

# WETLANDS AND WATERBIRDS PROGRAM

---

## PROGRAM LEADER

J Lane

## CURRENT RESOURCES (1991/92)

This program comprises 2.70 persons (1.90 Professional + 0.8 Technical). Its estimated CRF budget is \$160 355 (including \$11 655 salaries and \$43 800 operating costs).

## RESOURCES IN PREVIOUS YEAR

This program comprised 3.60 persons (1.90 Professional + 1.7 Technical). Its budget was \$199 624 (\$155 824 salaries + \$43 800 operating costs).

## BACKGROUND

Western Australia has a great diversity of wetland types - greater than that of any other Australian State - ranging from the extensive mangal, tidal mudflats, tropical lakes, rivers and floodplains of the Kimberley region, through the many extensive, occasionally inundated shallow "pans" of the arid north-west and interior, to the highly seasonal, winter-filled lakes and streams of the temperate south-west.

These wetlands support an enormous abundance and substantial diversity of plant and animal life. Many sites are of international significance. Lakes Argyle, Gregory and Roebuck Bay and Eighty Mile Beach each support more than 250 000 waterbirds of 50 or more species, many of them transequatorial migrants. The seasonal swamps of Ellen Brook and Twin Swamps near Bullsbrook contain the only known populations of the endangered Western Swamp Tortoise (*Pseudemydura umbrina*), one of the rarest animals on earth.

The Wetlands and Waterbirds Program aims to ensure the conservation of these wetlands and their flora and fauna. Central to the program approach is the dual theme of conserving representative samples of wetland types and conserving the systems or networks of wetlands, many of which are seasonal,

which are necessary to maintain present numbers of migratory fauna, principally waterbirds.

## ACHIEVEMENTS

During the past year funding was obtained for a major survey of the invertebrate aquatic fauna and fringing and emergent flora of wetlands of the south coast, from Cape Naturaliste to Albany. This work is to be completed by early 1992. Further funding is likely to be obtained in 1991-92 for surveys of wetland-associated vertebrates (principally fish and frogs) and submerged aquatic flora of the region. Knowledge of the conservation values of the wetlands of the south coast will be greatly improved by this work.

The aquatic fauna of Two Peoples Bay Nature Reserve was documented. Forty-two species of waterbird, eight species of fish and 118 species of aquatic invertebrate have been recorded. This work will be published in a departmental Research Bulletin on Two Peoples Bay in 1992.

Work continued on a long-term multi-disciplinary study of Lake Gregory in the Great Sandy Desert. Collections of aquatic invertebrates and waterbird counts have been made in October 1989, when the lake was saline and about to dry out and in June 1990, after the lake had re-flooded and was fresh. Approximately 80 000 birds were counted on both occasions and the number of aquatic invertebrates was high, especially after the lake re-flooded. Geological work is about to begin. Cores taken from the lake can be used to study past climatic conditions. Small invertebrate fossils in the cores can be used to study how the ecology of the lake and the fauna within it have changed with climate.

Research undertaken by scientists of Murdoch University, with partial funding and supervision from CALM, has identified a more environmentally acceptable alternative to the organophosphate Temephos for midge (chironomid) control. This work has also demonstrated the importance of good catchment management (particularly reductions in nutrient discharge) in long term control of midge populations.

A wetland-waterbird database, incorporating data obtained from the 1981-85 surveys of waterbird usage of Wetland Nature Reserves of the South West and from subsequent surveys, has been established. It is intended that historical and contemporary data will be added as and when funding permits, and that this will be the major State repository for data concerning waterbird usage of Western Australian wetlands.

## **AIM**

To provide scientific information to ensure effective conservation and management of Western Australia's wetland ecosystems, including the maintenance of waterbird populations.

## **PRIMARY OBJECTIVES**

### Wetland Values

To identify conservation values of the wetlands and wetland systems of Western Australia, particularly with respect to reservation of a representative sample of wetland types, maintenance of species (flora and fauna) diversity and provision of habitat necessary for the maintenance of the State's waterbird populations.

### Status of Waterbird Populations

To monitor and manage the State's 130 species of waterbirds.

### Wetland Ecosystem Dynamics

To develop an increased understanding of the functioning of wetland ecosystems, identify major degrading influences and provide management solutions.

### Public Involvement

To foster a sympathetic public attitude to the conservation of waterbird populations and wetlands through direct involvement of the public in appropriate research projects and through open communication of research findings.

## Communication

To communicate research results in the form of technical and scientific publications, educational literature, committee representation, and to provide advice and liaison with other CALM staff, other Departments, and the community at large by way of training courses and seminars.

## **20 YEAR GOALS (based on current resources and in priority order)**

1. Establish an inventory of wetlands of the State and a reservation system that represents all types of wetlands, with emphasis on improved representation in areas outside the south west and along streams, rivers and tidal zones.\*\*\*
2. Study factors affecting population dynamics, distribution and occurrence of waterbirds, especially migratory waders.\*\*
3. Determine conservation status of wetland and stream invertebrates and native fish and examine factors affecting their occurrence.\*\*
4. Examine the effects of environmental changes on the biota of wetlands and ways of ameliorating the effects of changes including salinization, Greenhouse effect and eutrophication.\*\*
5. Document habitat quality of wetlands, including rivers and streams, with emphasis on riparian vegetation and water quality.\*
6. Study issues related to pest management, artificial creation of wetlands and other management matters to ensure that the actions undertaken are biologically sound.\*

## **5 YEAR GOALS**

1. Establish and maintain a volunteer-based program for annual assessment of the abundance of waterfowl and for identification of important waterbird sites in south western Australia.

2. Determine waterbird usage of wetlands on the Swan Coastal Plain and identify wetland attributes that influence usage.
  3. Determine the conservation value (principally the level of usage by waterbirds) of remote wetlands (eg. Lake Gregory) of probable international importance.
  4. Monitor water levels and water quality of a sample of south-west wetlands. Use these data to assess the condition of wetlands.
  5. Assess the conservation status of the lentic invertebrate fauna in the south-west through wetland surveys and examine how various environmental parameters (eg. salinity, nutrients) affect the distribution of species.
  6. Assess the conservation values of different habitats in Leschenault Inlet and the effect of mosquito control on those values for waterbirds and invertebrates.
  7. Study the effect of salinity on usage of wetlands by ducks for both breeding and as drought-refuges as an indication of the impact of increased salinization in the south-west on waterbirds.
  8. Examine food selection in waterbirds in relation to the invertebrate prey available to gain some understanding of how invertebrate species composition and abundance affect waterbird distribution.
  9. In collaboration with other State and Local Government authorities, develop more effective and environmentally acceptable methods of midge (chironomid) nuisance control.
  10. Examine pesticide levels in Herdsman Lake and animals therein in relation to both spraying for Argentine ants and other uses of insecticide within the catchment.
  11. Gain a preliminary indication of the level of threat to native avifauna and wetland ecosystems posed by continued use of lead shot for waterfowl hunting in the south-west of W.A.
  12. Investigate potential for lowering of salt loads of the Yenyening Lakes system through experimental manipulation of Qualandary Crossing outflows (Yenyening Lakes Interdepartmental Working Group).
  13. Preparation of waterbird habitat protection guidelines for Vasse and Wonnerup Estuaries.
  14. Analyse and publish results of Australian Pelican banding and wing-tagging program.
- PROJECTS TO BE COMPLETED FROM JULY 1991 TO JUNE 1996**  
(numbers refer to the Table following)
- 1-4,7,11-14,16,17-21
- PROPOSED NEW PROJECTS - with additional resources (in priority order)**
1. State of the Wetlands. Develop procedures for periodic assessment of the rate of loss (or gain) of wetland types. This information would be used to counteract the current piecemeal loss of wetland resources and to enable policy development, protective legislation, acquisition, management etc. to be targetted on areas of greatest need.
- PUBLICATIONS\* AND REPORTS 1990/91**
- \*Burbidge, A.A. and Halse, S.A. (1990). Summary of papers presented and general discussion. In *The Natural Features of Lake Gregory : a preliminary review* (ed. S.A. Halse), pp. 32-34. Department of Conservation and Land Management Occasional Paper 2/90.
- \* Halse, S. (1990). Review of bird pest research in Western Australia. In *Proceedings of the national bird pest workshop, Armidale 1990* (ed. P. Fleming, I. Temby, J. Thompson), pp. 34-37. Department of Conservation, Forests and Lands, Victoria.
- \*Halse, S.A. (1990) (ed). *The Natural Features of Lake Gregory : A Preliminary review*". W.A. Department of Conservation and Land Management Occasional Paper 2/90.

- \*Halse, S.A. (1990). Waterbirds at Lake Gregory : available data and information required. In *The natural features of Lake Gregory : A preliminary review* (ed. S.A. Halse), pp. 20-29. W.A. Department of Conservation and Land Management Occasional Paper 2/90.
- \*Halse, S.A., Jaensch, R.P., Munro, D.R. and Pearson, G.B. (1990). Annual waterfowl counts in south-western Australia - 1988/89. W.A. Department of Conservation and Land Management Technical Report 25.
- Lane, J.A.K. (1991). Biological advice related to consideration of a possible duck hunting season in the South West and Eucla Land Divisions in 1991.
- Jaensch, R.P. and Vervest, R.M. (1990). Waterbirds at remote wetlands in Western Australia, 1986-8. Part one : Lake Argyle and Lake Gregory. Royal Australasian Ornithologists Union Report No. 32.
- Jaensch, R.P. and Vervest, R.M. (1990). Waterbirds at remote wetlands in Western Australia, 1986-8. Part Two: Lake MacLeod, Shark Bay, Camballin Floodplain and Parry Floodplain. Royal Australasian Ornithologists Union Report No 69.
- \*Marchant, N.G. and Halse, S.A. (1990). The flora of Lake Gregory. In *Natural features of Lake Gregory : A preliminary review* (ed. S.A. Halse), pp. 12-16 W.A. Department of Conservation and Land Management Occasional Paper 2/90.
- \*Story, A.W., Bunn, S.E., Davies, P.M. and Edward, D.H. (1990). Classification of the macroinvertebrate fauna of two river systems in south western Australia in relation to physical and chemical parameters. *Regulated Rivers: Research and Management* 5: 217-232.

RPP No	TITLE	PRINCIPAL INVESTIGATOR
3/84F	The effect of thinning, fertilization, and coppice control on growth and form of crop trees	P Hewett
25/85F	Basal area thinning experiment - Treen Brook	P Hewett
19/86F	Karri site classification	G Inions
25/86F	Karri spacing experiment : Muirillup	P Hewett
3/89F	The effect of thinning and fertilizing on the growth and form of crop trees on a 21 year old regrowth karri stand	P Hewett
13/89F	Sheltercup sowing of <i>E. diversicolor</i> seed in regeneration coupes	P Hewett
24/89F	Success of infilling karri ( <i>E. diversicolor</i> ) seedlings in 1yr old coupes	P Hewett

## RESEARCH TECHNIQUES

2/91N	Standardization of Taxon names and codes in CALM	M Choo
95/91N	Consolidating a State-wide Lat/Long Map Base	P Gioia
96/91N	TAXAPLOT	P Gioia
97/91N	Register of Research Division Corporate Datasets	P Gioia
98/91N	Database of Research Project Plans	M Choo
99/91N	TRAK - animal radio tracking utility - feasibility study	P Gioia
100/91N	SEdit - A species editing utility	P Gioia
101/91N	Networking PCs in Research Division	P Gioia
102/91N	Declared and Endangered Fauna Register	P Gioia
103/91N	HERBIE	P Gioia

## WETLANDS AND WATERBIRDS

24/91N	Annual counts of ducks, swans and coots in south-western Australia	S Halse
25/91N	Study of waterbird usage of Swan Coastal Plain wetlands and the environmental factors controlling usage of the wetlands	S Halse
32/91N	Analysis of results of pelican banding and wing-tagging project	J Lane
38/91N	Surveys of aquatic invertebrates in the South west to gain a preliminary idea of the conservation status of different groups and species and to develop an understanding of how the physical characteristics of a wetland affect its species richness and composition	S Halse
39/91N	Study of distribution of waders of Roebuck Bay and Eighty-mile Beach in relation to abundance of invertebrate prey	S Halse
40/91N	Multidisciplinary study of waterbirds, aquatic invertebrates, hydrology and palaeohistory of Lake Gregory to prepare management guidelines	S Halse

## WOOD UTILIZATION

30/82F	Wood quality of pinaster and radiata pine	G Siemon
9/86F	Effect of drying method on Lyctus susceptibility of W.A. sheoak and regrowth karri	G Brennan
26/86F	Strength properties of regrowth eucalypts	G Siemon
41/86F	Durability of Western Australian grown timber species	G Siemon
6/88F	Seasoning - Pre-drying eucalypt timbers from green to below fibre saturation point (f.s.p.) using a batch kiln	G Brennan
46/88F	Brown wood in karri	P Newby
4/89F	Sawn graded recoveries from a sawmilling trial of regrowth jarrah and karri	E Davison
14/89F	Field survey of incidence of brown wood in regrowth karri	K White
25/89F	Stability of regrowth and mature karri panels constructed from boards	E Davison
31/89F	Effect of pre-steaming and hot water soaking on the drying behaviour of jarrah boards	P Newby
33/89F	An equilibrium moisture content survey of timber in Western Australia	B Glossop
15/90F	Field testing on an ultrasonic moisture meter	G Brennan
16/90F	Treating <i>E. globulus</i> fence posts using four timber preservatives	B Glossop
58/90F	Attempts to omit fungi from Karri brown wood and rots	G Brennan
		E Davison

## PLANTATION SILVICULTURE

**Professional Total = 4.50**

J. McGrath (Program Leader)	SRS	Busselton	80%
J. Bartle	PRS	Como	10%
T. Butcher	SRS	Como	100%
R. Harper	RS	Albany	(contract) 100%
R. Mazanec	RS	Dwellingup	60%
R. Moore	SRS	Busselton	100%

### EXTERNALLY FUNDED

J. Bartle (VATPAS)	PRS	Como	90%
D Bicknell	RS	Esperance	100%
G. Ellis (VATPAS)	RS	Manjimup	100%

**Technical & Clerical Total 8.50**

T. Birmingham		Dwellingup	60%
M Cully		Manjimup	100%
I Dumbrell		Busselton	100%
R Hingston		Busselton	100%
M. Mason		Dwellingup	60%
B. Read		Busselton	80%
J. Stritoff		Como/Wanneroo	100%
S. Suffling		Como	50%
			(of 2.5 days/week = 50%)
A. Wills		Como	100%
L. Wong		Como	100%

### EXTERNALLY FUNDED

D. Burton (VATPAS)		Como	100%
J. Dorlandt (VATPAS)		Como	15%

## RESEARCH TECHNIQUES

**Professional Total = 4.70**

M. Choo (Program Leader)	SRS	Woodvale	90%
A. Chapman	RS	Manjimup	100%
P. Gioia	RS	Woodvale	100%
M. Williams	RS	Como	80%
M. Yung	RS	Woodvale	100%

**Technical Total = 2.10**

A. Wincza		Dwellingup	90%
Y. Woods		Manjimup	100%
B Read		Busselton	20%

## WETLANDS AND WATERBIRDS

**Professional Total = 1.9**

J. Lane (Program Leader)	PRS	Woodvale	90%
S. Halse	SRS	Woodvale	100%

### EXTERNALLY FUNDED

A. Storey	RS	Woodvale	100%
-----------	----	----------	------

**Technical Total = 0.8**

G. Pearson		Woodvale	80%
------------	--	----------	-----

## WOOD UTILIZATION

**Professional Total = 3.50**

G. Siemon (Program Leader)	PRS	Como	100%
G. Brennan	RS	Harvey	100%
E. Davison	SRS	Como	50%
B. Glossop	RS	Harvey	100%

**Technical & Clerical Total = 5.25**

J. Dorlandt		Como	25%
G. Godfery		Como	50%
T. Jones		Como	100%
T. McDonald		Como	100%
J. Pitcher		Harvey	100%
C. Summerell		Harvey	100%
F. Tay		Como	50%

Wills, R.T. The ecological impact of *Phytophthora cinnamomi* in the Stirling Range National Park, Western Australia.

#### PLANTATION SILVICULTURE

Hopkins, E.R. and Butcher, T.B. Improvement of *Pinus pinaster* Ait. in Western Australia.

Hopkins, E.R. and Butcher, T.B. Provenance comparisons of *Pinus pinaster* Ait. in Western Australia.

McGrath, J.F. Site assessment for *Pinus radiata* plantations in the Blackwood.

#### RESEARCH TECHNIQUES

Gioia, P. Computers, Research and Pretty Pictures.

#### WETLANDS AND WATERBIRDS

Halse, S. The relationship between catchment management and wetlands, avifaunal utilisation of wetlands and agricultural wetland management.

Halse, S.A., Pearson, G.B. and Patrick, S. Vegetation of depth-gauged wetlands in nature reserves of south Western Australia 1987-88.

Lane, J.A.K. An overview of wetland conservation policies and programs in W.A.

Lane, J.A.K. The wise use of wetlands - managing wildlife habitat.

Sharley, A.J., Best, L.W., Lane, J.A.K. and Whitehead, P. An overview of lead poisoning in

Australian waterfowl and implications for management.

#### WOOD UTILIZATION

Brennan, G.K., Glossop, B.R. and Hanks, W.R. Drying regrowth Eucalypts using a low temperature batch kiln.

Brennan, G.K. Basic and air-dried density and log moisture content survey of regrowth Jarrah and Karri.

Brennan, G.K., Glossop, B.R. and Rayner, M.E. Sawmilling regrowth Karri of different ages from different site types and dominance classes.

Davison, E. Impel rods are unsuitable for controlling rot in Karri trees.

Mathews, L.R. Drying of Valwood® in a veneer dryer.

McDonald, T.G. Developing a solar, low cost, timber drying system.

Newby, P. Practical aspects of producing Valwood® blanks.

Sieman, G.R. Strength properties of laminated Jarrah and Karri crossarms.

Thomson, A.B. Moisture loss from small jarrah firewood billets.

White, K.J. Growth stress evaluation of regrowth Jarrah.

## PART 10

## SEMINARS PRESENTED BY RESEARCH AND ASSOCIATED STAFF 1990/91

---

During 1990/91 nineteen seminars were organized and presented by Research Division staff. Seminar presentations are designed to disseminate information and stimulate discussion and are open

to all CALM staff, tertiary institutions, other research organizations and interested members of the public. The following seminars were presented during the fiscal year:

Scientist	Topic
A Hopkins	Regeneration strategies of vascular plants after disturbance
P Pigott	Degradation and remnant bushland on wheatbelt farms
J Lane	Management of duck hunting in Western Australia
B Maslin	<i>Acacia</i> : How many genera?
D Coates	Genetic diversity, population size and extinction
P Hewett	Thinning regrowth karri - preliminary results
S Patrick	The role of CALM's Flora Information Program
G Brennan	Utilisation of regrowth hardwoods
P Christensen	Gibson Desert mammals and fire
R Mazanec	Genetic parameters and potential gain from selection in Karri
D Algar	Fox control: an overview
G Perry	Nomenclature stability and the Botanical Code
N Burrows	Fire history of the Jarrah forest based on dendrochronological analysis
T Macfarlane	Electronic methods of presenting flora information - alternatives to the written word
M Choo	Applying modern technology to research
J Wheeler	Western Australian regional floras - a new format
S Hopper	Early postfire regeneration of granite outcrop mallee communities on Chiddarcooping Nature Reserve
J Farr	<i>Cardiaspina</i> sp n. A new insect species outbreaking on Flat-Topped Yate
L McCaw	Fire management in the western United States : some contemporary issues



**PART 11****NEW RESEARCH PROJECTS**

The following new Research Project Plans were approved during 1990/91. Information on these research projects can be obtained from the principal investigator.

<b>RPP No</b>	<b>Title</b>	<b>Principal Investigator</b>
<b>Biogeography</b>		
8/90	A regional study of the Warren Botanical sub district	N Gibson
9/91	Biological survey of islands in the Dampier Archipelago	K Morris
10/91	Biological survey of the terrestrial and marine environments of the Montebello Islands	K Morris
12/91	Management guidelines for the Montebello Islands	K Morris
22/91	Assessment of conservation values of VCL near Coolcalalaya	AH Burbidge
31/91	Biological survey of the islands of Exmouth	N McKenzie & A Start
57/91	Analysis software for survey data	N McKenzie
58/91	Eastern Goldfields Biological Survey	N McKenzie & G Keighery
59/91	Ecomorphological clues to community structure	N McKenzie
60/91	Kimberley Rainforest	M McKenzie
61/91	Mandora Paledriver/Radi Hills Survey	N McKenzie
62/91	Buccaneer Archipelago Survey	N McKenzie & K Kenneally
63/91	Regional Survey Design	N McKenzie, G Keighery, K Kenneally
66/91	Genetic variation among endemic eucalypts	G Wardell-Johnson
67/91	Vertebrate and flora survey of the Walpole Nornalup National Park	G Wardell-Johnson
68/91	Floristic pattern in the Warren and Menzies botanical subdistricts	G Wardell-Johnson
69/91	Forest fauna and habitat management in south-western Australia - a review of research	G Wardell-Johnson
70/91	Biogeography and ecology of WA granite outcrop plants	S Hopper
71/91	A biological survey of the proposed Mt Windell (eastern access) road alignment into the Hamersley Range National Park	S van Leeuwen
72/91	Flora surveys of the wheatbelt and other selected lands	S Hopper
74/91	Comparing floristic and structural data and satellite thematic mapper OTM imagery in the Walpole Nornalup and Mt Frankland National Parks	G Wardell-Johnson
78/91	Biological survey of John Forrest National Park and the adjacent Red Hill area	AH Burbidge
83/91	Biological survey of Serpentine National Park	AH Burbidge
<b>Economic Entomology</b>		
1/91	Spatial variation in rate of parasitization of Jarrah Leafminer larvae	I Abbott
36/91	Impact of prescribed Spring fire on rate of parasitization of Jarrah Leafminer in heavily infested Jarrah forest	I Abbott

STEVE HOPPER Research Division Policy Group Wildflower Industry Review Committee Endangered Flora Consultative Committee	EPA Task Force on Red Book Reserve Recommendations EPA Working Group on Land Releases IUCN Species Survival Commission Orchid Specialist Group IUCN Species Survival Commission Australasian Plant Specialist Group	Australian Pollination Ecologists Society - Secretary Australian Orchid Foundation Research Committee Australian Flora Foundation Research Committee
GREG KEIGHERY	CONCOM Weeds Group Stirling/Porongurup Mgt Planning Team	Vice/President Perth Branch W.A. Wildflower Society
KEVIN KENNEALLY Scientific Publications Editorial Committee Nuytsia Editorial Board	Herdsmen Lake Management Committee Natural Environment Evaluation Panel (WA) of the Australian Heritage Commission	W.A. Naturalists' Club - Co-ordinator Wongan Hills Biological Survey Committee W.A. Naturalists' Club - Editor W.A. Gould League - President
JACK KINNEAR	Co-operative Research Centre for Biological Control of Vertebrate Populations (Scientific Principal)	
NICHOLAS LANDER Nuytsia Editorial Board		
JIM LANE Vasse-Wonnerup Working Group	Midge Research Steering Committee (Chair) CONCOM WG on International Agreements Relating to Migratory and Wetland Birds Yenynning Lakes Working Group (Chair) Associated Minerals Consolidated Wetlands Management Committee	
MARIANNE LEWIS Scientific Publications Editorial Committee (Secretary)		
STEPHEN van LEEUWEN Pilbara Region Fire Planning Committee Pilbara Region Strategic Planning Committee		
TERRY MACFARLANE		Australian Systematic Botany, CSIRO Editorial Committee
NEVILLE MARCHANT Nuytsia Editorial Board		Secretary, South-east Asian Botanical Program (UNESCO) Member, Scientific Advisory Board, Asian Co-ordinating Group for Chemistry
JOHN MCGRATH Plantation Management Group Forest Research Group	AFC - RWG3 - Forests Soils and Nutrition AFC - RWG5 - Plantation Silviculture	
LACHLAN MCCAWE Regional Leaders Group - Southern Forest Region Protection Branch Meetings	AFC - RWG6 - Fire Management (Secretary)	
NORM MCKENZIE Pastoral Areas Conservation Steering Committee		
RICHARD MOORE Central Forest Region, Regional Leaders' Group	Water Resource Catchment Rehabilitation Subcommittee WA Agroforestry Working Group National Agroforestry Working Group (AFC-RWG 11)	International Tree Crops Institute (Committee Member)
KEITH MORRIS Animal Experimentation Ethics Committee (Secretary)	Montebello Islands Planning Team Advisory Council - Centre for metabolism and reproduction of Australian Fauna NW Island Management Committee	IUCN Special Survival Commission: Rodent Specialist Group, Captive Breeding Specialist Group

RPP No	Title	Principal Investigator
18/91	The impact of pathogenic fungi on native vegetation at the King Jarrah Heritage Trail, Manjimup	R Wills
19/91	Infection of tolerant and susceptible <i>Pinus radiata</i> clones by <i>Phytophthora</i> spp.	E Davison & M Stukely
20/91	Register of type specimens and photographs held at the Perth Herbarium	B Koch
23/91	Pattern analysis of climatic data to assess correlates with the activity of pathogenic fungi in the south west of Western Australia	R Wills
26/91	Symptoms on <i>Pinus radiata</i> clones infected by <i>Phytophthora</i> spp.	E Davison & M Stukely
27/91	Measurement of oxygen concentration in sub-surface flows	E Davison
81/91	Heat tolerance of <i>Phytophthora citricola</i> , <i>P cinnamomi</i> and <i>Armillaria luteobubalina</i>	E Davison

#### Research Techniques

2/91	Standardization of Taxon names and codes in CALM	M Choo
95/91	Consolidating a State-wide Lat/Long Map Base	P Gioia
96/91	TAXAPLOT	P Gioia
97/91	Register of Research Division corporate datasets	P Gioia
98/91	Database of Research Project Plans	M Choo
99/91	TRAK - animal radio tracking utility - feasibility study	P Gioia
100/91	SEDIT - A species editing utility	P Gioia
101/91	Networking PCs in Research Division	P Gioia
102/91	Declared and Endangered Fauna Register	P Gioia
103/91	HERBIE	P Gioia

#### Wetlands and Waterbirds

24/91	Annual waterfowl counts in South-Western Australia	S Halse
25/91	Assessment of the value of different types of wetland for waterbirds using the Swan Coastal Plain as a case study	S Halse
32/91	Pelican breeding colonies, movements and survival	J Lane
38/91	Surveys of aquatic invertebrate fauna of south Western Australia	S Halse
39/91	Habitat use, diet and prey occurrence for migratory waders at Roebuck	S Halse
40/91	Waterbirds and limnology of Lake Gregory	S Halse
82/91	Lead shot ingestion by waterfowl	J Lane

#### Wood Utilization

58/90	Attempts to fruit fungi from karri brown wood and rots	E Davison
-------	--	-----------

RESEARCH  
P L A N  
1991 - 1996  
VOLUME NO 5

