Department of Conservation and Land Management
Western Australian Threatened Species and Communities Unit

W.A. Wildlife Research Centre
Ocean Reef Road, Woodvale
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Your ref:
Our ref:

Ian Abbott
Science & Information

Dear Ian

WA THREATENED SPECIES AND COMMUNITIES CONFERENCE

Thank you for your attendance at the conference. We were very pleased with the presentations, they were of high standard and extremely informative, and all were very positive about the future. Everyone I have spoken to thought the conference a success.

Because of the large amount of paperwork involved with copying all the overheads presented at the conference, I have included photocopies only to persons whom have especially requested them. If you feel the need to obtain a particular overhead or a complete set, please telephone Jill Pryde (4055128).

Yours sincerely,

Andrew A Burbidge

ANDREW A BURBIDGE
Director, Threatened Species and Communities Unit

16 May 1994

COL INGRAM EXTERNAL RESOURCES
COMMUNITY INVOLVEMENT COORDINATOR

MAXIMISING EXTERNAL RESOURCES

OPPORTUNITIES

- PARTNERSHIPS
  - ECO-TOURISM
  - SPONSORSHIP
  - THE COMMONWEALTH
  - COMMUNITY
    - VOLUNTEERS
    - COMMUNITY ORGANISATIONS
    - FUNDRAISING

THREATS

- FAILING TO MEET CURRENT CHALLENGES
- NOT CHANGING OUR APPROACH TO INVOLVING THE THE COMMUNITY
- THE TOP DOWN APPROACH
- LOSING TIED GRANTS
- DIRECT COMMUNITY FUNDING

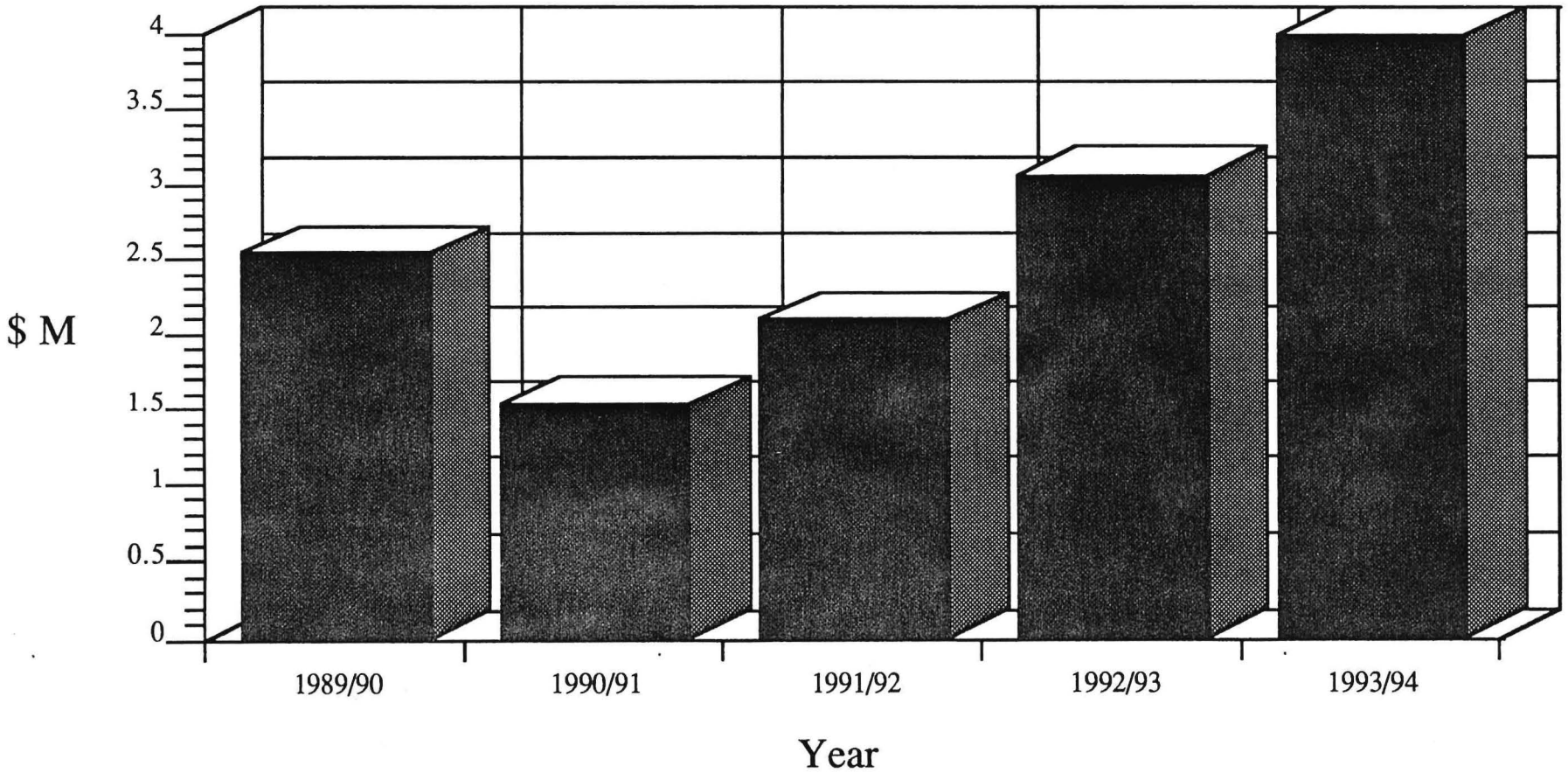
OTHER FUNDING SOURCES

WWF BIOLOGICAL DIVERSITY PROGRAM

LANDSCOPE CONSERVATION VISA CARD

FEDERAL DUCK STAMP PROGRAM

EXTERNAL FUNDING
Commonwealth Grants



PREPARING GRANT APPLICATIONS

1 Carefully detail all costs.

- plant identification,
- mounting and
- data-basing for biological surveys.
- fauna specimens collected - work provided by the WA Museum

If the project costs are understated your cost centre may have to pick up any shortfall or else reduce the scope of the project.

2 Consult with affected others.

- Science and Information Division
- Land Information Branch
- Other Branches

Please consult these units to determine the availability of staff.

3 Hidden Costs

- Inputting data
- Oncosts and overheads

GRANT APPLICATIONS

SELECTION CRITERIA

- Degree of threat or threatening processes
- Gaps in knowledge
- Ability to obtain alternative sources of funds
- Areas of high bio diversity which are proposed as additions to the conservation reserve system
- the priorities provided by the funding agency, and
- relevance to other studies or projects recently proposed or completed.

NATURE CONSERVATION PROGRAM

COMMONWEALTH GRANTS

ENDANGERED SPECIES PROGRAM

FERAL PESTS PROGRAM

CEPANCRM

ABRS

CRC

SAVE THE BUSH

NATIONAL RESERVE SYSTEM COOPERATIVE PROGRAM

NATIONAL ECOTOURISM STRATEGY

NATURE CONSERVATION PROGRAM

OPPORTUNITIES

- PARTNERSHIPS
  - ECO-TOURISM
  - SPONSORSHIP
  - THE COMMONWEALTH
  - COMMUNITY
    - VOLUNTEERS
    - COMMUNITY ORGANISATIONS
    - FUNDRAISING

THREATS

- NOT CHANGING TO MEET CURRENT CHALLENGES
- NOT INVOLVING THE COMMUNITY
- LOSING TIED GRANTS
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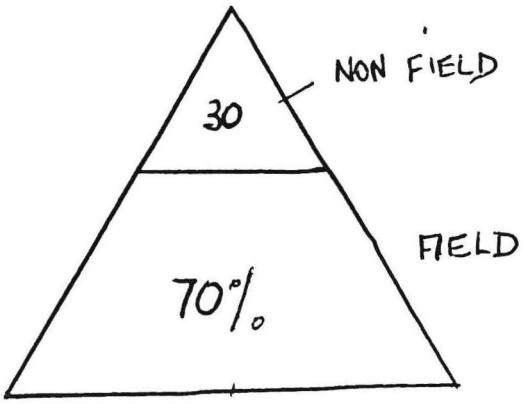
STAFF RATIOS



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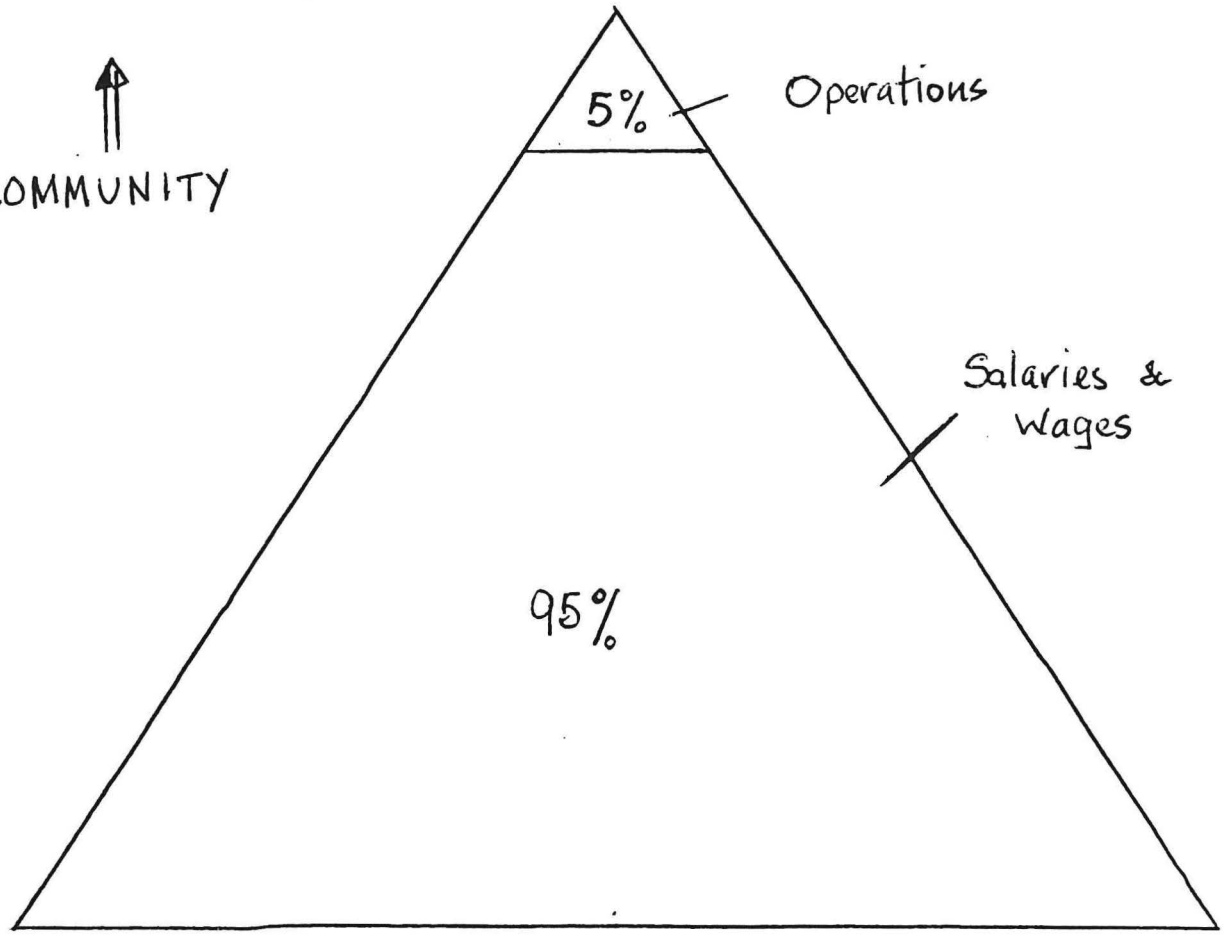
- GRANTS
- BENEVOLENT FOUNDATION

COMMUNITY

1994



NUMBAT RECOVERY PLAN

Recovery Objectives:

Downlisting from Endangered to Vulnerable (ANZECC) within 10 years, by

(i) ensuring that the species persists within its present range

(ii) increasing the total number of self-sustaining populations to at least 10, encompassing a wide range of habitats previously occupied by the species.

"Self-sustaining" is defined as maintaining numbers without the nett addition of individuals. Re-introduction sites chosen are such that if Numbats colonise all suitable habitat, total populations size will exceed 5000.

NUMBAT RECOVERY PLAN

Recovery Criteria:

(1) At Dryandra, sighting rates of over 5 sightings/100 km on the monitoring route in November/December.

(2) At Perup-Kingston, sighting rates of over 1 sighting/100 km in November/December on the monitoring route.

(3) At Boyagin, where a self-sustaining population has already been established by translocation, sighting rates of over 4 sightings/100 km on the monitoring route.

(4) Self-sustaining populations established at seven sites additional to the three above.

Translocation programs have already been commenced to Karroun Hill NR, Tutanning NR, Batalling block in State Forest and Yookamurra Sanctuary (S.A.). Allowing for failure of some re-introduction attempts, translocations will be carried out to Dragon Rocks NR, Julimar Conservation Park, sites in the northern and central jarrah forest and in the arid zone.

NUMBAT RECOVERY PLAN

Actions Needed:

A recovery team comprising members from WADCALM, SADCNR, Perth Zoo, ANCA and WWFA has been established to co-ordinate and supervise the following actions:

(1) Management of existing populations and habitat.

(2) Genetic survey of existing populations.

(3) Translocations to establish at least seven further self-sustaining populations.

(4) Disease survey and health monitoring of all populations.

(5) Captive breeding to provide animals for display and to supplement translocation program if necessary.

(6) Establishment and support of a public awareness and sponsorship program.

NUMBAT RECOVERY PROGRESS 1993

1. Research

1.1 Predation on Numbats at Karroun Hill

1.2 Genetic studies

2. Population monitoring

2.1 Dryandra

2.2 Perup

2.3 Boyagin

3. Translocations

3.1 Karroun Hill

3.2 Batalling

3.3 Yookamurra Sanctuary

4. Captive breeding

DAVID MITCHELL A STANDARD INFORMATION SYSTEM
REGIONAL ECOLOGIST, WHEATBELT, NARROGIN

WESTERN AUSTRALIAN THREATENED SPECIES AND COMMUNITIES UNIT CONFERENCE, 1994.

Session 3: Information Management (Chair Andrew Brown)

A Standard Information System (David Mitchell) 10 mins

Hugh will discuss Discussion Paper 8, then Discussion Paper 10 to introduce me...

INTRODUCTION

Title based on a rash promise made when I commenced as Regional Ecologist. Had planned to have commenced computer storage of biological information (including rare flora and fauna) on PC as one of first tasks.. but reality got in the way. So I apologise to any one who is expecting something high-tech.

So I will describe the current system of recording threatened species information in the wheatbelt

and use that discussion to look at some of the challenges and issues of creating a CALM-wide system.

and then finish with a quick look at where we (in the wheatbelt) might be going.

THE CURRENT PAPER-BASED SYSTEM

Use Wheatbelt as an example of a paper or file based system of recording information on threatened species.

This would be a similar system to that used in other Districts with one or two variations....(I will explain why later.... also have differences in our own Districts ... what does this mean for a CALM standard system..)

Based on the districts GENERAL FILES - all topics, admin right through to Flora and Fauna. Two subsets of those files to look at here, the ESTATE Files and the FLORA AND FAUNA Files

ESTATE FILES - Each piece of CALM estate has a suspension file by reserve number in numeric order. Within each reserve suspension file there are several pinned files on sub-topics, being:

Administration/General
Aerial Photographs
Biophysical (including threatened flora and fauna)
Dieback and Hygiene
Firebreaks
Fire History
Human Usage
Introduced & Declared Plants and Animals
Monitoring and Research
Wildfire Suppression (to be taken to a fire - derived info)

There is an OPERATIONS IMPACT CHECKLIST on the front cover of each reserve Administration/General file. This is a summary of threatened flora and fauna, aboriginal and historical sites, disease risks etc. It is a prime example of a summary that could easily be derived by a computer system.

But Threatened flora and fauna occur off the CALM estate, so records of DRF and Priority species and other species of interest are kept as part of the General filing in a FLORA AND FAUNA by species file. (In Narrogin this is 20.4)

As an example, , In the flora vertical files, each DRF and Priority species is given a suspension file and the species are filed alphabetically by species.

In each of these pinned files all information on the species is kept, including field report forms, Wildlife branch memos and other correspondance.

Note that each species is allocated a district species number and each population is allocated a district population number (these differ from the CALM number because of the risk of allocating the same numbers to different populations or species and due to time lags of reporting and simultaneous surveys).

From this information a summary sheet is prepared which details the populations (see overhead). This is derived information and gives an overview of the species in the district.

There is also information on maps, a set of 1:100 000 series covering the region/district. Yellow stickers are placed on these to indicate the approximate location of drf populations. Each sticker has the district species and population number. These maps are derived information.

Similar system with fauna species, One suspension file for each species and use red stickers on same maps. Threatened communities??

In most cases first action when considering an action or when responding to an activity is to look at the maps and species summary sheet. If further information is required follow the species/population number to the appropriate file and pages of the file. and if required to SOHQ files.

POINTS RAISED

First look at a couple of points about the paper-based system.....and what this tells us about the system..... and give an idea of what features should be considered in any computerised system

firstly and importantly it is paper-based... people are familiar with paper and so are comfortable using it. If a computer system is used people will require training and familiararity with computers, so that they do feel comfortable . When people are comfortable with it they will use it...(not everyone likes computers)

2nd it is simple both in intent and operation...
it is limited in its objective - its main task is to indicate the locations of populations of threatened flora and fauna (and what they are)

it is based in each district office for the use of districts and so aims to solve problems at that level

there is a minimum of manipulation involved there are simple aggregations and interpretations even at this level.. theoretically these could be done by computer... additional infrequent enquiries require additional work to get answers .... for example looking at reserve files can get a species list by reserve with a little effort (eg the operations impact checklist) ..... but to find all reserves where a species is found is onerous..

Note again the need for a district numbering of species and populations.

OTHER SYSTEMS

There are computer systems available already, Merredin has a computer database ... as a response to Management Program for District and due to lack of connection to Corporate systems.

I will talk briefly on the Merredin system (as I do not know a great deal about it) but will use it to illustrate a point ...

The Merredin database has a species table which has information on the taxonomy, and whatever of the species, and a population table with information on location ....

But has another table on management, which is used to prioritise species within the district, and to schedule, record and monitor the success of management actions.

This is a district based need for information, it is not necessarily the same information that, say Wildlife Branch, are after.... like the paper-based system it is designed around the district. .....(I will come back to this point later) But the first two data sets (species and populations can be supplied by Wildlife)

In addition in the Wheatbelt Region have

TENIS from LIB ORACLE and Friendly (WINDOWS and controls/limits on what can be done in it) B test version to be main frame - ?replace crown reserves database in Reliance Provides all tenure based information. Will become a graphical system and will interact with other systems, such as rare flora etc.

The point here is that this is an ORACLE database, but has a friendly, windows environment, mouse etc. But only as friendly as the users experience and familiarity will allow.

PAPYRUS - a bibliography of published documents which have relevence to wheatbelt Nature Reserves, it also has unpublished documents such as Department reports, and file memos and can store other information such as slides, and research projects. This has a keyword system to access records including reserve number. (The main challenge here is to keep "control" over what keywords are used.)

Have used an off-the shelf system, as it is purpose built for the task (bibliography) so dont have to reinvent the wheel and it minimises inconsistancies.

More advanced systems..... Wildlife Branch Rare flora and fauna Databases.... Ken Atkins and Gordon Wyre to discuss these.....and the computer systems being developed by the herbarium, which Neville Marchant will discuss. (Herbie, WAHerb etc.)

There are large threatened species and biological databases developed by the Victorian Dept of Conservation and Environment, Queensland Dept of Environment and Heritage and the Federal Govts. ERIN (Environmental Resources Information Network)

WHY DONT WE USE THOSE SYSTEMS? If someone has already got a system that works???

Part of the reason was mentioned previously... different users have different needs or questions to answer, and so will use and manage data differently.

different districts have different requirements (overhead) different populations have different threats and varying amount of resources available to districts. Also different specialist groups, as different groups are using the information to make different decisions.

And at different levels .....eg.

In the majority of cases at district level, tactical - day to day actions, interested in the current status of populations.

next want management actions required to protect and conserve populations (and to monitor the effect of those actions)..... as part of Management Program. Occasionally (annually etc) want to look at changes over time to assess management and for planning. Or want to look at the representativeness of the reserve system etc

higher again decisions are made on such things as the listing of species. this uses primary data but a larger set of data and uses different analysis. And on up to decisions made at Federal and even international levels.

So different users will use different sets of the available data and interpret it for different purposes. The corollory is that different users will collect different data dependet on their needs.

one way around this is to always store point-based primary data vs summary (aggregated or interpreted data..... summary info should be generated by the system..(more programming).. primary data can be accessed for specialist analysis or manipulation

The common thing is that the management of information is used to increase the knowledge or reduce uncertainty of the user - results in better decision making (we hope.)

in each case need to be clear on the endpoint, what is it for? need a useful output.. there has to be improved management (increased efficiency) getting more done or doing it better (it easy to be overtaken by the desire to have and manipulate information for its own sake....)

Database systems are great for storing information - thats what they are for....but need to keep in mind that decisions are made after some manipulation or interpretation of the data.

information systems should be more than data storage, the most common summaries should be produced by the machine eg the drf population summaries.

more complex manipulations can be done on the same data on an individual basis if access is available.

STANDARD SYSTEM? (Why have one?)

why standard? standards are necessary to allow data (from more than 1 source) to be integrated, analysed or shared. If want to use data from more than one source it needs to be standardised...

How do you do it??

two ways either 1. standardise the data that goes in - eg standard data input forms and matching input screens to those forms (eg rare flora report form)

or 2. make a system that can cope with a large variation in data ie a very flexable system - eg workshop held by ERIN to establish a core set of attributes for vegetation . of 90 odd core attributes, only 12 were mandatory and made a minimum record... these essentially only defined the observer, location and date, but did not include the observation. very flexible!

have minimum dataset but it defines where to get additional information or if it exists. (Similar to Hugh's data directory)

CONCLUSION

Summarise main points raised so far on overhead

FAMILIARITY = Training and use

KEEP IT SIMPLE (at least at the interface)

USE EXISTING SYSTEMS IF THEY WORK (Fix/modify if they do not meet your needs)

DIFFERENT USERS HAVE DIFFERENT REQUIREMENTS (the structure and design of a system reflects the needs of the designer)

STORE PRIMARY DATA IN DATABASES NOT SUMMARIES (the computer can generate summaries for you)

DO MORE THAN STORE DATA ON A COMPUTER (Common or frequent summaries and interpretations can be computer generated)

?STANDARDS?

and...

REMEMBER GIGO ("garbage in - garbage out")

REMEMBER THE END PRODUCT (improved management)

WHERE TO NOW ??

In wheatbelt we are not looking to reinvent systems such as the Threatened species systems from Wildlife Branch

Will be concentrating on methods and systems to optimise their utility to meet the needs of all users.

Do this by integrating by links or relationships between these and District databases which have those elements not supplied by the corporate systems.

Also seeking to increase linking and cross use of the various corporate systems

Continue to work on systems to make information more accessable such as the bibliographic database and will look at methods to store general biophysical information.

OTHER ISSUES

Data validation

have to remember "garbage in - garbage out" .... just because it is printed out of a computer doesn't make it true, although many think so. record and recognise the quality of the information or improve the quality of the information

Access and security

have a system that you can control who uses and how but have to allow flexibility and access to data

Data Custodianship and ownership -- local input

 Species information

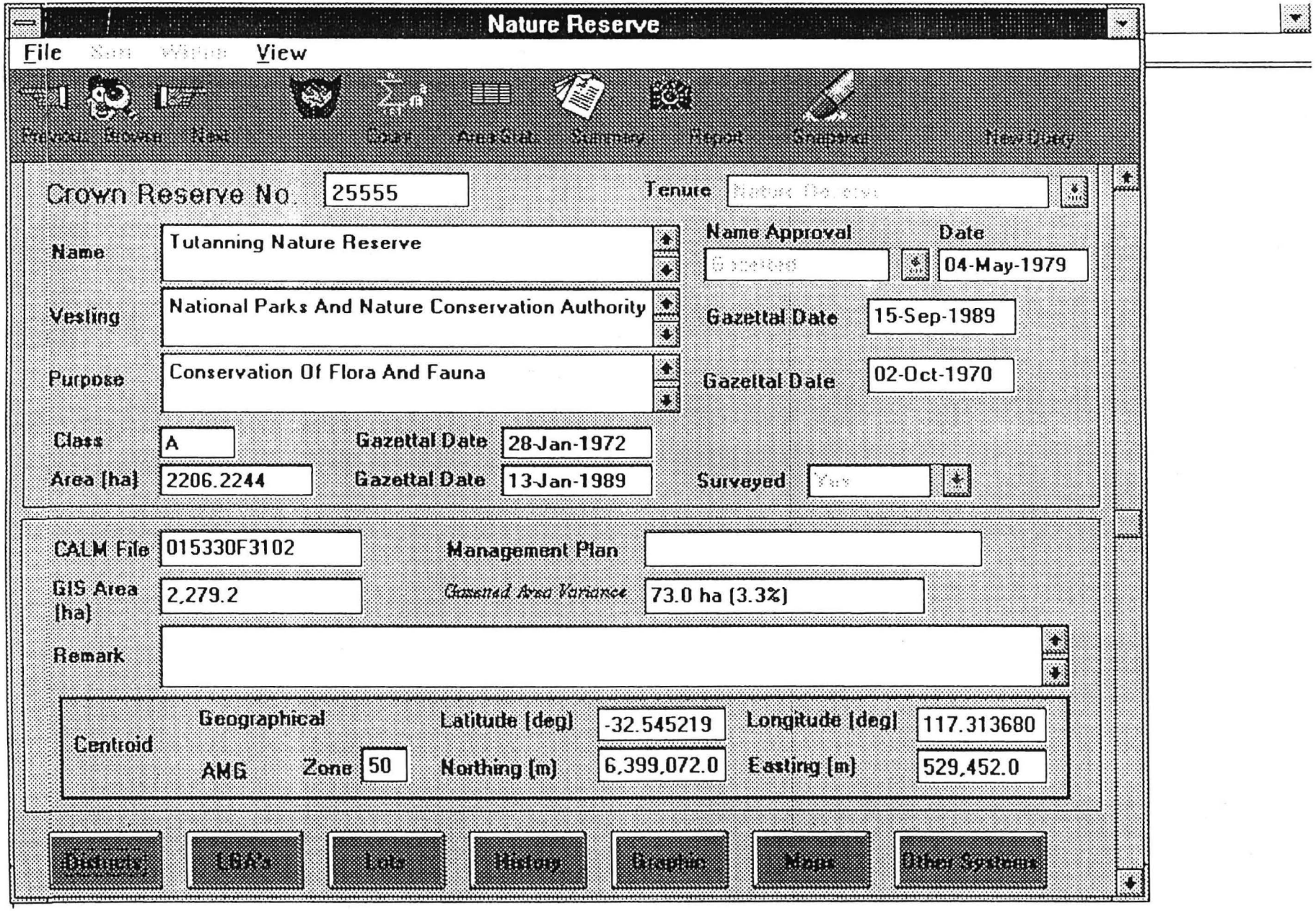
&  SPECIES SUMMARY SHEET

 SPECIES FILE

&  OTHER SPECIES FILES

 FLORA FILES (stored in alphabetic order)

User Friendly – Windows – Mouse point + click etc – but friendly if familiar still require training



Distribution of Threatened Flora Populations by CALM Regions and Land Status
% of Populations at 1989

	GREENOUGH	WHEATBELT	SOUTH COAST	SWAN	CENTRAL FOREST	SOUTHERN FOREST	GOLDFIELDS	GASCOYNE	PILBARA	KIMBERLEY
CALM Estate	13	23	87	27	24	59	25	37	0	0
Linear Road & Rail	25	41	8	10	36	19	0	12	0	0
Private & Pastoral	25	16	6	38	20	2	0	37	0	86
VCL	19	9	15	4	0	2	37	0	50	0
Other Crown Reserves	18	9	5	18	13	14	12	12	50	14
Unknown	0	3	6	2	8	2	25	0	0	0
Percent	100	100	100	100	100	100	100	100	100	100
Total Pop'ns	429	348	345	122	76	42	8	8	2	7
Total Species	63	77	71	28	18	12	5	5	2	4

South coast Phytophthora dieback ...

FAMILIARITY (= Training and use)

KEEP IT SIMPLE (at least at the interface)

USE EXISTING SYSTEMS IF THEY WORK (Fix/modify/add if they do not meet your needs)

DIFFERENT USERS HAVE DIFFERENT REQUIREMENTS (the structure and design of a system reflects the needs of the designer)

STORE PRIMARY DATA IN DATABASES NOT SUMMARIES (the computer can generate summaries for you)

DO MORE THAN STORE DATA ON A COMPUTER (Common or frequent summaries and interpretations can be computer generated)

STANDARDS (How to keep them?)

CUSTODIANSHIP (ownership, assess, security)

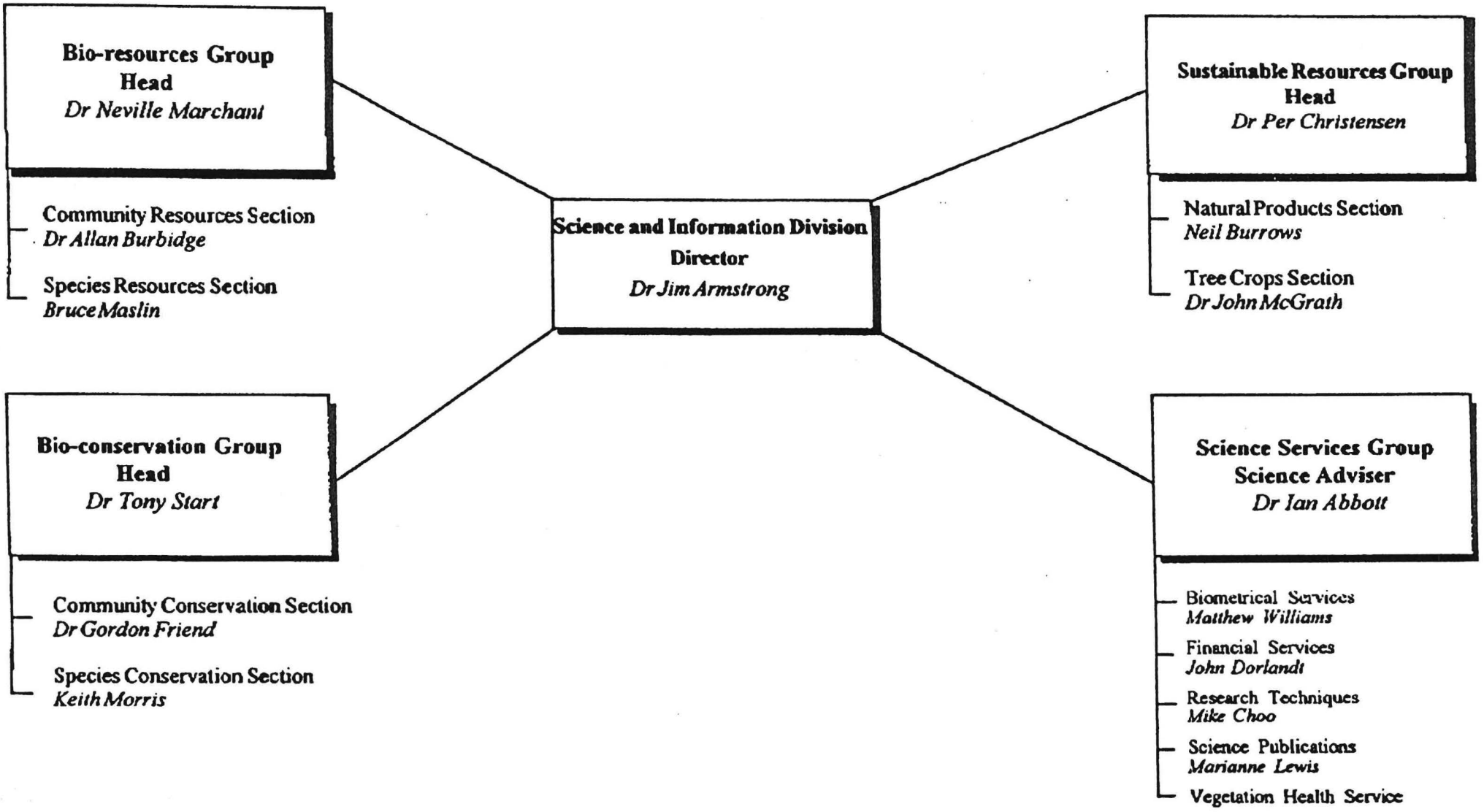
REMEMBER GIGO ("garbage in - garbage out")

REMEMBER THE END PRODUCT (improved management)

APPENDIX 1

SCIENCE AND INFORMATION DIVISION

(Revised Science Group Functions)



June 16, 1993

FERAL PESTS PROGRAM

This is a National Conservation Programs funded by the Commonwealth Government through ANCA

Aims

To develop and implement projects in cooperation with other Commonwealth and State/Territory agencies to reduce the impact of feral animal pest species on native species and/or the natural environment, ***particularly in areas important for the recovery of endangered species.***

FUNDS FOR 1993-4. total $1.9million

$400,000 AVAILABLE FOR NEW PROJECTS

$1.5MILLION COMMITTED TO ON-GOING PROJECTS

PRIORITY AREAS FOR FPP FUNDING

Currently foxes and cats ($1.37million of $1.9million)

Priority will be given to projects which meet one or more of the following criteria.:

1. **Management projects in areas important to the recovery of endangered species**

2. **Research and pilot management projects to assess and improve the effectiveness conventional control techniques and strategies, either empirically or by modelling** Fox Baiting

3. **Assessment of the environmental impact of feral animals. Preference will be given to projects where such assessments will be useful as indicators for measuring the effectiveness of control programs.** FRNP. ~~Bees~~

4. **Preparation for action plans for feral pest control which include guidelines for the involvement of community groups and land holders. Implementation of action plans should provide feedback to further development of the action plans.** Bees. 20,000.

5. ***Integration of feral pest control at the regional/district level*** NSW. 23000

6. ***Extension/education programs***

CALM Projects supported for 1993-94.

NEW PROJECTS

Eradication of feral sheep and goats - Peron Peninsula

$ 1993-94	$1994-95	$1995-96	$ Total
18,750	12,750	0	31,500

CALM Projects supported for 1993-94.

ON GOING PROJECTS

Effect of fox control on Red-tailed phascogale

$ 1993-94	$1994-95	$1995-96	1996-97	$ Total
14,955	18,607	18,607	3,652	5,8215

Conventional control and research on fox ecology

$ 1993-94	$1994-95	$1995-96	1996-97	$ Total
225,050	225,050	225,050	-	675,150

Broad scale control of cats + fox control at Karoun Hill

$ 1993-94	$1994-95	$1995-96	1996-97	$ Total
122,280	-	-	-	122,280

Predator control for benefit of Western Swamp Tortoise

$ 1993-94	$1994-95	$1995-96	1996-97	$ Total
90,000	71,800	43,500	-	205,300

TOTAL

$ 1993-94	$1994-95	$1995-96	1996-97	$ Total
452,285	315,457	287,157	3,652	1,058,551

CALM SHARE OF FPP FUNDING TO STATES

CATS

TOTAL $453,872
CALM $122,808 = 27%

FOXES

TOTAL $915,476
CALM $330,005 = 36%

GOATS

TOTAL $153,750
CALM $ 18,750 = 12%

RABBITS

TOTAL $104,000
CALM NIL

OTHERS

ANCA PROJECTS
CAMELS
GREEN PARROT _ NORFOLK ISLAND:
BARRED GALAXIAS AND TROUT
STARFISH
FERAL BEES
REGIONAL PLAN -CENTRAL NSW

TOTAL $282,150
CALM * NIL

TOTAL TO STATES $1,619,616
CALM $ 417,035 = 25.7%

RECOVERY TEAM

Tony Start (CALM Chair)

David Armstrong (SA)

Andrew Burbidge (CALM WATSCU)

Stephanie Maxwell (ANCA)

Gordon Wyre (CALM Wildlife Branch)

Brian McMahon (CALM Wheatbelt Region)

Bob Hagan (CALM Southern Forest Region)

John Skillen (CALM Central Forest Region)

John Watson (CALM South Coast Region).

Paul Jones (CALM Swan Region

Some reasons for recovte. of Plan

1. **Additional populations of Woylies have been discovered or established in Western Australia.**

2. **Woylie populations have been discovered in areas of State Forest in Western Australia which are zoned for sustainable timber harvesting.**

3. **Proposals for widespread fox control in south-west forests (Operation Foxglove) provide an opportunity to markedly increase the range of the species.**

4. **The South Australians found it necessary to employ a person to carry out work in that State.**

5. **Techniques for re-introduction to the mainland in South Australia have been revised.**

Recovery Plan objectives. By the end of 1995:

1. **Determine the current wild distribution of the Woylie in Western Australia.**

2. **Establish a population of Woylies on a mainland area in South Australia without using predator-proof fences.**

3. **Develop prescriptions for the maintenance and extension of Woylie populations in multiple-use forest in Western Australia.**

4. **Ensure that translocated Woylie populations maintain genetic variability.**

5. **Prepare a recommended revision of the conservation status of the Woylie, using internationally accepted criteria.**

Recovery criteria:

Western Australia

1. **Maintenance of at least six populations of Woylies, each extending over at least 1 500 ha at densities that, when trapped under standard techniques, provide a minimum 20% trap success rate.**

2. **Clarification of the status of the Woylie in conservation reserves and State Forests of the south-west of WA.**

3. **Establishment of experiments to determine the effects of timber harvesting (at Kingston Forest) and fuel-reduction prescribed burning (at Batalling Forest) on Woylies.**

South Australia

1. **Maintenance of two island populations, on Wedge and St Peter Islands.**

2. **Establishment of at least one mainland population in addition to the Yookamurra population.**

Both States

1. **Established long-term monitoring programs (to include genetic diversity) and action plans to address adverse trends (if any) detected by monitoring of these populations.**

THREATENED SPECIES AND COMMUNITIES DATA DIRECTORY

WATSCU's Discussion Paper No 8 - which proposed the development of a TSC DD -was distributed last November for comment. Its reception was very favourable and it's quite clear that the DD will be most welcome.

Very briefly summarising the main points of the Discussion Paper, I'd like to reiterate that:

1 Financial considerations dictate a low-cost system which will be readily accessible throughout CALM;

2 Therefore, the DD has been conceived, not as a high capability database (such as the Herbarium's RED system) but as "a directional index; an automated 'handbook' which should point the enquirer in the right direction by giving BASIC information, which, if followed up, will enable the users to subsequently find out ALL the relevant information held by CALM offices and officers".

It's not just a matter of indicating what is held where, but also who knows what. Quite often, information on file or on software or in a map or slide, needs the comments of an expert to give you the complete picture. Consequently, one of the fields on the DD will provide information on personnel; mostly, but not necessarily, CALM staff.

The Discussion Paper indicated that we intend to provide the database information on diskette. That needs to be clarified in three ways.
First, we do indeed hope to provide as much of the data as possible on diskette - for the convenience of those Districts which don't have access to the CALM network and also for those offices which would prefer to use diskettes.
Second, It is certainly our intention to have all the information available on the Network and to encourage Districts and Regions to update the information online.
Third, please remember that the DD is essentially an index; even online network users will not be able to access *all* the required information from the Directory. Other systems, such as the departmental files, may need to be referred to.

It must be emphasised that the Data Directory will be a directional indicator of the location of all sorts of materials relating to TSCs - and that includes a variety of independent, already-established databases (such as the Wildlife Branch database and the RED system).
The Data Directory will certainly indicate the availability of specific information on other databases, but it may be necessary to access such databases independently.

At this stage, we reckon the fields and database interrelationships will be like this:

There will, of course, be a user's manual issued to Regions and Districts as soon as the system is available.

STRUCTURE OF WATSCU DATA DIRECTORY

Field	No Of Characters	
TABLE Species		
1. SpCode	A8	(for plants, same as WAHERB)
2. Genus	A30	
3. Species	A60	
4. InfraspRank	A9	
5. InfraName	A40	
6. Common Name	A40	
7. Wildlife Branch DB		A1 (Y or N)
8. RED database	A1	(Y or N)
9. WA WC Act	A2	
10. WA Rank	A2	
11. ANZECC	A2	
12. Action Plan	A2	
13. Curr-know	A50	
14. Recovery plan	A20	
15. IWMG	A20	
16. Recovery Team Chair		A4 LINK TO Names
Plus a series of many-to-many links:		LINK TO Files LINK TO Names LINK TO References LINK TO Slides LINK TO EcolCom

TABLE Names

1.	Initials	A4
2.	Name	A50
3.	Affiliation	A50
4.	Address	A75
5.	TelNo	A8

TABLE Files

1.	FileNo	A12
2.	Location	A30
3.	Title	A50

TABLE References (same structure as BIBLIOG in T:\PUBLIC)

1.	RecNo	N
2.	Author	A50
3.	Editor	A6
4.	Date	A8
5.	Title	A150
6.	Source	A150
7.	KeyWords	A200

TABLE Slides

1.	Location	A10	
2.	Info	A150	
3.	Owner	A4	LINK TO Names

Internal draft of 10 September, 1993

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

WATSCU DISCUSSION PAPER NO. 10
by Hugh Clift

A STANDARD INFORMATION SYSTEM

One of the WATSCU Strategic Plan's major objectives is "to develop an efficient threatened species and communities information management system within CALM". Objective 9.2 states that WATSCU should "[assist] Regional staff to develop a standard system for handling information relating to [TSCs]".

Ideally, a standard system implies uniformity of hardware, software and data input methods. Obviously, in the short-term forseeable future, the standardisation of hardware and software throughout CALM isn't feasible. Decisions have already been taken and software systems have been purchased which have committed most Regions to their continued use, while financial constraints prohibit the purchase of alternative systems.

Consequently, it is assumed that the variety of hardware and software currently in use will continue indefinitely and that standardisation in this respect implies nothing more than compatibility of data exchange by diskette.

However, the standardisation of a *method* of data input and storage is practicable and readily achievable with:

- the identical formatting of data for hard copy proformas (e.g, the DRF sheets)
- the identical layout of screen displays, and
- a standardised data entry from proformas to PCs.

The purpose of such standardisation is to facilitate data exchange by diskette so that all the TSC information held by the Department may be readily obtainable by authorised staff.

Rather than try to standardise the systems in all Regions at the same time, it is recommended that one Regional office (Narrogin) and two District offices (Narrogin and Katanning) be taken as the locations for the development of a standard system, which could then be recommended to other Regions.

The Wheatbelt Region is preferred for the following reasons:

1. Its reasonable proximity to Perth.

2. The Regional Manager is familiar with the WRC systems.

STANDARDISATION OF METHODS
of data input and information storage
by

formatting of proformas

layout of screen displays

standardised data entry

WHEATBELT REGION

"Close" to Perth.

Familiarity with the WRC systems.

Regional Ecologist's responsiblities

Information Management strategies

Progress

Minimise duplication

Future cooperation

Katanning

FUTURE PRIORITIES FOR THE CONSERVATION OF THREATENED ECOLOGICAL COMMUNITIES

It would be nice to be able to present a list here of ecological communities for which we have enough information to know their distribution, both now and historically, their current condition throughout their range, and the threatening processes to which they are exposed. We would then be able to place them with confidence in a particular category which summarises their conservation status, and I could talk about the priorities in terms of actual ecological communities and threatening processes.

In fact, of course, unlike species of plants and animals, we are a long way from being able to do this for ecological communities. We are still at the stage of deciding what definition we should use for ecological communities in general, how to define particular ecological communities and how we can separate one such community from another.

At present we have a draft CALM policy statement shortly to be considered by the Corporate Executive, which goes some way to providing consistent definitions and determining a procedure for the identification and listing of threatened ecological communities. In a broad sense the draft Policy identifies what I see as the priorities for actions required to bring the conservation of threatened ecological communities into line with that for threatened species of plants and animals.

The draft policy has the following Operational Objective;

> "to maintain the biological diversity of natural ecosystems in Western Australia by identifying ecological communities which are threatened with extinction, or with severe modification throughout their range, and by ensuring their conservation".

The draft policy then defines terms, including ecological community, severe modification, and the various categories into which threatened ecological communities may be placed depending upon the degree and urgency of threat; that is critical, endangered, vulnerable and insufficiently known. It then lists nine policies and many strategies for their implementation.

For this brief presentation I do not intend describing all of those policies and strategies, but simply to pick some key ones out for discussion.

The draft policy is very much about establishing consistent and defensible procedures for conserving threatened ecological communities, and will inevitably take some time to complete and implement. In the meantime there are already a number of ecological communities which are clearly threatened with continuing reduction in area and continuing modification or degradation of their condition. It seems to me to be important that we should be capable of taking immediate action to protect those we know well enough to be sure that they are critically threatened.

PRIORITIES FOR THE FUTURE

- **Initiate emergency action for those TECs for which good information indicates that severe modification or destruction throughout their range is imminent.**

As an example, on the Swan Coastal Plain, where the most detailed survey has been conducted, Greg Kieghery and Neil Gibson have identified nine clearly definable plant assemblages which are either critical or endangered, and six which are either vulnerable or susceptible. (**overhead**)

- **Establish and use consistent and scientific criteria for identifying, listing and ranking TECs**

- **Identify, list and map threatened ecological communities throughout the State, and rank as to the urgency for conservation action;**

- **Produce and implement recovery plans for TECs in priority order**

- **Promote the conservation of threatened ecological communities to all sectors of the community.**

- **Identify, list and rank the threatening processes which are endangering the most highly ranked TECs.**

- **Produce and implement State or regional control plans for identified threatening processes in priority order.**

- **Seek legislation to provide statutory protection to listed TECs.**

- **Conduct and promote appropriate research, and publish and disseminate results as widely as possible.**

THREATENED ECOLOGICAL COMMUNITIES BASED ON BOTANICAL ASSEMBLAGES

1. Communities of the Eastern Swan Coastal Plain

***Eucalyptus calophylla* open forest**
Geographical Range: previously widespread, very restricted
Conservation Status: very poor, pockets of only 1ha on the Pinjarra plain
Threats: weed invasion, urbanisation

***Eucalyptus calophylla* woodland over *Kingia* shrubland**
Geographical Range: previously widespread, now very restricted
Conservation Status: poor, confined to two small reserves
Threats: weed invasion, urbanisation

***Eucalyptus wandoo* woodland**
Geographical Range: restricted to the alluvial soils adjacent to the Scarp
Conservation Status: very poor, not in conservation reserves
Threats: weed invasion, fire, urbanisation

***Eucalyptus lane-poolei* low woodland**
Geographical Range: restricted
Location: Conservation Status: very poor
Threats: weed invasion, fire, urbanisation

***Casuarina obesa* low forest or woodland**
Geographical Range: restricted to isolated pockets in the GinGin area
Conservation Status: very poor
Threats: weed invasion, fire, flooding

***Banksia* low open forest**
Geographical Range: restricted to small parts of the Ridge Hill Shelf
Conservation Status: very poor
Threats: weed invasion, fire flooding

Northern Ironstone heath
Geographical Range: Gin Gin to Mundijong
Conservation Status: Very poorly conserved, only tiny remnants remain
Threats: mining, clearing, road works, urbanisation

Claypan communities - *Melaleuca lateritia* open shrubland
Geographical Range: Muchea to Harvey
Conservation Status: poorly conserved
Threats: clearing, urbanisation, off-road vehicles, weeds, drainage

2. Other Threatened Ecological Communities

Southern Ironstone heath
Geographical position; Adjacent to Whicher Scarp.

Ironstone heaths of the Scott River Plain

Tall Acacia Shrublands of the Geraldton Region, including the Greenough flats.

DR PADDY BERRY
WA MUSEUM

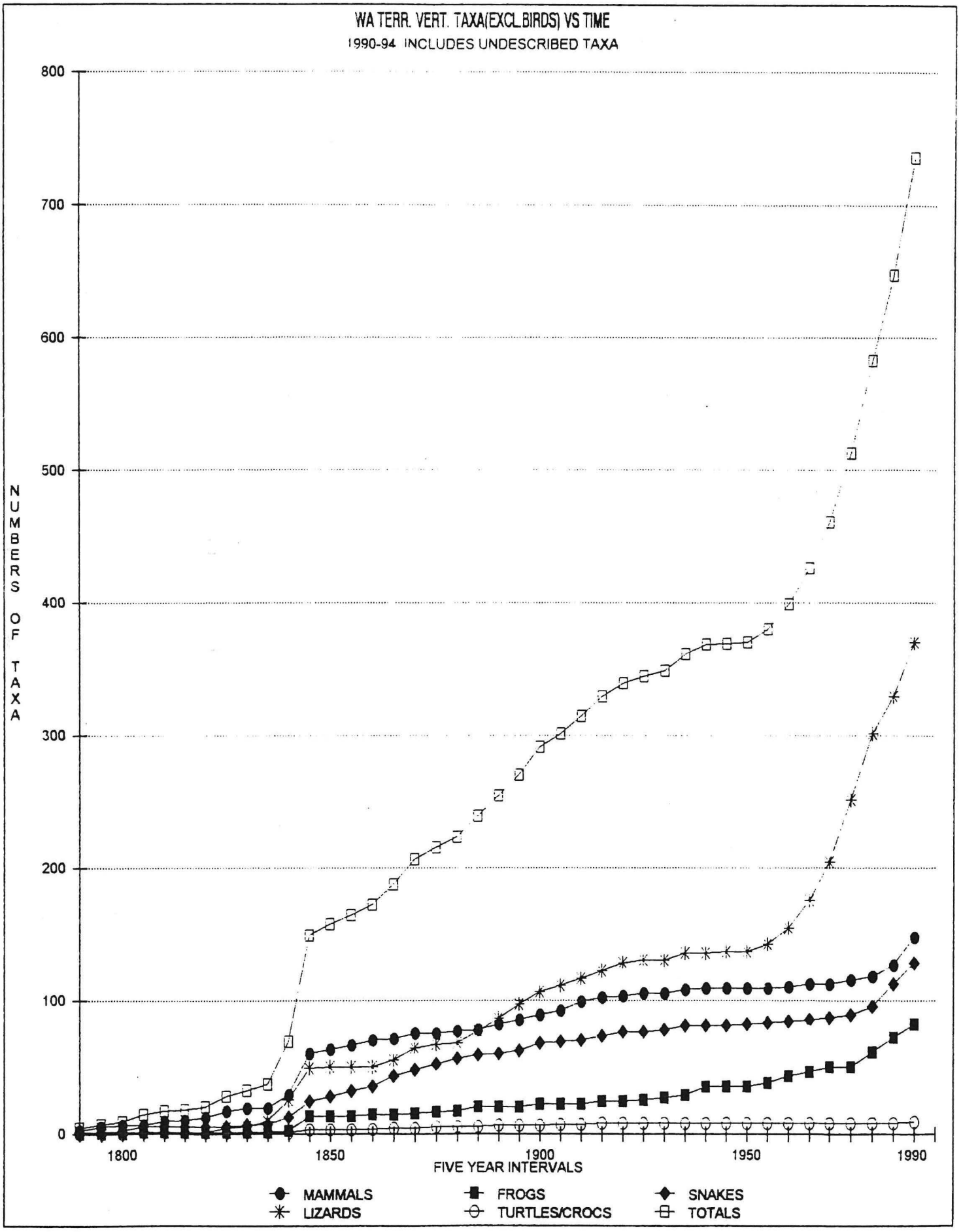
ROLE OF WA MUSEUM

WA TERRESTRIAL VERTEBRATE TAXA (EXCL. BIRDS) VS TIME (FIVE YEAR INTERV AS AT MARCH 1994

FIVE YEAR INTERVALS	MARSUPIALS	BATS	RODENTS	TOTAL MAMMALS	FROGS	SNAKES	LIZARDS	CROCODILES & F/W TURTLE	TOTAL HERPTILES	GRAND TOTALS
	2	0	0	2	1	1	0	0	2	4
	5	0	0	5	1	1	0	0	2	7
1800	6	0	0	6	1	2	0	0	3	9
	6	0	0	6	1	5	1	1	8	14
	7	1	1	9	1	5	1	1	8	17
	7	2	1	10	1	5	1	1	8	18
	9	2	1	12	1	5	1	1	8	20
	13	2	2	17	1	5	4	1	11	28
	15	2	2	19	1	6	5	1	13	32
	15	2	2	19	1	7	9	1	18	37
	20	5	4	29	2	12	25	1	40	69
	40	11	9	60	13	24	49	3	89	149
1850	42	11	10	63	13	28	50	3	94	157
	43	12	11	66	13	32	50	3	98	164
	45	13	12	70	14	35	50	3	102	172
	45	14	12	71	14	43	55	4	116	187
	46	17	12	75	15	48	64	4	131	206
	46	17	12	75	16	52	67	5	140	215
	46	18	13	77	17	56	68	5	146	223
	46	19	13	78	20	59	77	5	161	239
	48	19	15	82	20	60	86	6	172	254
	50	20	15	85	20	62	97	6	185	270
1900	52	20	17	89	22	68	106	6	202	291
	53	21	18	92	22	69	111	7	209	301
	55	22	22	99	22	70	116	7	215	314
	55	25	22	102	24	73	122	8	227	329
	56	25	22	103	24	76	128	8	236	339
	56	25	24	105	25	76	130	8	239	344
	56	25	24	105	27	78	130	8	243	348
	57	25	26	108	29	81	135	8	253	361
	57	26	26	109	35	81	135	8	259	368
	57	26	26	109	35	81	136	8	260	369
1950	57	26	26	109	35	82	136	8	261	370
	57	26	26	109	38	83	142	8	271	380
	57	27	26	110	43	84	154	8	289	399
	59	27	26	112	46	85	175	8	314	426
	59	27	26	112	50	87	204	8	349	461
	61	28	26	115	50	89	251	8	398	513
	63	29	26	118	61	95	301	8	465	583
	69	30	27	126	72	112	329	8	521	647
1990	77	40	30	147	82	128	370	9	589	736
undescribed taxa (brackets)	(+6)	(+4)	(+1)	(+11)	(+5)	(+13)	(+20)	(+1)	(+38)	(+49)

APPROXIMATE SIZES OF THE WA MUSEUM NATURAL SCIENCE COLLECTIONS

MAMMALS	40 000 SPECIMENS
BIRDS	35 000 SPECIMENS
REPTILES	85 000 SPECIMENS
FROGS	25 000 SPECIMENS
INSECTS	200 000 PINNED SPECIMENS
SPIDERS, SCORPIONS ETC.	180 000 SPECIMENS
FISHES	126 000 SPECIMENS
MOLLUSCS	190 000 LOTS
CRUSTACEANS	50 000 LOTS
WORMS	2 500 LOTS
CNIDARIANS (CORALS, ANEMONES ETC)	10 200 LOTS
SPONGES	925 LOTS
ECHINODERMS (STARFISHES, SEA URCHINS ETC)	18 500 LOTS
OTHER MARINE INVERTEBRATES	3 400 LOTS
FOSSILS	1 500 000 SPECIMENS
METEORITES	13 000 SPECIMENS
MINERALS	10 000 SPECIMENS


WA TERR. VERT. TAXA(EXCL.BIRDS) VS TIME
1990-94 INCLUDES UNDESCRIBED TAXA
NUMBERS OF TAXA
800
700
600
500
400
300
200
100
0
1800
1850
1900
1950
1990
FIVE YEAR INTERVALS
MAMMALS
FROGS
SNAKES
LIZARDS
TURTLES/CROCS
TOTALS

Box 6
Numbers of Individual Animals in Zoos

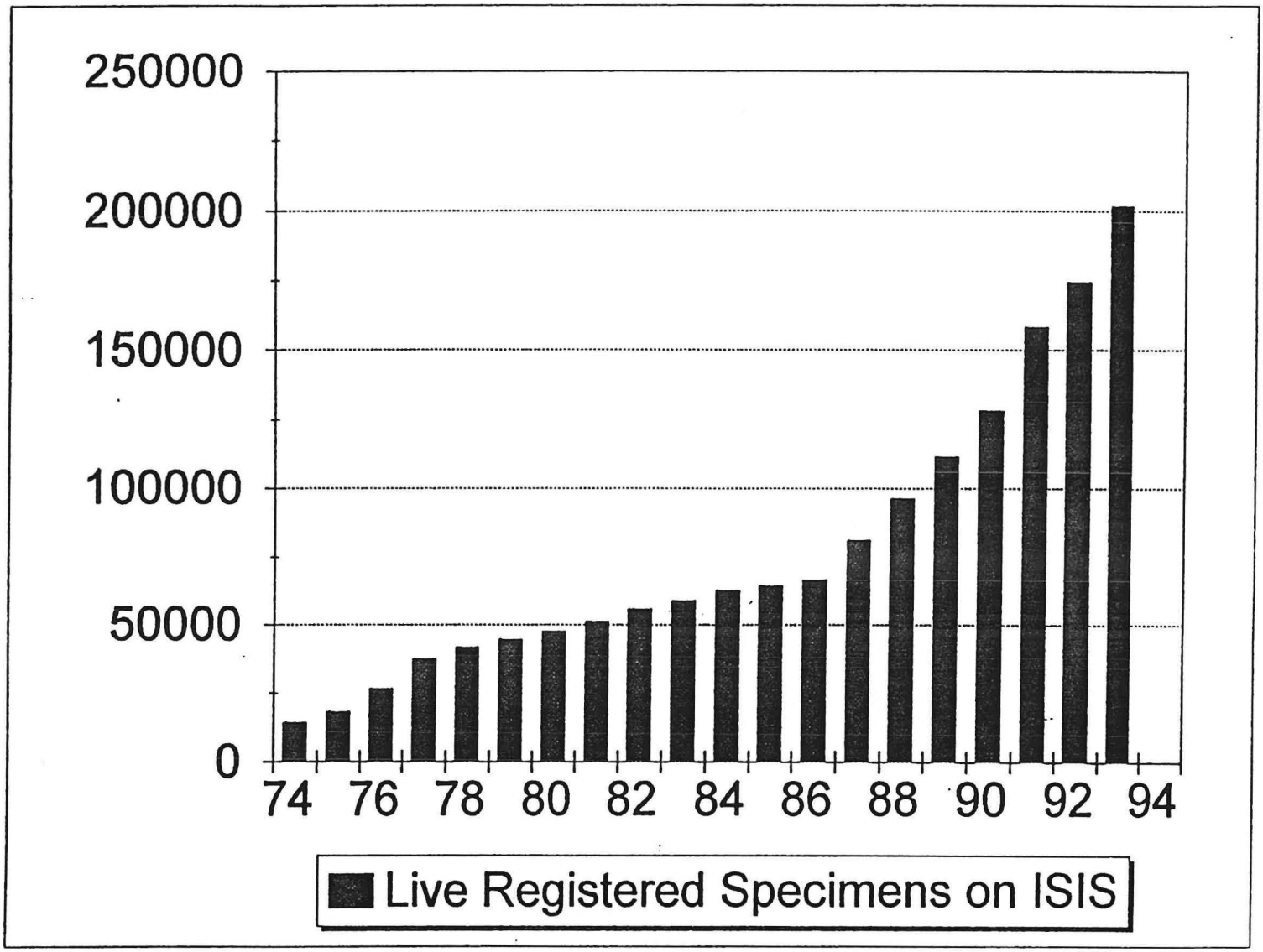
The table below gives estimated numbers of individuals of mammals, birds, reptiles, and amphibians in zoos on all continents. The estimates are based on information from ISIS (International Species Information System), IZY (International Zoo Yearbook), and extrapolations to cover all zoos indicated in Box 3. Invertebrates are not included. Fish are not registered in ISIS; their numbers are estimates based on the collections of a number of aquariums. [For amphibians and fish only those individuals beyond larval and very young stages are included.]

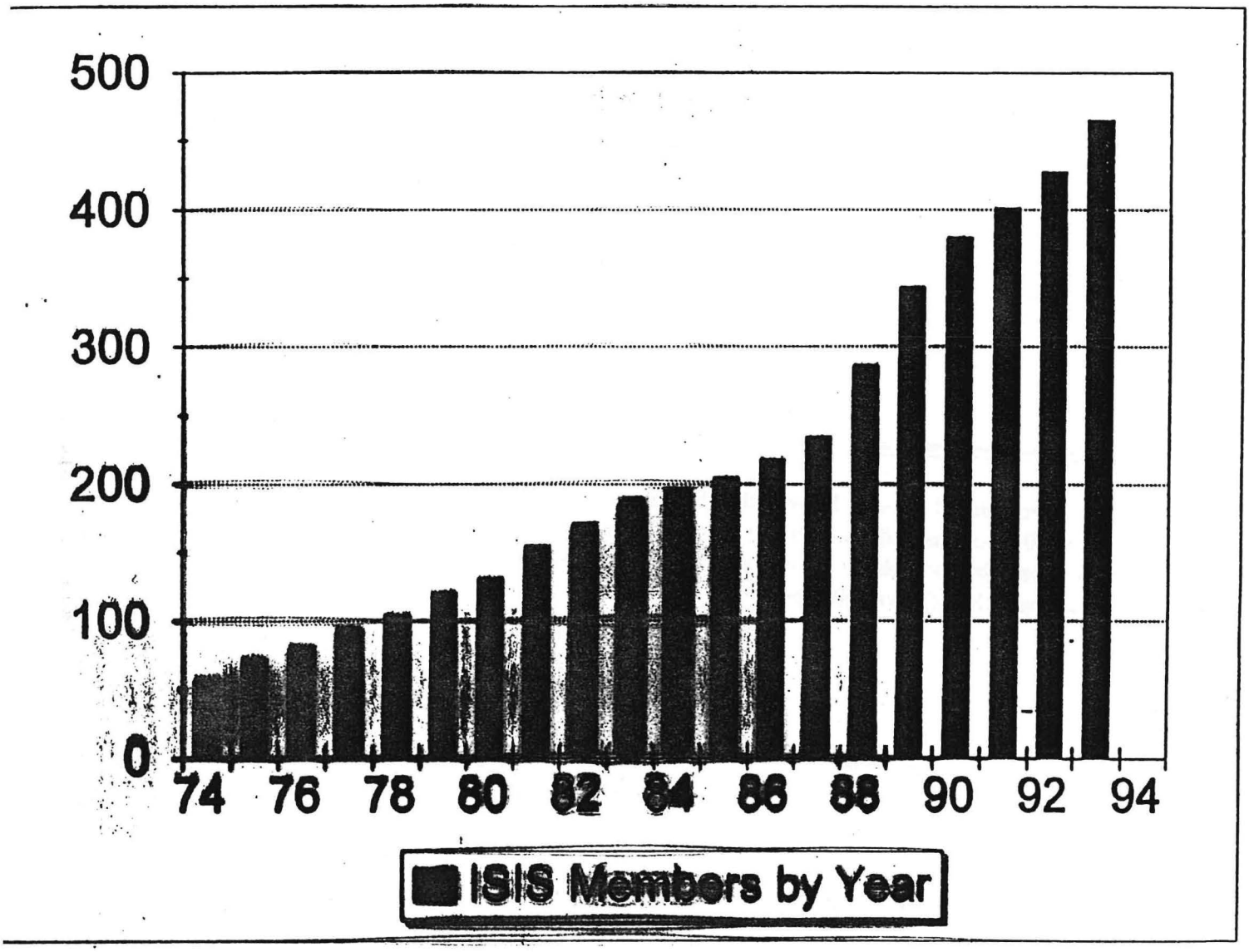
	Mammals	Birds	Reptiles	Amphibians	Fish
North America	60,000	70,000	25,000	5,000	100,000
Latin America	10,000	25,000	5,000	1,000	25,000
Europe	90,000	130,000	20,000	8,000	180,000
Asia	75,000	100,000	20,000	10,000	50,000
Africa	7,500	15,000	2,500	500	5,000
Australia	7,500	10,000	2,500	500	20,000
Totals per group	**250,000**	**350,000**	**75,000**	**25,000**	**300,000**

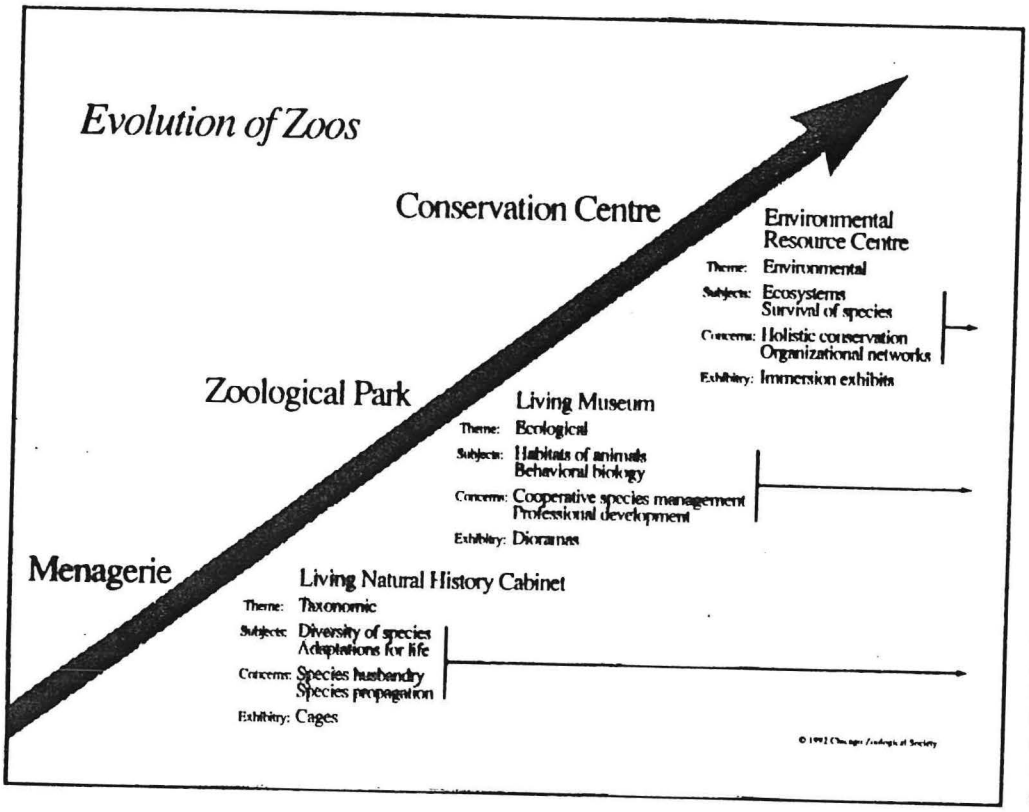
Estimated World Total of Zoo Vertebrates: 1,000,000

The following table presents some examples of numbers of animal species and specimens in various kinds of zoos (data from the International Zoo Yearbook 1990). [Numbers of species are in bold, numbers of individuals are in normal type.]

	Mammals	Birds	Reptiles	Amphibians	Fish	Invert.	Total
New York (Bronx)	**148**	**284**	**128**	**25**	—	**20**	**605**
(typical zoo, large)	1,756	1,015	803	372	—	1,400	5,346
Doué la Fontaine	**40**	**45**	**12**	—	—	—	**97**
(typical zoo, small)	280	350	100	—	—	—	730
Vancouver	**8**	**15**	**25**	**19**	**342**	**229**	**638**
(aquarium)	41	46	265	98	4,193	4,756	9,399
Walsrode	—	**932**	—	—	—	—	**932**
(birdpark)	—	5,620	—	—	—	—	5,620
Apeldoorn	**17**	**6**	—	—	—	—	**23**
(primate zoo)	294	28	—	—	—	—	322
Regensburg	—	—	**257**	—	—	—	**257**
(reptile zoo)	—	—	517	—	—	—	517


250000
200000
150000
100000
50000
0
74
76
78
80
82
84
86
88
90
92
94
Live Registered Specimens on ISIS

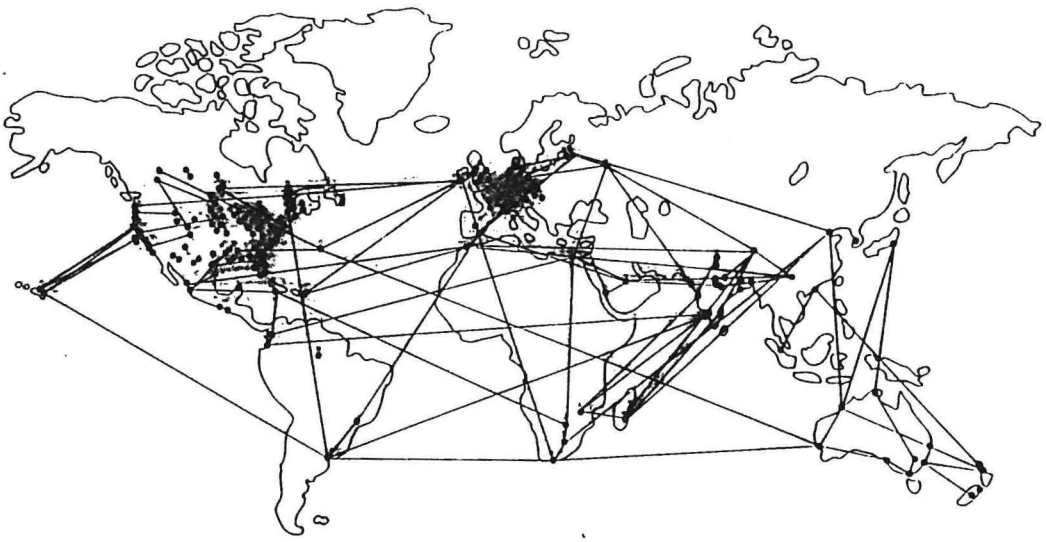

500
400
300
200
100
0
74
76
78
80
82
84
86
88
90
92
94
ISIS Members by Year



Zoos are rapidly evolving to serve in multiple ways as conservation centres. The horizontal arrows indicate that professional capacities of concern and subjects communicated to the public in earlier phases of zoo development are now vital services to conservation. As conservation centres, zoos must additionally address sustainable relationships of humankind and nature, explain the values of ecosystems and the necessity of conserving biological diversity, practise the conservation ethic throughout zoo operations, and cooperate within the world zoo network and with other conservation organizations. Immersion exhibits involve zoo visitors in the environmental circumstances of the animals, and such experiences are conducive to favourable reception by visitors of strong conservation messages.

The International Species Information System (ISIS) registers data on zoo animals. In 1993 over 400 zoos submitted data on (parts of) their collections to ISIS. The ISIS database comprises historical data on over 400,000 zoo animals, and on 180,000 living specimens (not including fish and invertebrates).

ISIS Network
405 Members in 48 Countries



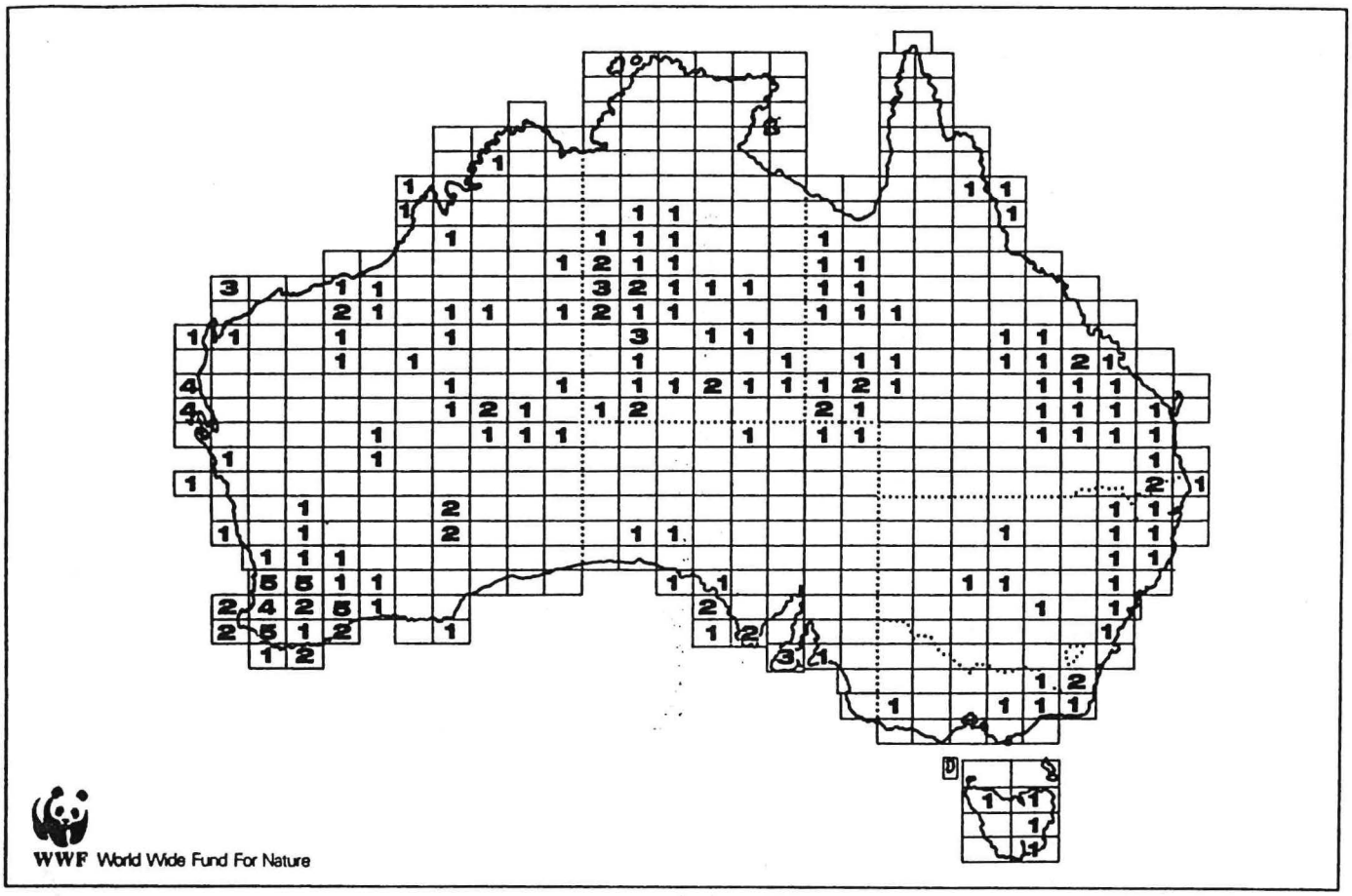


Figure 16. Distribution of endangered and vulnerable Australian marsupials.

EXTRACT FROM AMMSG ACTION PLAN

NUMBER OF ENDANGERED OR VULNERABLE SPECIES OF AUSTRALIAN MARSUPIAL : 27

NUMBER OF THESE PRESENT IN W.A. : 16

NUMBER OF THESE ONLY (VIRTUALLY) IN W.A. : 11

NUMBER OF THESE NOMINATED AS NEEDING OR POSSIBLY NEEDING CAPTIVE BREEDING : 10

NUMBER OF THESE CURRENTLY BEING BRED : 2

Box 2

Statements on the Role of Zoos in Conservation

Action 4.2 of "Caring for the Earth" (1991) calls to "Use a combination of in situ* *and* ex situ* *conservation to maintain species and genetic resources".* It states that "Zoological gardens have a key role in maintaining *ex situ* populations of animals". It calls on the zoo world to develop a "Zoological Gardens Conservation Strategy".

Action 69 of the "Global Biodiversity Strategy" (1992) calls to "Strengthen the conservation role of zoological parks". It states that "A conservation strategy should be developed to help set priorities and strengthen collaboration among zoos. The starting point would be identifying collective institutional strengths and weaknesses and evaluating national and international opportunities for further contributions to conservation".

Action 71 of the "Global Biodiversity Strategy" calls to "Strengthen collaboration among off-site and on-site conservation institutions, partly to enlarge the role of off-site facilities in species reintroduction, habitat restoration, and habitat rehabilitation". It states that "Zoos also continue to play an important role in reestablishing naturally extinct species in the wild". And it recognizes that "Aquaria are increasingly becoming involved in on-site conservation as well".

Article 9 of the "Convention on Biological Diversity" (1992) states that: "Each Contracting Party shall..., predominantly for the purpose of complementing in situ *measures (a) Adopt measures for* ex situ *conservation...; (b) Establish and maintain facilities for* ex situ *conservation of and research on plants, animals, and micro-organisms...; (c) Adopt measures for the recovery and rehabilitation of threatened species and for their reintroduction...; (d) Regulate and manage collection of biological resources from natural habitats for* ex situ *conservation purposes...; and (e) Cooperate in providing financial and other support for* ex situ *conservation..."* IUCN's "Guide to the Convention on Biological Diversity" (1993) remarks that "the main institutions for *ex situ* conservation of wild animal species are zoos and aquaria."

*A definition of *in situ* and *ex situ* is provided in Chapter 2.3.

Box 18

Important Categories of Zoo Research

It is impossible to give within the framework of this document a summary of all the professional areas, subdisciplines, and related sciences that are of importance to the conservation objectives of zoos. Thus, only a short overview of important research categories is provided here:

1. *Species-specific research.* Almost all animal species in zoos, especially those playing an important role in *ex situ* conservation, require further research in a wide range of areas, e.g. husbandry, nutrition, various behavioural characteristics, interactions with the environment, medicine, reproduction, physiology, endocrinology, and a whole host of others. Increased knowledge in these areas is required for improvement of longevity, well-being, reproduction, long-term conservation, and reintroduction potential.

2. *Population biology research* to increase our general knowledge of the dynamics of *in situ* and *ex situ* populations. It includes: theoretical development of small population genetics and demographics, adjustment of theoretical generalizations to species-specific situations, genetic and molecular genetic studies of various real populations, taxonomic studies to determine species and subspecies boundaries (using a variety of techniques and approaches), improvement of population management techniques, etc.

3. *Biotechnical research* is required to explore fully the ways in which artificial reproduction and cryopreservation techniques can support *in situ* and *ex situ* conservation.

4. *Conservation research* is primarily species-specific, but also involves the development of general methods and techniques for assessing the viability and degree of endangerment of species, populations, and habitats. This information is basic to the formulation of action plans and priority lists for species requiring *ex situ* conservation.

5. *Educational research* is needed to increase the educational impact of all aspects of conservation on public awareness.

Box 15

Benefits of Cryopreservation to Species Conservation

Cryopreservation of germ plasm (semen, ova, and embryos) has a number of distinct advantages in regard to species conservation:

1. It enables easy transportation of genetic material over long distances; this can greatly simplify exchange of genetic material between sub-units of *ex situ* populations, as well as between *ex situ* and *in situ* populations.

2. It makes increase of generation time in *ex situ* populations possible—frozen sperm, ova, or embryos may be used long after a parent's death. This means that fewer animals would be required per *ex situ* population, hence more species can be preserved in a more cost effective way through *ex situ* efforts.

3. It enables retrospective analyses of genetic founder material, which may be important in pedigree analysis.

4. It may form an insurance against loss of living representatives of important genetic lineages, as frozen genetic material of ancestors can be revived.

5. Similarly, it may form an insurance against undesirable effects of unnatural selection in *ex situ* populations—if such selection did occur, founder material that had not yet been selected upon could be injected into the population.

6. Finally, cryopreserved material could provide insurance against epidemic diseases or other catastrophes in *in situ* or *ex situ* populations. After decimation of the population by such an event, reintroduction of genetic material from cryopreserved bloodlines could help revitalize the population. It should be noted, however, that cryopreserved germ plasm can only be used for this purpose as long as at least a minimal number of living individuals of a species are available to carry on the species' non-genetic heritage (see Box 16).

Box 14

Benefits of Artificial Reproduction Techniques for Population Management

Artificial reproduction techniques are useful tools for population management, because:

1. They can simplify the exchange of genetic material between two or more *ex situ* programme sites in order to avoid inbreeding, and for other objectives. Transport of sperm and embryos is considerably less expensive, and also carries far fewer risks than transport of animals.

2. They can enable reproduction in animals with behavioural or physical reproductive handicaps (e.g. behaviourally incompatible pairs, human imprinted animals, physical obstructions to mating and/or pregnancy). This can be very important if it involves animals that represent important genetic lines in breeding programmes. Care should be taken, however, not to breed animals with genetically determined handicaps.

3. They make rapid population growth possible. This can be of crucial importance if only a very small founder population is available for a critically endangered species, as it is then of paramount importance to have swift population expansion in the first few generations.

4. They can help to correct uneven sex ratios; for example embryos of the needed sex can be transplanted.

5. They can help to regulate the number of offspring per individual animal, i.e. reproduction can be stimulated in animals with too few offspring; this is particularly important if the animal represents an important founder line.

6. They can make possible exchange of genetic material between *ex situ* and *in situ* populations, when and where necessary, without requiring the transfer of animals. *Ex situ* populations can be reinforced without removing animals from wild, relict populations. *In situ* populations can be "injected" with new genetic material from captive populations without all of the problems associated with reintroduction of animals, and the dangers of introducing diseases.

Box 8
IUCN Policy Statement on Captive Breeding

IUCN released a policy statement on captive breeding (4 September 1987) stating that:

"....Certain groups of species are at particularly high risk, especially forms with restricted distribution, those at the top of food chains, and those which occur only in climax habitats. Species in these categories are likely to be lost first, but a wide range of other forms are also at risk. Conservation over the long term will require management to reduce risk, including *ex situ* populations which could support and interact demographically and genetically with wild populations."

"Over 3,000 vertebrate species are being bred in zoos and other captive animal facilities. When a serious attempt is made, most species breed in captivity, and viable populations can be maintained over the long term. A wealth of experience is available in these situations, including husbandry, veterinary medicine, reproductive biology, behaviour, and genetics. They offer space for supporting populations of many threatened taxa, using resources not competitive with those for *in situ* conservation...."

IUCN urged that:

"....Those national and international organizations and those individual institutions concerned with maintaining wild animals in captivity commit themselves to a general policy of developing demographically self-sustaining captive populations of endangered species wherever necessary."

IUCN suggested the following protocol:

"*WHAT:* The specific problems of the species concerned need to be considered, and appropriate aims for a captive breeding programme made explicit."

"*WHEN:* The vulnerability of small populations has been consistently underestimated. This erroneously shifted the timing of establishment of captive populations to the last moment, when the crisis is enormous and when extinction is probable. Therefore, timely recognition of such situations is critical, and is dependent on information on wild population status, particularly that provided by the IUCN/Conservation Monitoring Centre. Management to *best* reduce the risk of extinction requires the establishment of supporting captive populations much earlier, preferably when the wild population is still in the thousands. Vertebrate taxa with a current census below one thousand individuals in the wild require close and swift cooperation between field conservationists and captive breeding specialists, to make their efforts complementary and minimize the likelihood of the extinction of these taxa."

"*HOW:* Captive populations need to be founded and managed according to sound scientific principles for the primary purpose of securing the survival of species through stable, self-sustaining captive populations. Stable captive populations preserve the options of reintroduction and/or supplementation of wild populations...."

Figure 3: Research Management Recommendations

(CAMPs Since December, 1992)

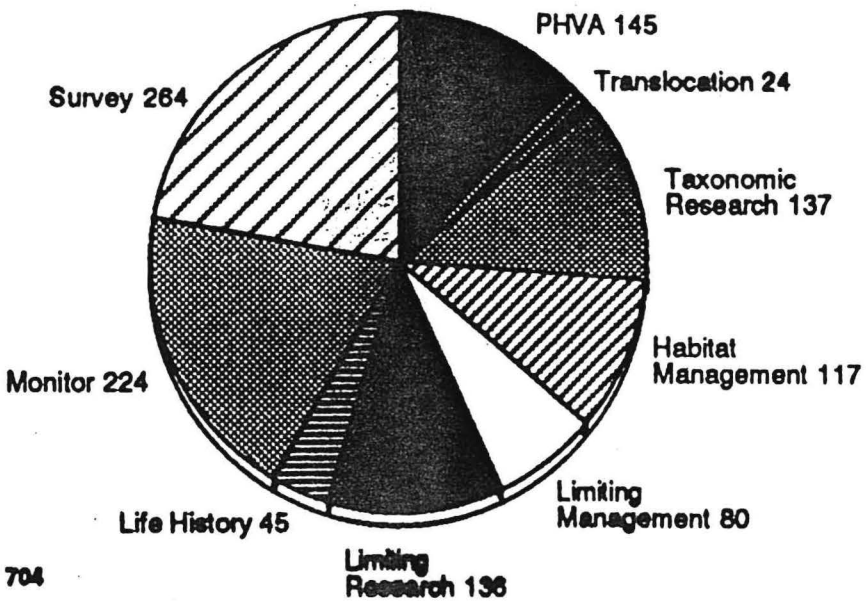


Figure 4: Captive Program Recommendations

From CAMP Workshops through August, 1993

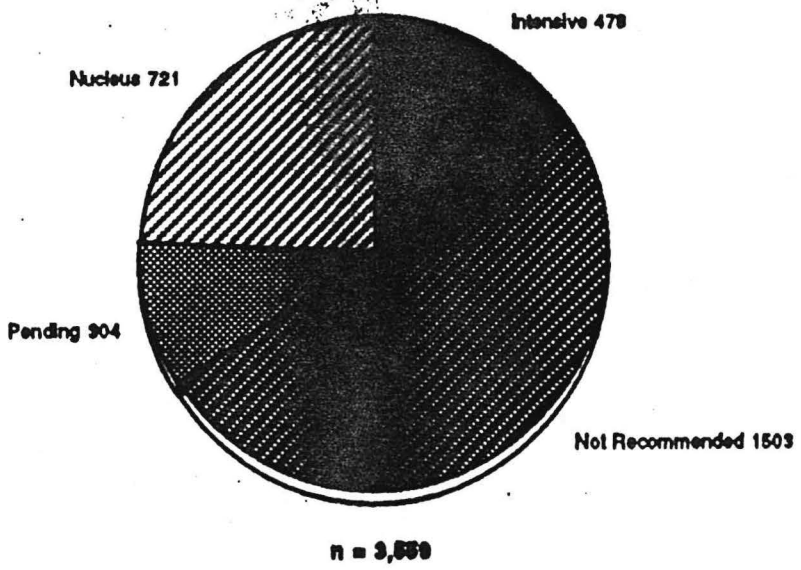


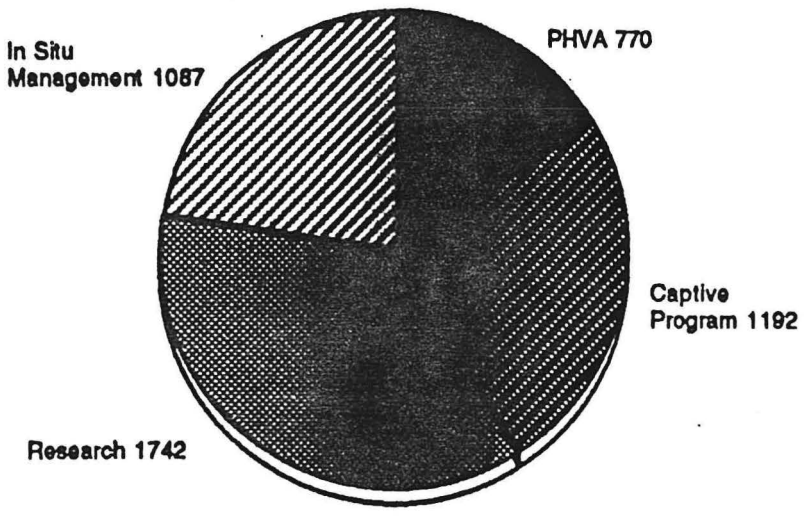
TABLE 2

NUMBER OF INTENSIVE ACTION RECOMMENDATIONS

	TOTAL TAXA	PHVA	MORE *IN SITU* MGMT	RESEARCH	CAPTIVE BREEDING
BOIDS/PYTHONIDS	159	20	29	94	57
VARANIDS	65	5	32	57	26
IGUANIDS	66	21	42	62	30
PENGUINS (preliminary)	24	17	14	24	13
WATERFOWL	234	92	173	166	150
PIGEONS & DOVES	352	35	77	53	40
CRANES	31	25	23	27	24
PARROTS	428	125	175	199	169
ASIAN HORNBILLS	52	35	15	50	45
HAWAI'IAN FOREST BIRDS	65	23	59	59	15
PRIMATES	512	136	37	192	229
CANIDS, HYAENAS	225	14	22	47	33
PROCYONIDS	20	10	9	40	12
MUSTELIDS	60	7	37	78	12
LUTRINAE	19	3	19	39	2
VIVERRIDS	49	9	20	56	7
HERPESTINAE	42	5	13	40	6
FELIDS	264	30	80	120	98
CERVIDS	164	45	27	127	55
ANTELOPE	395	62	111	119	138
CAPRINAE	87	51	73	93	31
TOTAL (%)	3,314	770	1,087	1,742	1,192

Figure 2: Recommendations for Action

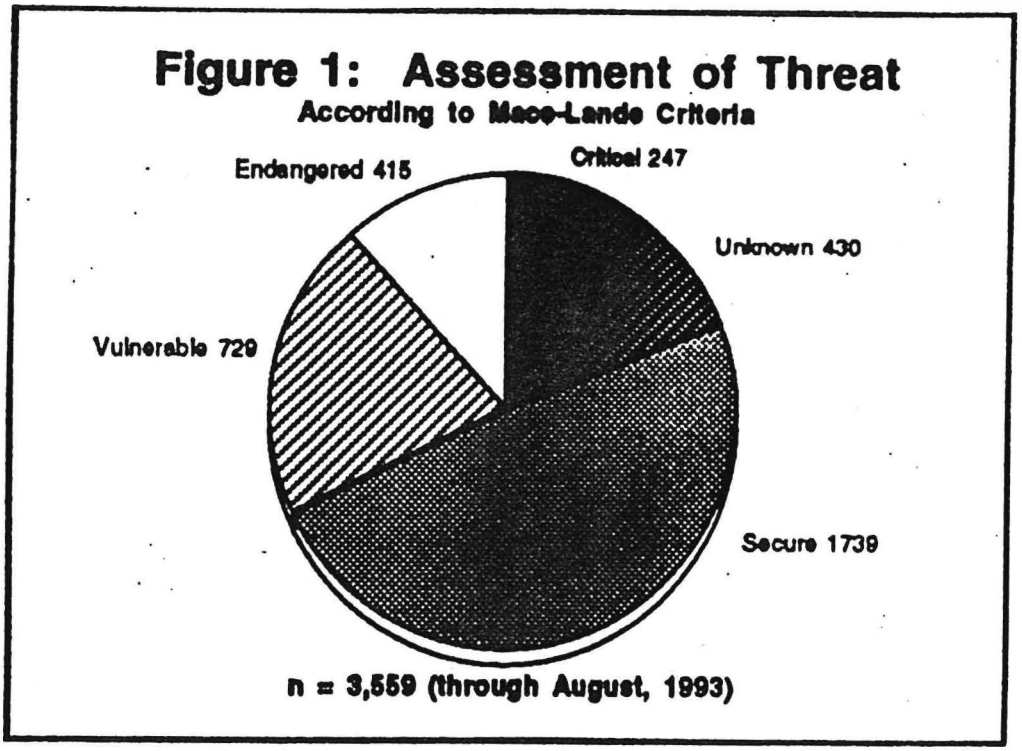
From CAMP Workshops through August, 1993



n = 3,314

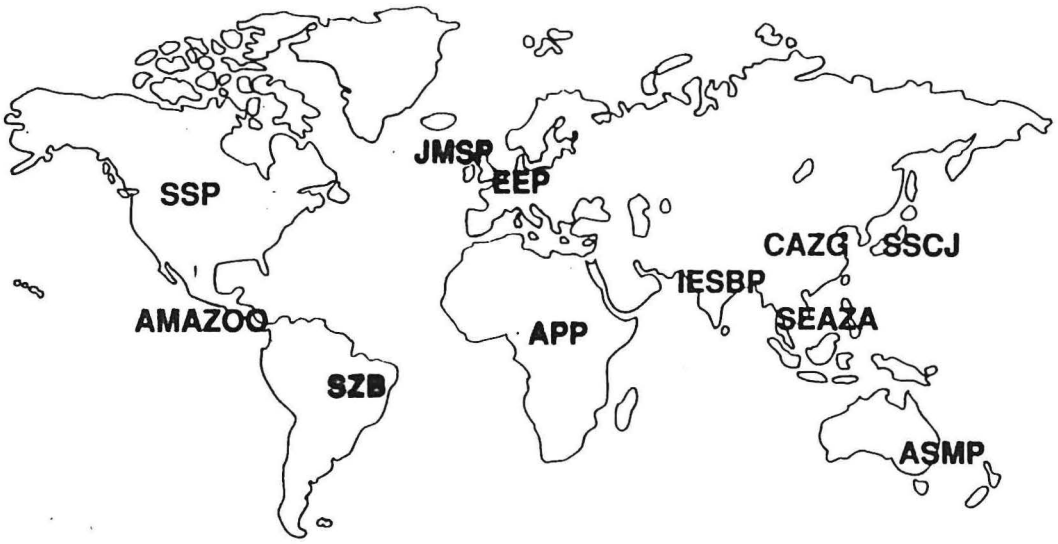
TABLE 1
ASSESSMENT OF THREAT

	TOTAL TAXA	CRITICAL	ENDANG.	VULNER.	SAFE	UNK	TOTAL THREATENED
BOIDAE/PYTHONIDAE	159	4	13	31	108	3	48 (30%)
VARANIDAE	65	0	2	23	29	11	25 (38%)
IGUANIDAE	66	3	10	27	14	12	40 (60%)
PENGUINS (preliminary)	24	0	3	7	11	3	10 (41%)
WATERFOWL	234	10	24	43	157	0	77 (33%)
GALLIFORMES (excl. Cracidae)	245	5	25	61	142	12	91 (37%)
PIGEONS & DOVES	352	15	28	51	222	36	94 (27%)
CRANES	31	9	7	7	8	0	23 (74%)
PARROTS	428	25	36	78	228	61	139 (32%)
ASIAN HORNBILLS	52	5	15	24	9	0	44 (85%)
HAWAI'IAN FOREST BIRDS	65	22	12	23	0	8	57 (88%)
PRIMATES	512	59	69	93	291	0	221 (43%)
CANIDS, HYAENAS	225	8	10	16	191	0	34 (15%)
PROCYONIDAE	20	7	3	2	7	1	12 (60%)
MUSTELIDAE	60	3	5	12	35	5	20 (33%)
LUTRINAE	19	0	4	9	3	3	13 (68%)
VIVERRIDAE	49	2	12	11	20	4	25 (51%)
HERPESTINAE	42	0	4	8	23	7	12 (28%)
FELIDS	264	31	60	104	69	0	195 (74%)
CERVIDS	164	21	29	23	60	31	73 (44%)
ANTELOPE	395	9	21	46	87	232	76 (19%)
CAPRINES	87	10	22	30	25	0	62 (71%)
TOTAL (%)	3,559	246 (6%)	414 (12%)	730 (20%)	1,739 (49%)	429(12%)	1,345 (38%)



Box 10

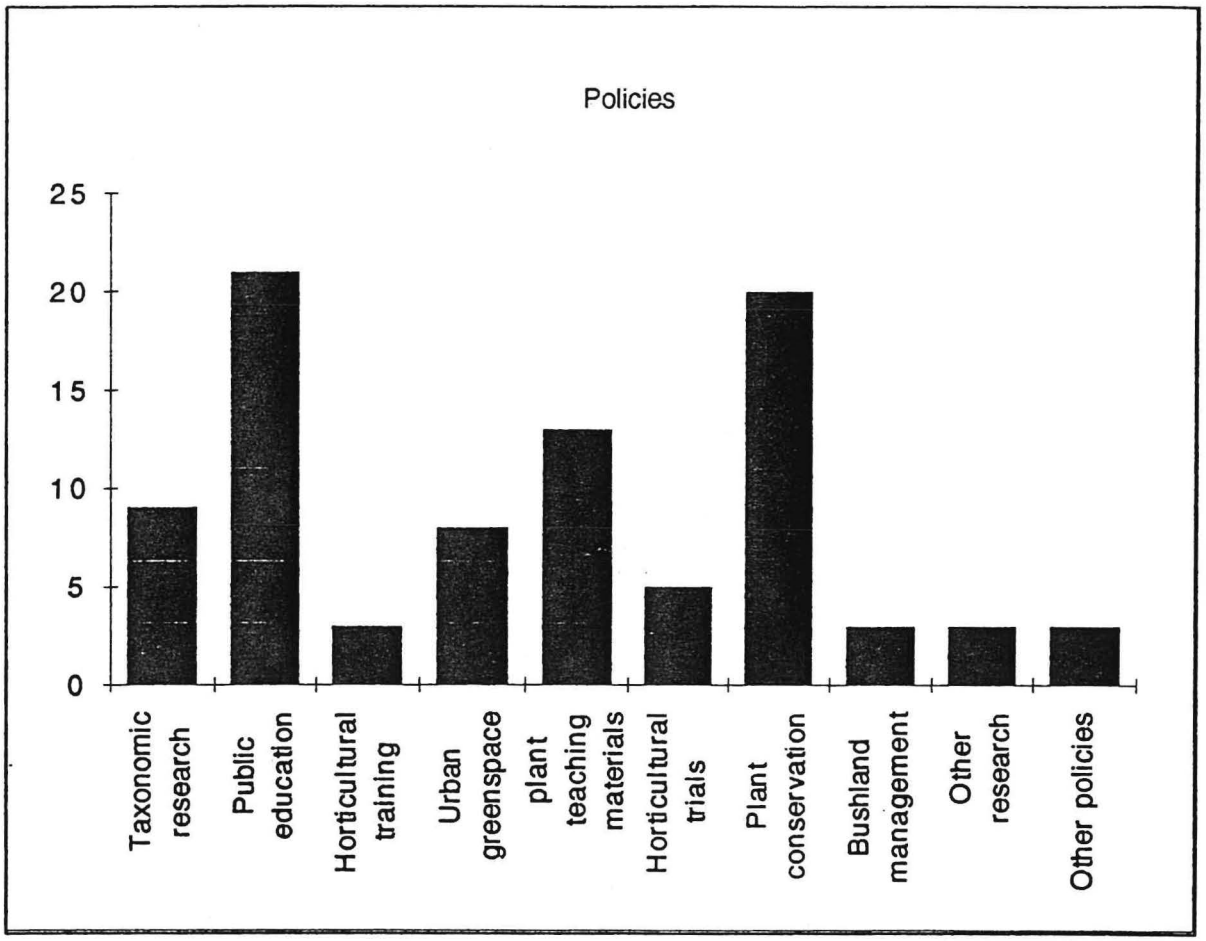
Regional Breeding Programme Organizations



SSP:	Species Survival Plans, conducted by the American Association of Zoos and Aquaria (AAZPA)
EEP:	European Endangered Species Programme, conducted by the European Association of Zoos and Aquaria (EAZA)
JMSP:	Joint Management of Species Programme, conducted by the Federation of Zoological Gardens of Great Britain and Ireland (these nations also participate in the European Endangered Species Programme, EEP)
APP:	African Propagation Programmes, being initiated by the Pan African Association of Zoological Gardens, Aquaria and Botanic Gardens (PAAZAB)
AMAZOO:	Regional captive breeding programmes being initiated by the Association of Meso American Zoos (AMAZOO)
ASMP:	Australasian Species Management Programme, conducted by the Australian Regional Association of Zoological Parks and Aquaria (ARAZPA)
SSCJ:	Species Survival Committees Japan, conducted by the Japanese Association of Zoological Gardens and Aquaria (JAZGA)
CAZG:	Captive breeding programmes being initiated by the Chinese Association of Zoological Gardens (CAZG)
SZB:	Captive breeding programmes being initiated by the Brazilian Zoo Society (SZB)
IESBP:	Indian Endangered Species Breeding Programmes, conducted by the Central Zoo Authority of India
SEAZA:	Regional captive breeding programmes being initiated by the South East Asian Association of Zoos (SEAZA)

WATSCU '94 S.D. HOPPER
Role of Kings Park & Botanic Garden

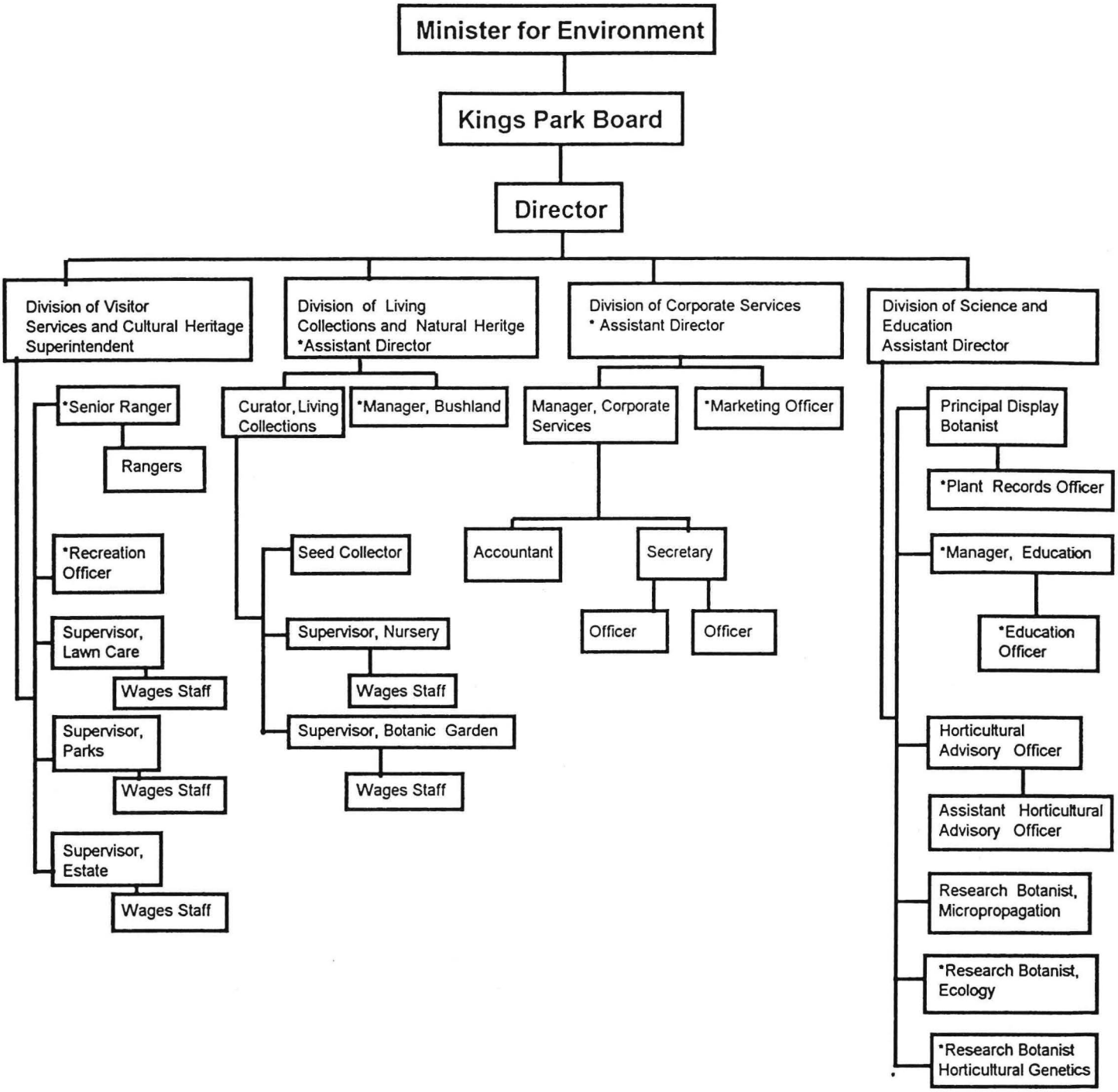
Role of Botanic Gardens



PURPOSE

To ensure that the natural and cultural heritage and recreational resources of Kings Park and the State's Botanic Garden are conserved, enhanced and displayed for the lasting benefit of the community,
and
to contribute to the conservation of Western Australian and other plant life

NEW ORGANISATIONAL STRUCTURE



* = new position

HOW MIGHT KINGS PARK AND BOTANIC GARDEN CONTRIBUTE?

- benchmark urban bushland
- access to living collections
- identification of taxa
- *ex situ* propagule storage and horticulture
  - seed and seedling biology
  - cuttings
  - micropropagation
  - cryobiology
  - horticultural management
- repair, recovery & restoration
  - ecophysiology
  - reproductive biology
  - population biology
  - community ecology
- education
- interpretation

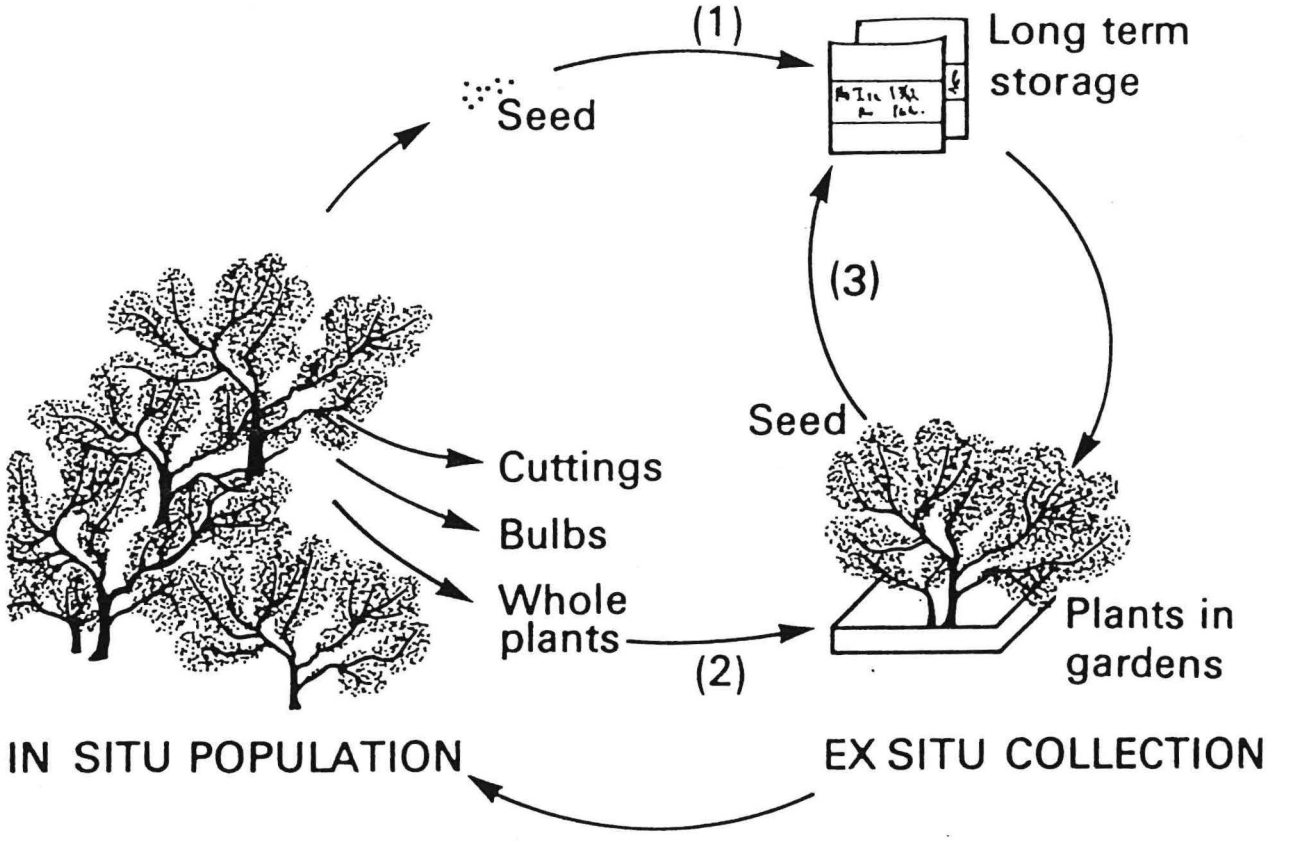


Figure 7.1. Three basic routes by which an *ex situ* collection is established, and its feedback to the source *in situ*.

KINGS PARK NURSERY REPORT ON DECLARED ENDANGERED FLORA 1990/91

CUTTINGS AND GRAFTS (COLLECTIONS 1/7/90-30/6/91)

No.	Species	Collectors Name	Date Cuttings taken	Cuttings		Grafts		Comments
				No. Taken	No. Potted	No. Taken	No. Success	
1	Pityrodia scabra	Kingsley Dixon via CALM	6/8/90	55	Nil	-	-	
	Pityrodia scabra	S426	8/11/90	176	Nil	9	5	Cuttings from established grafts were successful.
2	Daviesia spiralis	S85	31/8/90	295	Nil	-	-	
3	Halosarcia bulbosa	S75*	31/8/90	252	12	-	-	
4	Microcorys eremophiloides	S91*	31/8/90	85	Nil	-	-	
		S397*	8/11/90	103	23	7	5	Cutting grafts
		S662	19/12/90	36	Nil	12	11	Cutting grafts
5	Eriostemon wonganensis	S98*	31/8/90	210	14	8	Nil	
6	Daviesia megacalyx/MS	E.M.B. 5509	31/8/90	15	1	-	-	
7	Hemigenia viscida	S96	31/9/90	37	Nil	11	5	
8	Darwinia masonii	S219*	19/9/90	140	50	-	-	
9	Verticordia sp. (Fitzgerald)	Bob Dixon **	25/9/90	23	9	-	-	
10	Thomasia montana	Judy Williams	1/10/90	11	2	-	-	
11	Grevillea sp. S.Hopper 6350 (Dandaragan)	Kingsley Dixon**	29/10/90	48	8	-	-	
12	Darwinia carnea Mogumber form	N. Marchant	7/11/90	43	16	-	-	
13	Grevillea dryandroides	Kingsley Dixon**	19/11/90	10	Nil	-	-	
	Grevillea dryandroides	S648*	19/12/90	34	9	-	-	
14	Eremophila inflata	S564*	28/11/90	151	1	-	-	
15	Acacia forrestiana	S722*	15/2/91	57	1	-	-	
16	Tetratheca harperi	B2/91/1/91 Jeni Alford	22/1/91	18	Nil	-	-	

CUTTINGS AND GRAFTS CONTINUED

No.	Species	Collectors Name	Date Cuttings taken	Cuttings		Grafts		Comments
				No. Taken	No. Potted	No. Taken	No. Success	
17	Verreauxia verreauxii	G.B. 109	12/6/91	25		-	-	
18	Pimelea rara	G.B. 107	12/6/91	-	-	20	18	
19	Lechenaultia laricina	G.B. 114	12/6/91	102		-	-	No result as yet
20	Lechenaultia pulvinaris	G.B. 111	12/6/91	92		-	-	No result as yet
21	Darwinia collina	S329*	18/10/90	61	4	-	-	
22	Boronia revoluta	CALM	16/7/90	15	Nil	-	-	

PLANTS BROUGHT INTO NURSERY

	SPECIES	NAME OF DONATOR	NO. OF PLANTS
1	Verticordia harveyi	NP Moyles	3
2	Pandanus spiralis var. flammeus	S799	6
3	Sowerbaea multicaulis *	Ray Paynter	4
4	Tetratheca harperii	Jeni Alford	1
5	Dryandra serratuloides 'Mogumber form' 'Badgingarra form'	 E. George E. George	 1 1
6	Dryandra mimica	E. George	2
7	Dryandra sp. (Kamballup)	E. George	2

RESEARCH SECTION REPORT ON THE TAKING OF DECLARED ENDANGERED FLORA 1990/91

SPECIES	MATERIAL	AMOUNT	DATE	COLLECTOR	LOCATION	COMMENTS
Caladenia elegans	Whole plant Pollen from	1 5 plants	9/8/90	with Steve Hopper and Andrew Brown	Northampton	To isolate mycorrhiza collected, frozen, used to fertilise ca
Diuris recurva	Whole Plant Pollen from	1 5 plants	9/8/90	As Above	As Above	10 plants, pods harvested September As Above
Eremophila racemosa	Seed from	7 plants	-	Dennis Hilder	CALM Narrogin	
Wurmbea drummondii	Seed from	20 plants	3/10/90	Len Tallot	CALM Mundaring	** See Nursery Report
Anigozanthos viridis sp terraspectans	Whole plants	5	29/10/90	Kingsley Dixon	near Walka/Cooljarloo Roads intersection	
Grevillea aff. hookeriana	Cuttings Seed Pods	20 10	29/10/90 29/10/90	Kingsley Dixon Kingsley Dixon	Moora - Caro Rd near intersection Minyulo Rd	** See Nursery Report
Grevillea dryandroides	Cuttings from plants	10 2	19/11/90	Kingsley Dixon	30.6km south of Dangin on Aldersyde Rd	** See Nursery Report
Verticordia sp. nov	Cuttings		21/9/90	N.J. Stevens per Bob Dixon, Horticultural Advisor	Ken Newbey's Arboretum	** See Nursery Report Original collection probably by K. Newbey from Fitzgerald River National Park

DRAFT

Kings Park and Botanic Garden

The Collection Policy for Declared Park Flora Species for Storage, Cultivation and Recovery in the Wild

1. AIMS

a) To secure by seed and vegetative collection the storage and cultivation of rare flora endangered in the wild.

b) To maintain genetic and allelic richness within a sampled species.

c) To maintain a bank of material available to bulk up a species for return to the wild.

2. GENERAL COLLECTING GUIDELINES

a) Collecting material should always be assessed as to the availability of material and should not place the population under stress.

b) Collection of vegetative material should be done randomly but with a regard to phenotype and be representative with respect to ecological variations within the site.

c) Unusual forms within a population should be treated as individuals collections.

d) Healthy disease free material should be collected wherever possible.

3. SAMPLING GUIDELINES

a) Where there is a population of less than 15 individuals then material should be collected from each individual and treated as a separate collection. Locations of each individual to be mapped and numbered.

b) Where there are more than 15 individuals in a population then material should be collected from 5-10 individuals in the population. Selection should be random if possible, but site and habitat variations should be taken into account and material collected from these various areas.

c) Where there are numerous population (>5), material should be collected from 5-10 individuals in each of the populations and these should be selected with regard to habit and likely genetic diversity.

4. CHOICE OF MATERIAL

a) Collection of cutting and or seed is dependant upon material being available.

b) Ideally seed will be collected.

c) Populations of less than 15 individuals may require seed and cutting collections from the same plants. This can be achieved at different times of the year. In the case of a larger population being available cuttings will be taken as (per. 3.)

d) Cuttings taken and subsequently propagated will become representative of that species and no further cutting material will be obtained from wild source except if that species is lost in cultivation.

5. OTHER

a) Other material of plants such as roots or whole plants would only be taken if the plant was perceived to be under immediate threat. This does not include divisions.

6. HERBARIUM SPECIMENS

a) One herbarium specimen only to be collected from any one population.

b) In the event of further material being required no further specimens shall be obtained.

c) Where a population is variable a number of specimens indicating a specific change may be taken.

7. PHOTOGRAPHS

a) A photographic record should be taken of plant, flowers and site. This should include a field number for reference.

Kings Park & Botanic Garden
Collecting costs for D.R.F. material.
21st March 1994

Cost of making 1 collection.

On average we collect 10 to 12 species per day. Therefore costs for 1 collection are the daily rate divided by 10.

Cost per day

Fuel & Camping allowance	$120
Vehicle cost	$ 76
Staff costs	$220
Equipment	$ 50
	$466

Cost per collection $46
+ Research & planning $35

Cost for D.R.F. collection $81 per species.

Seed cleaning, fumigation and storage. $17 per accession

Identification & photographs $17 per species

Cost to collect, clean, record, identify and store seed for one accession of one species. $115

Kings Park Nursery D.R.F. Propagation and Holding Costs.

Re: Background of costs involved for asexual propagation.

The Declared Rare Flora can be divided into three general groups which will indicate reasons for variations involved.

Group A
These plants require standard nursery practices for cultivation needing no special requirements and produce good material from which propagation proves to be easy.

Costs below involve establishment of a plant in the respective pot size
75mm pot - $2
125mm pot - $4
150mm pot - $6

To hold genetic material of species which fall into this category would be $70 per clone line per year.

Group B
These plants prove difficult to propagate with the material not always suitable. Requiring some special handling and growing conditions and have moderate vigour.

Costs below involve establishment of a plant in the respective pot size
75mm pot - $4
125mm pot - $6
150mm pot - $8

To hold genetic material of species which fall into this category would be $100 per clone line per year.

Group C
These plants are very difficult to propagate with good material hard to come by. Plants require specialist treatment often requiring grafting technics for plants to be brought into cultivation.

Costs below involve establishment of a plant in the respective pot size
75mm pot - $8
125mm pot - $10
150mm pot - $12

To hold genetic material of species which fall into this category would be $150 per clone line per year.

EXAMPLE OF GROUP A PLANT

Leschenaultia superba - this species has a 90% strike rate and has no cultural problems.

THE RECOVERY PROCESS

1. review the conservation status of taxa,
2. prepare priority lists of threatened taxa,
3. conduct the necessary research,
4. produce costed Recovery Plans,

   and for each Recovery Plan,

5. obtain funding,
6. implement,
7. monitor and review.

SOME OF THE SUCCESSES!

- legislative protection for threatened plants
- noisy scrub-bird - fire management and translocation
- woylie, numbat, chuditch - fox control, translocation
- short term protection of *Phytophthora*-infected plant populations with phosphonate
- western swamp tortoise - captive breeding, habitat management
- threatened plants - "extinct" taxa rediscovered, many new populations located and protected
- improved plant propagation and germination

PARADOXES

- legislation for threatened fauna inadequate
- no plant recoveries in wild
- little effort directed towards 99% of species diversity
- priorities have sometimes been *ad hoc*

DRAFT IUCN RED LIST CATEGORIES
(December 1993)

EX	EXTINCT	
EW	EXTINCT IN THE WILD	
CR	CRITICAL	THREATENED
EN	ENDANGERED	
VU	VULNERABLE	
CD	CONSERVATION DEPENDENT	
SU	SUSCEPTIBLE	
LR	LOW RISK	
DD	DATA DEFICIENT	
NE	NOT EVALUATED	

THREATENED SPECIES

1. Now an issue of State, national and international importance.

2. Accordingly, threatened species have become a major political issue.

3. Enormous challenges world-wide.

4. WA leads Australia in research and conservation action, but there remains much to be done.

APPROACHES TO BIODIVERSITY CONSERVATION

1. Conserving ecosystem diversity (= ecological communities)

2. Conserving species diversity

3. Conserving genetic diversity

4. Combating threatening processes

MISSION: RECOVERY

Oblivion or Hope for Western Australia's threatened Plants, Animals and Ecosystems

THREATENED ECOLOGICAL COMMUNITIES

1. Australia leads the world! Some experience in Victoria, little elsewhere.

2. Essential that we get the science right.

3. Has potential to become a major political "green versus brown" issue. Will need careful management.

5. STRATEGIES

To accomplish the above objective and policies, the Department will:

5.1 Set up a Ranking Panel consisting of six to ten scientists, from CALM or other organisations as appropriate, with a wide knowledge of the conservation status of the Western Australian fauna and flora. Each threatened taxon will be scored using a scoring sheet; the current one is provided at Appendix 1. The Panel will then review the scores by asking questions such as:

(i) Is there a single over-riding threat, eg, *Phytophthora*, predation or habitat destruction, that is likely to lead to the early extinction of the taxon? If so, the score will be compared with those of other taxa, and increased in rank as appropriate.

(ii) Is the taxon rare and geographically restricted, but not subject to immediate threats? If so, the score will be compared with those of other taxa, and decreased in rank as appropriate.

(iii) Does the taxon exist only in small remnant(s) with no suitable habitat elsewhere? If so, the score will be compared with those of other taxa, and increased in rank as appropriate.

(iv) Does the taxon have a high degree of habitat specificity and is that habitat rare or threatened? If so, the score will be compared with those of other taxa, and increased in rank as appropriate.

The Panel will then allocate all declared threatened taxa with populations known to occur in Western Australia to the following categories, using the scores and the draft IUCN criteria (Appendix 2) as guidelines: Critical (CR), Endangered (EN), Vulnerable (VU), and Susceptible (SU).

CALM, WATSCU

Draft Conservation Action Priorities, WA's 35 most endangered vertebrate animals (as listed in Nature Conservation Strategy)

CRITICAL

Species	Common name	Conservation action status
Ctenotus lancelini	Lancelin Island Skink	IWMG being implemented, research underway
Geopsittacus occidentalis	Night Parrot	No IWMG
Pseudemydura umbrina	Western Swamp Tortoise	Recovery Plan being implemented

ENDANGERED

Amytornis textilis textilis	Thick-billed Grass-wren	No research, no IWMG
Atrichornis clamosus	Noisy Scrub-bird	Recovery Plan being implemented
Bettongia lesueur	Boodie	Some research, no IWMG
Cacatua pastinator pastinator	Long-billed Corella (southern population)	No research, no IWMG
Caretta caretta	Loggerhead Turtle	Research underway, no IWMG
Dasycercus cristicauda	Mulgara	National Recovery Team preparing a National Recovery Plan
Dasyornis longirostris	Western Bristlebird	Research Plan being implemented, Recovery Plan to be written at completion of research work
Dasyurus geoffroii	Chuditch	Recovery Plan being implemented
Erythrura gouldiae	Gouldian Finch	Recovery Plan being prepared
Falcunculus frontatus whitei	Northern Shrike-tit	No IWMG
Geocrinia alba	White-bellied Frog	Recovery Plan being implemented
Geocrinia vitellina	Yellow-bellied Frog	Recovery Plan being implemented
Isoodon auratus (not *I. a. barrowensis*)	Golden Bandicoot	No IWMG
Lagorchestes hirsutus	Mala, Rufous Hare-wallaby	National Recovery Plan in preparation
Lagostrophus fasciatus	Banded Hare-wallaby	No IWMG
Leipoa ocellata	Malleefowl	No IWMG
Leporillus conditor	Greater Stick-nest Rat	National Recovery Plan being implemented
Macrotis lagotis	Dalgyte, Bilby	National Recovery Plan in preparation
Myrmecobius fasciatus	Numbat	Recovery Plan being drafted
Notomys fuscus	Dusky Hopping-mouse	No IWMG
Parantechinus apicalis	Dibbler	No IWMG
Perameles bougainville	Western Barred Bandicoot	Some research, no IWMG
Petrophassa smithii	Partridge Pigeon	No research, no IWMG
Pezoporus wallicus flaviventris	Western Ground Parrot	Research Plan written, no resources to implement, no IWMG
Phascogale calura	Red-tailed Phascogale	Research underway, no IWMG
Pseudocheirus occidentalis	Western Ringtail Possum	Research Plan written, no resources to implement, no IWMG
Pseudomys australis	Plains Rat	No IWMG
Pseudomys fieldi	Shark Bay Mouse	Recovery Plan being implemented
Pseudomys shortridgei	Heath Rat	No research, no IWMG
Psophodes nigrogularis	Western Whipbird	Research Plan written, no resources to implement, no IWMG
Sminthopsis psammophila	Sandhill Dunnart	No research, no IWMG

Draft allocation of priorities for writing Recovery Plans or IWMGs

Amytornis textilis textilis	Thick-billed Grass-Wren	High
Bettongia lesueur	Boodie	Low, but required for translocation
Cacatua pastinator pastinator	Long-billed Corella (southern population)	High
Caretta caretta	Loggerhead Turtle	High
Falcunculus frontatus whitei	Northern Shrike-tit	Low, needs survey
Isoodon auratus auratus (not *I. a. barrowensis*)	Golden Bandicoot	High
Lagostrophus fasciatus	Banded Hare-wallaby	Medium
Leipoa ocellata	Malleefowl	Low
Notomys fuscus	Dusky Hopping-mouse	Low, needs survey
Parantechinus apicalis	Dibbler	High
Petrophassa smithii	Partridge Pigeon	Medium, needs survey
Perameles bougainville	Western Barred Bandicoot	Medium
Pezoporus wallicus flaviventris	Western Ground Parrot	High
Pseudomys australis	Plains Rat	Low, needs survey
Pseudomys shortridgei	Heath Rat	High
Psophodes nigrogularis	Western Whipbird	Medium
Sminthopsis psammophila	Sandhill Dunnart	High

Endangered Species Program

Aims

To ensure that endangered and vulnerable species and ecological communities can survive and flourish, retain their genetic diversity and potential for evolutionary development in their natural habitat, and to prevent further species and ecological communities from becoming endangered. Specifically:

- Prevent the extinction, due to human causes, of endangered native flora and fauna;
- Prevent further species from becoming endangered; and
- Return endangered and vulnerable species and endangered ecological communities to a secure status in the wild.

Priority areas

Priority is given to species and communities that are considered to be nationally endangered or vulnerable. Agencies should be guided by the ANZECC lists and the schedules to the Commonwealth *Endangered Species Protection Act 1992*.

1 Preparation and implementation of Recovery Plans for species and communities (see Recovery Plan guidelines).

2 Implementation of Research Plans for species and communities to obtain sufficient information for a Recovery Plan (see Recovery Plan guidelines).

3 Research into and management of threatening processes (such as *Phytophthora* dieback disease and weeds) that affect a number of endangered species.

4 Surveys to identify or clarify the range and status of species and communities thought to be endangered or vulnerable.

Funds available

Program total of $5.6 million. Due to commitments for ongoing projects, only a fraction of this is available for new projects in 1994/95. The ESP prefers to fund a mix of short term (one year) and long term projects. Funds for new projects in 1994/95 will be available in October 1994 allowing projects to commence in January 1995. Funds will not generally be provided for:

- species or communities that are locally or regionally threatened but not considered to be nationally threatened (eg Koala, Lime Fern);
- projects that are not coordinated or integrated with other States and Territories in the species' range;
- purchase, lease or acquisition of land; or
- bounties for pest control.

Notes

All proposals for ESP funding should have the same format as Research and Recovery Plans, including a similar summary page (guide enclosed). Where the ESP already has copies of the plans proposed for funding, it is only necessary to submit the summary pages. The proposals submitted by your agency for ESP funding must be included on a list ranked in priority order.

Feral pest control for the benefit of endangered species should normally be done within the context of a Research or Recovery Plan. Recovery or Research Plans that have such feral pest control components should be submitted to the ESP for consideration. The ESP managers will liaise with the FPP managers regarding these projects.

Contact Officer

Mr Bruce Male	Telephone	(06) 2500281
	Facsimile	(06) 2500214

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

CALM POLICY STATEMENT NO. 50

SETTING PRIORITIES FOR THE CONSERVATION OF WESTERN AUSTRALIA'S THREATENED FLORA AND FAUNA

This Policy should be read in conjunction with Policy Statements 9 (Conservation of threatened flora in the wild), 29 (Translocation of threatened flora and fauna), 33 (Conservation of endangered and specially protected fauna in the wild) and 44 (Wildlife Management Programs).

1. OPERATIONAL OBJECTIVE

To ensure that conservation resources are allocated on a priority basis to the most threatened taxa of plants and animals.

4. POLICY

The Department will:

4.1 At least every two years, rank threatened taxa according to the procedures laid down in this Policy Statement.

4.2 Ensure that all taxa identified as Critical are conserved, through the preparation and implementation of Recovery Plans or Interim Wildlife Management Guidelines (see Policy Statement No 44) and that taxa identified as Endangered and Vulnerable are allocated research and management resources in priority order.

4.3 Ensure that conservation action for taxa identified as Critical commences as soon as possible and always within one year of endorsement of that rank by the Minister.

5. STRATEGIES

To accomplish the above objective and policies, the Department will:

5.1 Set up a Ranking Panel consisting of six to ten scientists, from CALM or other organisations as appropriate, with a wide knowledge of the conservation status of the Western Australian fauna and flora. Each threatened taxon will be scored using a scoring sheet; the current one is provided at Appendix 1. The Panel will then review the scores by asking questions such as:

(i) Is there a single over-riding threat, eg, *Phytophthora*, predation or habitat destruction, that is likely to lead to the early extinction of the taxon? If so, the score will be compared with those of other taxa, and increased in rank as appropriate.

(ii) Is the taxon rare and geographically restricted, but not subject to immediate threats? If so, the score will be compared with those of other taxa, and decreased in rank as appropriate.

(iii) Does the taxon exist only in small remnant(s) with no suitable habitat elsewhere? If so, the score will be compared with those of other taxa, and increased in rank as appropriate.

(iv) Does the taxon have a high degree of habitat specificity and is that habitat rare or threatened? If so, the score will be compared with those of other taxa, and increased in rank as appropriate.

The Panel will then allocate all declared threatened taxa with populations known to occur in Western Australia to the following categories, using the scores and the draft IUCN criteria (Appendix 2) as guidelines: Critical (CR), Endangered (EN), Vulnerable (VU), and Susceptible (SU).

Appendix 1

SCORE SYSTEM FOR AIDING THE DETERMINATION OF PRIORITIES FOR RESEARCH AND MANAGEMENT OF THREATENED TAXA IN WESTERN AUSTRALIA

Scoring to be for all known wild populations of this taxon, world-wide

TAXON .....SCORE ..... DATE .....

CURRENT GEOGRAPHIC DISTRIBUTION ☐

5 Very narrow endemic, total range < 50 km^2 or < 20 km linear
4 Narrow endemic, total range < 500 km^2 or 100 km linear
3 Confined to single Phytogeographic District
2 Confined to single Phytogeographic Region
1 Endemic to Western Australia
0 Not endemic to Western Australia

NUMBER OF POPULATIONS ☐

10 Only one known
8 Only two known
5 3 or 4 known, or unknown but thought to be few
3 From 5 to 10 known
0 > 10, or unknown but thought to be many

EFFECTIVE POPULATION SIZE ☐

Vertebrates and invertebrates

10 < 50
8 50 - 500, or range area < 1 ha (or unknown but thought to be small)
5 500 - 2000, or range area 1 - 100 ha
0 > 2000, or range area > 100 ha (or unknown but thought to be large)

Vascular and non-vascular plants

10 < 50, or range area < 1 ha
8 50 - 500, or range area 1 - 10 ha (or unknown but thought to be small)
5 500 - 2000, or range area 10 - 50 ha
0 > 2000, or range area > 50 ha (or unknown but thought to be large)

RANGE DECLINE ☐

10 Occupies < 1% of former range area, almost all habitat destroyed or unsuitable
8 Occupies 1 - 5% of former range area, most habitat destroyed or unsuitable (or range decline unknown but thought to be large)
5 Occupies 5 -10% of former range area, apparently suitable habitat remaining
2 Occupies 10 - 50% of former range area
0 Occupies 50 - 100% of former range area (or range decline unknown but thought to be small)

POPULATION DECLINE RATE ☐

(if present circumstances do not change)

10 Total wild population declining at rate that threatens survival within 5 years
8 Declining at rate that threatens survival within 5 - 20 years or unknown but thought to be high
5 Declining at rate that threatens survival in 20 - 50 years
2 Declining at rate that threatens survival in 50 - 100 years or unknown but thought to be low
0 Total wild population stable or increasing

PROTECTION OF HABITAT ☐

5 No populations known from any conservation reserves or State Forest
4 One population in conservation reserve or State forest
2 More than one, mostly small, populations known from conservation reserves or State forest
0 Several large populations in conservation reserves or State forest

EXISTING HABITAT LOSS RATE ☐

10 100% of habitat (or 100% of breeding habitat) likely to be destroyed or severely modified in < 10 years
8 > 75% likely to be destroyed or severely modified in < 10 years, or unknown but thought to be high
5 50 - 75% likely to be destroyed or severely modified in < 10 years
2 25 - 50% likely to be destroyed or severely modified in < 10 years, or unknown but thought to be low
0 No change likely or < 25% likely to be destroyed or severely modified

ENVIRONMENTAL THREATS ☐

Vertebrates and invertebrates (includes exotic predators)

10 Mammal 35g - 8000g, ground-nesting bird in arid or semi-arid area or reptile > 50g / environmental threats (eg, dieback, hunting) likely to have severe impact on taxon
8 Mammal 35g - 8000g, ground-nesting bird in Darling / Environmental threats likely to have high impact on taxon
4 Environmental threats likely to have moderate impact on taxon
1 Environmental threats likely to have low impact on taxon
0 No environmental threats

Vascular plants

10 High susceptibility and high risk of infection by *Phytophthora*, most populations already infected, or very high risk of destruction or habitat degradation due to clearing, dieback, salinity, recreation, grazing, etc.
8 High susceptibility and high risk of infection by *Phytophthora*, some populations already infected, or high risk of destruction or habitat degradation.
5 Moderate susceptibility and high risk of infection by *Phytophthora* or other fungal diseases, moderate risk of destruction or habitat degradation.
3 Moderate susceptibility and moderate risk of infection by *Phytophthora* or other fungal diseases, moderate to low risk of destruction or habitat degradation.
1 Low to moderate susceptibility and low risk of infection by fungal diseases, low risk of destruction or habitat degradation.
0 No environmental threats

EFFECTS OF FIRE ☐

10 Habitat consumed by fire, risk of frequent (in terms of taxon's biology) fires high, habitat recovery rate slow / obligate seed regenerator in fire prone environment with high risk of frequent fire
8 Habitat consumed by fire, risk of frequent fires moderate, habitat recovery rate moderate / obligate seed regenerator in fire prone environment with moderate risk of frequent fire
5 Occupies fire prone habitat, risk of frequent fires moderate, habitat recovery rate rapid / obligate seed regenerator in fire prone habitat with low risk of frequent fire, or seed regenerator with inappropriate fire regime, or non-obligate seed regenerator but is not regenerating satisfactorily after fire
2 Occupies fire prone habitat, risk of frequent fires low, habitat recovery rate moderate-rapid / obligate seed regenerator in fire prone environment with low risk of frequent fire
0 Occupies habitat that is not fire prone / not an obligate seed regenerator or regenerates satisfactorily after fire

COMPETITION ☐

(e.g. Competition for food by exotics / competition by environmental weeds)
10 All populations subject to competition, impact extreme
8 Many populations subject to competition , impact high, or impact unknown but thought to be high
5 Some populations subject to competition, impact low to moderate
2 Competition having some impact, or unknown but thought to be low
0 Competition insignificant

REPRODUCTIVE BIOLOGY ☐

5 Short-lived (< 10 years) perennial plant (not disturbance opportunist) poor seeder or short seed life; short-lived animal with low reproductive potential or recruitment (use Millsap *et al.* as a guide for animals)
3 Short-lived perennial (disturbance opportunist), prolific seeder with short seed life or long-lived perennial, poor seeder or unknown but thought to have low reproductive potential; short-lived animal with medium reproductive potential or recruitment or long-lived animal with low reproductive potential or recruitment or unknown but thought to have low reproductive potential
2 Short-lived perennial (disturbance opportunist), prolific seeder with long seed life or long-lived perennial medium seeder; short-lived animal with high reproductive potential or recruitment, or long-lived animal with medium reproductive potential or recruitment
1 Reproductive potential unknown but thought to be high
0 Long-lived perennial, prolific seeder; long-lived animal with high reproductive potential or recruitment

Millsap *et al*: (add two scores and divide by 2)
eggs or live young produced
5 <1 offspring/adult female/year
3 1-9 offspring/adult female/year
1 10-100 offspring/adult female/year
0 > 100 offspring/adult female/year
minimum age at which females typically first reproduce
5 >8 years
3 4-8 years
1 2-3 years
0 < 2 years

EX SITU BREEDING/PROPAGATION ☐

5 Not known to be in captivity/cultivation, seed store or germplasm bank and/or breeding in captivity/propagation unsuccessful
4 Rarely in captivity / cultivation, not or poorly represented in seed store or germplasm bank and/or breeding in captivity/propagation often unsuccessful/not well documented and may require highly specialised techniques
3 Occasional to frequent in captivity/cultivation, not or poorly represented in seed store or germplasm bank and/or not breeding in captivity/propagation variable / only one captive / propagated population, breeding/propagation successful
2 Occasional to frequent in captivity/cultivation, well represented in seed stores or germplasm banks and/or; breeding in captivity/propagation successful
0 Widely bred/grown in documented collections

TOTAL SCORE POSSIBLE = 100

Scoring Panel members: ... ...

... ...

Appendix 1

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(if present circumstances do not change)

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8 Mammal 35g - 8000g, ground-nesting bird in Darling / Environmental threats likely to have high impact on taxon
4 Environmental threats likely to have moderate impact on taxon
1 Environmental threats likely to have low impact on taxon
0 No environmental threats

4. POLICY

The Department will:

4.1 At least every two years, rank threatened taxa according to the procedures laid down in this Policy Statement.

4.2 Ensure that all taxa identified as Critical are conserved, through the preparation and implementation of Recovery Plans or Interim Wildlife Management Guidelines (see Policy Statement No 44) and that taxa identified as Endangered and Vulnerable are allocated research and management resources in priority order.

4.3 Ensure that conservation action for taxa identified as Critical commences as soon as possible and always within one year of endorsement of that rank by the Minister.

Vascular plants

10 High susceptibility and high risk of infection by *Phytophthora*, most populations already infected, or very high risk of destruction or habitat degradation due to clearing, dieback, salinity, recreation, grazing, etc.
8 High susceptibility and high risk of infection by *Phytophthora*, some populations already infected, or high risk of destruction or habitat degradation.
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Millsap *et al*: (add two scores and divide by 2)
eggs or live young produced
5 < 1 offspring/adult female/year
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minimum age at which females typically first reproduce
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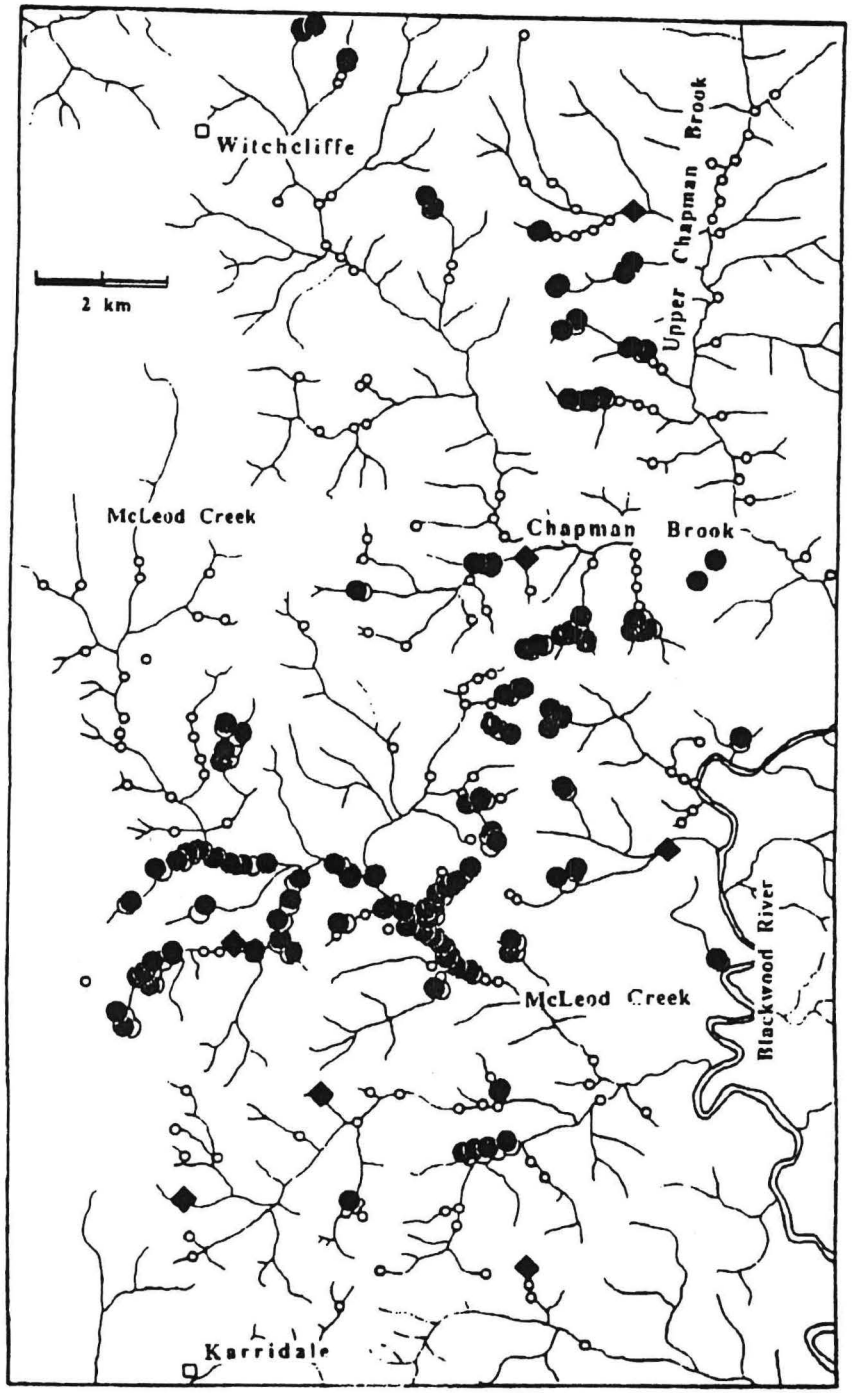
2 Occasional to frequent in captivity/cultivation, well represented in seed stores or germplasm banks and/or; breeding in captivity/propagation successful
0 Widely bred/grown in documented collections

TOTAL SCORE POSSIBLE = 100

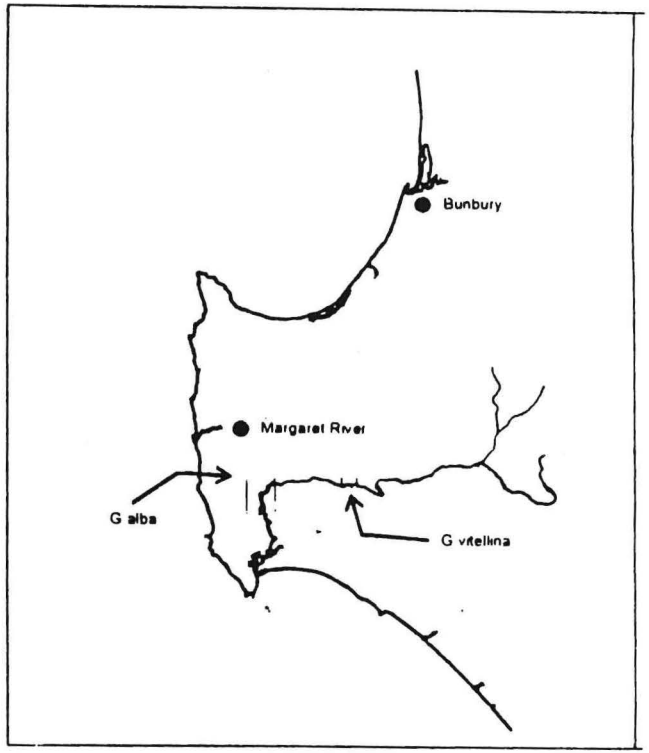
Scoring Panel members: ... ...

... ...



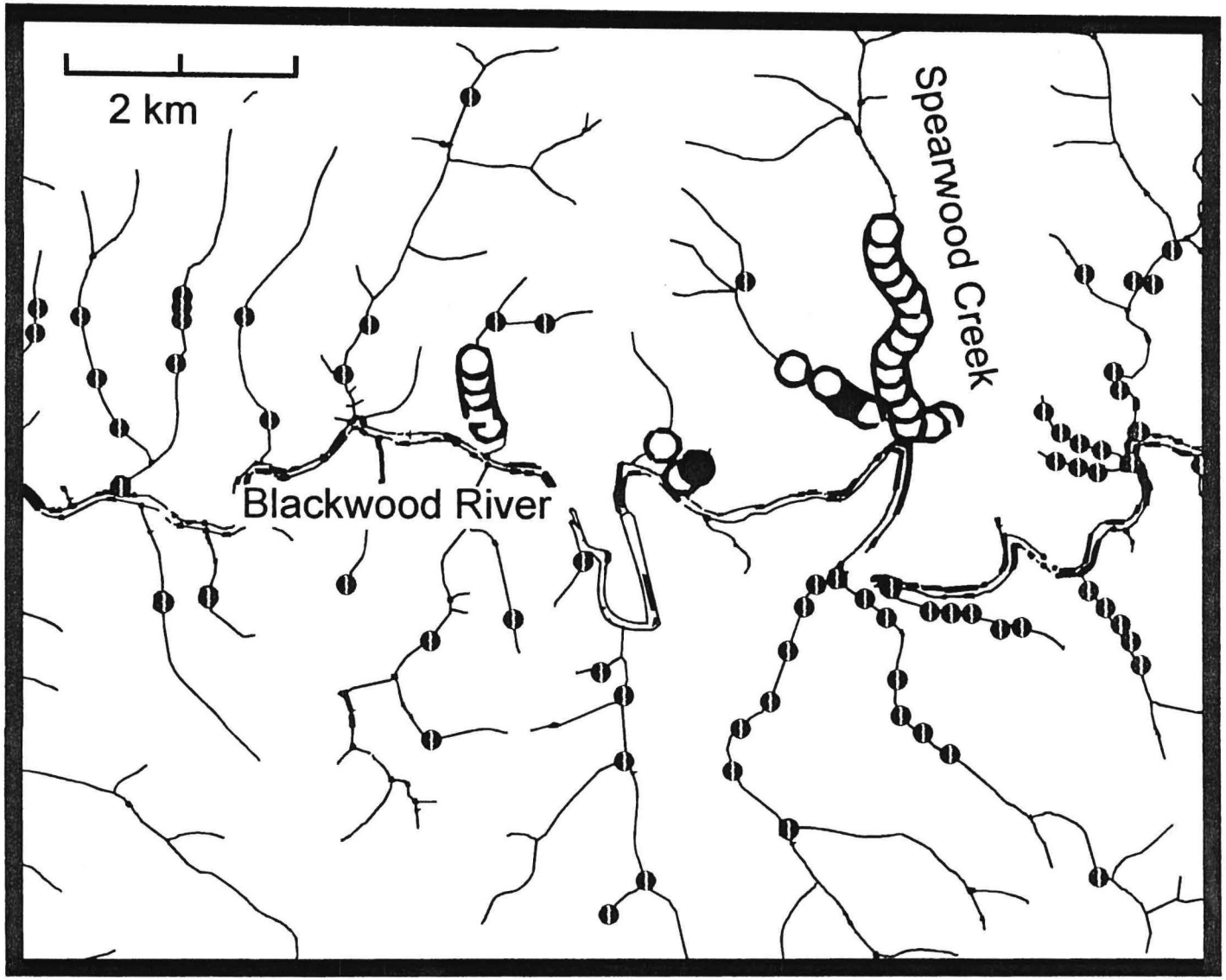
White-Bellied Frog (G. alba)

- ● *G. alba* present
- ○ G. alba absent
- ◆ Former G. alba site



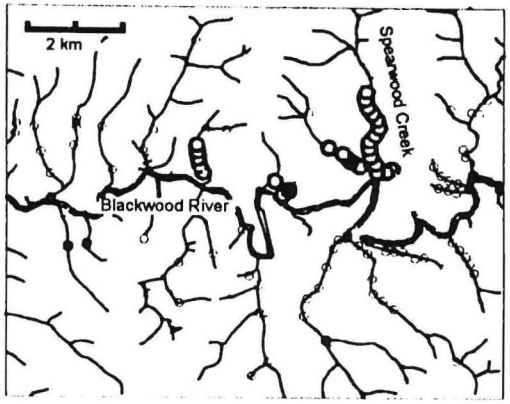
REGIONAL LEADER INFORMATION & CONSERVATION, BUNBURY

Yellow-Bellied Frog (G.vitellina)

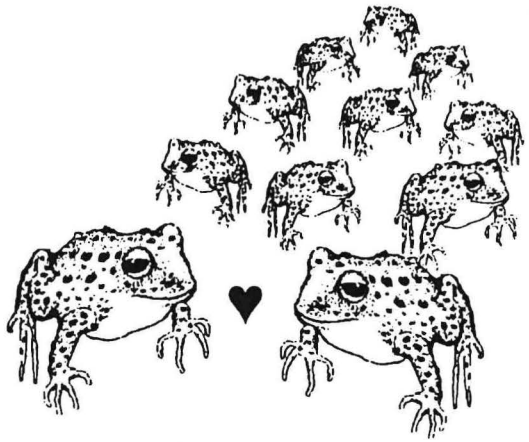


● Absent ○ Present.

Research



Species Distribution &
Population Monitoring

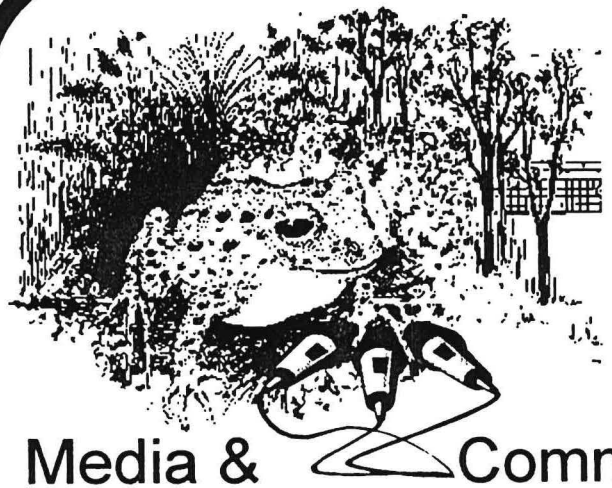


Population Genetics

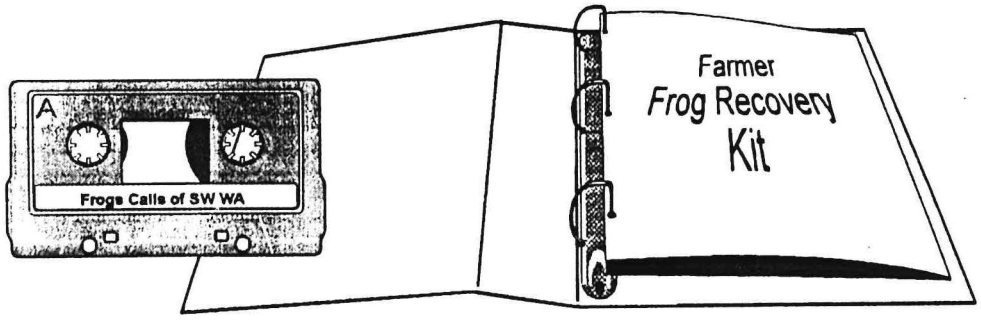
Impact of Fire

Translocation
& Biogeo Analysis

Communications Plan

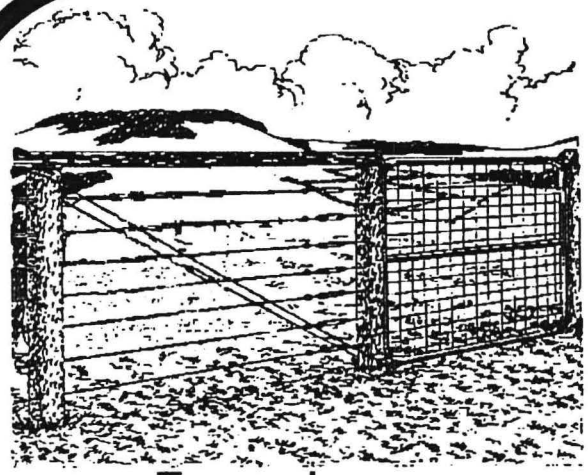


Media & Community Awareness

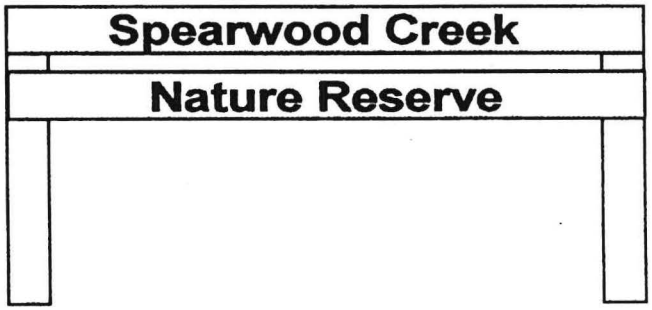


Farmers Kit + Audio tape

Management

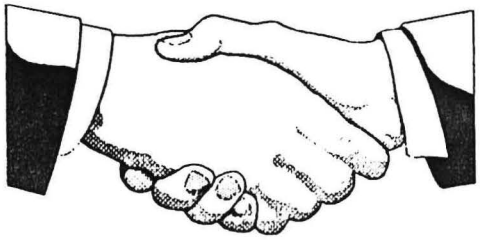


Fencing



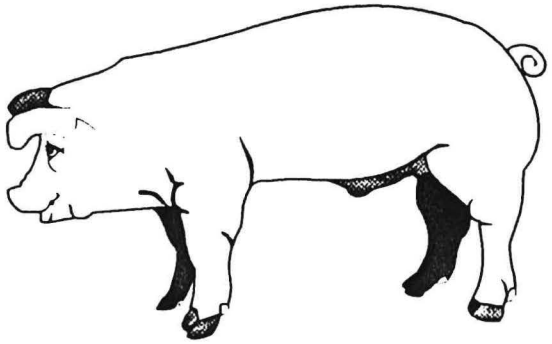
Tenure Changes

review logging
& fire regimes

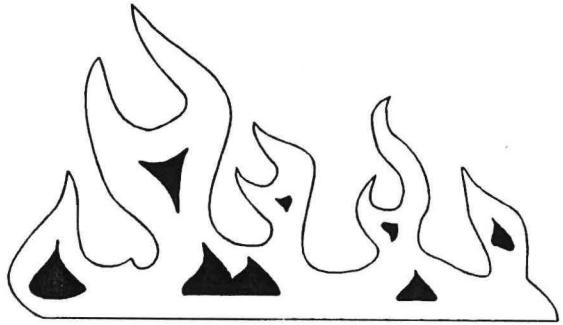


Liaison

Potential Problems



Feral Pigs

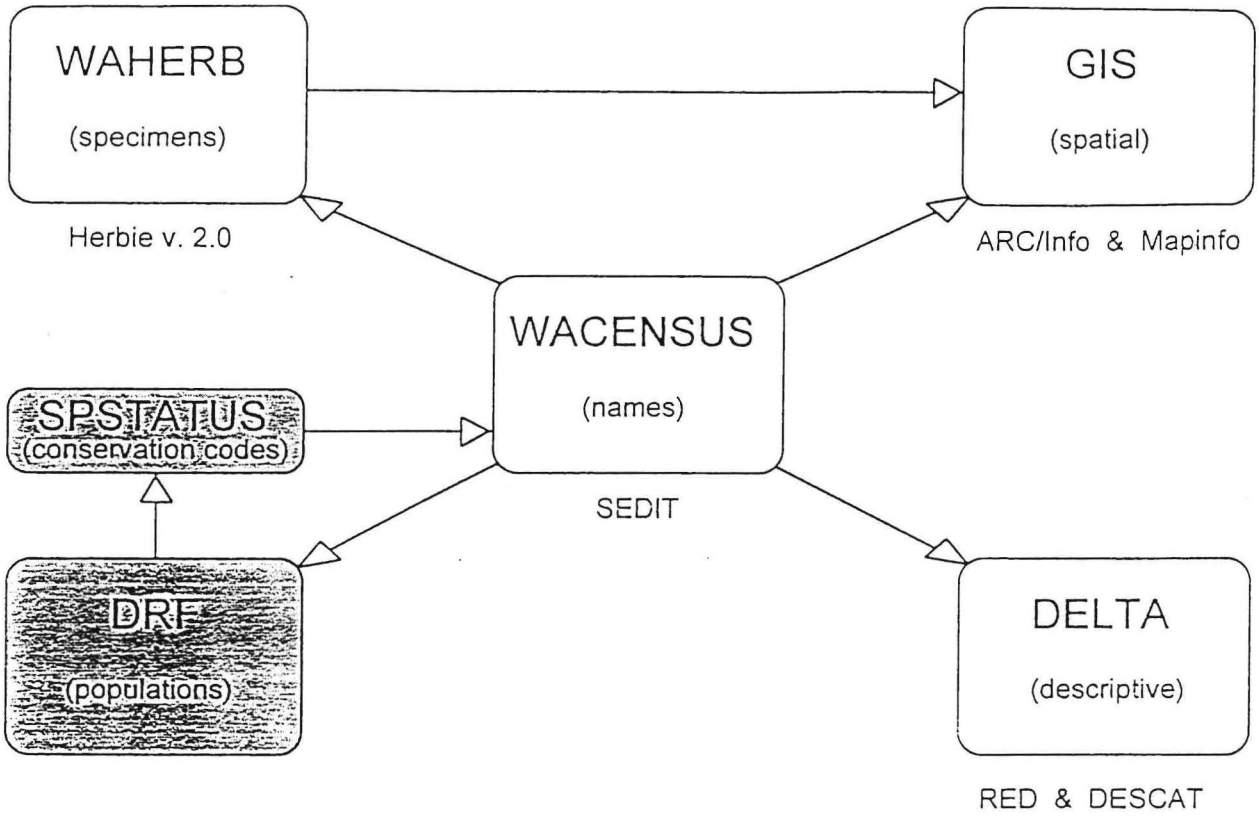


Wildfire

Subdivisions

Stock Grazing

DATASET INTER-RELATIONS



ENDANGERED FLORA CONSULTATIVE COMMITTEE

REPORT ON STATUS OF DRF DATABASE

Strategy for Processing Taxa

Since the last EFCC meeting priorities for entering Declared Rare Flora have been

- taxa susceptible to *Phytophthora* dieback
- taxa in the Swan Region
- taxa found only in the Moora District
- taxa in the Merredin District
- the new additions to the DRF Schedule.

69% of the taxa susceptible to *Phytophthora* dieback have been entered. All of the DRF highly susceptible to *Phytophthora cinnamomi* according to Greg Keighery's report, The impact of *Phytophthora* species on rare plants, have been entered.

All except 8 of the DRF in the Swan Region have been entered. All except 5 of the DRF found only in the Moora District have been entered. All of the DRF in the Merredin District have been entered, with the exception of *Daviesia oxylobium* ms which is being considered at this EFCC meeting for recommendation for deletion. 6 of the 10 new additions to the Schedule of Declared Rare Flora in 1993 have been entered. One of these is still awaiting further information. One is not in WACensus due to taxonomic problems. The files for the other two taxa are currently marked to other people and have been requested.

Proportion of Taxa and Populations Completed

During 1993 there was a change in the entry of taxa into the database, from entering all the surveys of the populations (historical data), to entering only the most recent survey of each population. This was done in order to have as many populations of DRF on the database as quickly as possible.

62.5% (170) of the 272 taxa listed on the DRF Schedule have been entered. 1198 of the populations have been entered, which is an estimated 70% of the populations.

Completion Timeframe

Last year it was estimated that it would take a further 2 years to complete all the taxa with the existing resources. This means that at this stage it would have been hoped that 75% of the populations would have been entered including all historical data. However, there were more populations for the taxa that have been entered during the past year than was estimated. Therefore the correction factor that was used to adjust the number of populations from that reported in Hopper et. al. (1990) has been increased this year. New taxons are also being added each year, and some taxa that are deleted have already been databased. Therefore it is estimated that it may take more than one further year to complete the DRF database.

RARE FLORA REPORT FORM

TAXON: _____ POPULATION No.: _____

File No. Head Office: _____ File No. District: _____

DRF ☐ Proposed DRF ☐ Priority Species No. ☐ Geog. Restr. ☐

New Population ☐ Routine Inspection ☐ Re-survey ☐ Opportunistic Survey ☐

FROM: _____ TITLE: _____ SURVEY DATE: _____

REGION: _____ DISTRICT: _____ SHIRE: _____

District Site Ref.: _____ MAP REF.: _____

LAND STATUS:

Nature Res. ☐	Water Res. ☐	Gravel Res. MRD ☐	Gravel Res. Shire ☐
National Park ☐	Railway Res. ☐	Rd. Verge MRD ☐	Rd. Verge Shire ☐
State Forest ☐	Private ☐	VCL ☐	Shire Reserve ☐
Other ☐	State: _____		

LOCALITY: _____

LATITUDE: _____ LONGITUDE: _____ ALTITUDE: _____ ASPECT: _____

LANDFORM:

Hilltop ☐	Flat ☐	Drainageline ☐	Swamp ☐	Ridge ☐
Outcrop ☐	Breakaway ☐	Slope ☐	Gully ☐	Valley ☐
Riverbank ☐	Lake Edge ☐	Low Plain ☐	Sand Dune ☐	Cliff ☐
Firebreak ☐	Other: _____			

ROCK TYPE:	Laterite ☐	Granite ☐	Dolerite ☐	Limestone ☐	Other: _____	
ROCK FORM:	Sheet ☐	Boulder ☐	Fluviatile Gravel ☐	Concretionary gravel ☐		
SOIL TYPE:	Sand ☐	Loam ☐	Clay ☐	Peat ☐	Gravel ☐	
SOIL COLOUR:	Red ☐	Brown ☐	Yellow ☐	White ☐	Grey ☐	
SOIL CONDITION:	Perm. wet ☐	Moist ☐	Dry ☐	Saline ☐	Other: _____	

VEGETATION CLASSIFICATION (Muir's): _____

ASSOCIATED SPECIES: _____

No. OF PLANTS:

Estimated ☐ Actual ☐ Mature: _____ Seedlings: _____ Dead: _____ Area Occupied: _____

REPRODUCTIVE STATE: in bud ☐ flower ☐ immature fruit ☐ dehisced ☐ vegetative ☐

POLLINATORS: Native bees ☐ honey bees ☐ mammals ☐ birds ☐ insects ☐

Other observations: _____

CONDITIONS OF POPULATION: Recently burnt ☐ diseased ☐ disturbed ☐ undisturbed ☐

Other ☐ State: _____

POTENTIAL THREATS: Firebreaks ☐ mining ☐ recreational activities ☐ 'disease' ☐ weeds ☐

grazing ☐ clearing ☐ prescribed burning ☐ Other ☐ State _____

FIRE HISTORY: Not known ☐ Burnt in 19_____ Summer ☐ Autumn ☐ Winter ☐ Spring ☐

Next control burn: Year: _____ Month: _____

VOUCHER SPECIMEN: Retained ☐ W.A. Herb. ☐ Other ☐ State: _____

ATTACHED: Map ☐ Mudmap ☐ Illustration ☐ Photo ☐ Field Notes ☐

ACTION: Taken: _____

Required: by District ☐ S.O.H.Q. ☐ State: _____

FENCING REQUIREMENT: _____

ROADSIDE MARKERS: _____

OTHER COMMENTS: _____

COPY SENT TO: Regional Office ☐ District Office ☐ Other ☐ State: _____

SOHQ TO SEND COPY TO: Regional Office ☐ District Office ☐ Other ☐ State: _____

Signed: _____ Date: _____

NOTE: More than one box, in any section, may be ticked.

RECORDS: PLEASE FORWARD TO ADMINISTRATIVE OFFICER, FLORA, WILDLIFE ADMINISTRATION

DRF D.E.F. Data Management System 28-AUG-92
Select Species By Lat/Long Range

Geographic Range : From	Latitude	Longitude	to	Latitude	Longitude
	30° ' "	115° ' "		30°30' "	115°45' "

Current Rare And Endangered Priority

Sheet	TaxonID	Name	Pop No	Shire	Latitude	Longitude
1413	3341	Acacia forrestiana	2 A	29	30° 6' 6"	115°10'18"
1277	3341	Acacia forrestiana	2 B	29	30 6 6	115 10 18
1278	3341	Acacia forrestiana	3	29	30 5 8	115 12 23
1279	3341	Acacia forrestiana	4 A	29	30 5 44	115 12 41
1414	3341	Acacia forrestiana	4 B	29	30 5 44	115 12 41
1280	3341	Acacia forrestiana	5	29	30 6 19	115 12 41
1415	3341	Acacia forrestiana	6	29	30 11	115 13
1416	3341	Acacia forrestiana	7	29	30 10	115 16
1571	4397	Asterolasia drummondii	2	29	30 5 50	115 12 40
1566	4397	Asterolasia drummondii	2	29	30 5 50	115 12 40
1565	4397	Asterolasia drummondii	2	29	30 5 50	115 12 40

Esc Tab ListVal Enter EntQry PF3 Save PF4 Exit 2 NxtBlk 6 NxtPag

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Figure 11. Page 1 - Selecting species by geographic region

D.E.F. Data Management System
Select Species By Lat/Long Range

Taxon	Pop No	DRF Pri	Size	Date	District	Vesting
Acacia forrestiana	2 A	R	25	19-APR-89	MOO	
Acacia forrestiana	2 B	R	25	19-APR-89	MOO	
Acacia forrestiana	3	R	250	19-APR-89	MOO	
Acacia forrestiana	4 A	R	250	19-APR-89	MOO	PRI
Acacia forrestiana	4 B	R	250	19-APR-89	MOO	
Acacia forrestiana	5	R	20	19-APR-89	MOO	
Acacia forrestiana	6	R	50	15-JUN-89	MOO	
Acacia forrestiana	7	R	70	15-JUN-89	MOO	PRI
Asterolasia drummondii	2	R		19-APR-89	MOO	NON
Asterolasia drummondii	2	R		25-JUN-88	MOO	NON
Asterolasia drummondii	2	R	1000	15-JUL-86	MOO	NON

6 NxtPag

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Figure 12. Page 2 - Selecting species by geographic region