DEPARTMENT OF FISHERIES AND WILDLIFE

Western Australian Wildlife Research Centre

WILDLIFE RESEARCH AND MANAGEMENT SEMINAR

9 MAY 1983

DEPARTMENT OF FISHERIES AND WILDLIFE

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

WILDLIFE RESEARCH AND MANAGEMENT SEMINAR

9 May 1983 - 9.00 a.m.

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PROGRAMME

MONDAY MAY 9 : WILDLIFE RESEARCH SEMINARS

0900-0945	Dr A.A. Burbidge
0945-1030	Mr N.L. McKenzie

MORNING TEA

1100-1145	Dr J.E. Kinnear
1145-1230	Dr R.I.T. Prince

LUNCH

1400-1445	Dr J.A. Friend
1445-1530	Dr S.D. Hopper

AFTERNOON TEA

1600-1645	Dr I.G. Crook

REFRESHMENTS

TUESDAY MAY 10 : RESERVE MANAGEMENT SEMINARS

0900-0930	Introduction by Ian Crook
0930-1000	The state of planning - including the Toodyay management plan, beekeeping plan supplement and Dandaragan audits - Sue Moore

MORNING TEA

1030-1100	Reserve Information System - Sue Moore
1100-1130	Rural Information Project - Ian Crook

LUNCH

1300-1330	Karratha proposal/progress report - Keith Morris
1330-1400	Two Peoples Bay - Graeme Folley
1400-1430	Pingelly progress report - Ken Wallace
1430-1500	An introduction to fire control strategies - Ken Wallace and Gordon Graham

AFTERNOON TEA

1530-1600	Interpretation of nature reserves - Ian Crook
1600-1630	The Metropolitan nature reserves - ~~Jim Goodsell~~ Sue

WEDNESDAY MAY 11 : WORKSHOPS

0900-0930	Interpretation and environmental education - Ian Crook
0930-1000	Management planning for small bush areas in the Perth Metropolitan area - Robert Powell

MORNING TEA

1030-1100	Two Peoples Bay - *Phytophthora cinnamomi* survey - Ray Hart
1100-1130	Experimental trapping techniques on the Toodyay nature reserves - Andy Williams
1130-1200	Monitoring as part of reserve management and planning - Ian Crook

LUNCH

1300-1400	Fire control in the south-west of Western Australian - Ken Wallace and Gordon Graham
1400-1500	Discussion topics

AFTERNOON TEA

1530-1630	Discussion summary - Ian Crook

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CHIEF RESEARCH OFFICER'S REPORT

ANDREW A. BURBIDGE

The current staff disposition of the Wildlife Research Branch is as follows:

Wildlife Research Section: 8 professional officers, 7 technical officers, 1 technical assistant.

Nature Reserve Management Section: 6 professional officers, 4 reserves officers, 1 technical officer, 1 graduate assistant.

Administration: 2 clerical, 1 wages staff.

There have been no changes in research staffing during the past year and some programmes continue to be inhibited because of lack of technical assistance. We have been able to support the Numbat research programme to some extent by the employment of Rod Burrows, a graduate of the W.A. Institute of Technology, via the additional assistance programme, but this provides no guarantee of continuing funds.

The Cabinet approval programme to station reserve management teams in country towns, which has been postponed annually since 1978, recommenced again during the past year. However, this was at some cost. Of the two staff allocated one came from administration and the other was an existing position from this Branch - an item which had been temporarily allowed to the Reserve Management Section and which was to have reverted to Research.

To cap this unsatisfactory but necessary reallocation of priorities the Treasury declined to allocate any funds to equip the team and at present this situation remains unchanged.

The excess typing work load has been partially reduced by employing a typiste part time via the additional assistance programme. The only long term solution is to have a second full time person and a multi-station word processor. Requests for these items have been included in the 1983-84 estimates.

Other major initiatives proposed for 1983-84 include:

Computing Staff

In May 1981 the Department initiated a Strategic Planning Study to develop an Information Systems Plan. This was completed in March 1983 and contains a strategy for the provision of information services over the next 5 to 7 years. One of the major conclusions of the study was that an analyst/programmer and a programmer should be appointed to take responsibility for the planning, development and maintenance of EDP systems for the Wildlife Research

Branch. This will provide a Wildlife EDP section separate from the existing Fisheries EDP section which will continue to be responsible for the Fisheries and general Administration areas within the Department.

The Study conclusion reflects the changing priorities for computer based information in wildlife, which is developing geographic based systems in line with the State's Land Information System, while fisheries systems are largely statistical in nature.

Flora Conservation

The Department has developed a three-year plan for the development of flora conservation research and management. This programme was based on conclusions developed by Dr Stephen Hopper from his experience as the Department's only flora conservation botanist over a period of five years. The programme provides for 51 new staff, comprising 17 research officers, 20 technical officers, 5 clerks, 3 typistes, 5 wildlife officers and a journalist. Only with this number of staff, plus supporting resources, can the State develop the necessary scientific data on which to base meaningful conservation programmes over the next 20 years.

Land Releases for Agriculture

With a review of procedures for assessing land release areas imminent, the need for staff to carry out biological/nature conservation surveys becomes even more important. Over the past year some botanical work has been carried out by consultants but this has been possible only by diverting reserve management research funds.

Reserve Management Staff and Resources

The need for additional staff and resources in this area is clear. It will be discussed further in the Chief Reserve Management Officer's Report.

Computer Hardware

The Tektronix 4054 graphics computer lacks a high quality interactive digital plotter. The benefits of acquiring this device are many. The generation of camera-ready maps and diagrams will assist a variety of programmes including the Flora Atlas Project, fire ecology, biological survey, animal ecology, wetland management and general reserve management (e.g. fire control reserve maps). It will also speed up the provision of material for publication.

A request for approval to purchase a plotter has been prepared and forwarded to the Computer Policy Committee.

Some notable activities during the past year include:

Salisbury Island

A visit to Salisbury Island, the largest of the South-East Islands of the Archipelago of the Recherche Nature Reserve, took place during April 1982. A report subsequently prepared outlining the nature conservation values of the island, was presented to the Mining Warden's Court in Kalgoorlie on 15 February 1983 during the hearing of W.A. Wildlife Authority and Departmental objections to an application for two mineral claims covering most of the island.

The Mining Warden found in favour of the objectors and recommended that the claims not be granted.

CSIRO Wildlife Research

When it became apparent during 1982 that the CSIRO Division of Wildlife Research was to close their Western Australian Laboratories the Government made representations to CSIRO to keep them open. Discussions held between Dr Krebs, Chief of the Division of Wildlife Research (now Division of Wildlife and Rangelands Research) and Head Office and Wildlife Research Centre staff culminated with a visit by the CSIRO Executive to the WAWRC on 14 February 1983. Following this visit the Executive announced that the W.A. Laboratories would remain and that the staff would be strengthened to enable research to be carried out into scientific aspects of nature reserve management. This is a most satisfactory outcome and I look forward to a close working relationship with the Reserve Management Group.

Kangaroo Management

A decision was taken recently to transfer responsibilities for monitoring data from the red kangaroo management programme from the Wildlife Research Branch to Head Office Administration. Implementation of this decision will be phased in over the next few months. Following implementation Wildlife Research involvement will be limited to an annual examination of the data and making recommendations of offtake. The decision marks a change in status of the red kangaroo programme from a research project to a monitoring situation and will allow Dr Bob Prince to move toward developing new research programmes.

Unfortunately I have to record that the extensions to the Wildlife Research Centre have not commenced. Detailed planning, quantity surveying and estimating were completed in time for the 1982 Budget, but funds were not allocated. The current serious overcrowding of staff will be exacerbated if the Katanning Reserve Management team have

to be stationed in Perth and the current application to WWF Australia for funds for Research into captive breeding of the Numbat is successful. The housing of any additional staff will be extremely difficult. It is to be hoped that employment funds will enable the work to proceed before too long.

Finally I would like to thank all staff for their support over the past year. Research and reserve management work has continued to be of a high standard and the Branch is highly productive.

Support from Wildlife Officers and administrative staff continues to be excellent and on behalf of the Branch I would like to thank them for their efforts.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

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A.A. Burbidge

1. SHORT-NECKED TORTOISE (Pseudemydura umbrina)

1.1. Objectives

To monitor the populations on Twin Swamps and Ellen Brook Nature Reserve. To develop techniques for captive breeding.

1.2. Procedures

Visits were made to both Nature Reserves at frequent intervals during Winter and Spring. Tortoises were captured by hand. Data on sex, age, size, growth and location were entered in a card index. Population numbers are estimated using the Jolly-Seber Model and the Manley and Parr method, and a minimum number is calculated from mark and recapture data.

A captive population comprising animals from Perth Zoo and wild-caught animals from Twin Swamps Nature Reserve has been established.

1.3. Results

1.3.1. Twin Swamps Nature Reserve

This population is considered non-viable and is almost extinct. Only one animal was found in 1982 (outside the reserve) and this was placed in the captive colony.

1.3.2. Ellen Brook Nature Reserve

Nine animals were captured in 1982. Population estimates continue to indicate a fairly stable population of ca 15 to 30 tortoises. Recruitment occurs in most years.

1.3.3. Captive Breeding

Only one of the 1980 hatchlings remains alive but it is not growing. Various treatments have been tried to trigger growth, so far without success.

No eggs were obtained during 1982. The reasons for this are not known.

1.4. Publications 1982/83

Burbidge, A.A. 1983. A very rare Australian. Aust. Nat. Hist. 21(1), 14-17.

2. DESERT WILDLIFE (Joint project with N.L. McKenzie)

2.1. Objectives

To document the flora and fauna of existing and proposed Nature Reserves in Western Australian Deserts. To investigate the status of rare animals.

2.2. Procedures

Data collected in the Great Sandy Desert were prepared for publication. A series of applications for funds to W.W.F (Australia) for research into the causes of decline of the Dalgyte (Macrotis lagotis) was finally successful when a grant was made to the Conservation Commission (N.T.) and this Department.

2.3. Results and Conclusions

Recommendation for a series of conservation reserves in the Great Sandy Desert were forwarded to the Environmental Protection Authority and the Under Secretary for Lands.

2.4. Proposals for 1983/84

A field trip to the Gibson Desert and Alice Springs will be made to help plan research into the causes of decline in the Dalgyte. Proposals to carry out work on the Nullarbor Plain, postponed from 1982/83, will be reviewed, and the work will be commenced when opportune.

2.5. Publications 1982/83

Nil.

2.6. Publications 1983/84

1. N.L. McKenzie, A.A. Burbidge, A.S. George and A.S. Mitchell. "Environment". In Wildlife Research Bulletin No. 12 on the Great Sandy Desert (in press).

2. A.A. Burbidge. "Amphibians and Reptiles". In Wildlife Research Bulletin No. 12 on the Great Sandy Desert (in press)..

3. A.A. Burbidge and N.L. McKenzie. "Conclusions and Recommendations". In Wildlife Research Bulletin No. 12 on Great Sandy Desert (in press).

4. Biological survey of Cooloomia Nature Reserve. With S.D. Hopper, P.J. Fuller and J.K. Rolfe.

3. BIOLOGICAL SURVEY OF THE EASTERN GOLDFIELDS

(Joint project with N.L. McKenzie)

3.1. Objectives

See Mr McKenzie's paper.

3.2. Procedures

Most field work was completed in March 1981 and the data are now being compiled and written up. A paper, "Introduction and Methods", was completed.

3.3. Results and Conclusions

None at this stage.

3.4. Proposals for 1983/84

Complete write-up and publication.

3.5. Publications 1982/83

Burbidge, A.A. and Fuller, P.J. (1983). Banded Stilt breeding at Lake Barlee, Western Australia. Emu **82**, 212-216.

3.6. Publications 1983/84

1. Biological Surveys Committee. The Biological Survey of the Eastern Goldfields of Western Australia. Part I - Introduction and Methods. Rec. West. Aust. Mus. Suppl. (Author of "Background", co-author of "Methods").

2. The Wildlife of the Barlee Area and the Mt Manning Range Nature Reserve (in Eastern Goldfields series).

3. The conservation status of plants and animals in the Eastern Goldfields of Western Australia.

4. BUCCANEER ARCHIPELAGO (Joint project with N.L. McKenzie, J.A.K. Lane and A.J.M. Hopkins).

4.1. Objectives

To document the flora and fauna to major islands in the Buccaneer Archipelago. To make recommendations for nature reserves.

4.2. Procedures

A visit was made to the area during May-June 1982.

4.3. Results and Conclusions

See Mr McKenzie's paper. Recommendations for reserves were prepared and forwarded to the Environmental Protection Authority and the Under Secretary for Lands.

4.4. Proposals for 1983/84

Collation of data and writing up of work. Because of priority of Eastern Goldfields and other work the publication will probably not be ready until 1984/85.

5. WORKING GROUP ON LAND RELEASES

5.1. Objectives

Visit areas under consideration for release for agriculture. Document the flora and fauna of little known areas and areas recommended for conservation.

5.2. Procedures

Visits were made to the Ravensthorpe area, the Mt Beaumont area and an area north-east of Jibberding. Consultancies were let for examination of the flora of all three areas. The fauna of the Jibberding area was documented during visits in September and December 1982.

5.3. Results and Conclusions

Data and reports have been presented to the Working Group. A new series of unpublished reports, incorporating Consultants' Reports, has been commenced.

5.4. Proposals for 1983/84

As for 1982/83.

5.5. Publications 1982/83

Nil.

5.6. Publications 1983/84

Burbidge, A.A., Dixon, K. and Fuller, P.J. The wildlife of a (proposed) nature reserve north-east of Jibberding.

6. EGGSHELL THINNING

No progress has been made with data analysis. The major partner, Mrs P. Olsen of CSIRO Wildlife, is still collecting data from eastern states' egg collections.

7. CONSERVATION OF THE DIBBLER (Antechinus apicalis)

There are no proposals for further work at this time.

8. BARROW ISLAND

The bi-annual visit of inspection took place during March 1983. The major project undertaken was to inspect adjacent small islands for the presence of Rattus rattus and native mammals and plan control procedures. Results were:

Pascoe Island : Rattus rattus.
Boodie Island : Rattus rattus and Bettongia lesueur.
Middle Island : Rattus rattus, Isoodon auratus, and Hydromys chrysogaster.
N. Double Island : Rattus rattus.

S. Double Island : Rattus rattus.
Boomerang Island : Rattus rattus, Lagorchestes conspicallatus, Bettongia lesueur, Trichosurus arnhemensis, Hydromys chrysogaster.

Boomerang Island is joined to Barrow Island at spring low tides. This gave cause for major concern and a control programme was instigated and underway at the time of writing. A trapping programme on Barrow Island in the region of Boomerang Island and the barge landing was also underway.

9. REVISION OF BEAUFORTIA R.BR.

Field work continued during 1982 with a series of visits to areas north of Perth and in the wheatbelt, usually associated with other work. An examination of Beaufortia purpurea suggested that it is an extremely rare species and it will be listed for detailed examination by a consultant. This work is programmed for completion in 1989.

10. BEDOUT ISLAND

A visit to Bedout in May 1982, 8 months after the control progamme, revealed no sign of Rattus rattus. A further visit will be programmed in one or two years. A publication will be prepared.

11. MANAGEMENT PLANS

11.1 Objectives

When possible, to provide assistance in the preparation of Draft Management Plans for Nature Reserves, especially where I have been heavily involved in management in the past.

11.2 Publications 1982/83

Crook, I.G. and Burbidge, A.A. 1982. Lake Magenta Nature Reserve. West. Aust. Nat. Reserve Manage. Plan No. 4. (Dept. Fish. Wildl. : Perth.)

11.3 Publications 1983/84

Burbidge, A.A. and Folley, G.L. Past management of Two Peoples Bay Nature Reserve. In : Two Peoples Bay Nature Reserve. West. Aust. Nat. Reserve Manage. Plan No. 7.

COMMITTEES

I am a member of the following committees:

1 Bush Fires Board.

2 National Parks Authority (Deputy to Mr Bowen).

3 Conservation and Environment Council (Deputy to Mr Bowen).

4 W.A.W.A. Reserves Committee.

5 W.A.W.A. Rare and endangered Fauna Committee.

6 CONCOM Working Group on Endangered Fauna.

7 CONCOM Working Group on Crocodiles.

8 CONCOM Working Group on the Management of Threatened Vertebrates.

9 Biological Surveys Committee (Chairman).

10 Working Group on Land Releases (EPA).

11 Editorial Advisory Committee, Australian Wildlife Research.

12 National Conservation Strategy for Australia, DCE Working Group.

13 Policy Advisory Committee, Master of Natural Resources Management, University of Western Australia.

14 Organising Committee. Zoology Section ANZAAS 1983 Congress.

ADMINISTRATION

Administration of the Wildlife Research Centre, the provision of advice to Head Office, other Government Departments and the public, and Committee work, accounts for about 60% of my time.

Galley proofs of accounts of species from the forthcoming book 'Mammals of Australia', edited by Ron Strahan, were checked : Onychogalea lunata, Lagorchestes hirsutus, Lagorchestes conspicillatus, Bettongia lesueur, Wyulda squamicaudata, Perameles bougainville and Sminthopsis longicaudata.

I attended a Warden's Court hearing in Kalgoorlie of WAWA objections to mining on Salisbury Island on 15 February 1983. A report on the wildlife of Salisbury Island was presented to the Court and will be published.

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N.L. McKenzie

1. BIOLOGICAL SURVEY - DESERTS

1.1. Objectives

Improve knowledge of the habitats, distributions and conservation status of desert wildlife from which the reserve system proposed by CTRC (1974) can be assessed and where necessary additional reserves delineated.

1.2. Procedures

Organise and undertake biological surveys in desert regions. Review relevant available data in the collections of Australian Museums. This is a continuation of previous work.

1.3. Results and Conclusions

The Great Sandy Desert bulletin has been edited and is submitted to the printer. Recommendations for several Nature Reserves and a second National Park to represent the biota of the desert are included although further surveys in the Radi Hills and far eastern sector are still required to provide a geographically complete assessment.

Core sections were taken from the peat in Dragon Tree Soak in September 1982. Radio Carbon dates of material taken from the peat-sand interface at the bottom of two of these cores are now available. Pollen and diatom analyses of the cores are being undertaken by an honours student at U.W.A. under the supervision of K.H. Wyrwoll. Radio carbon dates for one of the other cores are being arranged.

1.4. Proposals and Recommendations

The results of the Dragon Tree Soak/Mandora Palaeoriver work are expected to provide hard data on the timing of climatic events fundamental to understanding the Holocene biogeography of north-western Australia.

This work is being undertaken with a view to recommending appropriate boundaries for a nature reserve representing the western parts of the palaeoriver based upon both extant biological values and an assessment of the scientific importance of the few, small, scattered, fresh-water swamps as unique and fragile records of climatic events in north-western Australia during the last 10 000 years. The swamps examined near Mandora function as station "watering points"; their margins are severely trampled by cattle; there is a considerable risk that they will be bulldozed to provide dams at which stock cannot become bogged.

Our radio carbon dates evidence holocene fluctuations in the climate of north-western Australia similar to those suggested by Buckley (1982) among others. That our dates

are unexpectedly recent compared with the models of Chappel and Thom and Bowler indicates a need to take deeper cores looking for additional organic bands. However, the possibility of lateral movements of this swamp during the Holocene, and the likely sensitivity of Dragon Tree Soak to sand movements resulting from even minor increase in aridity (desert core effects) have induced us to shift the study site to similar, but sub-coastal, swamps found near Mandora on the 80-mile beach, in the estuarine portion of the Palaeoriver. In these swamps coastal amelioration of climate is likely to have reduced the "arid-sensitivity" hypothesised at Dragon Tree Soak so that only the more obvious Holocene climatic fluctuations are recorded.

A twelve-day visit to the Mandora Salt Marsh is proposed (9 to 20 August 1983) to take core samples. K.H. Wyrwoll is arranging more elaborate coring equipment to allow substantial penetration of any sand strata encountered. At the same time plant and vertebrate survey work, such as pit-trapping, will be undertaken on the more widespread surfaces typical of the area.

The Nullarbor Plains survey is deferred pending completion of the Goldfields survey.

1.5. Publications 1982/83

McKenzie, N.L. and Archer, M. (1982). Sminthopsis youngsoni (Marsupialia : Dasyuridae) the Lesser Hairy-footed Dunnart, a new species from arid Australia. Aust. Mamm. 5(4), 267-279.

1.6. Publications 1983/84

McKenzie, N.L., Burbidge, A.A., George, A.S. and Mitchell, A.S. "Environment". and

McKenzie, N.L. and Youngson, W.K. "Mammals". and

Burbidge, A.A., McKenzie, N.L. and Start, A.N. "Conclusions and Recommendations"

IN

Burbidge, A.A. and McKenzie, N.L. (Eds.) (In press). "Wildlife of the Great Sandy Desert". Wildl. Res. Bull. West. Aust. No. 12.

2. BIOLOGICAL SURVEY - KIMBERLEY

2.1. Objectives

Improve knowledge of the habitats, distributions and conservation status of Kimberley wildlife to provide a basis for reserve acquisition recommendations and to identify areas of particular conservation concern.

2.2. Procedures

(i) Organise and undertake biological surveys in the Kimberley.

(ii) Encourage, edit contributions to, and write survey publications on Kimberley wildlife, thereby promoting study of plant and animal groups in the Kimberley by government organizations.

(iii) Undertake survey work and write papers relevant to Kimberley mammals, especially their biogeography and taxonomy, where these are relevant to conservation needs.

2.3. Results and Conclusions

The Dampier Peninsula Bulletin (No. 11) is now with the printer, having been edited during the year.

In conjunction with A.A. Burbidge, A.J.M. Hopkins, J.A.K. Lane and K.F. Kenneally, a biological survey of the Buccaneer Archipelago was undertaken in June 1982 using the department's patrol vessel 'Dirk Hartog' for transportation. A grant from the Australian Biological Resources Study (A.B.R.S.) was used to access (curate) the plant collection, estimated to involve 400 species, to the W.A. Herbarium.

During the survey, plant, mammal, bird and reptile collections were made from the islands listed in Table 1. The team visited all the larger islands in the Buccaneer Archipelago except Koolin and an unnamed island in Talbot Bay. Data is already available from Koolan and access is easy because it has been settled for many years. The islands visited were selected to provide the best geomorphic and geographic coverage of the Archipelago possible in the time available. The following islands are recommended as A Class nature reserves - Hidden, Long, Gibbings, Conilurus, the King Hall/Cafferelli group, Macleay and Irvine.

A poster on the Buccaneer and other Kimberley areas surveyed since 1971 has been prepared for presentation at the Symposium on the "Ecology of the Wet-Dry Tropics" in Darwin.

A survey of the Cambridge Gulf mangal was undertaken from 7-13 October 1982 in conjunction with the District Wildlife Officer (Mike Osborne) and R.E. Johnstone of the W.A. Museum. This work was concentrated in the Ord River Nature Reserve (31967), one of the two conservation reserves in W.A. that include mangrove communities.

Twenty-one species of birds were recorded in the mangal of the reserve - a typical array of mangrove birds including populations of two species apparently restricted in Western Australia, to the Bonaparte Basin (Lemon-breasted Flycatcher and Black Butcherbird). Eight species of bat and the only known East Kimberley population of Mosaic-tailed

TABLE 1. Islands Visited: geology, size, survey effort and land tenure.

Name	Geological Surfaces	Approx Area (km^2)	Survey Effort (Team days)	Land Tenure
Hidden	Pkl Qc	30	7	VCL
Sunday	Pkl Qc	24	7	Aboriginal Reserve
Lachlan	Pkl Pdh	16	4	VCL
Long	Pkl Qc	16	4	VCL
Pasco	Pkl Qc	3.6	1	VCL
Conilurus (Margaret)	Pqw	5	2	VCL
Gibbings	Pkp Pke Pkpy Qc	6.3	3	VCL
MacLeay	Sandstone?	5	2	VCL
King Hall	Pkl Qc	6	3	VCL
Sir Frederick	Pkl Qc	5.3	2	VCL
Cafferelli	Pkl Qc	3	1	VCL
Irvine	Pkpy	11	3	VCL
Bathurst	Pkpy	7.5	3	VCL

VCL = vacant Crown land

Rat were also recorded in the reserve.

When compared with previously collected bird lists from the contiguous Parry Lagoon Nature Reserve, a clearer understanding of the conservation values of this reserve can be appreciated and the importance of including littoral areas in conservation reserve systems is illustrated.

During the same work, negotiations with the PWD District Engineer in Kununurra for reservation of a substantial part of Kununurra Swamp were successfully completed. Together with two other small reserves in the area (Point Spring and Swan Island Nature Reserves) this reserve system provides a coverage of the spectacular wetland and river fringing communities of both the estuarine and fresh water sections of the lower reaches of the Ord River. These are the only reserves in the Bonaparte Basin of Western Australia - the variety of other landscape elements is not represented.

2.4. Recommendations and Proposals

That the Ord River Nature Reserve be extended northward to include the extensive mangrove stands in the mouth of Cambridge Gulf. These include stands of *Sonneratia alba*, a species not represented in the Ord River Nature Reserve.

No further field projects in the Kimberley are envisaged during 1983/84 but a system of reserves representing the uplands of the Bonaparte Basin is required.

2.5. Publications 1982/83

Nil.

2.6. Publications 1983/84

McKenzie, N.L. and Kenneally, K.F. "Background and Environment". and

McKenzie, N.L. "Mammals". and

McKenzie, N.L. "Conclusions and Recommendations".

IN

McKenzie, N.L. (Ed.) (In press). "Wildlife of the Dampier Peninsula, South-west Kimberley, Western Australia". Wildl. Res. Bull. West. Aust. No. 11, 1-83.

3. BIOLOGICAL SURVEY - C.T.R.C. SYSTEM 11

3.1. Objectives

In conjunction with the organizations represented on the Biological Survey Committee to design, organize and undertake a biological survey of C.T.R.C. System 11 (Eastern Goldfields, W.A.) with emphasis on the more southern portions. The main objectives are:

1. Conduct a quantitative survey of the vegetation at selected sites to document structure and species composition. This information will be used to provide habitat data for fauna collections and observations and to re-define existing vegetation maps.

2. Observe, and collect where necessary, vertebrate animals at selected sample sites to provide information on distribution, habitat utilization, temporal fluctuations in abundance, and taxonomy.

3. Using data gathered, reassess the conservation requirements of the system.

3.2. Procedure

As discussed in the 1978 research seminar, the goldfields have been divided into twelve cells with the W.A. Wildlife Research Centre being responsible for surveying six and the W.A. Museum undertaking the survey of the remaining six. The three-year field program was listed in the 1979 research seminar.

3.3. Results and Conclusions

Table 2 lists the tabulations of vertebrate data that have been completed.

TABLE 2. Goldfields Vertebrate Tabulations (X = completed)

Cell Number	Mammals	Birds	Reptiles
1		X	X
6	X	X	X
7		X	X
10			

Discussions of the mammal and reptile results of Cell 6 (Kalgoorlie/Kurnalpie area) have been drafted and a report on the techniques and design philosophies of the survey has been prepared in conjunction with A.A. Burbidge, R. How and R. Hnatiuk. A draft vegetation account of Cell 6 has been written by the consultant (A.V. Milewski) and R.J. Hnatiuk.

The Kalgoorlie-Kurnalpie cell covers about 20 000 km^2 and is t described as a non-seasonal desert with hot dry summers and cool winters in which most of the rain falls (annual average 240 mm). Geomorphologically the cell is a plain interrupted by two ancient, shallow, occluded river valleys. Minor relief is provided by outcrops of greenstone, granite monolith and laterite breakaways. The last are confined to the highest levels in the landscape.

Forty-five distinct associations and sub-associations of vegetation were described and grouped into 15 structural formations. Ten distinct surfaces were sampled for vertebrate animals and yielded a total of 19 native mammal, 101 bird, 43 reptile and 3 amphibian species.

Investigation of records in the W.A. Museum, in the literature, and from other sources (such as the R.A.O.U. bird atlas) has shown that 35 native mammals, 163 bird and between 70 and 80 reptile species were probably extant in the cell circa 1880. The pattern of decline in the native mammal fauna since European settlement can account for all but four of the mammals undetected by our surveys and supports the hypothesis that most mammal extinctions have occurred during or before the pastoral phase of development rather than during the clear-farming phase. Among birds, 25 of the species overlooked are waterbirds; aside from station dams, no natural bodies of water were sampled during the survey although several occur near Kalgoorlie. A further two are species that have declined in abundance since settlement (Princess Parrot and Mallee Fowl) and nine others are Bassian species for which the area would have included only marginal habitat even before the influence of the pastoral and mining industry was felt.

The fauna of Cell 6 is Eyrean, only a comparatively small

number of Bassian species occur. This observation corresponds with the phytogeographic data; the cell lies across the "mulga-eucalypt line". None of the species recorded is restricted to the cell although the survey has extended or filled-in gaps in the known range of many species and provided habitat data fundamental to conservation decisions.

The reptile data from Cell 6 was sufficient to:

1. Detect a positive relationship between the proportion of Eyrean species and the better-drained (more sandy) surfaces found higher in the landscape.

2. Show that surfaces of similar type (sands versus alluvia) have more similar arrays of reptile species (highest species similarity coefficients).

3.4. Recommendations and Proposals

Analysis and compilation of data will continue as the priority project during 1983.

3.5. Publications 1982/3

Nil.

3.6. Publications 1983/4

Baverstock, P.R., Adams, M., Archer, M., McKenzie, N.L. and How, R.A. (in press). "An Electrophoretic Study of Species Boundaries within the Marsupial Genus Ningaui. Aust. J. Zool.

McKenzie, N.L., Rolfe, J.R. and Cashin, K.E. (in prep.). "Vertebrates In "The Biological Survey of the Eastern Goldfields of Western Australia". VI - The Kalgoorlie/Kurnalpi Area.

Biological Survey Committee (in prep.) "The Biological Survey of the Eastern Goldfields of Western Australia". I - Introduction and Methods.

4. ECOLOGICAL STUDIES - MANGROVE BAT COMMUNITIES

4.1. Objectives

A long term study, the first step of which is an inventory of the species richness of bats in the different mangrove communities along the W.A. coastline. The project aims to inventory bats occurring in each block of mangroves.

4.2. Procedure

By relating the environmental situation and obsrved behaviour of each bat recorded with the flight characteristics of its wings (aspect ratio calculations based on wing bone measurements), it is hoped to document species structure of

bat communities in mangroves. In effect, I am trying to separate the species within each such fauna in terms of ecological niche parameters related to differences in the functional requirements of their food hunting.

4.3. Results and Conclusions

A guild of insectivorous bats was inventoried in four of the tropical mangrove biogeographical districts recognised in Western Australia by Semenuik et al. (1978).

Using flight morphology as an index of potential foraging niche, the species composition of each mangrove district was compared with the pool of potential colonizers (the array of additional bat species known from the adjacent terrestrial district). The flight morphologies of co-existing species were dissimilar. In both districts, the flight morphologies of nearly all potential colonizers overlapped with at least one mangrove bat species.

Four flight zones (foraging microhabitats) were arbitrarily distinguished within the mangal in terms of their relative obstruction to direct flight: high over stand, close over canopy, beside stand and under canopy. All zones were occupied by at least one bat species; each species was found to favour one zone. Field observations indicated that two of these zones should have been further sub-divided.

4.4. Recommendation and Proposals

The results of the study will be presented in May in Darwin at the symposium "Ecology of the Wet-Dry Tropics. The manuscript is written and will be submitted for publication soon thereafter.

4.5. Future Publication

McKenzie, N.L. and Rolfe, J.K. (in prep.). Bats of Mangrove Communities in Western Australia : faunal composition, biogeographical relationships and community structure.

5. CHIROPTERAN STUDIES - MORMOPTERUS TAXONOMY

5.1. Objective

To review the taxonomy and distribution of Tadarida (Mormopterus) in Western Australia.

5.2. Procedure

Morphometric examination of available specimens; comparison with material from elsewhere in Australia. Use of enzyme electrophoresis to cross-check morphometric conclusions. Material for this purpose will be collected as convenient during biological survey trips.

5.3. Results and Conclusions

Glans penis anatomy of all male specimens included in the study is being examined and more than sixty specimens, resulting from field studies funded by an A.B.R.S. grant to Peter Bavistock of Adelaide, are being incorporated in the study. Two species have been distinguished within the Goldfield's Mormopterus "planiceps".

5.4. Recommendations and Proposals

This is an ongoing project occupying 1-2 weeks each year.

5.5. Publications 1983/4

Nil.

5.6. Proposed Publication

Taxonomy and Distribution of Australian Mormopterus (Chiroptera : Molossidae).

COMMITTEES AND WORKING GROUPS

Biological Survey Committee - the System 11 study is the current project.

Department of Conservation and Environment study on the future of the Bungle-Bungle area.

SEMINARS, WORKSHOPS, PUBLIC RELATIONS, EXTENSION

Advice to Murdoch University on survey techniques and philosophies appropriate to vertebrate studies of the Opthalmia Dam area near Newman.

Page proofs of five species accounts for "Mammals of Australia" by R. Strahan (Ed.) were checked : Isoodon auratus, Mesembriomys macrurus, Ningaui ridei, Nyctophilus arnhemensis, Sminthopsis hirtipes. Distribution maps for more than forty species of mammal were checked and updated where necessary for the same publication.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

WILDLIFE RESEARCH AND MANAGEMENT SEMINAR

9 May 1983

J.E. Kinnear

1. SAND PLAIN HABITAT STUDY

1.1. Preamble

Most of the islands of the Dampier Archipelago have lime sand deposits and on some islands the areas of sand are quite extensive. Enderby and Rosemary Islands have large deposits and both islands support thriving populations of rock wallabies (Petrogale rothschildi).

Assays of the lime sands have shown that most deposits are suitable for the iron ore refinery process. Mining the sand plains would be a simple matter of "digging up and shipping out".

Recent research therefore, has focused on the importance of the sand plain habitat with particular reference to rock wallabies (RW). The project has received funds from Hamersley Iron - the major lease-holder of the deposits in the Archipelago.

1.2. Methods

1.2.1. The rock wallaby survey of Enderby was completed using a helicopter.

1.2.2. A 1 metre wide footpath was cleared around the perimeter of the sand plain study area: RW traffic in and out of the sand plain was monitored daily by track counts.

1.2.3. Scat transects - RW scats were systematically collected from 4 areas (2 sand plain; 2 triodia/scree). The collections were oven-dried and weighed.

1.2.4. Fresh scat samples from different vegetation associations were analysed for recognisable plant epidermal fragments.

1.2.5. An attempt was made to establish RW on W. Lewis Island; 15 were released.

1.3. Results (Data will be displayed at the Seminar).

1.3.1. RW survey: RW were sighted throughout the entire island, but in greater numbers in shelter bordering sand plains. It is estimated that observers were sighting 20% of the population.

1.3.2. RW traffic: activity is considerable as judged from track counts; the data imply that RW leave the surrounding scree and converge on to the sand plain.

1.3.3. Scat transects: Without question the density of RW scats is greatest on the sand plain.

1.3.4. Food analysis: The results are consistent with the foregoing, but in the light of new findings some additional work is necessary. This aspect will be discussed at the seminar.

1.3.6. West Lewis Island: The fate of the RW released on West Lewis is not known at this stage; surveys are planned.

1.4. Conclusions

The sand plains are vital to the RW population; destruction of this habitat would adversely affect the carrying capacity of Enderby Island.

1.5. Proposals 1983/84

Field work will be completed this winter; the project will then be written up.

2. VISIT TO DEPUCH ISLAND 2.1. Preamble

A museum expedition to Depuch Island (1962) recorded the presence of the rock wallaby species Petrogale lateralis. The fox was also recorded.

2.2. Objective

The island was visited to gather information about this Pilbara population.

2.3. Methods

Selected areas were surveyed by day, and by spotlighting at night.

2.4. Results

No traces of RW were found; the only mammal sighted was the fox.

2.5. Proposals 1983/84

It is planned to survey the island intensively to confirm the presence or absence of RW.

3. EXPEDITION TO SALISBURY ISLAND

3.1. Preamble

The writer was a member of this expedition and was assigned the task of observing the RW population.

3.2. Objectives

To collect as much relevant information as possible.

3.3. Methods

i) Population estimates by counts.

ii) Food by scat analyses and direct observation.

iii) Distribution of RW - by foot surveys.

3.4. Results

RW were sighted everywhere on the island. Food fragments were largely dicots. (70/30 ratio dicot : monocot).

The animals were in exceptionally good condition - some reasons for this will be discussed.

3.5. Publications 1983/84

Burbidge, A.A., Fuller, P.J., Hopkins, A.J.M., Kinnear, J.E. and McKenzie, N.L. The wildlife of Salisbury Island, Archipelago of the Recherche, Western Australia. Departmental Report.

4. WHEATBELT ROCK WALLABY PROJECT

4.1. Preamble

Five small populations of rock wallabies (Petrogale lateralis) persist in the wheatbelt; a body of circumstantial evidence suggests that the populations are adversely affected by foxes and/or feral cats.

An experiment is currently in progress to test this possibility.

4.2. Objectives

To develop and evaluate methods for controlling foxes and feral cats on nature reserves.

4.3. Methods

4.3.1. By baiting with various kinds of bait.

4.3.2. Assessment: by counting predator tracks in a systematic manner.

4.4. Results

4.4.1. It is possible to exterminate foxes and feral cats on a Nature Reserve, but re-invasion occurs within a 30-60 day period.

4.4.2. Meat is the most effective bait evaluated to date: APB factory baits e.g. fish flavoured and 'cat' baits are taken but are less effective.

4.5. Conclusions

The impact of our control efforts on RW will be determined when the populations are trapped in 1984. An increase in RW activity has been noted.

4.6. Proposals 1983/84

The wet season poses problems regarding baiting e.g. nothing is known about bait potency after exposure to rain, damp soil, etc.

4.6.1. It is proposed to erect bait stations suitably weather-proofed, on strategic sites within the reserves.

4.6.2. Chemical analysis of baits now looks possible due to Dr R. Meade's work at Murdoch University. Tests will be made on exposed baits for potency.

4.6.3. Aerial baiting will be evaluated; on economic grounds aerial baiting is likely to be the most efficient method of bait dispersal should baiting be used as a management tool.

4.6.4. Final trapping of the RW populations - to be carried out March-April 1984.

4.6.5. Field work will then cease.

5. COMMITTEES

1. Feral Cat.

2. Feral Pig Control.

6. PUBLICATIONS

None: Data processing for all projects is now underway.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

WILDLIFE RESEARCH AND MANAGEMENT SEMINAR

9 May 1983

R.I.T. Prince

1. RED KANGAROO MANAGEMENT (Also including EUROS)

1.1. Objectives

To maintain up to date information on the harvested kangaroo stocks and to improve knowledge of the exploitation system and its impact on the kangaroos.

1.2. Procedures

Commercial shooting data obtained from shooter's returns (Form 3) are processed via standard EDP programme. Summarized data are obtained in the form of tables and graphs.

Additional information aiding understanding of this situation is sought where possible.

1.3. Results

Sufficient modifications to data processing procedures were made to allow production of publication ready tables and graphs for the 1970-1979 review paper.

Necessary maintenance work to restore the direct data processing facility for dealing with subsequent data for this species has only recently been completed. New harvest data to the end of 1982 have been added to the data-base files as they have become available. Validation work required to ensure that summaries may be extracted from the post 1980 records is being dealt with as resources permit.

The 1982 Red Kangaroo harvest accounted for ca. 135 000 animals. This harvest represents > 20% of the total rangeland stocks of Red Kangaroos estimated to be present at the beginning of 1982.

Pastoral areas rainfall during 1982 was average or less in the coastal areas of the North West and slightly above average in some more inland areas, but winter rainfall was generally poor. The good early season rain in January-February and the reasonable follow-up rain in May-June would have stimulated breeding. Some recruits due to breeding after the break of the 1976-1980 drought would also have entered the hunted sector of the population, but total numbers would not have increased during the year.

Further input to national efforts to persuade the United States of America Government to extend its relaxation of the former ban on importation of kangaroo products has been provided over the past 6 months. No decision has yet been reached in the U.S.

1.4. Conclusions

The harvesting pressure exerted during 1982 most probably led to further decrease in the numbers of Red Kangaroos on pastoral rangelands.

The general harvest pattern during 1982 was an extension of that occuring in 1981.

Confirmation of present numbers of Red Kangaroos on the State's pastoral rangelands would be desirable.

1.5. Programme for 1983/84

This monitoring programme cannot be continued within the research area. Responsibility for maintenance of further harvest monitoring records is being transferred to Head Office. This transition of responsibility is being implemented progressively and should be completed by early 1984. Data from 1 January 1983 onwards will be dealt with according to this new arrangement.

Research effort to the end of 1983 will be directed to tidying up problems with the 1980 through 1982 data files and production of a supplementary report covering this 1980-1982 triennium.

1.6. Publications 1982/83

Manuscripts of:

Exploitation of Kangaroos and Wallabies in Western Australia I - A review to 1970, with special emphasis on the Red and Western Grey Kangaroos.

Exploitation of Kangaroos and Wallabies in Western Australia II - Exploitation and management of the Red Kangaroo : 1970-1979.

were submitted to the Department for publication in October, 1982.

1.7. Publications 1983/84

A supplementary report dealing with the 1980-1982 harvests and harvest impact is planned (cf. 1.6 above).

2. WESTERN GREY KANGAROO MANAGEMENT

2.1. Objectives

To gain knowledge of the management situation.

2.2. Procedures

General programme in suspense during 1982/83. Recent harvest data have been hand sorted and some batches added to the data-base files (see 1.2.).

2.3. Results

The total harvest for 1982 was ca. 40 000 animals.

2.4. Conclusions

As previously stated.

2.5. Programme 1983/84

Further research involvement in this programme is being terminated as explained in 1.5. (above).

2.6. Publications

See under 1.6. - 1.7.

3. DORRE ISLAND STUDIES

Work in suspense through 1982/83 as before.

4. BANDED HARE WALLABY - DIRK HARTOG ISLAND

4.1. Objectives

To attempt re-establishment of the species on Dirk Hartog Island. To obtain further information about the species and its biology.

4.2. Procedures

The project is presently being reviewed. It is considered that a further attempt at direct introduction of Dorre Island adults to the Dirk Hartog Island experimental area should be tried.

Subject to satisfactory results of the review it is proposed to repair the original field release enclosure and to build a second larger enclosure nearby. These two enclosures will be stocked with a total of c. 20 new adult wallabies. Following the stocking of these new experimental groups the field release programme will be similar to that followed previously through 1977-78 and thence through to late 1980.

4.3. Results

None for 1982/83.

4.4. Conclusions

Further funding and support will be needed to effect work as proposed.

4.5. Programme 1983/84

May 1983 - review situation Dirk Hartog Island.

July-August 1983 - Erect new fencing Dirk Hartog Island and stock enclosures with new wallabies from Dorre Island.

November 1983 - check status of experimental group.

March 1984 - ditto.

4.6. Publications 1982/83

Nil.

4.7. Publications 1983/84

Revise and complete unfinished manuscripts dealing with initial work on this programme.

5. DUGONG

5.1. Resume

No further work attempted during 1982/83.

Professor P.K. Anderson completed a further 12 months study on the Shark Bay population in August 1982.

Sir Peter Scott also paid a brief visit to Shark Bay in March 1983 to see dugongs first hand.

5.2. Results

The further work on the Shark Bay population during the 1981/82 period expanded our knowledge of patterns of seasonal distribution of dugongs in this area, and pointed to the critical importance of different parts of the Bay to the local dugongs. This knowledge has aided us in formulating policies to minimize conflict between fishing activities and the needs of the dugong.

5.3. Programme 1983/84

The need for further general knowledge of the dugong in northern Western Australian waters remains.

Some general observational data have been extracted from the logs provided by observers on coastal surveillance flights. Further contact with these people and some first hand observations of the coastal areas traversed by the surveillance flights would serve the initial need. Weather conditions are best suited to observation of dugongs in northern waters in the May-September period.

5.4. Publications 1982/83

Nil.

5.4. Publications 1982/83

Nil.

5.5. Publications 1983/84

None planned.

SEMINARS, EXTENSION, PUBLIC RELATIONS, ETC. 1982/83

Participated in meeting of CONCOM ad hoc Working Group on Kangaroo Management in August 1982 to prepare documents for presentation to the U.S. Federal Government in their consideration of removal of the Red, Western and Eastern Grey Kangaroos from their list of endangered species and continuation of trade in kangaroo products. Further information has been provided since the meeting as required.

Programme 1983/84

Attendance 2nd International Rangelands Congress, ADELAIDE, S.A. - May, 1984.

COMMITTEES

1. Kangaroo Management Advisory Committee

2. Coordinating Committee (APB, Animal Health-Agriculture, Fisheries and Wildlife).

3. Technical Sub-Committee (Coordinating Committee) to consider Holdings of Fauna and Exotic Animals.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

WILDLIFE RESEARCH AND MANAGEMENT SEMINAR

9 May 1983

J.A. Friend

RESEARCH PROJECTS

NUMBAT ECOLOGY AND CONSERVATION

The main emphasis of the last year's research has been on the ecology and biology of the numbat. Most time in the field, which amounted to over 120 days, was spent in searching for, capturing and radio-tracking adult and young numbats in Dryandra Forest. This has resulted in a far greater understanding of the species' use of its habitat and of the recruitment of young into wild populations. Meanwhile, further studies of numbat habitat have continued.

1. NUMBAT: SURVEY OF DISTRIBUTION AND DESCRIPTION OF HABITAT

1.1. Objectives

To provide information on the status of the species and to help define suitable numbat habitat.

1.2. At Dryandra

1.2.1. Procedures

i) Driven surveys for sightings.

ii) Surveys on foot, recording the diggings of numbats, and collecting scats.

1.2.2. Results

The areas in which sightings have been made during 1982/83 confirm the conclusions of the previous year regarding the numbat's preferred habitat at Dryandra.

Familiarity with the appearance of numbat diggings has made possible surveys on foot which have greatly extended the known numbat distribution at Dryandra. This now encompasses natural bushland from one end of the Forest to the other.

1.2.3. Conclusions

Numbat habitat at Dryandra is fairly widespread and comprises principally the sides of valleys bearing wandoo (Eucalyptus wandoo) where the density of trees is reasonably high. This conclusion has been confirmed by radio-tracking studies, reported later.

1.2.4. Proposals for 1983/84

Continuation of driven surveys and foot surveys to monitor the status of the numbat at Dryandra.

1.3. Elsewhere in the South-west.

1.3.1. Procedures

Numbat sightings reported by members of the public are investigated. In addition, searches of wooded areas thought to contain suitable numbat habitat are being carried out. The most productive and reliable method known is survey on foot, searching for diggings and scats.

1.3.2. Results

The following areas have been searched unsuccessfully for numbat diggings:

Tutanning Nature Reserve (6 person-days)
Nature Reserves 19740 and 36742 (Brookton Highway near Westdale - 2 person-days)
Lupton block, State Forest (1 person-day)
Saddleback block, State Forest (Worsely Alumina initial mining area - 4 person-days)

Five areas in State Forest near the Albany Highway between Armadale and Bannister have been searched, following reported numbat sightings. Diggings have been found at four of these localities, and scats at one.

Several of these areas were burnt in fuel-reduction fires last spring. Patterns of reported sightings and presence/absence of diggings on various dates indicate that in jarrah forest at least, numbats are not present in burnt areas immediately after fire, even if they were present previously. Regular surveys of recently burnt and unburnt areas will continue.

1.3.3. Conclusions

There are numbat populations in the northern jarrah forest as well as those known from Dryandra and from the southern Tone/Perup State Forest M.P.A.

Numbats were last sighted at Tutanning as recently as two years ago. Our failure to find any trace of them in January/February 1983 indicates that this population has become extinct, or very nearly so.

1.3.4. Proposals for 1983/84

Foot surveys for diggings in areas likely to support numbats. Monitoring of sites in the northern jarrah forest.

1.4. Areas east of the Wheatbelt.

1.4.1. Procedures

Collection of information on the "desert" form of numbat, Myrmecobius fasciatus rufus, last collected in central Australia in 1933. Travel to areas of most recent occurrence, interviewing Aborigines; collection of termites and ants in former habitats, examination of other aspects

of habitat. Analysis of gut contents of museum specimens.

1.4.2. Results

The major settlements in the area between Warburton - Everard Range (S.A.) - Ayers Rock (N.T.) - Giles were visited in July-August 1982. 36 Aboriginal family groups in 26 communities and camps were interviewed. No definite indication of the persistence of M. f. rufus was found. The most recent reliable report of this subspecies was from a girl at Warburton, who saw an individual near the Clutterbuck Hills (central Gibson Desert) in the late 1960s. The decline of M. f. rufus in central Australia was apparently rapid.

The habits of the desert numbat, as described by Aborigines from their own observations, were very similar to those of the numbat of the southwest, given differences in habitat.

A paper describing this work on M. f. rufus will be presented at the ANZAAS conference in Perth, May 1983.

1.4.3. Proposals for 1983/84

Investigation of suitable parts of Dragon Rocks and Lake Magenta Nature Reserves for signs of surviving numbat populations will be carried out in winter 1983.

1.4.4. Publication 1982/83

Friend, J.A., P.J. Fuller and J.A. Davis (1982). The numbat in central Australia. SWANS **12**(3) : 20-26.

2. NUMBAT: FACTORS AFFECTING ASPECTS OF HABITAT.

2.1. Objectives

To distinguish environmental influences affecting the availability of food and shelter for numbats.

2.2. Procedures

Fire effects on termites and logs

- monitoring short-term effects in areas to be burnt, examined before and after fire and subsequent monitoring for 1-2 years.

- comparison of similar areas with different fire histories to elucidate long-term effects.

Effect of climate on termites

- manipulation of climate in a small area of forest by watering on several occasions during summer drought to simulate rainfall. Comparison of termite abundance in numbat feeding zones in watered and unwatered areas.

2.3. Results

These projects were postponed for various reasons, chiefly the lack of time. No suitable area of Dryandra was burnt during 1982/83.

Meanwhile, methods for the assessment of termite abundance are being developed. A comparison of termite numbers in the numbat feeding zone in wandoo and powderbark (E. accedens) was made. This indicated that powderbark supports smaller termite numbers in the upper soil layers than does wandoo, especially in summer, when termite abundance falls in both woodland types.

2.4. Proposals for 1983/84

Monitoring of effects of burn on termites, small wood and logs in an area of Dryandra to be burnt during 1983.

3. NUMBAT: EFFECT OF INTRODUCED PREDATORS ON POPULATIONS

3.1. Objectives

To determine whether the presence of introduced predators, particularly the fox, reduces numbat population numbers.

3.2. Procedure

Reduction of predator numbers in an experimental area by baiting, using 1080, over a period of 2-3 years.
Monitoring of numbers of numbats in this and a control area by driven surveys.

3.3. Results

Baiting has been carried out at intervals of 3 weeks to 1 month since September 1982. Fresh meat baits as well as manufactured baits have been used. Poisoned foxes have been found regularly in the baited area.

No change in relative numbers of numbat sightings has been recorded to the present time.

3.4. Proposals for 1983/84

The baiting and monitoring programmes will be continued during the coming year.

4. NUMBAT : STUDIES OF INDIVIDUALS AND POPULATIONS

4.1. Objective

To study aspects of the numbat's ecology relevant to management of the species.

4.2. Procedure

Radio-tracking and observation of individuals in Dryandra

Forest.

4.3. Results

Sixteen numbats have now been fitted with transmitters and followed for varying lengths of time. This has yielded much information regarding the home ranges of individuals, feeding and the production and care of young. One female has worn transmitters for over a year, and is carrying her second litter of young since her initial capture. The behaviour of young numbats was observed until they left their parental territory in November-December, when they apparently moved a large distance from the study area, and their signals were not picked up again.

The importance of standing dead trees in providing nest hollows for numbats was demonstrated by these observations, as well as the reliance on small "nursery" areas in which young numbats learn to forage and gradually become independent of their mother.

4.4. Proposals for 1983/84

Radio-tracking at Dryandra will continue on a limited scale during the next year with the main emphasis on following the dispersion of young.

4.5. Publications 1982/83

Friend, J.A. (1982). The numbat - an endangered specialist. Australian Natural History **20**(10) : 339-342.

Friend, J.A. and R.G. Burrows (1983). Care of its young by the numbat. SWANS (in press).

5. NUMBAT : SEASONAL FEEDING DIFFERENCES

5.1. Objective

To investigate variation in numbat feeding patterns between seasons.

5.2. Procedure

i) Collection of scats from individual numbats at different times; analysis of scat composition; identification of insect remains.

ii) Recording signs of feeding by radio-tracked numbats.

5.3. Results

The extremely time-consuming analysis of scats is still in progress. The majority of insect remains comprises termites, although ants are sometimes well-represented, apparently more so in the cooler months.

Feeding at all times of year appears to be done mainly by

exposing termite galleries under soil in open areas, supplemented by digging and scratching associated with dead branchwood and logs. Feeding sessions are of two types - either a series of diggings is concentrated in a small area or along an extended track, occasional diggings are made while the numbat moves steadily through the forest.

Differences in feeding patterns between individual numbats are apparent.

5.4. Proposals for 1983/84

Scat analysis and recording feeding patterns in the field will continue.

5.5. Publication 1982/83

Fain, A. and J.A. Friend (1983). Two new hypopi of Acaridae (Acari, Astigmata) from the faeces of the Numbat Myrmecobius fasciatus Waterhouse. Records of the Western Australian Museum (in press).

6. TRANSLOCATION OF NUMBATS TO AREAS OF FORMER OCCURRENCE

6.1. Objectives

To re-establish numbats in apparently suitable forested areas which previously supported populations.

6.2. Procedure

Capture of numbats from populated areas; release of animals fitted with transmitters in suitable patches of bushland; monitoring their survival and establishment.

This project is dependent upon the availability of suitable animals. The release would be preceded by baiting for predators in the release area.

6.3. Proposals for 1983/84

Boyagin Nature Reserve is thought to be the most suitable place for an experimental release of Dryandra numbats. Attempts will be made during the year to capture and fit transmitters to numbats in Dryandra so that they can later be recaptured and released at Boyagin N.R.

7. ESTABLISHMENT OF CAPTIVE BREEDING COLONY OF NUMBATS AT WOODVALE

7.1. Objectives

i) To establish a colony of numbats in captivity at W.A. Wildlife Research Centre;

ii) To provide conditions of captivity conducive to breeding;

iii) To formulate an artificial food for numbats so that provision of live termites is not necessary for their survival and breeding;

iv) To increase knowledge of numbat biology by observation of captive specimens.

7.2. Procedures

World Wildlife Fund Australia is at present attempting to raise funds for this project. These funds would provide a full-time technical officer for 2 years to care for the colony, suitable enclosures, a vehicle for use in searching for numbats and regular collection of termites, and other support.

7.3. Proposals for 1983/84

If funds are available, a person will be employed, enclosures constructed and numbats captured to stock the colony.

OTHER PROJECTS

8. TAXONOMY AND ZOOGEOGRAPHY OF AUSTRALIAN LANDHOPPERS (TERRESTRIAL AMPHIPODA).

8.1. Objectives

Description of new species; revision of group at generic level; drawing geographic conclusions.

8.2. Procedures

Collection of specimens; examination of these and museum collections; drawing and description; application of classical and numerical taxonomic concepts.

8.3. Results

Phenetic and cladistic analyses of morphological data on fourteen Tasmanian species was carried out using a computer program developed by M.A. Burgman. The relationships indicated agreed closely with results of earlier analyses, and were zoogeographically consistent. It is proposed to include this information in a manuscript in preparation.

8.4. Proposals for 1983/84

Completion and submission of paper on texonomy and zoogeography of Tasmanian landhoppers.

Identification of Australian Museum material now on loan, selection of type specimens for species descriptions.

8.5. Publication 1982/83

Friend, J.A. (1982). New Terrestrial amphipods (Amphipoda

: Talitridae) from Australian forests. Australian Journal of Zoology 30 : 461-491.

8.6. Proposed Publication 1983/84

Friend, J.A. Tasmanian terrestrial Amphipoda (Talitridae). (Manuscript under revision.)

SEMINARS AND PUBLIC RELATIONS

"The numbat : recent research on an endangered specialist". Paper presented at the Australian Mammal Society's 26th Scientific Meeting, Canberra, 12-14 May 1982.

"Research on the Numbat at Dryandra". Talk given to the W.A. Naturalists' Club, Nedlands, on 5 November 1982.

Assistance was given to Guy Baskin of Channel 9 in preparing a segment on the numbat for a documentary programme "Wonder of Western Australia, Part 3" which was broadcast on 18 March 1983.

Two articles were refereed for the editorial committee of Australian Forest Research.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

WILDLIFE RESEARCH AND MANAGEMENT SEMINAR

9 May 1983

S.D. Hopper

1. ATLAS OF THE W.A. FLORA - PILOT PROJECT

1.1. Objectives

To initiate a volunteer - participant atlas project aimed at recording the present distribution and abundance of Western Australian orchids (136 spp.), banksias (58 spp.) and kangaroo paws (12 spp.) To develop an interactive computerized data base system which allows for the retrieval and manipulation of the biogeographical information to serve departmental responsibilities in wildflower conservation. To assess the value of extending the atlas project to other plant groups on completion of the pilot scheme.

1.2. Procedures

Activity this past year has included:

a) continued development of computer programs that allow mapping of species' distribution data on the minicomputer screen; the current system now allows for a linear scale (in km) and major town names to be automatically plotted.

b) continued soliciting of sight records on the distribution of orchids from members of the W.A. Native Orchid Study and Conservation Group;

c) the preparation of an interim series of distribution maps showing orchid sight records that were on computer file as at August 1982;

d) the development of a kangaroo paw mapping system as part of the pilot project run by LISAC using Intergraph and Vax equipment;

e) the preparation of the manuscript of a colour book on orchids of Perth that will serve as a guide to identification in future Atlas work.

1.3. Results

Figure 1 is an example of the first series of interim orchid maps produced for contributors to the Atlas Pilot Project.

The number of Sight Record Sheets received from orchid club members still stands at 200, reflecting a loss of enthusiasm due to the long delay in providing interim maps to contributors. However, the first series of maps have instilled renewed enthusiasm, and it is hoped that the coming season will see a major influx of contributions to the Pilot Project.

The manuscript for the book on orchids of Perth is complete and ready for printing.

1.4. Conclusions

None as yet.

1.5. Proposals for 1983/84

Solicit as many new orchid Sight Record Sheets as possible and prepare at least a further two series of interim maps for contributors (in August and December/January). Attempt a number of analyses and explore graphics capabilities using the kangaroo paw and orchid data sets. Maintain a close liaison with the orchid club to stimulate interest in the project. Apply to A.B.R.S. for further funding so that consultants can be appointed to assist with programming, editing of data and liaison with contributors. If the A.B.R.S. grant application is successful, extend the project to banksias, eucalypts and rare flora.

1.6. Publications 1982/83

Hopper, S.D. (1983). Ed. Orchids. Interim Map Series 1. Atlas of the Western Australian Flora. Pilot Project. Mimeographed Report, 91 pp. (Dept. Fish. Wildl. : Perth).

1.7. Proposed Publications 1983/84

Brown, A.P., and Hopper, S.D. Orchids of Perth.

Hopper, S.D. (Ed.). Orchids. Interim Map Series 2 and 3. Mimeographed departmental reports.

Distribution of kangaroo paws and related plants - coauthored with P. Gioia and N. Hall.

2. LICENSING AND MANAGEMENT OF THE WILDFLOWER INDUSTRY

2.1. Objectives

To advise on the effective management of the wildflower industry. To undertake research on aspects of the industry that effect the conservation status of wildflowers.

2.2. Procedures

Activity on this project was restricted to examining incoming pickers' returns, storing the same, and meeting with members of the W.A. Wildflower Exporter's Association to discuss proposed changes to licensing and the return system. Two papers were presented to a Workshop on Wildflower Farming at the University of W.A.

2.3. Results

None to report for this past year, other than a recommendation

was proposed by W.A. and Australia at the 1983 meeting of CITES at Botswana to have all W.A. wildflowers except Banksia laricina and Macropidia fuliginosa removed from Appendix II of CITES.

2.4. Proposals for 1983/84

Await proposed changes to legislation and the licensing system. Subject to funds being available, appoint a consultant to document the presence of heavily exploited wildflowers in national parks and nature reserves. Research on the effects of harvesting on wildflowers cannot be undertaken under existing staff levels and defined priorities.

2.5. Publications 1982/83

Burgman, M.A. and Hopper, S.D. (1982). The Western Australian Wildflower Industry 1980-81. Dept. Fish. Wildl. West. Aust. Rept. No. 53 (Dept. Fish. Wildl., Perth.)

Hopper, S.D. (1983). Cut flowers and seed harvested by licensed wildflower pickers in 1980-81. In P. Watkins and R. Collins (eds.) Proceedings, National Technical Workshop on Production and Marketing of Australian Wildflowers for Export pp. 25-26. (University Extension, University of W.A., Nedlands.)

Hopper, S.D. (ibid.). Interspecific hybridization in kangaroo paws. pg. 121.

2.6. Publications proposed 1983/84

Nil.

3. CONSERVATION STATUS AND BIOLOGY OF RARE SPECIES

3.1. Objectives

To investigate the systematics, distribution and reproductive biology of rare plant species and undertake effective programmes of reserve acquisition and management for their conservation. To supervise contractual work aimed at surveying rare plants.

To recommend additions and deletions to the list of taxa gazetted as rare under the Wildlife Conservation Act. To prepare publications on the State's rare flora.

3.2. Procedures

Information on rare species was obtained through literature searches, consultation with local botanists, active field programmes, and through the letting of consultancies for surveys of particular species. Attempts to acquire reserves for rare plants were continued. A major effort to prepare material for publication was undertaken.

Applications for grants for research on rare plants were made to the Australian Heritage Commission and to the Australian Biological Resources Study.

3.3. Results

(a) Systematics

A large proportion of research time was allocated to systematic studies on rare flora these past 12 months. Field work, herbarium studies and preparation of manuscripts were undertaken to clarify the status of rare flora in the genera Eucalyptus, Conostylis, Anigozanthos, Blancoa, Drakaea and Caladenia. Projects nearing completion include revisions of Drakaea, Conostylis, Blancoa and Anigozanthos, papers describing new rare taxa among eucalypts of the Mt Lesueur and Stirling Range regions, and among Caladenia species in the Perth Flora region.

(b) Survey

Largely through the labours of consultants, survey information on rare plants was obtained from herbarium records and through field work. The projects undertaken varied from general collations of existing data on rare and geographically restricted plants through to detailed searches for individual species.

G.J. Barrett, K.A.G. Millar and K. Gillen collated published literature, photographs, herbarium records and drew maps for geographically restricted plants of the Swan Coastal Plain, Darling Scarp, Wheatbelt, jarrah and karri forests, and the Albany district.

Mr Barrett, as part of a W.A.I.T. work experience program, obtained data on 116 plants of the Swan Coastal Plain and Darling Scarp. Of these, 49 had ranges less than 50 km. Barrett found the 116 species to be concentrated in the Darling Scarp east of Perth, where up to 43 species occurred in a single 15' x 15' (25 km^2) grid cell. Metropolitan coastal plain grid cells also had high numbers of species (18 and 23), while minor areas rich in restricted species were documented for Pinjarra (9 spp.), Bunbury (10 spp.) and Busselton (12 spp.). There clearly is a need for follow-up survey work on our own doorstep.

Ms K.A.G. Millar summarised her Wheatbelt compilation (over 800 pages long) as follows:

"This report provides information on 228 rare or geographically restricted plants and a further 11 rare but widespread species occurring in the Wheatbelt area of Western Australia. Original and some subsequent published descriptions, collection details of Herbarium specimens and distribution maps for each of the species are presented. Species rarity, range, geographical restriction, conservation status and flowering period data are assessed. Of the 239 species, 20% are gazetted as rare, 44% are very geographically

restricted having a range of less than 50 km, while 47% are geographically restricted with a range of 50 to 160 km.

The percentage of species known to occur on existing conservation reserves is 44% while only 2% do not occur within 15 km of a reserve. The majority of very geographically restricted species occur on or near reserves in the Kalbarri, Geraldton, Wongan Hills, Tammin and Pingelly areas."

Mr K. Gillen recorded 101 geographically restricted species for the jarrah (81 spp.) and karri (20) forests. Half these species had known ranges of less than 50 km, and 16 have only one known locality.

For the Albany region, Mr Gillen found 79 geographically restricted species. Again, half had very restricted ranges of less than 50 km and 24 are known from only one locality.

A grant of $20 000 awarded by the Australian Heritage commission enabled surveys of rare wheatbelt plants to be undertaken by K.A.G. Millar, M.A. Burgman and S.J. Patrick. Usually two or three plants occurring in the same area were selected for detailed work, and a watchful eye was maintained for a number of others that may turn up in the same area.

Ms K.A.G. Millar searched for three rare and three presumed extinct species in the Cunderdin-Quairading area during July and August of 1982. Of the three rare species, Hakea aculeata (Column Hakea) was found to be the most endangered. Sixteen populations, containing an estimated 375 plants, were located, all on road verges or small areas of bush on private property. Careful management of these areas will be essential if this species is to survive in the wild. Casuarina fibrosa (Wooley Sheoak) failed to turn up anywhere other than its only previously known location, which is in a flora reserve. Some 550 plants of this small pine-like sheoak were counted. A total of 450 Banksia cuneata (Quairading Banksia) were found at five locations - four on road verges and one (containing 300 plants) on a nature reserve vested in the Western Australian Wildlife Authority. Provided the status of this reserve remains unchanged, this species will be relatively safe from extinction.

The status of the three presumably extinct species that were searched for (Hakea tamminensis, Hemigenia viscida and Melaleuca arenicola) regretably remains unchanged, as none were seen during the survey.

A survey of nine rare, restricted or poorly known plants in the Mogumber area was undertaken by K.A.G. Millar in October and November 1982. Darwinia acerosa (Fine-leaved Darwinia) was located in areas of exposed granite rock at six locations. An estimated 3 400 plants were seen. All occurred on farming property, so the long term future of this species is in doubt unless some populations are given

total protection. Darwinia carnea, the prized Mogumber Bell, was not located in the survey area and is presumably extinct there. It persists in wi as a small popula on on a farm near Narrogin.

Urocarpus niveus, the Bindoon Starbush, is equally in danger of extinction. Only one population of two plants was located, this is on a verge. Ptychosema pusillum (Dwarf Pea) may ready be extinct, as no plants were encountered despite a thorough search of the only known modern location and of suitable nearby habitat. Three other poorly known species, Lasiopetalum rotundifolium, Lhotskya brevifolia and Petrophile plumosa, also failed to turn up and are presumably extinct.

One population of Acacia anarthros containing 100 plants was located on a road verge and extended into adjacent private property. Although an intense search for this species was not made, the survey indicated that it is extremely rare. Calothamnus pachystachyus, the last species surveyed, proved to be very common (60 000+ plants in at least 26 populations) but had a geographical range of only 48 km. Fortunately, some populations of this attractive plant were found on conservation reserves, so its future is relatively assured.

Consultant Mr M.A. Burgman searched for two rare and three poorly known but restricted species of the Watheroo-Coorow area during November-December 1982. Gastrolobium appressum (Scale Leaf Poison) was located in 14 populations containing an estimated 2 660 plants, all on road verges, uncleared farmland or railway reserves. Hemiandra gardneri (Crimson Snakebush) was equally at risk, with 2 200 plants counted in 6 populations on road verges, farms or railway verges.

Of the three poorly known species, Regelia megacephala was found at 5 sites containing an estimated 23 400 plants, all on private land. With a geographical range of only 10 km, it is seriously at risk despite its local abundance. Both Jacksonia eremodendron and Adenanthos stictus were found to be relatively safe, being widespread and well represented on conservation reserves within the study area.

The beautiful aqua-blue Lechenaultia pulvinaris (Cushion Lechenaul a) was the main object of a survey of the Wickepin area by Mrs S.J. Patrick during November-December 1982. Previously only recorded from two localities, the survey recorded a total of 12 populations containing an estimated 4 400 plants. Some 3 000 of these plants occur on nature reserves, while one large population of 1 400 plants occurs on farmland deliberately left uncleared by the owner to conserve the Cus on Lechenaultia. Even though its geographical range has been reduced by agricultural development from 58 km down to 19 km, Cushion Lechenaultia is comparatively well protected for a rare wheatbelt plant.

M.A. Burgman and Technical Officer R.E. Sokolowski summarised their survey for the Echidna Wattle as follows:

"Acacia depressa is a rare and very geographically restricted species. It is confined to the wheatbelt of Western Australia near the Tarin Rock Nature Reserve between Lake Grace and Dumbleyung. A field survey was conducted in January 1983 to assess the distribution, abundance, habitat and conservation status of the species. This information was used to recommend conservation measures considered necessary for the protection and survival of the species. Acacia depressa is well represented, 6 populations occur on Tarin Rock Nature Reserve and two further populations occur outside the Reserve - one in private land and the other on a local district road verge. As less than 1 000 plants were recorded in this study there is therefore a need for the continued legislative protection of the species."

Another bizarre wheatbelt plant, the Underground Orchid, was the subject of a survey and report by Dr K.W. Dixon:

"Discovered and described in 1928, Rhizanthella gardneri was collected sporadically a further seven times up to 1979. Since then localities where populations of the orchid are known to be extant have increased to five, all but one being present on Crown land. Prior to 1979 all discoveries were accidental, coinciding with periods of major agricultural expansion in the southwest land division, with prolific flowering of the orchid apparently coinciding with heavy falls of rain the previous summer.

Since 1979 almost 150 sightings of the orchids have been made by deliberate, non-destructive means, providing many details of the complex phenology, nutrition and reproductive biology of the species. The orchid produces a flowering head or capitulum of up to 100 small orchid flowers which are buried 1.5 - 2.0 cm below soil surface. An involucre of wax-like, linear-obovate bracts surround the flowers and may appear at or just above soil level. Rarely has a faint odour been detected emanating from the intact flowering head. Several suspected pollination vectors have been observed whereas no agent(s) for seed dispersal have operated on field populations of the orchid. Seed set is poor (<5% successful fertilization) if the capitulum is left undisturbed whereas more than 50% of flowers are fertilized if the capitulum is exposed for a week or more. Attempts at axenic and habitat germination of seed has resulted in mediocre success with no development beyond the protocorm stage.

This report outlines the history of discoveries, search methodology and details of reserves and vacant Crown land examined for the orchid. Observations are provided on the biology of the species with proposals for management of reserves containing the orchid. A recent locality for the orchid is encompassed in a recommendation for creation of a new Class A reserve".

Surveys undertaken by Departmental staff involved the following highlights:

1. Wongan Hills D.W.O. Phil. Roberts discovered a population of 1 000+ plants of the Wongan Triggerplant Stylidium coroniforme on a water reserve. Previously, this species was known from only 3 plants that had been fenced off in a sheep paddock and hand pollinated to obtain seed for cultivation. W.O. Roberts also has investigated the distribution of a number of other rare plants in his district.

2. Busselton D.W.O. Peter Lambert has located new populations of several gazetted rare species, notably Plumed Lanoline Bush Franklandia triaristata and Meisner's Scott River Banksia Banksia meisneri var. ascendens.

3. Albany D.W.O. Ray Smith extended the known ranges of two very rare species, Albany Woollybush Adenanthos cunninghamii and Round-leaf Honeysuckle Lambertia orbifolia.

4. Technical Officer Ron Sokolowski searched for Chittering Grass Wattle Acacia anomala and added new locations for the record of this very rare Darling Scarp plant. Less than 100 plants are known of this species.

I undertook surveys of a number of taxa. Work in the Stirling Range National Park during March and May (with assistance from S.A. Moore, K.A.G. Millar and R.E. Sokolowski) led to the discovery of six rare new species of Eucalyptus, plus several very rare eucalypt hybrids. At least three more new species were surveyed in the Mt Lesueur proposed reserve, and one or two were discovered north-east of Merredin. Seven plants of Carnaby's Mallee Eucalyptus carnabyi were discovered near Cataby. This probable hybrid was previously only known from one plant further east.

A population of Barren's Feather Flower Verticordia helichrysantha was found at Cape Riche by interested wildflower enthusiast Mr N. Stevens of Ongerup. This population was subsequently inspected and mapped.

An orchid survey in September resulted in the location of populations of two new and very rare species of hammer orchids (Drakaea). A search for the Lavender Orchid Caladenia lavandulacea at Wedin in company with members of the W.A. Native Orchid Study and Conservation Group was fruitless.

The Australian Biological Resources Study awarded a grant of $25 000 to be expended in 1983 for a flora survey of the mallee belt on the inland margin of current farms between Ravensthorpe and Cape Arid National Park. This region has

a flora that is poorly known but apparently rich in species of woody shrubs and mallees. Many of these (at least an estimated 20%) have not yet been named by botanists.

The mallee flora is under imminent threat of broadscale destruction, as extensive areas are being cleared for agriculture or are under consideration for release for this purpose. While a small percentage of land routinely is set aside for flora and fauna conservation in any agricultural land release, government officers responsible for defining boundaries of such reserves have been hampered in the past by a dearth of data on the presence and distribution of flora in specific areas.

Consequently, this newly funded project aims to engage a consultant botanist for two years to survey the mallee flora and to deposit extensive collections in the Western Australian Herbarium as a permanent record on which future studies of the naming, geography and conservation of the flora may be undertaken. Emphasis will be placed on poorly known and presumably rare plants.

During 1983, the botanist (M.A. Burgman) will survey the study area on general collecting trips revisiting sites at least twice (in autumn and spring), allowing two months field work during each season, and eight months for preparatory data collation, processing of specimens and initial appraisement of the collections made. It is estimated that the field work would entail approximately 30 000 km travel. Provided additional funds are granted, areas of special interest would then be surveyed in 1984 to improve knowledge on poorly known and rare species. The final outcome will be a publication listing all the species found, discussing their distribution, and providing a series of maps with proposed reserve boundaries delineated.

c) Reserve acquisition and management

Reserve proposals have been prepared for several areas of land to conserve rare plants: these include proposed reserves north of Eneabba, north-east of Ravensthorpe, north-east of Merredin, in the Morseby Range near York, and near Munglinup. Liaison with Reserve Management Officers was maintained, particularly in relation to threats to rare plants posed by firebreak construction.

d) Administration and legislation

Advice was given on a number of applications to take gazetted rare plants. Administrative arrangements to notify landowners of the presence of gazetted rare plants on their properties were initiated for numerous species.

Research on additions and deletions to the gazetted rare flora was undertaken and recommendations were made.

e) Extension and publicity

Assistance was provided in the preparation of a colour poster on kangaroo paws. A supplement to the 'Guide to the Gazetted Rare Flora of Western Australia' was completed and published. Articles on flora conservation were prepared for SWANS. A number of talks were given to amateur and scientific bodies interested in rare plants.

3.4. Conclusions

None.

3.5. Proposals for 1982/83

Surveys of rare and poorly known species will continue, primarily by consultants, with an emphasis on land under consideration for release for agriculture.

The Australian Heritage Commission has awarded a further grant of $25 000 for a survey of rare wheatbelt plants. A major thrust will be made on this project, and on the A.B.R.S. funded survey of the mallee region.

Information on locations of rare plants will be accessed onto computer files developed for the Flora Atlas Pilot Project.

The survey of rare eucalypts, banksias and other plants on existing nature reserves will be continued, commencing with the Stirling Range National Park and adjacent nature reserves.

Wildlife Officers interested in surveys of rare plants will be given every assistance possible.

Taxonomic work on rare Conostylis, Anigozanthos, Caladenia and Drakaea will continue.

A taxonomic study of rare acacias related to Acacia myrtifolia will be initiated in collaboration with B.R. Maslin.

Taxonomic studies of rare eucalypts will be continued in collaboration with M.I.H. Brooker.

3.6. Publications 1982/83

Brooker, M.I.H. and Hopper, S.D. (1982). New subspecies in Eucalyptus caesia and in E. crucis of Western Australia. Nuytsia, 4 : 113-128.

Hopper, S.D. (1982). A new species of Conostylis (Haemodoraceae) from the Wongan Hills district. Nuytsia, 4 : 17-21.

Hopper, S.D. (1982). An excursion into southern Western Australian eucalypts. SWANS 12(1) : 10-17.

Hopper, S.D. (1982). Hand pollination of rare triggerplant

successful. SWANS 12(2) : 12-13.

Hopper, S.D. (1982). Orchid Conservation in Western Australia. SWANS 12(3) : 3-9.

Hopper, S.D. (1983). Applied plant systematics : case studies in the conservation of rare Western Australian flora. Australian Systematic Botany Society Newsletter (in press).

Hopper, S.D., Campbell, N.A. and Moran, G.F. (1982). Eucalyptus caesia, a rare mallee of granite rocks from south-western Australia. In R.H. Groves and W.D.L. Ride (eds.). 'Species at Risk. Research in Australia.' (Australian Academy of Science : Canberra pp. 46-61.

Hopper, S.D. and Burgman, M.A. (1983). Cladistic and phenetic analyses of phylogenetic relationships among populations of Eucalyptus caesia. Australian Journal of Botany 31, 35-49.

Hopper, S.D., Campbell, N.A. and Caputi, N. (1983). Geographical variation in fruits, leaves and buds of Eucalyptus caesia. Nuytsia (in press).

Moran, G.F. and Hopper, S.D. (1983). Genetic diversity and the insular population structure of the rare granite rock species, Eucalyptus caesia Benth. Australian Journal of Botany 31, 161-172.

Patrick, S.J. and Hopper, S.D. (1982). Guide to the Gazetted Rare Flora of Western Australia : Supplement 1. Dept. Fish. Wildl. West. Aust. Rept. No. 54. (Dept. Fish. Wildl. : Perth).

Rye, B.L. and Hopper, S.D. (1982). Misapplication of the aboriginal name Gungurru to Eucalyptus caesia Benth and notes on the species' distribution. J. Roy. Soc. West. Aust. 65, 93-95.

3.7. Proposed publications 1983/84

Bird pollination of Eucalyptus caesia.

Geographical variation and conservation status of Mottlecah Eucalyptus macrocarpa and E. macrocarpa x pyriformis hybrids - coauthored with T. Fetherstonhaugh and N. Caputi.

Eucalyptus carnabyi - rare hybrid or relict species?

Conservation status of the Kalbarri catspaw Anigozanthos kalbarriensis.

New eucalypts from the Mt Lesueur region and the Stirling Range - coauthored with M.I.H. Brooker.

Revisions of Drakaea, Conostylis, Blancoa and Anigozanthos.

New taxa and natural hybrids in Caladenia.

(Rare flora leaflets - it has been decided to discontinue this series in favour of writing a book on rare plants over the next two years).

4. RESERVE SURVEY, ACQUISITION AND MANAGEMENT

4.1. Objectives

To contribute botanical expertise in reserve survey, acquisition and management on an ad hoc basis.

4.2. Procedures

Proposed reserves were visited when requested by the C.R.O. or opportunity allowed, and recommendations made regarding acquisition and management.

4.3. Results

Over the past year several reserves or proposed reserves were surveyed or visited and relevant notes entered on departmental files.

4.4. Proposals for 1983/84

Contribute towards Sue Moore's biological survey of Chiddarcooping Hill Nature Reserve.

Make plant collections from other granite rock nature reserves.

Continue the survey of the eucalypts and banksias in the Stirling Range National Park and adjacent nature reserves.

Prepare for publication results of the biological survey of Cooloomia Nature Reserve.

Continue other surveys on an ad hoc basis.

4.5. Conclusions

None.

4.6. Publications 1982/83

Griffin, E.A., Hnatiuk, R.J. and Hopper, S.D. (1982). Flora conservation values of vacant Crown land south of Mount Adams, Western Australia. Western Australian Herbarium Research Notes 7, 31-47.

4.7. Publications proposed 1983/84

A biological survey of Cooloomia Nature Reserve - co-authored with A.A. Burbidge, P.J. Fuller and J. Rolfe.

Banksias and eucalypts - a pilot study of the distribution and habitats of flora on Two Peoples Bay Nature Reserve -coauthored with G.L. Folley.

Eucalypts of Stirling Range National Park.

5. BIOLOGY OF KANGAROO PAWS AND CONOSTYLIS

5.1.

To collate and prepare for publication studies conducted on the kangaroo paws and Conostylis. To continue observations on pollination on an ad hoc basis. To undertake a detailed study of the systematics of Conostylis

5.2. Procedures

Standard data analysis, literature research, herbarium studies and writing manuscripts. Limited field surveys were also conducted. A consultant botanical artist was appointed to draw all species.

5.3. Results

Opportunistic field observations on several species of kangaroo paws and Conostylis were made in the course of routine field work on other projects. Descriptions of several new taxa were drafted. A visit to the national herbaria in Melbourne and Sydney in November enabled several types to be examined and photographed. Drawings of all Conostylis species were completed by Mrs S.J. Patrick.

5.4. Conclusions

None.

5.5. Proposals for 1982/83

Write papers and continue field observations as time, inclination and opportunity allow. Prepare descriptions of all Conostylis species for a taxonomic revision.

Commence work on a field guide to the kangaroo paws and related plants.

5.6. Publications 1982/83

See 3.6 above.

5.7. Publications proposed 1983/84

See 3.7 above.

6. POLLINATION ECOLOGY OF THE AUSTRALIAN FLORA

6.1. Objectives

To develop an understanding of Australian plant-pollinator relationships, particularly those involving birds and small mammals. To explore the significance of pollination studies in conserving rare plants.

6.2. Procedures

Pollination observations were made on an ad hoc basis in conjunction with field work. Methods were mainly observational, but also may have included capturing pollinators and checking for pollen loads, measuring nectar volume and nectar concentration, and examining related features of the reproductive biology of plants under study. A literature search was continued for observations of vertebrates feeding at flowers of W.A. plants.

6.3. Results

Further original observations of honeyeaters and honey possums feeding on flowers were made. These, together with published observations and numerous personally communicated records from interested colleagues have been collated in draft form for a proposed departmental report. A paper coauthored with A.A. Burbidge on feeding behaviour of birds and mammals on flowers of Banksia grandis and Eucalyptus angulosa was published.

6.4. Conclusions

None.

6.5. Proposals for 1983/84

To continue ad hoc observations.

6.6. Publications 1982/83

Hopper, S.D. and Burbidge, A.A. (1982). Feeding behaviour of birds and mammals on flowers of Banksia grandis and Eucalyptus angulosa. In J.A. Armstrong, J.M. Powell and A.J. Richards (eds.). 'Pollination and Evolution.' (Royal Botanic Gardens : Sydney.)

Hopper, S.D. and Burbidge, A.A. (1982). Observations on honeyeaters and their food plants in Peak Charles National Park. Western Australian Naturalist 15, 74-75.

6.7. Proposed publications 1981/82

A checklist of observations of vertebrates feeding at flowers and on fruit of Western Australian plants - coauthored with Allan Burbidge.

Evolutionary responses of Western Australian plants to nectarivorous birds - co-authored with Allan Burbidge.

Mechanical and temporal controls of flower opening in

Banksia - coauthored with V. Turner.

Pollination ecology of Grevillea petrophiloides coauthored with I. & G. Crook.

7. EVOLUTION AND BIOGEOGRAPHY OF THE AUSTRALIAN FLORA

7.1. Objectives

To develop an understanding of evolutionary processes and biogeographical principles in the Australian flora.

7.2. Procedures

Literature review and analysis, writing manuscripts, ad hoc field work.

7.3. Results

None.

7.4. Conclusions

None.

7.5. Proposals for 1983/84

Continue work on the phytogeography of Australian acacias and eucalypts.

7.6. Publications 1981/82

Maslin, B.R. and Hopper, S.D. (1982). Phytogeography of Acacia (Leguminosae : Mimosoideae) in Central Australia. In W.R. Barker and P.J.M. Greenslade (eds). 'Evolution of the Flora and Fauna of Arid Australia.' (Peacock Publications : Adelaide.)

7.7. Proposed Publications 1982/83

None

COMMITTEES

1. W.A.W.A. Flora Committee.

2. Technical Advisory Committee to the Road Verges Conservation Committee.

3. Convening Committee, Perth Chapter, Australian Systematic Botany Society.

4. CONCOM Working Group on endangered flora.

Committee work this past year involved 10% of my time during office hours.

SEMINARS AND SYMPOSIUM POSTERS

1. Eucalyptus carnabyi - rare hybrid or relict species? School of Environmental and Life Sciences, Murdoch University (May 1982).

2. Flora conservation - Coorow and districts wildflower club (20 May 1982).

3. Evolution of the W.A. flora - University of W.A.'s extension course on wildlife (30 June 1982).

4. Hybridization in spider orchids (Caladenia) - Northern Districts Orchid Club (June 1982).

5. Flora conservation - University of W.A.'s Extension course on wildlife (7 July 1982).

6. Hybridization in Anigozanthos - Australian Academy of Science discussion meeting on the 'Evolutionary Significance of Hybrid Zones' (Canberra, 13 July 1982).

7. Naming new orchids - W.A. Native Orchid Conservation and Study Group (August 1982).

8. Cladistic and phenetic hypotheses of phylogeny in the granite rock mallee Eucalyptus caesia - Zoology Department, University of W.A. (Sept. 1982).

9. Cut flowers and seed harvested by licensed wildflower pickers in 1980-81. University Extension/Department of Agriculture workshop on 'Production and Marketing of Australian Wildflowers for Export' (1 November 1982).

10. Interspecific hybridization in kangaroo paws. University Extension/Department of Agriculture workshop on 'Production and Marketing of Australian Wildflowers for Export' (1 November 1982).

11. Flora conservation - Lesueur Branch of the W.A. Wildflower Society (10 November 1982).

12. Anigozanthos and Conostylis - Maroondah Branch of the Society for Growing Australian Plants (Melbourne, 16 November 1982).

13. Applied plant systematics : case studies in the conservation of rare Western Australian flora - Melbourne Chapter of the Australian Systematic Botany Society (Melbourne, 19 November 1982).

14. Bird pollination in semi-arid south-western Australia. Invited lecture, W.A.I.T. Biology Student Enrichment Program (29 January 1983).

15. Introduction to wildflowers - University of W.A.

Extension course on 'W.A. Wildflowers : evolution and conservation' (15 March 1983).

16. Evolution of wildflowers - University of W.A. Extension course on 'W.A. Wildflowers : evolution and conservation, (15 March 1983).

17. Pollination - University of W.A. Extension course on 'W.A. Wildflowers : evolution and conservation' (29 March 1983).

18. Flora conservation - University of W.A. Extension course on 'W.A. Wildflowers : evolution and conservation' (11 April 1983).

19. Rare flora - University of W.A. Extension course on 'W.A. Wildflowers : evolution and conservation' (19 April 1983).

20. Drakaea, the hammer orchids - W.A. Native Orchid Study and Conservation Group (20 April 1983).

21. Rare flora - Eastern Hills Branch of the W.A. Wildflower Society (15 April 1983).

22. Flora conservation research - W.A.I.T. Biology Department 'Biothon' work experience discussion (27 April 1983).

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

WILDLIFE RESEARCH AND MANAGEMENT SEMINAR

9 May 1983

J.A.K. Lane

1. WETLAND NATURE RESERVES (WNRs) : MONITORING OF WATER DEPTH AND QUALITY

1.1. Objectives

Routine monitoring of water depth and water quality of selected WNRs in the south-west of the State assists in:

i) annual evaluation of conditions for waterfowl breeding

ii) prediction of summer conditions for waterfowl

iii) determination of seasonal, annual and longer-term variations in water depth and quality - important aspects of the condition of WNRs.

iv) management of particular WNRs e.g. Lakes Chittering, Nonalling, Byenup, Tordit Garrup, Poorginup and Chandala.

1.2. Procedures

i) Gauge Installation : 11 depth gauges (staffs) were installed during 1982/83 - 9 on previously un-gauged wetlands and 2 on gauged wetlands. (Some wetlands require more than one gauge due to the gently sloping nature of their shores). The total number of gauged wetlands is now 119. 100 of these are WNRs vested in W.A.W.A. This completes the gauge - installation programme.

ii) Monitoring : Depth and salinity have been monitored by Research Staff at two-monthly intervals since November 1978. Regular monitoring of pH commenced January 1982. West Australian Field and Game Association members have assisted in monitoring since January 1980.

1.3. Results

All data are now on computer and available on request in either tabular or graphical form.

1.4. Conclusions

In conjunction with rainfall statistics, results obtained from the monitoring programme provide a sound basis for season-to-season comparisons of conditions for waterfowl breeding, and for prediction of conditions likely to prevail during impending duck-shooting seasons. (See Research Project 3.10).

The data gathered have also assisted in studies of the distribution and occurrence of aquatic macrophytes (including important bird-food plants such as Ruppia and Chara) in relation to salinity and permanence of habitats. (See Research Project 3.5).

Monitoring of wetland condition during the "Waterbird Usage" project (Research Project 2) is also provided for by the present programme.

1.5. Proposals for 1983/84

Two-monthly monitoring of water depth by Research Staff and W.A.F.G.A. members will continue through 1983/84. Salinity and pH will also be monitored. Monitoring frequency will be reduced to 3 per year (July, Sept. and Nov.) from July 1985 onwards.

1.6. Publications 1982/83

Lane, J.A.K. and Munro, D.R. (1982). 1981 Review of Rainfall and Wetlands in the South-West of Western Australia. Dept. Fish. Wildl. Rept. No. 56 : 1-38.

Lane, J.A.K. and Munro, D.R. (1983). 1982 Review of Rainfall and Wetlands in the South-West of Western Australia. Dept. Fish. Wildl. Rept. No. 58 : 1-41.

1.7. Publications 1983/84

The 1983 Review of Rainfall and Wetlands will be published early 1984.

2. WETLAND NATURE RESERVES : SURVEY OF WATERBIRD USAGE

2.1. Objectives

i) to provide information on waterbird usage to assist in the management of WNRs and in the resolution of conflicts between different uses.

ii) to assess the role and importance of the WNR system in the conservation of waterbird populations

iii) to provide appropriate experience for future monitoring of waterbird abundance.

2.2. Procedures

The Royal Australasian Ornithologists Union has been commissioned to undertake this 4 year study which began in April 1981. Total funding for the project is $93 000; $42 800 from the Wildlife Conservation Trust Fund (duck-shooters' licence fees) and $50 200 from Consolidated Revenue. The RAOU has appointed a full-time Project Coordinator, Mr Roger Jaensch, who has two main roles; to recruit, train and coordinate a team of amateur observers, and to design, test and report on census techniques. A more complete account of procedures is contained in the April 1981 Research Seminar paper.

2.3. Results

The Project Coordinator's activities during the past 12 months have included:

Production of 4 editions of the quarterly project newsletter W.A. Bird Notes.

Participation in a 3-day workshop on waterbird counting techniques at Rotamah Island Bird Observatory, Victoria in May 1982. This workshop closely examined and expressed strong support for the way in which the Waterbird Usage project was being conducted. J. Lane also participated in the workshop.

Training of observers through field excursions and campouts.

Experimentation with various techniques for locating and identifying more-secretive waterbirds (crakes, rails and bitterns).

Inspection and survey of some Nature Reserves not yet covered by amateur observers.

Vetting of survey forms submitted by observers.

Development of programmes (with the aid of a contract programmer from UWARCC) to collate and analyse survey data

Correspondence with observers.

Vital statistics for the project are (10th March '83):

73 active participants (have contributed data) of which 42 (58%) are in country districts (9 at Rockingham).

50 contacts (no data contributed yet, or had left the project).

75 reserves allocated to observers for regular (monthly or two-monthly) survey.

Data received and processed for 82 reserves.

13 reserves judged likely to be important for waterbirds have not yet been allocated to observers.

13 project participants assist with office work, 5 regularly.

878 completed survey sheets have been received. A high standard of data has been maintained and few requests for verification have been necessary. The level of effort has been high and many additional comments have been added to data sheets.

Data from 626 sheets have been incorporated in the data bank at UWARCC. Trial printouts have been circulated to critics and some minor changes to programmes have resulted.

A printout of all data to 31 Dec. '82 is due in April 1983. A summary of this and later data will be presented for the April 1984 Research Review seminar.

2.4. Conclusions

The project is running on schedule and within budget.

Regular coverage of 75 of the 88 reserves believed to be of importance to waterbirds has been achieved.

The 73 active participants are contributing high quality data.

2.5. Proposals for 1983/84

Recruiting and training of additional observers will be given high priority in the forthcoming year, as will data analysis and interpretation.

3. WETLANDS : OTHER STUDIES AND MANAGEMENT PROJECTS

Waterbird Research Staff were involved in a number of other research and management projects during 1982/83.

3.1. History of Regulations Governing Duck-Hunting in Western Australia since First Settlement

An extensive search of relevant literature including more than 60 archived departmental files; Game, Fauna and Wildlife Conservation Acts, and the W.A. Government Gazette from 1873 to 1982 was made during 1982. A first draft has been completed and the final document will be published in the Departmental Report series in 1983/84.

3.2. Lake Chittering

The "check structure" (adjustable-height weir) on the outlet from Lake Chittering continues to require frequent checking and adjustment (by Technical Officer Don Munro) during winter and spring each year in order to fill the lake without flooding the adjoining landholders' properties. Since the check structure was installed in April 1977 it has been possible to hold water right through summer, despite the low rainfalls of recent years. Lake Chittering is therefore a most valuable breeding and summer refuge area for waterbirds.

3.3. Lakes Byenup, Poorginup, Tordit-Garrup (Lake Muir Wetland Nature Reserve).

Mines Department require regular monitoring of water depth, salinity and pH of the above lakes prior to mining for peat. This monitoring has been carried out by D. Munro since April 1977 and is now being performed as part of the wetland monitoring programme (Research Project 1).

3.4. Farm Dams for Waterfowl

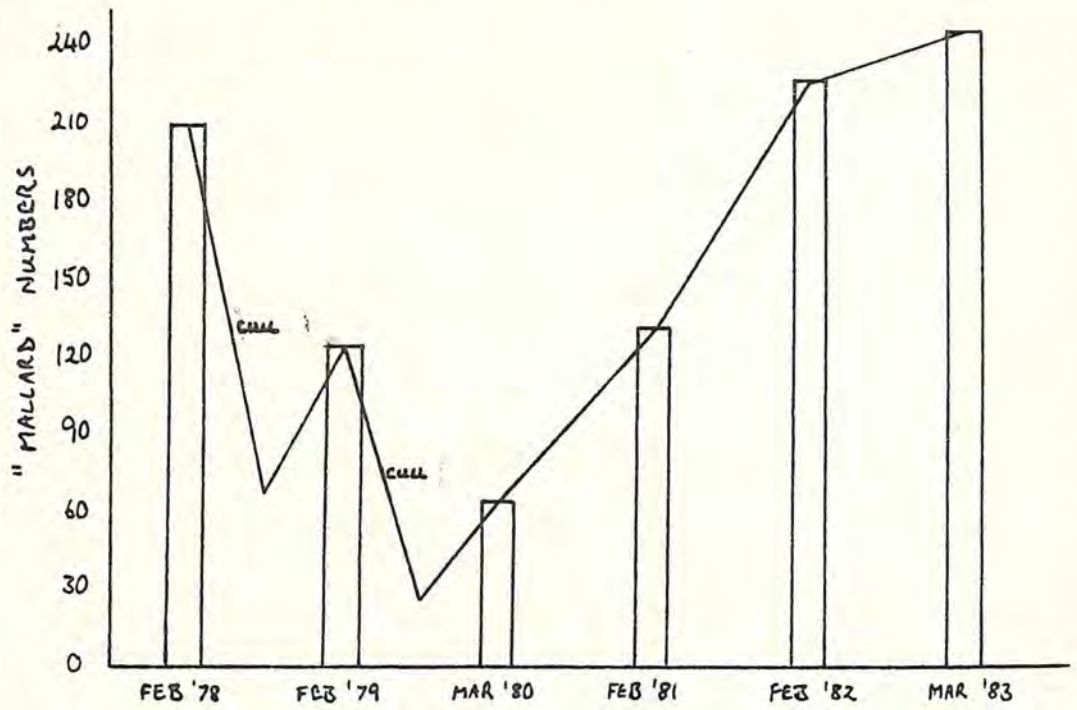
A pamphlet describing methods for increasing the suitability of farm dams for breeding waterbirds, particularly game-species of ducks is being printed for distribution to students of Agricultural High Schools and other interested persons, and for publication in S.W.A.N.S. Members of the W.A. Field and Game Association continue their experimentation with various designs of nest-boxes for ducks.

3.5. Aquatic Flora

Dr M. Brock's studies (Murdoch University) of the ecology of hydrophytes (angiosperms and the larger algae) in salt lakes of W.A. continued during 1982/83. Research Staff assisted with collection of plant material from selected WNRs. Early results of this work were presented to the 2nd International Symposium on Saline Lakes in Canada, June 1982 (Margaret A. Brock and J.A.K. Lane. "The aquatic flora of a wide range of saline wetlands in relation to salinity, depth and permanence." Hydrobiologia in press.)

3.6. Feral Ducks and Geese

The last cull of feral ducks and geese on metropolitan lakes by Departmental staff (D. Munro) was in 1979. From February 1982 to February 1983 feral "mallard" (i.e. Anas platyrhynchos - derived domestic ducks) numbers rose from 223 to 252, muscovy fell from 27 to 17 and geese from 29 to 27. The rate of increase in "mallard" numbers observed in recent years has declined; probably due to the efforts of private citizens who have been encouraged, and in two cases authorized, to remove these birds.



An assessment of the risk in terms of gene flow which the feral "mallard" population poses to native Black Duck (A. superciliosa) populations was suggested to the University of W.A. Zoology Department as an Honours project. It has since been taken up by Ms M. Silberstein and is due for completion by November 1983. D. Munro and members of the W.A. Field and Game Association are assisting with the collection of specimens.

3.7. Australian Wader Studies

Technical Officer Grant Pearson assisted members of the Australian Wader Study Group in planning, equipping and running the spring '83 expedition to the north-west. More than 300 000 waders were counted and 4 100 of these were banded and colour-dyed. (See S.W.A.N.S. 12(2) : 16-20 for report on previous season's activities). In February 1983 Pearson and Lane undertook an aerial survey of the north-west coast as part of a national wader count. 480 000 birds were counted; 310 000 of these were on 80 Mile Beach making this the largest known concentration of migratory wading birds in Australia.

In October 1982, G. Pearson led a one-week course on wader identification, trapping and banding at Eyre Bird Observatory. (Pearson, G.B. 1983. Mobile cannon netting for waders at Eyre Bird Observatory. S.W.A.N.S. 12(3) : 27-30). A similar course will be run by Pearson and Lane in October 1983.

3.8 Wetland Nature Reserves : Card Index and Photographic Library

The card index of administrative information concerning the 250 -odd Wetland Nature Reserves in the southern half of W.A. was up-dated during 1982/83, as was the aerial photographic library (Lands and Surveys Dept. 9" x 9" prints - 1 : 40 000). These continue to be useful in dealing with the many queries which arise each year concerning WNRs and their management.

No further progress has been made towards computerising a salinity-permanence classification of the reserve system. (See Research Project 2 of 1981/82)

3.9. Duck-Shooting Seasons : Opening Day Bag-check Data

Bag-check data for all shooting seasons since 1972 are currently being re-worked for publication during 1983/84.

3.10 Determination of Annual Duck-Shooting Seasons

Decisions concerning duck seasons in the south-west of the State (i.e. the South West and Eucla Land Divisions) are based on annual assessments of conditions for waterfowl breeding. These assessments are based on rainfall data, and on water-depth data derived from the WNR monitoring programme.

Due to poorer than average conditions in 1982 a restricted shooting season was declared for the summer of 1982/83. See Lane and Munro, 1983 (Research Project 1) for a more-detailed explanation of this decision.

3.11 Wetland Creation

No further progress was made during 1982/83 with the proposal to create new wetlands by damming old drainage lines (salt lake chains) of the wheatbelt. A start on this project is now awaiting an assessment of waterbird usage of the Beverley Lakes WNR, as part of the larger assessment of usage of all WAWA-vested WNRs (Research Project 2).

3.12 Benger Swamp

Since 1972 the Department has purchased approx. 85% of Benger Swamp (Harvey). Benger used to be the State's main potato-growing area however rising costs during the 1960's made this an unprofitable activity. Typha orientalis is rapidly invading those areas which are no longer cultivated. This and other problems have necessitated the appointment of a consultant, Mr D. Watkins, 6 months per year for the next three years to study the present situation, liase with landholders and advise the Department on management. Mr Watkins began his appointment in December 1982 and is supervised by J. Lane.

3.13 Buccaneer Archipelago and Lacepede Islands

J. Lane participated in a 3 week biological survey of the Buccaneer Archipelago in June 1982 (see N. McKenzie's review) and 5 days on the Lacepede Islands in July with Technical Officer P. Fuller.

ADVICE AND COMMITTEE WORK

During 1982/83 approximately 20% of the Waterbird Research group's time was spent on advice, committee and liaison work.

COMMITTEES

I am a member of the following committees:

1. Bird Committee of W.A.W.A.

2. Standing Working Group on Birds of the Council of Nature Conservation Ministers. (Corresponding member only).

3. Wetland Advisory Committee of the Environmental Protection Authority. (Didn't meet during 1982/83).

4. Field Investigation Committee of the Royal Australasian Ornithologists Union.

I was on Annual Leave for 6 weeks during 1982/83. Five weeks of this time and one week of Departmental time were spent in South Africa presenting a paper at the "Birds and Man" Symposium and visiting National Parks, Game Reserves and other areas of wildlife interest. The paper was titled "Important Aspects of Duck-Hunting in Australia".

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

WILDLIFE RESEARCH AND MANAGEMENT SEMINAR

9 May 1983

A.J.M. Hopkins

SUMMARY

Work on the completion of existing, major projects has continued throughout the year. No new projects were initiated and little time was spent in the field. Although the main thrust of the work for the next year will be towards preparation of papers on past work, the normal programme of field work will resume. A preliminary study of small scale pattern in vegetation at Tutanning will be undertaken and an experimental fire is proposed for early 1984. The programme of collaborative study at Cambridge University may well stimulate further initiatives.

RESEARCH PROJECTS

FIRE ECOLOGICAL STUDIES

1. MODELLING

1.1 Objectives

To develop an array of ecosystem and land-use modelling strategies for use in reserve management decision making and in research.

1.2 Procedures

The development of PREPLAN (Pristine Environment Planning Language and Simulation) has been discussed in past years. Recent work has been directed towards improving the data base using Geographic Information System technology at ESRI Australia Ltd. The new resource inventory is now complete. It remains to integrate this with the other PREPLAN components.

In July 1982, Dr H.H. Shugart from the Oak Ridge National Laboratory, Tennessee, visited the WAWRC to examine means of modelling succession in local plant communities. A proposal for demographic modelling is being developed.

1.3.,4. Results and Conclusions

The value of this deductive approach to the study of change in, and effects of management decisions on, complex ecosystems have been elaborated in previous years. The approach is complimentary to the inductive approach based on direct observation and measurement.

1.5. Proposals for 1983/84

The new version of PREPLAN will be implemented in the year. A version will be put up on the Tektronix. Assessment of the PREPLAN will then be possible. The experimental fire planned for Tutanning for early 1983 has been postponed for 12 months. PREPLAN will be used in planning this fire.

Development of a JABOWA - type plant succession model will begin with classification of Tutanning plant species by

their reproductive strategies.

1.6. Publications 1982/83

S.R. Kessell, R.B. Good & A.J.M. Hopkins (in press). The Implementation of two new resource management information systems in Australia. Environ. Manage.

1.7. Publications 1983/84

Nil.

2. CENTRAL WHEATBELT STUDIES (TUTANNING, BOYAGIN, DRYANDRA).

2.1. Objectives

To develop a knowledge and understanding of patterns and processes in vegetation in this area, particularly in relation to fire.

2.2. Procedures

Historical and field environmental data are collected and collated in a variety of ways. A permanent systematic grid has been established at Tutanning for sampling and long-term monitoring.

2.3.,4. Results and Conclusions

Field sampling has been completed and grid data are gradually being compiled. A separate study of the shrublands has highlighted the floristic importance of this vegetation type and has shown that species-richness declines little with increasing time since fire (at least to age 50 years).

2.5. Proposals for 1983/84

The experimental burn scheduled for 1983 will be conducted in early 1984. Some plots have been established in the area to be burnt; these will be re-examined in Spring 1983.

Analyses of the Grid data will commence.

A study of Xanthorrhoea growth and flowering patterns is planned.

A study of pattern in some shrub communities has been initiated.

2.6. Publications 1982/83

J.M. Brown & A.J.M. Hopkins (1983). The kwongan (sclerophyllous shrublands) of Tutanning Nature Reserve, Western Australia. Aust. J. Ecol 8 : 61-71.

2.7. Publications 1983/84

A.J.M. Hopkins, A.A. Burbidge & J.M. Brown. Tutannning Nature Reserve I. History, environment and results of some preliminary studies. Dept. Fish. Wildl. West. Aust. Report.

3. TWO PEOPLES BAY

3.1. Objective

To study the processes and time scales of regeneration on south coast kwongan vegetation after fire.

3.2. Procedures

Two study plots have been established, sampled, burnt and resampled over a 5 year period.

3.3. Results

Harvested plant material has been dried and weighed and preliminary results are presented below.

	PREFIRE ($9\frac{1}{2}$ yr old)	IMMED POST-FIRE	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
			GRAZING EXCLUDED				GRAZED
Above Ground Biomass (tonnes/ha-1)	16.4	2.9	6.1	7.5	10.6	16.2	7.7
No species ($625\ m^2$)	~~54~~ 48	0	~~68~~ 56	~~64~~ 61	~~63~~ 56	~~59~~ 58	~~73~~ 64

3.4. Conclusions

The vegetation regenerates strongly after fire particularly in the absence of grazing. Where small patches of vegetation are burnt, grazing is a major influence on regeneration. Ungrazed vegetation could carry a fire under normal circumstances after 5 years; under hot, dry windy conditions it would burn after only 3 or 4 years. A suite of fire sensitive, obligate seed regenerating species (mainly Epacrids) requires a minimum of 4-5 years between fires to maintain population levels.

3.5. Proposals for 1983/84

Analysis of results will continue. Two further harvests are scheduled for October 1983.

3.6. Publications for 1982/83

Nil.

3.7. Publications 1983/84.

A management planning document is currently being prepared and publication of the Draft is scheduled for late 1983. The document will include a chapter on fire as well as chapters on the flora and vegetation.

4. MIDDLE ISLAND, RECHERCHE ARCHIPELAGO

4.1. Objectives.

To monitor the regeneration of the vegetation after fire and to study the development and maintenance of vegetation in the absence of fire.

4.2.,4. Procedures, Results, Conclusions.

As for 1982.

4.5. Proposals for 1982/83.

The report on studies to date will be completed in 1983. A trip is scheduled for November 1983 to monitor regeneration quadrats.

4.6. Publications 1982/83.

Nil.

4.7. Publications 1983/84.

A.J.M. Hopkins (editor). Results of Studies on Middle Island (Recherche Archipelago), Western Australia. Wildl. Res. Bull. West. Aust. No. 13 (carried over from 1982/83).

5. OTHER

5.1. Objectives.

To examine population structure and reproductive strategies of important plant species in relation to fire. To examine the effects of fire on structural and successional patterns in vegetation.

5.2. Procedures.

Sampling of the two Eneabba study sites (discussed last year) has been completed and papers are being prepared for publication.

5.4.,4. Results and Conclusions.

Virtually the complete range of possible regeneration strategies are developed in Eneabba vegetation. These include patch regeneration (reported for tropical rain forest), the slow trickle regeneration and pulse regeneration (after fire or major disturbance).

5.5. Proposals for 1983/84.

Data will be prepared for publication.

5.6. Publications for 1982/83.

Nil.

5.7. Publications for 1983/84.

E.A. Griffin and A.J.M. Hopkins. The dynamics of long unburnt vegetation at Eneabba, Western Australia I and II.

D.J. Bell, A.J.M. Hopkins & J.A. Pate. Fire in the Western Australian kwongan. In J.S. Beard & J.S. Pate (eds). Life of the Sandplain. The kwongan vegetation of south-western Australia.

REGENERATION STUDIES

6. ENEABBA RESERVES

6.1. Objectives.

To develop an understanding of the ecology of the Eneabba area to ensure appropriate land-use management, particularly in relation to the various mining activities on the area.

6.2. Procedures.

Studies undertaken to date are:

1. Ecological survey of the mineral sand mining area at Eneabba.

2. Effects of cutting native vegetation for use in rehabilitation as brush material.

3. Rehabilitation after sand mining (analysis of results of the Allied Eneabba S.E. Factorial experiment).

4. Regional variation in kwongan on lateritic uplands.

5. Detailed ecological survey of the Mt Lesueur - Cockleshell Gully area.

Minor field work undertaken in 1982/83 was mainly in the Mt Lesueur area where CRA Exploration has applied for Coal Mining Leases and Prospecting Licenses.

6.3.,4 Results and Conclusion.

As discussed at last years Seminar.

6.5. Proposals for 1983/84.

Preparation of material for publication will continue.

6.6. Publications for 1982/83

E.A. Griffin, A.J.M. Hopkins & R.J. Hnatiuk (1983). Regional variation in mediterranean-type shrublands near Eneabba, south-western Australia. Vegetatio, in press.

A.J.M. Hopkins, G.J. Keighery & N.G. Marchant (in press). Species-rich uplands in south-western Australia. Proc. Ecol. Soc. Aust. 12.

6.7. Publications for 1983/84

E.A. Griffin & A.J.M. Hopkins. The vegetation of the Mt Lesueur area, Western Australia I. The plateau and slopes of Mt Lesueur. Aust. J. Bot. (in review).

E.A. Griffin & A.J.M. Hopkins. The vegetation of the Mt Lesueur area, Western Australia II. A comparison of two lateritic mesas.

R.F. Black, J. Elkington, E.A. Griffin & A.J.M. Hopkins. Techniques for rehabilitation after heavy mineral sand mining at Eneabba, Western Australia. Reclam. Reveg. Res.

7. BARROW ISLAND

No work was undertaken at Barrow Island over the past year.

8. TUTANNING

8.1. Objectives

To examine appropriate methods for revegetating disused farmland in the central wheatbelt.

8.2. Procedures

This is a collaborative study with Dr Peter Farrington (CSIRO Groundwater). Details are given in last years papers.

8.3.,4. Results and Conclusions

Nil yet.

8.5. Proposals for 1983/84

Dr Farrington will continue to have major responsibility for this work; the commitment of WAWRC staff is small.

8.6.,7. Publications 1982/84

Nil.

9. OTHER

Several other areas on Nature Reserves are being rehabilitated; progress is monitored as appropriate. A detailed study of Phytophthora cinnamomi at Two Peoples Bay Nature Reserve was carried out by a consultant (Dr Ray Hart). The widespread distribution of this pathogen has been demonstrated. Many of these infections predate the creation of the reserve. Results of the study will be discussed later in this Seminar and will be incorporated in the Management Plan. Proposals for management will be developed.

RESERVE ADEQUACY

10. TUTANNING NATURE RESERVE - EDGE EFFECT

No action has been taken in the past 12 months. Data from the Grid samples will be analysed as appropriate.

11. EUCALYPTUS FORRESTIANA

11.1. Objectives

To examine the distribution of Eucalyptus forrestiana and make appropriate recommendations for reserves, particularly in the light of EPA Red Book 1 Recommendation 3-9.

11.2. Procedures

Existing and proposed reserves are surveyed as time permits.

11.3.,11.4. Results and Conclusions

Mr Robinson (Kings Park and Botanical Garden) is presently reviewing the taxonomy of this group. However the E. forrestiana ssp. dolichoryncha is not presently well conserved. Negotiations are underway to conserve populations on Reserve 24952 (Natives) and a small block about 2 km to the north.

11.5. Proposals for 1983/84

This study will be finalized in 1983.

11.6., 11.7. Publications

Nil.

12. OTHER

Two papers on kwongan have been written. The first (on the flora) deals with some aspects of diversity in this vegetation type and addresses the questions of stability/resilienc The second describes the heterogeneous nature of kwongan and discussed possible causes, significance and implication (particularly for reservation).

B.B. Lamont, A.J.M. Hopkins & R.J. Hnatiuk. The flora In J.S. Beard & J.S. Pate (eds) Life of the sandplain. The kwongan vegetation of south-western Australia.

A.J.M. Hopkins & E.A. Griffin. Community Patterns In J.S. Beard & J.S. Pate (eds) Life of the sandplain. The kwongan vegetation of south-western Australia.

MISCELLANEOUS

A number of minor projects are continued as time permits. There was some involvement with biological surveys of the Buccaneer Archipelago and Salisbury Island (Recherche Archipelago) during the past year.

Ms Brown has begun a study of the ecology of Typha on a number of Nature Reserves as part of an honours programme at Murdoch University.

A proposal for overseas study in 1983 received Government approval. The proposal involves a 10 week visit to Cambridge University to work with Dr P.J. Grubb (Botany School) on the contribution of regeneration mechanisms to the maintenance of species-richness in Australian sclerophyllous vegetation types.

SEMINARS, WORKSHOPS, PUBLIC RELATIONS

The Ecological Society of Australia Symposium on Mountain Ecology of the Australian Region (Canberra, May 1982) was attended. A paper discussing the possible significance of the concentrations of vascular plant species around Mt Lesueur and the Stirling Range was presented. The paper (listed earlier) will be published in the proceedings.

An afternoon workshop on plant succession models was organized at WAWRC in July 1982.

COMMITTEES

1. Mineral Sands Agreements (Eneabba) Rehabilitation Co-ordinating Committee (DRD).

2. W.A. Wildlife Authority Flora Committee.

3. Technical Committee on environmental Problems associated with Underground Water Extraction (PWD-MWB).

4. ANZAAS. Section 12. Steering Committee for 1983 Congress.

5. 4th International Conference on Mediterranean Ecosystems for Perth August 1984. Organising Committee.

6. Ecological Society of Australia. Council.

Commitment to committee work and to the provision of advice

within the Department has involved about 25% of time. Of this the major time consuming issue continues to be mining and rehabilitation. The additional amount of time devoted to this area in the past year reflected involvement in the Mt Lesueur coal mining issue, particularly supervision of the environmental programme.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

WILDLIFE RESEARCH AND MANAGEMENT SEMINAR

9 May 1983

CHIEF RESERVE MANAGEMENT OFFICER'S REPORT

IAN G. CROOK

INTRODUCTION

At this time last year the complement of Reserve Management staff was four professional and six general division personnel. The comparative figures for May 1983 are five professional and four general division officers, the changes arising from the resignation of Mr J. Smith, Reserves Officer Wanneroo and the upgrading of the Reserves Officer position at Karratha to a professional item. This change was effected with the appointment of Mr Keith Morris, a graduate of the University of Western Australia and well known to many of you. Keith has been based initially at Karratha where he has started work on a plan for management of the Dampier Archipelago. Keith will be introducing tomorrow the subject of management planning for the Archipelago.

The other change in staff disposition has been the establishment of Reserve Management Officer and Research Officer items for the proposed Katanning Reserve Management Team. This has been achieved at the cost of the Director reassigning one of his two proposed Assistant Director positions to become a Reserve Management Officer. The Reserves Officer post comes from the research section.

These reassignments attest to the priority that strengthening reserve management capability has in the Department, something which has been reflected in the directions and pace we have tried to set and maintain during the year.

In this report I have sought to highlight a few of the year's activities in a summary way. The next two days will be busy ones, when we will get into details, a welcome chance for review, and criticism to which all members are invited to contribute.

1. FIRE PROTECTION OF RESERVES : FIRE SUPPRESSION

Fire protection continues to be the pre-eminent function of nature reserve management in this dry-summered, Western Australian context. Getting the problems and issues under tighter control is the Section's first priority and the importance of fire protection has been underlined this summer by the occurrence of 19 wildfires on or near nature reserves in the south-west. Seventeen were attended by Reserve Management or Wildlife Inspection Branch personnel who assisted local fire fighting authorities in their control. The other two fires were on offshore islands.

To put this figure of 17 fires into some perspective, they have together absorbed over 40 man weeks of work, in actual firefighting.

Without the generous help of District Wildlife Officers this effort would not have been possible, and on a number of occasions the word "help" does not adequately describe the role that District Wildlife Officers have taken. They

have frequently been first on the fire scene by many hours.

One of the first customs we have sought to adopt in fire suppression over the past two seasons has been to respond with aid to all reasonable requests for assistance at wildfires and prescribed or clearing burns on or near nature reserves. The logic of doing so is clear. Given the importance of fire, to us and local interests, assistance at wildfires has become a central part of the "good neighbour" approach to reserve management, in its turn the best means of consolidating the Department's standing with local communities as a competent, interested management authority.

In Western Australia bush fire protection is primarily the responsibility of local communities. Firefighting is carried out by volunteers in their own interests. Local communities are frequently nervous about the big lumps of "dirty" bush on their fences which we call nature reserves. In such a situation, when there is a fire, the arrival of a small force from "Fisheries and Wildlife", even of a single man, who is prepared to muck in and work alongside the locals is about the most positive indication the Department can provide that it is interested in its reserves, and that there may be something on the credit side of the ledger, apart from dickie birds and daisies, to help balance out the risk of farming alongside one of our reserves.

The District Wildlife Officer is usually the best known member of the Department in local communities. He is also usually the closest. It can take fire crews from Wanneroo or Pingelly 4, 6 or even 8 hours to get to a fire. The District Wildlife Officer can sometimes do it in one or two. In big fires, which can require crews for six or more days, back-up and relief are also important. Wildlife Officers have played a major part here, too, and I would particularly mention Peter Lambert, Rob Coughran, Doug Coughran, Ray Smith, Les Quoine, Ian Cooke, Leon Silvester and Bernie Haberley, a number of whom we have called on, or who have called us several times this year.

While on the subject of thanking people I would draw your attention to our temporary fire control labourers. One only from last year, Rick Stone, survived to return as our Foreman. He has been backed up by Terry Bloomer, Neil Stevenson and Glyn Hughes. The Pingelly post has been well occupied by Malcolm Graham. I have seldom had the pleasure of working with a more cheerful, competent and loyal gang of fellows. Midnight, weekends or public holidays make no difference. They've turned out every time without a murmur, they have worked over three weeks unpaid overtime to eke out the funds from which they have been paid while Doug Arnold and Alex Errington have done everything they can to keep the project alive with added money when it was sorely needed.

All this adds up to a major effort. Vehicle and equipment maintenance costs have been very high as well but the

strategy does seem to be working. Fire calls are up but unnotified fires are down. At Quarram Nature Reserve, where we had two fires this year, fighting the the first fire was difficult because of the lack of local interest. The second was quite the reverse. Local volunteers turned out in force. This pattern is repeating itself all over the south-west. There are a few major problem areas remaining but in terms of fire suppression I believe we are on the right track, to the point where we are ready to begin to formalise the direction as part of a detailed fire protection plan for nature reserves for the south-west. Gordon Graham and Ken Wallace are at the forefront of this project which Ken will present during tomorrow's proceedings.

2. FIRE PROTECTION : STRATEGIC MEASURES

2.1. Firebreak Construction and Maintenance

As at 30.3.82, 2 155 km of firebreaks on reserves were maintained by ploughing, grading or slashing, 968 km being in the Pingelly Reserve Management District. 79 km of new breaks were constructed.

A practice of surveying the routes of all proposed firebreaks, for rare flora, and for plants and vegetation communities poorly represented on the reserve concerned, was commenced during the year. Tony Milewski prepared Consultant's reports, as a pilot trial of the approach, for two reserves: South Stirling and Sheepwash Creek Nature Reserves.

This step was taken following the recommendations of a Consultant's report, by Graeme Chatfield, entitled the "Policies, principles and practices of firebreak construction and maintenance for Western Australian nature reserves". This was prepared as a position paper and as part of the basis for the review of our fire protection strategy. The Reserve Management Officer - Katanning will, I hope, have an opportunity to direct a major part of his attention to the development of this strategy.

2.2. Prescribed burning operations

Small progress only has been made with the idea of inter-agency agreements with the Forests Department for prescribed burning of higher rainfall forest and woodland areas. The two reserves to which I alluded in my report of last year were not burned as expected, partly because of Forests Department's own paucity of resources to take on extra work. This does not bode especially well for our hopes of making extensive use of Forest Department expertise in prescribed burning of nature reserves in high rainfall areas. The idea behind this approach is to give our people more time to develop complementary techniques in the burning of woodlands, and coastal and inland heathlands.

Further development of these thoughts I would leave to those developing the fire protection strategy to which I

have already referred.

2.3. Fire protection information

Greater reliance on more people in an increasingly intensive regime of fire protection management requires that formal provision be made for ready access to, and the maintenance of, a wide range of information. Fire crews called on to respond quickly to the report of fire on any one of several hundred reserves will immediately need information about where the reserve is, how to get there, sources of water, names and interest of reserve neighbours, position of firebreaks, fire histories and so on.

A good information system is equally important in the administration of firebreak maintenance and prescribed burning programmes and, outside the immediate fire management area, to other management needs, such as the maintenance of signs and facilities, and matters pertinent to control of pests.

Work on a fire protection information system began last year under the leadership of Ken Wallace and Gordon Graham. During this year Brett Tannahill, a Consultant working in conjunction with Reserve Management Staff, has prepared a valuable report and working model of a manual, file, map and aerial photograph-based information system which appears to meet the great majority of our immediate requirements for nature reserve information. Sue Moore and Gordon Graham will bring us up to date with progress in later sessions of the Seminar.

3. MANAGEMENT PLANNING AND GUIDELINES

3.1. Management Plans

Since my last report Sue Moore has taken over primary responsibility for management planning and I will leave the subject for her to speak on in detail.

The current states of management plans mentioned in my last report are as follows:

Lake Magenta Nature Reserve (No. 4)	Final plan printed
South Dandaragan Nature Reserve - (No. 5)	Draft published, audit of submissions drafted
Toodyay Nature Reserve (No. 6)	Draft plan in press
Two Peoples Bay Nature Reserve (No. 7/8)	In preparation
Nature Reserves near Perth (No. 7/8)	In preparation
Boyagin Nature Reserve (No. 9)	In preparation

Further plans in preparation or projected include:

Nature Reserves of the Shires of York and Northam
Nature Reserves of the Albany Shire
Chiddarcooping Nature Reserve
Nilgen Nature Reserve
Lake Muir Group of nature reserves.

3.2. Management guidelines

The idea of documenting guidelines for particular aspects of management relevant to the whole or a major part of the nature reserve system, providing a basis for consistency, accountability and continuity for planning and operations, has received considerable attention during the year. Two such guidelines documents were readied for publication and provide examples of the idea viz:

- Beekeeping on nature reserves

- A signs standard for use on Western Australian nature reserves.

Several other projects are likely to go the "guidelines" way, including the fire protection work already mentioned):

- Fire protection of nature reserves in the south-west;

- Interpretation of nature reserves; and

- The management planning process.

Several of these topics will be dealt with in some detail by later speakers.

The guidelines idea embraces both policy development on the one hand, and at least the broad issues of its application on the other. It is rightly part of the management planning process and it is appropriate that guideline documentation be published as supplements to the management plan series.

An abbreviated planning process for guidelines has been established, following the model set in the 1975 WAWA Fire Policy document.

One other important thing about the guidelines idea that bears mentioning here is that such documents provide a valuable opportunity for expounding the principles of conservation and management. What is the basis, scientific and otherwise of the Department's approach to fire protection? What are the principles of communiciation which should be applied in a nature reserve sign? What is interpretation and how can the idea be developed to further the management aims of a series of nature reserves in Western Australia?

Despite its isolation Western Australia is near the forefront of conservation area management development. We should continue to work to keep it there and one of several essentials for doing so is to document principles as they are applied and publish the results as widely as necessary. The rationale for doing so is identical to that of publication of the findings of original research. A publication is a basis for criticism and an attributable foundation for the further development of ideas.

Conservation area management in many countries applies the Topsy principle of development. Partly because there is, or seems to be, no time for review, for updating objectives, or for keeping abreast with developments elsewhere, management proceeds in an incremental way. The results are exemplified substantial overpopulation of feral animals in certain U.S. national parks, by visitors loving alpine meadows to death, and by a system of national nature reserves in Britain perceived by many as being increasingly irrelevant to the needs of the country in the 1980s.

The only way I know to avoid such as these is through effective planning, in which the ad hoc and incremental approach is replaced by documented procedures based on stated objectives and principles, all of which are the subject of regular review: an iterative management system. The guidelines idea is one application of this interactive approach to management.

4. THE RURAL INFORMATION SYSTEM (RIS)

For our short term needs manually maintained files of maps, contact sheets and the like, properly administered and maintained, can give us the bare bone facts essential to efficient operations activity. The rural information system projects are interdepartmental initiatives aimed to solve the similar needs of agencies such as Mines Department, Forests, Public Works, Main Roads, Lands, and several others including ourselves, by employing the best available technology.

We as a Department have been taking a leading role in the R.I.S. which has already taken a shape which could embrace many of the information needs of Branch activities such as flora management, wetland monitoring and bushfire modelling as well as nature reserve management in the longer term.

We will be referring to the RIS in more detail later in the conference.

5. TWO PEOPLES BAY

I have singled out Two Peoples Bay for special mention for two reasons. During the year the Section funded a consultant's report on the distribution of Phytophthora caused dieback on the reserve. The consultant, Ray Hart, a microbiologist by profession, has come up with some disturbing results which need our urgent attention at this

conference.

The second reason is the imminent arrival of Mr Don Merton of the New Zealand Wildlife Service, an ex-colleague of mine whose skills in the field of re-establishment of new populations of birds are probably without parallel. He has certainly been responsible for saving one New Zealand species, the South Island Saddleback, from certain extinction following escape of ship rats on Big South Cape Islands, till then the last refuge of the bird. He has been instrumental in fostering, and perhaps averting the extinction of several more: the New Zealand Flightless Parrot - the Kakapo, the North Island Saddleback, the Chatham Island Robin, and the North Island Kokako, a member of the same endemic family of New Zealand Wattlebirds as the Saddleback.

Don is one of the most experienced people I know in management of offshore islands as conservation areas and WAWA has agreed to fund his travelling to Western Australia for the purpose of imparting some of his experience, and more specifically of attempting to establish a new colony of Noisy Scrub Birds on Mt Manypeaks Nature Reserve.

6. INTERPRETATION

Interpretation of nature reserves to the public is a new field in Western Australia and one, I believe, needs a particularly professional approach. There are two papers in this meeting which will highlight the interpretation idea: one, a report by Trevor Ramsden on the psycho-sociological basis of the use of signs; and the second, a broader treatise on interpretation prepared by a consultant, a report which could well form the basis of an interpretation strategy for this Department to follow.

7. CONCLUSION

In summing up I would draw your attention to the major thrusts of management development as they have shaped up during the past two years. It has been a period of intensive activity in three areas:

- OPERATIONS: To maintain and foster a professional approach to day to day management operations. In this Ken Wallace has taken the major lead. The Pingelly Reserve Management district vindicates both the vision of the people who conceived of the country-based management team idea and Ken's approach to bringing the idea to functional reality.

  More recently Gordon Graham has joined Ken on a near-equal footing working toward establishment of Wanneroo as part of the regional scheme. This will continue as an area of rapid and substantial development.

- PLANNING: The interface between research and

development of management principles on the one hand and management operations on the other. Without planning there is chaos. Here Sue Moore, with the assistance of Trevor Ramsden and Andy Williams, has made and is continuing to make great and satisfying progress.

- INFORMATION: The Key to decision-making. The stage is nearly set for work in this field, too, to continue to develop under its own steam.

Effective management operations and the planning and information needed to drive them are beginning to converge as the main elements of an overall strategy for the management of Western Australian nature reseves. The establishment of such a strategy has been my objective. Over the next two days there will be many chances to gain more detailed insights of this strategy and its parts. I hope you enjoy the opportunity to do so and hence contribute to their development.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

WILDLIFE RESEARCH AND MANAGEMENT SEMINAR

9 May 1983

S.A. Moore

1. MANAGEMENT PLANNING

1.1. Objectives

To produce management plans for individual nature reserves of high importance and for groups of nature reserves of a similar type, or in the same local area.

To produce management plan supplements to guide the use of nature reserves for specified purposes (e.g. policy regarding beekeeping), or to document and describe standards set for management procedures (e.g. signs standard).

To produce consultants' reports which complement the management planning process (e.g. nature reserve management information system).

1.2. Procedure

Planning documents completed over the past year are listed in Section 1.3.

The management plan supplementary series has been initiated over the last year; the first publication in this series being 'Beekeeping on the Nature Reserves of Western Australia'.

Procedures and results pertaining to the nature reserve information system are detailed in 'Section 2. The Nature Reserve Management Information System'.

1.3. Results

The following management planning documents are at the stages of the planning process detailed below.

Management Plan Supplement No.	Document Name	Stage
5	Nature Reserves of the Shire of Dandaragan, Volume 1	Preparation of audit of public submissions
6	Nature Reserves of the Shire of Toodyay	Draft plan in press

Management Plan Supplement No.		
1	Beekeeping on the Nature Reserves of Western Australia	Draft plan in press

The "beekeeping" management plan supplement outlines WAWA policy regarding beekeeping on nature reserves, and indicates the reserves available, and the suitability of these reserves, for beekeeping.

1.4. Proposals

The following year should see the completion, at least to the draft stage, of the following management plans.

Nature Reserves of the Shire of Wyalkatchem.

Field surveys are complete and compilation of the draft planning document should be completed in the following year.

Nature Reserves of the Shires of York-Northam.

This project is in the pre-planning stages.

Chiddarcooping Nature Reserve.

Comprehensive field surveys will form the basis of this plan and these should be completed over the following year.

Nilgen Nature Reserve.

A management plan for the reserve is in the pre-planning stages following eviction of squatters from the reserve and the upgrading of perimeter firebreaks.

1.5. Publications

Moore, S.A., Crook, I.G., Williams, A.A.E. and Chatfield, G.R. (1983). 'Nature Reserves of the Shire of Toodyay. West. Aust. Nat. Reserve Manage. Plan No. 6 (Draft)' (Dept of Fish. and Wildl. : Perth).

Moore, S.A., Williams, A.A.E. and Crook, I.G. (1983). 'Beekeeping on the Nature Reserves of Western Australia. West. Aust. Nat. Reserve Manage. Plan Supplement No. 1 (Draft)' (Dept of Fish. and Wildl. : Perth).

Moore, S.A. and Ramsden, T.J. (1983. 'Nature Reserves of the Shire of Dandaragan, Volume 1. West. Aust. Nat. Reserve Manage. Plan No. 5 (Audit of Public Submissions)' (Dept of Fish. and Wildl. : Perth).

1.6. Future Publications

Management plans, at various stages of the management planning process, for those reserves covered in 'Section 1.4. Proposals', will be published over the following year.

2. NATURE RESERVE MANAGEMENT INFORMATION SYSTEM

2.1. Objective

To establish an easily accessible system for the storage and retrieval of data pertinent to the management of nature reserves.

2.2. Procedure

A consultant was employed for four months to establish and develop the reserve information system; accompanied by a report outlining the proposed uses of the system, its maintenance needs, and recommendations for future developments.

2.3. Results

The Nature Reserve Management Information System is now in use, and data is stored either in an operations, or management data, file. Information for each reserve covered by the system is stored in the former if it is needed in day-to-day operations, and in the latter if it is required in longer term management planning.

This system has provided a basic structure from which reserve information can be transferred into the Rural Information System (RIS) Joint Project (Section 3. Rural Information System Joint Project).

2.4. Publications

Tannahill, B.A. (1983). 'The Establishment, Development and Proposed Uses of a Management Information System as an Aid to the Management of the Nature Reserves of Western Australia. Reserve Management Consultant's Report No. 2' (Dept of Fish. and Wildl. : Perth).

3. RURAL INFORMATION SYSTEM (RIS) JOINT PROJECT

3.1. Objectives

To use Intergraph to store, retrieve, manipulate and display textual and graphic information pertinent to reserve management and planning. A complementary objective is to liaise closely with other Government departments to prevent duplication of information and allow ready access to all available information held by other departments.

3.2. Procedure

Complete familiarisation with the Integraph system and its capabilities is being achieved through training sessions, workshops and "hands-on" experience.

The Lake Magenta area, which contains six nature reseves, the largest of these being Lake Magenta Nature Reserve, has been chosen as the primary study area for the Joint Project. Therefore most of the data input, data manipulation and data display focuses on Lake Magenta Nature Reserve.

3.3. Results

None as yet.

3.4. Proposed Publication

The Department's participation in the Joint Project, and uses and expected benefits of the system, will be documented, and published, following project completion.

EXTENSION, PUBLIC RELATIONS

Discussions with, and advice given to, the Wanneroo Shire Council regarding the rehabilitation and management of Marangaroo Reserve, an area of degraded bush in the Shire of Wanneroo.

COMMITTEES

Group Leader RIS Joint Project.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

WILDLIFE RESEARCH AND MANAGEMENT SEMINAR

9 May 1983

K.D. Morris

1. PREPARATION OF A DRAFT PLAN TO MANAGE THE NATURE RESERVES IN THE DAMPIER ARCHIPELAGO

1.1 Background

The value of the islands in the Dampier Archipelago for both nature conservation and recreation has been realized for some time.

As early as 1962, recommendations were made by the Australian Academy of Science that islands in the Dampier Archipelago be gazetted as nature reserves, and that recommendations be made regarding the use of the islands for public recreation.

In 1974, the Conservation Through Reserves Committee (CTRC) recommended that the Dampier Archipelago be divided into several land use areas, these being areas for wildlife sanctuary, public recreation, port sites and associated industrial development, and provision for a causeway to Legendre Island.

The Dampier Archipelago Reserves Committee comprising local members of the public felt that the CTRC report did not deal with the needs and requirements of the increasing population in the area. They submitted their own report to the Environmental Protection Authority (EPA).

The EPA subsequently recommended in 1975, that the Dampier Archipelago should be managed in a way that recognized the multiple use of the islands. It was recommended that the total area should be an A Class Reserve vested in the Western Australian Wildlife Authority, with some areas set aside for open recreation, including camping, under controlled conditions.

In 1977, Cabinet endorsed the recommendations of the EPA for the multiple use of the Dampier Archipelago. Rosemary and Enderby Islands were to be set aside as A Class Nature Reserves and Goodwyn, Malus, West Lewis, East Lewis, Angel, Gidley, North Gidley, Keast, Hauy and Delambre Islands were to be set aside as C Class Nature Reserves. Areas on some of these islands were to be set aside as recreation reserves, vested in the Minister for Conservation and Environment. The Minister for Conservation and Environment also approved the appointment of the Dampier Archipelago Recreation Advisory Board to advise on the management of the proposed recreation reserves. The Department of Fisheries and Wildlife was initially represented on this board and a management proposal for the recreation reserves was presented to the Minister in August, 1981.

In June 1978, a Reserves Officer was appointed to manage the proposed Nature Reserves.

Further provision was made by Cabinet for the existing applications by Hamersley Iron for mineral leases to mine limesands and limestone on Enderby Island, and the islands designated as C Class Nature Reserves, to be granted. All applications for mining tenements on Rosemary Island were to be refused.

1.2. Present Status

Dolphin Island (approximately 3 600 ha) Reserve 134944 was gazetted as a B Class Nature Reserve in October 1977.

In October 1980, many of the larger islands in the Dampier Archipelago were gazetted as nature reserves and vested in the Western Australian Wildlife Authority. The relevant reserve classifications and the islands involved were as follows:

- Reserve A 36915 (approximately 4 352 ha) comprising Enderby Island and a major portion of Rosemary Island.

- Reserve C 36913 (approximately 6 090 ha) comprising Goodwyn, Keast, Cohen, Hauy and Gidley Islands, Collier Rocks and major portions of Malus, East and West Lewis, Angel and Delambre Islands.

The remaining portions of Rosemary, Malus, East and West Lewis, Angel and Delambre Islands were gazetted as Recreation Reserves and vested in the Minister for Conservation and Environment.

The multiple use of the islands was reviewed in October 1982 when the then Minister for Conservation and Environment inspected the Dampier Archipelago. His recommendations to Cabinet were that the whole of the East and West Lewis Islands, and Whalers Bay on Malus Island, be gazetted as Recreation Reserves, and the remaining Recreation Reserves be returned as Nature Reserves. Leases would be offered to the present shack owners on the recreation reserves, and the Department of Conservation and Environment are presently preparing management plans for the recreation reserves, which include formulating lease conditions for the shacks.

1.3. Objectives

As a Reserve Management Officer, I was appointed to Karratha in October 1982 to prepare a management plan to ensure the conservation of the habitat and wildlife of the Nature Reserves in the Dampier Archipelago. The close association of nature reserves and recreation reserves requires careful co-ordination of management programmes for the two classes of reserve.

I see the preparation of the management plan for the nature reserves as consisting of two major parts.

1. Undertaking a biological survey of the islands and

research into specific aspects of the fauna utilizing the islands. This research should be directed toward those species whose habitat is most vulnerable to human interference.

2. Assessing the magnitude of the public use of the nature reserves and establishing means by which public awareness of the nature reserve status of the islands can be stimulated.

The management plan should be completed by April, 1985.

1.4. Biological Survey and Research

1.4.1. Fauna Records

Using my own records and records of previous collecting trips, inventories of the vertebrate fauna of the Dampier Archipelago and the adjacent mainland have been made.

At present, the vertebrate fauna list is

	Dampier Archipelago	Mainland (Burrup and Dampier Salt Lease)
Mammals	8 (7 + 1)	15 (12 + 3)
Birds	74	90 approx
Reptiles	36	33
Amphibians	1	3

Six species of bird have been recorded breeding on islands in the Dampier Archipelago.

Biological survey will continue, to ensure a complete faunal list is available for the Dampier Archipelago.

The Departmental Research Station on Enderby Island provides a suitable base for biological survey and research work and it is intended to upgrade this establishment to encourage future research on the islands.

1.4.2. Island Biogeography

This year I am co-supervising an Honours student from the Zoology Department, University of W.A. on a project which involves examining the relationship between island reserve size and faunal diversity. It is expected that this work will concentrate on reptile and bird species on the small islands of the archipelago. This study should provide valuable information on the species - area relationship for the islands which can be used in the preparation of the reserve management plan. As some of the islands to be

studied are presently vacant Crown land, this study will also provide data on which to base recommendations for nature reserve status.

1.4.3. Rodent Ecology

I intend commencing a field study of the ecology of Rattus tunneyi and Pseudomys hermannsburgensis, two of the four native rodent species in the Archipelago. Aspects such as diet, water and sodium physiology, and population dynamics will be examined. These species occupy the foredune and sandplain areas of the larger islands; habitats which are adjacent to beaches and are most likely to suffer degradation following excessive or abusive public use. A control burn on Enderby Island in 1980 also provides an opportunity to examine these species' response to fire. The distribution of these and other small mammals on some of the smaller islands will be determined during work with the Honours student in August/September 1983.

1.4.4. Turtle Breeding

The Dampier Archipelago is an important rookery for at least three species of marine turtle: Chelonia mydas, C. depressa and Eretmochelys imbricata, and it is hoped to commence a study from December 1983 to February 1984, into the breeding biology of these species. It has been proposed to investigate the nesting distribution of these species and collect data on the population dynamics of each species. An obvious conflict in the use of beaches exists between the turtles and the public, and a study of this type is considered necessary to prepare a suitable management plan to ensure the preservation of the turtle rookeries. This study would continue during the summer of 1984/85.

1.4.5. Rock-wallaby Research

No further work on this project has been conducted since 15 Rock-wallabies were released on sandplain areas on West Lewis Island in August 1982.

1.4.6. Flora

Approximately 160 species of native plant are known from the islands, and six floral associations can be determined. One species of introduced plant, the Prickly Pear (Opuntia sp.) is established on East and West Lewis, and Enderby Islands. Previous eradication measures have proved unsuccessful and I am presently negotiating with the Agriculture Protection Board about the eradication of the Prickly Pear.

A vegetation map delineating the major vegetation association and identifying the dominant species present will be prepared for the nature reserves.

I am now involved with the establishment of the Pilbara

Flora Collection, being the convenor of the management committee for this collection. This project is supported by the W.A. Herbarium and the reference collection will be accommodated in the Karratha College. The collection will be managed by representatives from the W.A. Herbarium, Karratha College, National Parks Authority, Hamersley Iron, Forests Department and Department of Fisheries and Wildlife. This collection will become a valuable reference source for resident and visiting biologists working the Pilbara, and it is hoped that a full time collector from the W.A. Herbarium will be based in Karratha for 1984.

1.5. Public Utilization of the Nature Reserves

1.5.1. Background

The islands of the Dampier Archipelago provide a recreation area for approximately 21 000 - 25 000 people from the Dampier, Karratha, Wickham and Roebourne areas. Estimates of the amount of public utilization of the islands have been obtained by aerial and surface surveys during weekends, especially long weekends. Up to 76 boats have been observed at any one time moored in bays in the Dampier Archipelago. Twenty of these were associated with camping on nature reserves. These figures are probably under-estimates as many boats go beyond the Archipelago during the day, returning to shacks or to camp at night. Most popular are Malus, Rosemary and East and West Lewis Islands. However there are plans to construct a public launching ramp in Withnell Bay once construction of the NW Gas pipeline has been completed, and this will possibly make Angel, Gidley, Dolphin and Hauy Islands and Collier Rocks more accessible. Recently a marine charter company has commenced operating to the Dampier Archipelago and Monte Bello Islands.

Public utilization of the nature reserves is usually restricted to use of the beach and foredune areas. The generally arid nature of the islands and lack of fresh water effectively prevents use of larger areas of the islands. Generally, the beaches of the nature reserves are used only by day trippers and campers. This group of the public tend to avoid the shack beaches which are predominantly on the recreation reserves.

At present there are 31 shacks on the islands in the Dampier Archipelago. Their distribution is as follows:

Rosemary	two shacks - NW Game Fishing lease, and Associated Surveys.
Enderby Island	three shacks - including the Departmental Research Station.
Malus Island	seven shacks - recreation reserve in Whalers Bay.
West Lewis Island	13 shacks, including two built in Keoghs Cove following gazettal as

	a Nature Reserve.
East Lewis Island	two shacks - recreation reserve.
Delambre Island	three shacks - recreation reserve.
Goodwyn Island	one shack built following gazettal as a Nature Reserve, - owner has until 30th June to remove it.

The Department of Conservation and Environment intend to initially restrict the number of leases available on Recreation Reserves for shack development. However long term plans envisage an increase in the number of shacks, especially on East and West Lewis Islands.

1.5.2. Problems Associated With Public Utilization

As with many areas involving public utilization, the most obvious problems on nature reserves are rubbish, dogs and potential for wildfires. The problems of rubbish and dogs could be reduced significantly by a combined education and enforcement programme. The erection of large signs at all boat launching ramps and on commonly used beaches clearly showing the reserve status in the Dampier Archipelago and stating the conditions which must be observed by people landing and/or camping on the islands should be done as soon as possible. Strategically located rubbish bins such as at the boat launching ramps may encourage people to bring their rubbish back with them. Consideration should be given to the provision of certain beaches on nature reserves for camping purposes however selection of the appropriate beaches would require further investigation.

An approach to the public through articles in the press has been initiated and should be continued. These articles inform people of the work being done on the islands and serve to emphasize the "do's and don'ts" for use of the islands. Ultimately, enforcement of the Wildlife Act is necessary to ensure the preservation of the nature reserves, and this requirement will be further accommodated with the appointment of a Reserves Officer once the management plan has been accepted as a working document.

Many fire places have been haphazardly established on beaches and foredunes of nature reserve beaches and I consider the potential for wildfire is significant. The nature of this vegetation, arid climate and usually strong winds would ensure a fairly hot burn and very slow regeneration. Legendre Island was partially burnt in September 1982, and because of the lack of rain this summer no regeneration has yet occurred and the prevailing westerly breezes have begun to erode the top soil away.

The provision of safely located barbeques on beaches selected for camping would reduce this potential hazard.

The eviction of the illegally built shacks from nature

reserves, and the prevention of further shacks being built on nature reserves also necessitates an enforcement aspect to a management plan for the nature reserves.

I have now closed the airstrip on Rosemary Island, and following the discovery of vehicle tracks on the beach at Chookie Bay, suggested that the department have input into the conditions of lease for the NW Game Fishing Club on Rosemary Island. I consider that vehicles are not necessary on the island and should be removed.

Finally, I would like to emphasize that the success of a management plan for the nature reserves in the Dampier Archipelago depends largely on the continued presence of a Reserves Officer responsible only for the island nature reserves, and a close liaison with the Department of Conservation and Environment in their management of their recreation reserves.

2. PROJECT INVOLVEMENT OUTSIDE THE DAMPIER ARCHIPELAGO

2.1. Rattus rattus on Barrow and adjacent islands:

During February 1983 I visited Barrow Island with a Wildlife Authority/Departmental party to familiarise myself with the area. During April 1983, I was involved in a programme to eradicate Rattus rattus from Boomerang Island and to determine the extent of their distribution on Barrow Island.

2.2. Kingfisher Mortality:

Carcasses of the Sacred and Red-backed Kingfisher from Karratha, Dampier, Wickham, Port Hedland and Exmouth were forwarded to the Government Chemical Laboratories after several members of the public contacted the office with reports of dead and dying Kingfishers in their garden. This mortality coincided with pesticide spraying on public grounds and around gardens. Results show that the Sacred Kingfishers contained 1.2 mg/kg Dieldrin and 0.8 mg/kg Heptachlor. The Red-back Kingfisher contained 0.54 mg/kg Dieldrin and 1.4 mg/kg Heptachlor.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

WILDLIFE RESEARCH AND MANAGEMENT SEMINAR

9 May 1983

K.J. Wallace

1. FIRE

1.1. Firebreak Design and Construction

To the present date (April 2) no new firebreaks have been constructed. This year, however, work is programmed for the Boyagin, Tutanning and Dunn Rock Nature Reserves during April and May.

Budget proposals for the 1983/84 fi ancial year make provision for survey work by consultants to be carried out on the Westdale Nature Reserve complex, and on the Dunn Rock Nature Reserve. This work will provide a sound basis upon which to design and construct internal firebreak systems for these important Nature Reserves.

1.2. Firebreak Maintenance

Firebreaks managed from Pingelly now exceed 1 000 km, however this includes some reserves which lie within the Katanning Management District. In the coming twelve months it is intended to embark on a concerted programme to prevent firebreak erosion on larger Nature Reserves. It has also been decided to assess more accurately the effectiveness of herbicides and heavy equipment, such as blade ploughs, used in the maintenance of firebreaks.

1.3. Fire Control

To the present date (April 2) one wildfire has occurred on a Nature Reserve in the Pingelly District. The fire escaped from a clearing burn on adjoining private property. While only a small area of reserved land was burnt, action by departmental units prevented a potentially serious wildfire occurring. It is becoming apparent that the conditions on permits for burns adjoining Nature Reserves require more rigid constraints.

During February and March 1983 nine burns adjoining Nature Reserves were attended by personnel from the Pingelly Team. While this type of work is of great importance, it is exceedingly disruptive to on-going work programmed for late summer and early autumn.

A small prescribed burn has been programmed for a buffer strip on Boyagin in April/May of 1983. A method of monitoring the effects of prescribed burning on vegeation will be tested at this burn.

2. BIOLOGICAL SURVEY

2.1. Proposed Nature Reserves

Since April 30, 1982 12 areas of bushland have been examined and of these 9 have been recommended as Nature Reserves.

2.2. Vesting of Nature Reserves

One un-vested Nature Reserve has been surveyed since April 30, 1982 and recommended for vesting in the Western Australian Wildlife Authority.

2.3. Boyagin Nature Reserve

During 1982/83 a soil survey of the Boyagin Nature Reserve was completed by officers of the Department of Lands and Surveys. Broad scale mapping of the vegetation of Boyagin began during 1982/83 and it is anticipated that this will be completed before August. Once the vegetation map is completed, a draft bulletin on the natural history of Boyagin will be produced.

2.4. Tutanning Nature Reserve

Permanent pit-lines have been established at six sites on the Tutanning Nature Reserve to provide more detailed information on the ground fauna of the Reserve. This work is providing the basis upon which reptile and amphibian inventories for the Reserve are being written. It is anticipated that this work will continue for a further 18 months so that the impact of a prescribed burn on certain fauna may be assessed.

3. RESEARCH

Liaison with various research groups has continued throughout 1982/83.

4. GENERAL MANAGEMENT ACTIVITIES

A wide range of general management activities have been undertaken by the Pingelly Team. These have included:

1. examination of proposals to mine on Nature Reserves,
2. inspection of Nature Reserves,
3. production of base maps for Nature Reserves,
4. general maintenance activities,
5. examination of proposed land purchases.

5. OPERATIONS MANUAL

No work was carried out on the operations manual apart from assistance given to a consultant who was writing a policy document on firebreaks.

6. PUBLIC RELATIONS AND EDUCATION

Public relations and education activities have involved:

1. talks at an Advanced School of The Bush Fires Board and at the unveiling of a plaque at Mt Madden;
2. involvement with groups visiting the Pingelly District including international and interstate visitors.

7. OTHER ACTIVITIES

During late September and early October 1982, I participated in a workshop/seminar on Wildlife Conservation for management personnel in south-eastern Australia. This provided some most useful insights into management for wildlife conservation.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

WILDLIFE RESEARCH AND MANAGEMENT SEMINAR

9 May 1983

J.T. Goodsell

1. PREPARATION OF A DRAFT PLAN TO MANAGE A SYSTEM OF NATURE RESERVES OF THE PERTH REGION AS AN ENVIRONMENTAL EDUCATION RESOURCE

This is a plan to develop the following nature reserves in the Perth region (referred to throughout as PNR) as a resource for environmental education while protecting the wildlife habitats the reserves support:

Nature Reserve	Area (ha)
Carnac Island	19
Clackline	459
Forrestdale Lake	244
Goonaring Spring	40
Lake Joondalup	465
Mokine	289
Ellen Brook	67
Twin Swamps	155
St Ronans	118
Wambyn	215

The plan also aims to integrate management of these with three other reserves in the Perth region for which management plans are already in effect, viz.

Thomsons Lake	509
Modong	154
Moondyne	1991

A preliminary summary of the scope of the plan was presented at the 1982 Seminar. A preliminary draft of the plan was prepared during 1982-83 and a progress report is presented at this Seminar.

2. SURVEY OF VISITOR USE OF THE PERTH NATURE RESERVES (PNR)

2.1. Objectives

As part of the plan for their management, to design a visitor-use monitoring system which has the inherent ability to quantify and characterise use patterns of the Perth Nature Reserves.

2.2. Procedures

The 14 Perth Nature Reserves have been visited in order to survey the response of their biophysical resources to visitor use, and in order to survey patterns of use by visitors. Absolute counts of vehicles, visitors and distributions of both, have been made at 1330 hours. The sampling unit has been identified as the "group" and 14 sets of user categories have also been identified. A standard format of survey questions has been designed and visitors reactions to this approach has been tested. In

all cases visitors were keen to be involved.

As routine inspections only began in 1982, sample sizes overall are not yet large enough for a valid statistical analysis. However, the survey system has been tested at Carnac Island during summer over two weekend Sundays when 17 groups, representing 82 people were interviewed. Plane flights have also been made over the Island at 1330 hours in order to count absolute numbers and distributions of boats and visitors. In summary, the results of this test survey was as follows:

Numbers of boats using the Island as an anchorage on each Sunday: 18, 20, 42, 62, 74.

All visitors were residents of Perth and 81.25% intended to visit the Island when they left home. The Island's attractions are its proximity to Perth, seclusion, marine-environments, and animals; almost all said that they were interested in observing the Sea Lions.

The size of each group was 4.8 ± 1.7 (range 2 people to 8 people) and the time spent by each group at the Island was 4.32 ± 2.11 hours (range 1 hr and 10 minutes to 8 hrs). The numbers of days spent by each group at the Island per year are 5.23 ± 3.96 (range 1 day to 12 days).

Based on responses to requests about occupations, the leaders of each group (a family usually) were in the middle to upper income bracket. The out-of-pocket expenses incurred by each group was $\$21.11 \pm \$10.76$ (range \$10 to \$50). The value of boats owned by the groups ranged from \$5 000 to \$13 000.

The age composition of the visitors interviewed were:

0-15 years	:	36%
16-25 years	:	8%
26-40 years	:	39%
41-65 years	:	17%
65 - over	:	0%

Some interesting results have emerged from this test survey.

1. Visitors almost without exception were keen to assist an interviewer provided that an appropriate approach was made.

2. Visitors were going to the Island to enjoy it for what it is.

3. The test survey demonstrates that even average income earners are spending substantial amounts to visit the Island, thus implying that its aesthetic values are also valued economically.

4. The 26-40 age bracket were 39% of the total interviewed, and these represent the parents of children in the

0-15 age bracket. The latter account for 36% of the total. This implies that these children are being committed to a recreation use of the Island and will very likely be taking their own children to enjoy Carnac Island within twenty years. It would seem that this indicates there is now a pressing need to install some types of environmental education facilities in order to orient the children as well as the parents towards uses that are appropriate for the Island.

2.3. Proposals for 1982/83

Use-patterns will continue to be surveyed in order to determine their effects on reserves.

3. COMMITTEES

1. Advisory Committee - Diploma of Natural Resources - W.A.I.T.

2. Advisory Committee - Undergraduate Degree in Biology - W.A.I.T.

3. Northern Arthur River Wetlands Rehabilitation Committee.

4. PUBLIC RELATIONS AND OTHER ACTIVITIES

4.1. A talk was given to the Western Australian National Parks and Reserves Association on 15.9.82 concerning the use of the Perth Nature Reserves as an environmental education resource.

4.2. At Lake Toolibin Nature Reserve a WISALT interceptor drainage system was constructed during April 1981 along the lake's western side, both inside and outside the nature reserve's western boundary and directed water from farmland into the lake. The work represented an infringement of Regulations 46E (interfrence with water level) and 46L (construct or maintain a drain) of the Wildlife Conservation Regulations. Subsequently, prosecutions were instigated and the offences were dealt with at Narrogin Court House on 14.7.82.

A plea of guilty was entered in response to the prosecution concerning Regulation 46L, but the prosecution under Regulation 46E was defended. The prosecuting Wildlife Officer's evidence related to the act of constructing a drain. Additional to this, however, my role as a witness was to give technical evidence as to why the offence was deleterious to the lake's ecology. The Magistrate's subsequent finding was in favour of the Department, the defendant being found guilty.