of *Pityrodia scabra* were located within the area during the search.

33. Six north-south transects across the north-eastern portion of Soil Conservation Reserve 22983 on the north-western side of the junction of Boyne Road and Koorda-Wyalkatchem Road were surveyed on foot on January 1993.

Parts of the reserve contained similar vegetation to that which occurred with the known populations of *Pityrodia scabra* and may prove suitable for reintroduction of the species.

- no populations of *Pityrodia scabra* were located within the area during the search.

34. Six transects were searched on foot 50m south of Cowcowing West Road and 1km west of Jennings Road on Crown Grant 62 over an area of approximately 100m(N-S) x 400m (E-W) on 25 January 1993. The site had been deep ripped and replanted relatively recently.

- no populations of *Pityrodia scabra* were located within the area during the search.

35. Six east-west transects were searched in Reserve 12154 (Reserve for Conservation of Flora and Fauna, located on Inman Road) on foot on 25 January 1993. The south-west corner measuring approximately 200m x200m contained vegetation very similar to that which occurred with the known populations of *Pityrodia scabra* and was more thoroughly surveyed. The site may offer suitable sites for reintroduction of the species. In addition the contour banks immediately west of Reserve 12154 on Crown Grant 12394 were surveyed on foot.

- no populations of *Pityrodia scabra* were located within the area during the search.

36. Six east-west transects were searched on foot on 26 January 1993 in the remnant on the south-west corner of the junction of Boyne Road and the rail line. The site is probably the undeveloped Dukin Townsite and covers an area of approximately 300m (N-S) x 400m (E-W).

- no populations of *Pityrodia scabra* were located within the area during the search.

37. Four east-west transects were surveyed on foot on 26 January 1993 in the remnant located on private land on the eastern side of the Koorda-Wyalkatchem Road approximately 400m south of the recently located *Pityrodia scabra* plant. The remnant measured approximately 200m (NE-SW) x 600m (SE-NW).

- no populations of *Pityrodia scabra* were located within the area during the search.

38. One transect was surveyed on foot on 26 January 1993 1.2km west from a point located approximately 3.2km north of Wallambin Road on the Koorda-Wyalkatchem Road. The remnant was probably located between Crown Grant numbers 62 and 47. One transect was surveyed east-west on foot in the small remnant measuring approximately 200m x 250m at a point 200m south of the westerly end of this transect.

- no populations of *Pityrodia scabra* were located within the area during the search.

39. A series of transects approximately 50m apart were surveyed on foot in an east-west direction in the eastern portion of Cowcowing Reserve on 26 January 1993. The reserve consists of Crown Grants 301, 283 and 284 and an area of approximately 700m x 700m was searched. Vegetation and soils were found to be very similar to those found with the known populations of *Pityrodia scabra* and may offer suitable sites for reintroduction.

- no populations of *Pityrodia scabra* were located within the area during the search.

40. Five north-south transects were surveyed on foot on 26 January 1993 in Crown Grant 62 in an area located 1.45km west of Jennings Road and 100m south of Cowcowing West Road. The transects covered an area of approximately 100m x 150m which had been deep ripped and planted with Tagasaste relatively recently.

- no populations of *Pityrodia scabra* were located within the area during the search.

41. Six transects were surveyed on foot in an east-west direction in the northern half of Crown Grant 271 (land parcel located immediately north of Cowcowing siding) on 26 January 1993.

- no populations of *Pityrodia scabra* were located within the area during the search.

42. A drive by search of the road verges on Cooke East Road 500m east from the junction of the Koorda-Wyalkatchem Road to a fence across the road was conducted on 26 January 1993.

- no populations of *Pityrodia scabra* were located within the area during the search.

43. A drive by search of the verges on Lodge Road 4.9km east from the Koorda-Wyalkatchem Road was conducted on 26 January 1993.

- no populations of *Pityrodia scabra* were located within the area during the search.

44. A drive by search of the verges on Green Road 500m north from Lodge Road was conducted on 26 January 1993.

- no populations of *Pityrodia scabra* were located within the area during the search.

45. A drive by search of the road verges on Green Road 350m south from Lodge Road was conducted on 26 January 1993.

- no populations of *Pityrodia scabra* were located within the area during the search.

46. A drive by search of the road verges on Maher Road 1 km east from the Koorda-Wyalkatchem Road to Gravel Reserve 20874 was conducted on 26 January 1993.

- no populations of *Pityrodia scabra* were located within the area during the search.

47. A drive by search through Gravel Reserve 20874 was conducted on 26 January 1993. The reserve covers an area of approximately 2 hectares.

- no populations of *Pityrodia scabra* were located within the area during the search.

48. A drive by search of the road verges on Maher Road 2.1km east from Gravel Reserve 20874 to Crown Grants 184 and 185 was conducted on 26 January 1993.

- no populations of *Pityrodia scabra* were located within the area during the search.

49. Six north-south transects were conducted on foot immediately south of Maher Road in the northern portion of Crown Grants 184 and 185 which contained communities very similar to that found with the known populations of *Pityrodia scabra*. The communities examined covered an area of approximately 500m (E-W) x 400m (N-S).

- no populations of *Pityrodia scabra* were located within the area during the search.

50. A drive by search of the road verges on Maher Road 4.0km east to Green Road from Crown Grants 184 and 185 was conducted on 26 January 1993.

- no populations of *Pityrodia scabra* were located within the area during the search.

51. A drive by search of the road verges on Green Road 1km south from Maher Road was conducted on 26 January 1993.

- no populations of *Pityrodia scabra* were located within the area during the search.

52. A drive by search of the road verges on Maher Road 400m east from Green Road was conducted on 26 January 1993.

- no populations of *Pityrodia scabra* were located within the area during the search.

53. A drive by search of the road verges on Green Road 2.2km north from Maher Road was conducted on 26 January 1993.

- no populations of *Pityrodia scabra* were located within the area during the search.

54. A drive by search of the road verges on Coopers Road 4.2km west to Bowman Road was conducted on 26 January 1993.

- no populations of *Pityrodia scabra* were located within the area during the search.

55. A drive by search of the road verges on Bowman Road 2.2km south from Coopers to Maher Road.

- no populations of *Pityrodia scabra* were located within the area during the search.

56. A drive by search of the road verge on Coopers Road 3km west from Bowman Road to the Koorda-Wyalkatchem Road was conducted on 26 January 1993.

- no populations of *Pityrodia scabra* were located within the area during the search.

57. A drive by search of the road verges on the Koorda-Wyalkatchem Road south some 20km from the Koorda town site to Clifford Road was conducted on 27 January 1993.

- no populations of *Pityrodia scabra* were located within the area during the search.

4.3.3 Summary of Findings on *Pityrodia scabra*

One more plant of the species *Pityrodia scabra* was located by E.M. Mattiske and Associates in November 1992, on a rail reserve in close proximity to some of the individuals of the species which had died in recent years, see Appendix B. The plant was probably quite young and in a good state of health (see photograph in Appendix B). The site appeared to have been graded relatively recently, and was only 5 metres from an area along the rail line which was completely cleared only months earlier. The individual is located within the span of the DRF flags alongside the Koorda-Wyalkatchem Road, however, no flags occur on the rail reserve. The plant had just flowered and may provide some opportunity for experimentation with propagation in the near future, including possible manipulation of the site surrounding the area. Identification of the plant has been confirmed from photographs as this is the only possible method at this stage.

4.3.4 Recommendations for *Pityrodia scabra*

The newly discovered plant is not protected from possible disturbance from grading, grazing or general maintenance operations. As the plant is located on the Westrail reserve, Westrail and any other Departments or individuals likely to disturb the site, and the Local Shire Council should be informed of the need to avoid further disturbance in the area. The approximate position of the plant should be indicated by emplacement of further DRF flags along the rail reserve. It may be necessary to fence the plant from stock as the site is utilised by local farmers for stock movements (K.Jones, pers comm).

Recommendation 1:

> That the newly discovered plant be protected by providing information with regard its approximate location and of the need to avoid disturbing the site to all relevant personnel. The plant should also be provided physical protection, by emplacement of further DRF flags and/or by fencing.

The seed present on both the older and the newly discovered plant offer opportunities for experimenting with propagation. Given that the plant appears to respond to disturbance, treatments could include grading, scraping, digging or firing an area in close proximity to the existing plants and distributing seed, either prior to or following the disturbance, then leaving the area undisturbed for a period of time. In addition, plant propagation trials and seed germination trials should be undertaken by scientists from the Kings Park Board.

Areas which may prove suitable for reintroduction due to similarity of site and vegetation to those found with remaining individuals of *Pityrodia scabra* are as follows;

1. Reserve 9570 on the western side of the "T"junction at the northern end of Chilman Road.

2. Reserve 22983 on the north-western side of the junction of Boyne Road and the Koorda-Wyalkatchem Road.

3. Reserve 12154 on Inman Road.

Recommendation 2:

That personnel with relevant expertise be consulted with regard to possible experimentation with propagation of the available seed. Suitable areas for reintroduction may include Reserves 9570, 22983 and 12154.

In view of the lack of other populations this plant should be monitored twice a year by botanists from the Department of Conservation and Land Management or other experience Consultant botanists working in the area.

Recommendation 3:

The population of *Pityrodia scabra* should be monitored twice a year and a brief report prepared for Departmental records, with a summary of action needed as required to protect this population.

5. LIST OF PARTICIPANTS

Principal Plant Ecologist & Coordinator - Dr E M Mattiske

Senior Botanist - Mr M E Trudgen
Mrs B Newby
Mrs B L Koch
Mr N E Casson

Botanists/Biologists - Mrs V J English
Ms A M G O'Connor
Ms N J Keals
Ms D E True

6. ACKNOWLEDGEMENTS

The authors would like to thank the following organizations and individuals for their assistance in this project.

Department of Conservation and Land Management for the opportunity of assisting in this project and in particular:

Dr K J Atkins
Mr M Fitzgerald
Mr K Wallace
Officers of the Scientific Licence Branch
State Herbarium Staff

Local Farmers and Residents for their cooperation during field surveys in the Koorda-Wyalkatchem district.

Dr M Crisp - Division of Botany and Zoology, School of Life Sciences, Faculty of Science, Australian National University, Canberra for his cooperation and taxonomic assistance in the work on *Daviesia microcarpa*.

The geologists, mining personnel and environmental officers in the Pilbara Region who gave up their time on weekends to volunteer to assist in the search for populations of *Lepidium catapycnon*, namely - Tim Andrews, Dave Shoebridge, Dave Williams, Neil Beckingham, Alan Vasey and Trevor Mattiske

7. REFERENCES

Department of Conservation and Land Management (1992)
"Declared Rare and Priority Flora List". Published List by the Department of Conservation and Land Management, Perth, Western Australia.

Hewson, H.J. (1981)
"The Genus *Lepidium* L. (Brassicaceae) in Australia". Brunonia 4: 217-308.

Hopper, S.D., van Leeuwen, S., Brown, A.P. and Patrick, S.J. (1990)
"Western Australia's Endangered Flora and Other Plants under Consideration for Declaration". Published by the Department of Conservation and Land Management, W.A. Wildlife Research Centre, Wanneroo, Western Australia.

APPENDIX A: Summary of Terms used in the Department of Conservation and Land Management "Declared Rare and Priority Flora List" for Western Australia (1992)

Key	Descriptions
R:	**Declared Rare Flora - Extant Taxa** **Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection**, and have been gazetted as such.
X:	**Declared Rare Flora - Presumed Extinct** **Taxa which have not been collected, or otherwise verified, over the past 50 years despite extensive searching, or of which all known wild populations have been destroyed more recently**, and have been gazetted as such.
1:	**Priority One - Poorly Known Taxa** **Taxa which are known from one or a few (generally <5) populations which are under threat**, either due to small population size, or being on lands under immediate threat,e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
2:	**Priority Two - Poorly Known Taxa** **Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat** (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
3:	**Priority Three - Poorly Known Taxa** **Taxa which are known from several populations, at least some of which are not believed to be under immediate threat** (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora' but are in need of further survey.
4:	**Priority Four - Rare Taxa** **Taxa which are considered to have been adequately surveyed and which whilst being rare (in Australia), are not currently threatened by any identifiable factors**. These taxa require monitoring every 5-10 years.

APPENDIX B: Photographic Record of Declared Rare Species

Photograph 1: Location of *Daviesia microcarpa*, Norseman, November 1992

Photograph 2: Location of *Daviesia microcarpa*, Norseman, November 1992

APPENDIX B: Photographic Record of Declared Rare Species

Photograph 3: Healthy *Daviesia microcarpa*, Norseman, November 1992 (in fruit)

Photograph 4: Close up of fruit on *Daviesia microcarpa*, Norseman, November 1992

APPENDIX B: Photographic Record of Declared Rare Species

Photograph 5: Slightly stressed plant of *Daviesia microcarpa*, Norseman, November 1992 (in fruit)

Photograph 6: Recent death in one of the *Daviesia microcarpa* plants, Norseman

APPENDIX B: Photographic Record of Declared Rare Species

Photograph 7: Catwalk near Wittenoom near main population of *Lepidium catapycnon*, November 1992

Photograph 8: Stakes on northern fringes of track to protect *Lepidium catapycnon*

APPENDIX B: Photographic Record of Declared Rare Species

Photograph 9: ***Lepidium catapycnon*** **being photographed by D True on southern side of track in mounded soil from earthworks on track**

Photograph 10: ***Lepidium catapycnon*** **on edge of track on northern side**

APPENDIX B: Photographic Record of Declared Rare Species

Photograph 11: Close up of a flowering *Lepidium catapycnon* occurring at base of small cutting on northern side of the track, November 1992

Photograph 12: *Lepidium catapycnon* with some remaining fruit, November 1992

APPENDIX B: Photographic Record of Declared Rare Species

Photograph 13: Mature *Pityrodia scabra* near Koorda, November 1992

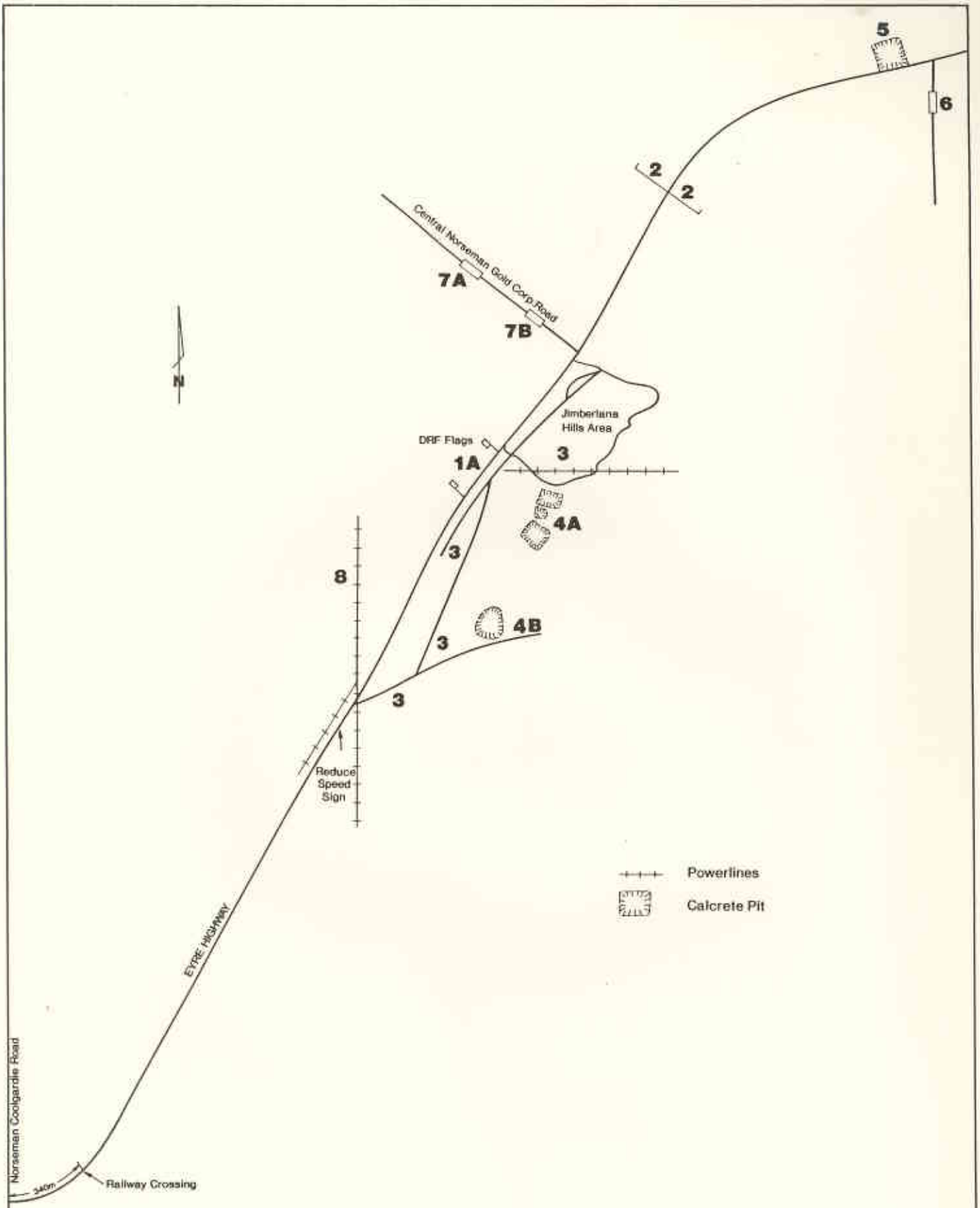
Photograph 14: Mature plant of *Pityrodia scabra* near Koorda, November 1992

APPENDIX B: Photographic Record of Declared Rare Species

Photograph 15: Young plant of *Pityrodia scabra* near Koorda, November 1992

APPENDIX B: Photographic Record of Declared Rare Species

Photograph 16: Young plant of *Pityrodia scabra* near Koorda, November 1992



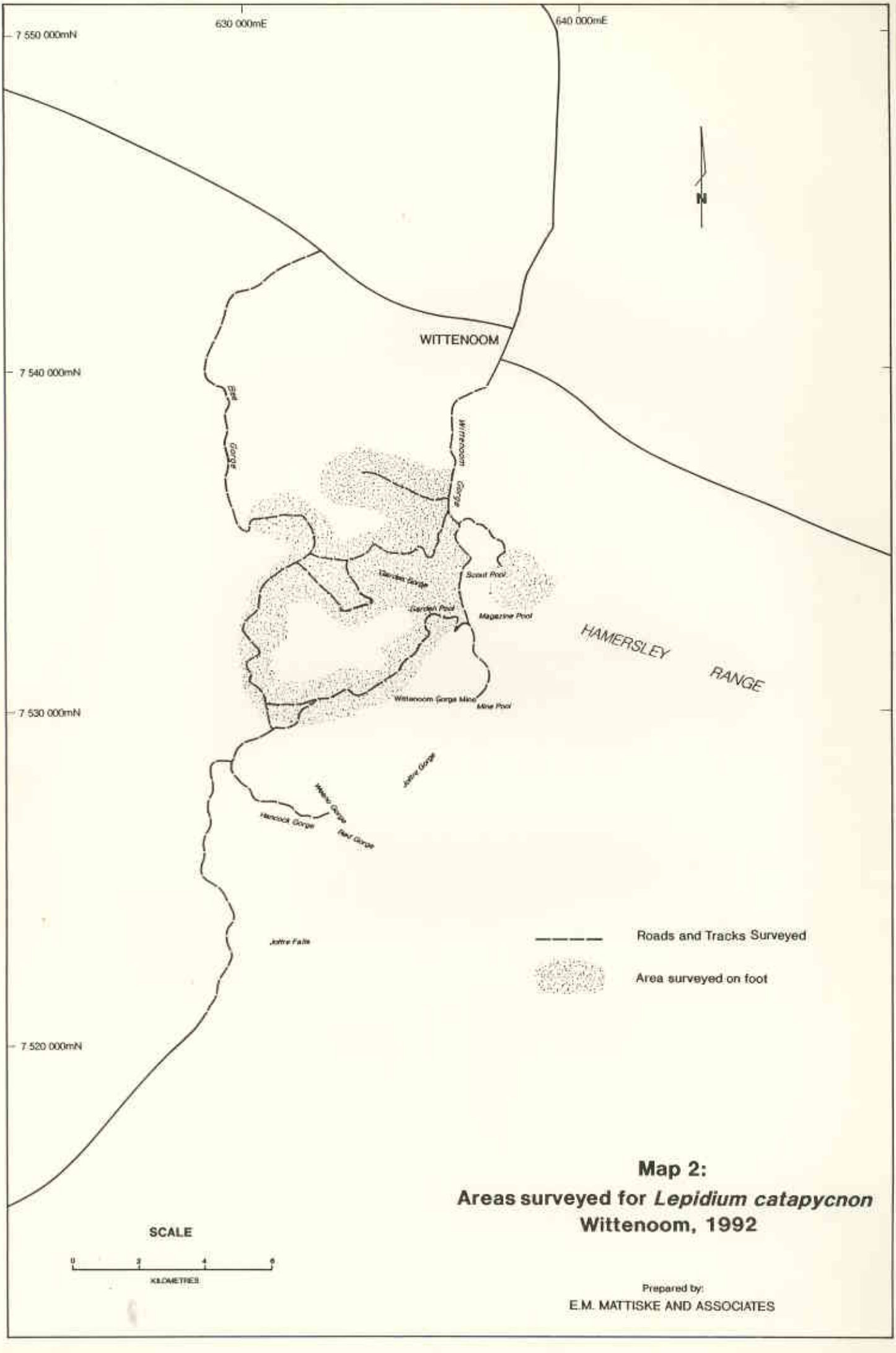
SCALE

0 1

KILOMETRE

Map 1:
Areas surveyed for *Daviesia microcarpa*
Norseman, 1992

Prepared by:
E.M. MATTISKE AND ASSOCIATES



Map 2:
Areas surveyed for *Lepidium catapycnon*
Wittenoom, 1992

Prepared by:
E.M. MATTISKE AND ASSOCIATES