New projects to be started 1987 to 1991.

Project No is as listed in proposed new projects.

Project No	Brief title	Goal	Year
1	Bauxite monitoring	1e	1987
2(i)	Species trials - jarrah	1f	1988
2(ii)	Provenance trials	1f	annually to 1991
3	Shelterbelt design	2h	1988
4	Regenerate native woodland	2c	1987
5	Rehab. species utilization	1g	1988

WETLANDS AND WATERBIRDS PROGRAM

Program Leader: J. Lane

Summary of Current Resources

This program comprises 3.55 persons (1.7 professional + 1.85 technical). Its budget is $173 734 ($115 234 salaries and $58 500 other).

Aim

To undertake studies that will assist in the conservation of Western Australia's wetland ecosystems, and the maintenance of waterbird populations.

Primary Objectives

1. 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.

2. STATE OF THE WETLANDS

To develop procedures for periodic assessment of the "state of the wetlands", i.e. the rate of loss (or gain) of particular wetland types.

3. STATUS OF WATERBIRD POPULATIONS

To develop procedures for periodic assessment of the status (abundance and distribution) of the State's 130 species of waterbirds, particularly those species of ducks which are harvested. To determine key factors affecting the status of waterbird species, both common and rare, so that existing population sizes can be maintained, through management if necessary.

4. MANAGEMENT OF HUNTING

To undertake studies needed to ensure that management of waterfowl hunting is soundly based, and to facilitate more active involvement of hunters in the creation and protection of waterbird habitats.

5. WETLAND ECOSYSTEM DYNAMICS

To develop an increased understanding of the functioning of wetland ecosystems (e.g. significance of hydrological and nutrient cycles, dynamics of aquatic plant and animal communities) in order that advice on management principles may be more soundly based.

6. SPECIFIC PROBLEMS

To investigate specific wetland management problems as they arise (e.g. midge and mosquito control, impact of recreational boating, use of lead shot by hunters, causes of major mortalities of waterbirds) and to advise on management options.

7. 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.

8. COMMUNICATION

To communicate the results of research through scientific and technical publications, through advice and liaison with other CALM staff, other organisations and the public and through involvement in training and public conferences and seminars.

Twenty Year Goals

To achieve the program's Primary Objectives.

Five Year Goals

1. Annually assess conditions for waterfowl breeding in south-western Australia as a basis for determination of duck shooting seasons.

2. Establish a volunteer-based program (500+ observers) for annual assessment of the abundance of waterfowl, particularly game species of ducks, in south-western Australia.

3. Determine the conservation value (principally the level of usage by waterbirds) of remote wetlands (Lakes Gregory, Argyle, McLeod etc.) of probable international importance.

4. Assess seasonal usage by waterbirds of a number of important, poorly known, wetland sites in south-western Australia.

5. Analyse results of 1981-1985 RAOU Waterbird Survey project as first step in identifying the general environmental parameters within a wetland that affect its usage by waterbirds.

6. Assess the conservation status of the lentic invertebrate fauna in the south-west through wetland surveys and then examine how various environmental parameters (eg. salinity, nutrients) affect the distribution of species.

7. Analyse and publish results of the Fisheries and Wildlife (Riggert) duck banding project. Funded by ANPWS States Assistance Grant ($24 000).

8. Study in the field 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.

9. Study in more detail the effect of salinity on various species of duck that cover the full spectrum of salinity tolerance using experimental and laboratory investigations so as to understand exactly why salt prevents species using wetlands.

10. Examine food selection in waterbirds in relation to the invertebrate prey available to gain some understanding of how changes in invertebrate species composition that result from salinization would affect waterbird distribution.

11. Determine the breeding status (number of breeding colonies, locations and size) of the Great Egret (Egretta alba) in Western Australia.

12. Develop methods of monitoring midge (chironomid) larvae numbers on metropolitan wetlands in order that control programs may, to that extent, be soundly based.

13. 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.

14. 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.

15. Complete "History of Duck Hunting in Western Australia" publication.

16. Publish results of Peel-Harvey, Leschenault Inlet and south-west estuaries waterbird surveys.

17. Analyse and publish results of the 1973-1987 duck season "bag" surveys.

18. Analyse and publish results of the Fisheries and Wildlife pelican breeding status and movements study.

Scope of Existing Program

For historical reasons the Program has, until quite recently, been concerned primarily with the collection of data needed:

i) to identify the conservation value (principally as waterbird habitat) of specific wetlands and thereby to assist in the struggle to protect these habitats from degradation and inappropriate forms of development or use, and

ii) to facilitate responsible management of annual duck hunting seasons.

A number of small studies directed towards the resolution of specific issues such as midge (chironomid) and mosquito control, bulrush (Typha) management, use of organochlorines to control Argentine Ants at Lake Herdsman, etc., have also been conducted. Program members have also been much involved in wetland reservation, management, management planning, policy issues and resolution of conflicts. This was particularly the case pre-1985 (i.e. in Fisheries and Wildlife Department days) when those matters were within the Wildlife Research Branch's area of responsibility. To a lesser extent this involvement continues.

With the formation of CALM and the structural separation of research, management, management planning and policy functions into different Divisions it is now appropriate for the Program to increase its emphasis on research and to be less involved in functions (except perhaps policy development) which are properly the responsibility of other branches. A few remaining routine management activities, such as water level control at Lake Chittering and water quality monitoring at Lake Muir should certainly be transferred to the Operations Division.

There is also a need for the Program to expand its scope to include more fundamental research aimed at improving our knowledge of wetland ecosystem processes and the life histories, population dynamics, physiological tolerances and

habitat requirements of various key species of wetland fauna and flora, as these relate to management. A valuable start has been made with the recent appointment of Dr S. Halse to the Program.

With the formation of CALM and the recent absorption of the Department of Conservation and Environment into the Environmental Protection Authority and the redefinition of its role, it may also be appropriate for the Wetlands and Waterbirds Research Program to broaden its scope to take in such projects as the development of procedures for the periodic assessment of the state of the wetlands (Proposed New Project 1.ii). Certainly this important project needs to be undertaken by some arm of State government.

Proposed New Projects

Projects are grouped according to priority.

Priorities have been determined on the basis of perceived importance and urgency of the topic in relation to achievement of the Program's Primary Objectives.

Resource requirements and proposed duration of each project are provided.

It would not be possible to undertake all proposed new projects during the 1987-1992 period without a substantial increase on existing allocations to the Program. What follows is a "selection list" as a basis for discussion.

1. High Priority

i) Wetlands of Swan Coastal Plain - Their role in the conservation of Waterbird Populations (PO 1,3 and 7): These wetlands are threatened by intensification of development, particularly groundwater extraction. Annual and seasonal patterns of use by waterbirds of individual wetlands and of the wetland system need to be determined if resource allocation and management decisions are to be soundly based. Mapping of the wetlands is underway (Semeniuk : Water Authority). CALM Scientist and RAOU team of 200+ waterbird volunteers needed 1989-1992 to survey waterbird usage of key sites (those not yet studied) plus a representative sample of wetland types. Resource requirements: CALM Scientist and RAOU Co-ordinator plus $45K per annum for 4 years. Propose joint funding by W.A. Water Authority and CALM. Proposed development late 1987.

ii) State of the Wetlands (relates to Primary Objectives 1 and 2). The aim of this project is to develop procedures for periodic assessment (5 or 10 year intervals) 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 targeted on areas of greatest need. Resource requirements: Initial phase; 1 Research Scientist, _ Assistant plus $10K for 1 year. Second Phase; 1 Research Scientist, 1 Assistant plus $10K per annum for 2 years. (EPA role?)

iii) Great Duck Count continuation (1989-1992) (PO 1, 3, 4 and 7). There is an ongoing need for annual assessment of abundance of harvested species of waterfowl. Development of procedures is due for completion in 1988. Resource requirements (1989-1992) (to fund RAOU coordinator and 500+ volunteers): $10K per annum.

iv) Ecological significance of fringing vegetation of salinized wetlands (PO 1, 5 and 6): Many wetlands of the State's south-west are fringed by emergent vegetation (Melaleuca, Casuarina, Eucalyptus etc.) which has been killed by rising water levels and salinities. Little to no regeneration is occurring. It is highly probable that this vegetation performs important ecological functions (eg invertebrate food supplies for waterbirds, bird nesting sites, shelter). In time this dead vegetation will be lost due to breakdown and decay. Studies are needed to determine the importance or otherwise of compensating for this loss and means by which this might be achieved. Resources required: 1 Research Scientist and .5 Tech. Officer plus $10K per annum for 3 years.

v) Physiological tolerances of key emergent species (PO 5 and 6): Emergent species of tree (Melaleuca, Casuarina, Eucalyptus) and shrub play a key role in the maintenance of waterbird populations by providing essential nesting and roosting sites, shelter, and substrate for invertebrate communities. Little is known of their physiological tolerances, particularly in relation to inundation and salinity. These tolerances need to be determined if wetlands are to be successfully managed. Resource requirements: 1 Research Scientist and .5 Tech. Officer plus $10K per annum for 3 years.

vi) Impact of recreational use (water sports) on conservation values of wetlands (PO 6): Increased demands for recreational access (powerboats, sailboats, canoes, sailboards, model boats, skiing, swimming etc.) pose a serious and worsening threat to waterbird usage of many important wetlands (e.g. Swan River tidal flats, permanent lakes of Perth and country). Studies are needed to assess existing and potential impacts if effective controls on recreational use are to be implemented. Resource requirements: 1 Research Scientist and .5 Tech. Officer plus $10K per annum for 3 years.

vii) Assessment of conservation values of fringing marshes of south-west estuaries. (PO 1, 2 and 6). Few wetland types are as seriously threatened as the fringing

marshes of south-west estuaries. Yet these marshes are valuable as waterbird habitats, fish nursery areas, components of estuarine ecosystems, and in their own right. Assessment of conservation values is required, together with classification, mapping, inventory and periodic assessment of the state of the resource. Resource requirements: initially 1 Research Scientist and $15K per annum for 1.5 years. (Waterways Commission joint funding?)

viii) Continuation of detailed assessment of conservation value of key waterbird sites e.g. Guraga, Preston and Clifton. Expansion to include wetlands of National Parks. (PO 1, 3 and 4). Although joint CALM/RAOU studies during the past six years have revealed and documented the importance of many important waterbird sites, it is clear that many more sites have yet to be "discovered" and their usage by waterbirds determined. Waterbird usage of a number of "recognized" sites is also inadequately known. Current Project 5, presently funded to December 1988, is aimed at filling these gaps. It is possible that continuation beyond 1988 will be needed if Primary Objective 1 is to be accomplished. Resource requirements: $5K per annum for 3 years (1989-1991) (Contract RAOU).

ix) Importance of waterfowl and benthic communities in transfer of nutrients from sediments to the water column (PO 5). Eutrophication is the major problem confronting managers of coastal plain wetlands. Evidence of eutrophication is often minimal in spite of a long history of high nutrient inputs because lake sediments act as a sink. However, once levels in the sediments become high enough they stop acting as a sink and instead constantly release nutrients into the water column with the result that there are acute symptoms of eutrophication that cannot be controlled by management of the catchment. Predicting these eutrophication problems and effective remedial action require a thorough understanding of the fluxes between sediments and water column, including major processes - such as waterfowl digging 'swan holes' - that increase the rate of nutrient release into the water column. The project would be carried out jointly with University of W.A. Resource requirements: $10K per annum for 2 years.

x) Oral history of Wheatbelt wetlands. (PO 1, 2, 5 and 7): Wetlands of the Wheatbelt Region have undergone massive changes, principally increases in salinity and inundation, due to land clearing. The agricultural consequences of land clearing have been well documented however there has been very little documentation of the changes which salinization and increased inundation have had on wetland flora and fauna. Preliminary interviews (K. Wallace, J. Lane) have shown that older members of the rural community with an interest in wildlife have a wealth of knowledge concerning these changes. This knowledge has intrinsic heritage value and would also be of assistance in understanding and

managing the wetland resources. Documentation is required if this knowledge is not to be lost to current and future generations. Resource requirements: 1 Researcher plus $5K for one year. (Commonwealth funding?)

xi) Midge control (PO 5 and 6): Perth is unusual in having numerous midge-producing wetlands surrounded by existing and proposed urban development. Present midge control methods - principally aerial application of organophosphate insecticide ("Abate") pose environmental problems. There is a need to improve present methods and develop new ones. Direction and nature of future research will be considered on completion of current (1987/88) Murdoch/CALM studies (Current Project 10).

2 Medium Priority

i) Determination of causes of larger-scale mortalities of waterbirds on metropolitan wetlands. Resource requirements: Consult with Agriculture Department. Services of veterinarian/microbiologist required at time of large-scale mortalities.

ii) Evaluation of conservation status of the Chestnut Teal (Anas castanea). Resource requirements: 1 Research Scientist plus $10K for two years. (Priority may be raised depending upon outcome of 1987 Great Duck Count)

iii) Management of farm dams and other privately owned wetlands for waterbird breeding. Research into ecological characteristics of productive breeding sites. Resource requirements: .5 Research Scientist, .5 Technical Officer plus $10K per annum for 3 years.

iv) North-south movements of waterbirds (PO 1, 3 and 4): This project would provide management information for waterbird conservation and duck hunting. Ducks are known to move throughout Australia in response to climatic conditions. The patterns of movement and their causes have to be understood to interpret results of duck counts (used to monitor abundance of game species). The current analysis of duck-banding data will do this for east-west movements but there are no factual data concerning north-south movements in W.A. There are large duck populations in the Kimberley and anecdotal information suggests populations sizes in the south-west are affected far more by north-south movements than east-west ones. In fact, a lot of east-west movement may occur via the north. These movements are not restricted to ducks; although there is no evidence, it is highly probable (and very significant from a management viewpoint) that for many species in the south-west, such as Sacred Ibis and Great Egrets, the bulk of recruitment is from the

north. Resource requirements: 1 Technical Assistant plus $10K per annum for 2 years.

v) Black Swan project. This is a large multidisciplinary study proposed by the Zoology Department, University of W.A., for which CALM has expressed support. If the project proceeds, it is anticipated that the Program will participate in whatever ecological studies seem most appropriate. Resource requirements: $5K per annum for 5 years.

vi) Assessment of "state of the river banks" particularly in agricultural areas of the south-west. (PO 1, 2 and 6). The rivers of the south-west agricultural areas (wheatbelt and coastal plain) have been progressively degraded by unrestricted stock access, clearing and "channelization" for so many years that this situation is now accepted by many as the norm. This is possibly Western Australia's most neglected problem in the area of wetland management. The conservation values of these seasonal rivers and their perennial pools have scarcely been considered. There is a dire need for an initial assessment of the magnitude of the problem. Resource requirements: 1 Research Scientist plus $10K per annum for 2 years.

vii) Inventory of invertebrate fauna and aquatic flora of proposed Wetlands of International Importance. (PO 1). Resource requirements: 1 Research Scientist, .5 Technical Officer plus 5K for one year (ANPWS funding?).

Low Priority

i) Assessment of potential for creation of major wetlands through low weir construction. e.g. Yenyenning Lakes. Resource requirements: 1 officer (engineer) plus $10K for 1 year. (Joint funding with Sport and Recreation Department?)

ii) Addition of historical records of waterbird usage of CALM-managed and other wetlands to RAOU/CALM data base. Improve access to data base. Computerization of CALM Wetland Nature Reserve index and integration with wetland monitoring program data base. Resource requirements: 1 computer analyst plus $1K for 4 months.

iii) Expansion of study of ingestion of lead pellets by waterbirds. Resource requirements (and need for project) unknown until 1988.

iv) Possible secondary poisoning of raptors by embedded/ingested lead shot. Resource requirements (and need for project) unknown until 1988.

v) Analysis and publication of opening day bag check (duck shooting season) data.

Projects to be completed 1987 to 1991

1. Publication of results of 1981-85 RAOU Survey of Waterbird Usage of Wetland Nature Reserves. R. Jaensch and J. Lane, RS 116.

2. Annual assessment of abundance of ducks, swans and coot. J. Lane, RS 117.

3. Assessment of waterbird usage of remote wetlands of probable international importance. J. Lane, RS 118.

4. Surveys of invertebrate species in south-west wetlands. S. Halse, RS 48.

5. Assessment of seasonal usage by waterbirds of a number of important, poorly known, waterbird sites in south-western Australia. J. Lane, RS 118.

6. Analysis of results of RAOU Waterbird Survey Project S. Halse, RS 47.

7. Analysis of Riggert/Fisheries and Wildlife 1960-1975 duck banding data. S. Halse, RS 49.

8. Diet of ducks in fresh and saline wetlands. S. Halse, RS 48, developmental.

9. Breeding status of egrets (Egretta spp.) in Western Australia. J. Lane, RS 118A.

10. Development of procedures for monitoring of chironomid (midge) larval numbers of Forrestdale Lake Nature Reserve. J. Lane, RS 114.

11. Herdsman Lake pesticide study. S. Halse, new

12. Ingestion of lead shot by waterbirds. J. Lane, new.

Staff Resources Released

None

Proposed Projects to be started 1987-1991 (Existing Resources)

These projects have been chosen from the list of proposed new projects because of their importance and also because of financial constraints. With greater resources a different selection would have been made.

1. Wetlands of the Swan Coastal Plain - Use by Waterbirds.

2. Annual Assessment of Abundance of Harvested Species of Waterfowl (the Great Duck Count). Continuation.

3. Detailed Assessment of Waterbird Usage of Key Waterbird Sites. Continuation.

4. Use of saline lakes by ducks for breeding and drought-refuge.

5. Experimental study of salinity tolerance of ducks.

6. Black Swan Project.

7. Determination of Relative Nuisance Value of Forrestdale Lake Midge species.

8. Addition of Historical Records to RAOU/CALM wetland data base.

9. Analysis and publication of opening day bag check (duck shooting season) data.

3.11 RESEARCH COMPUTING

Program Leader: M. Choo.

Summary of Current Resourses

The program comprises 5.15 persons (3.0 professional + 2.15 technical). Its budget is $283 013 ($135 413 salaries plus $147 600 other).

Aim

To set up and maintain an integrated computing environment that will provide the Research Division with the processing power and facilities necessary for it to more effectively and professionally perform its Aim, Primary Objectives and Research Projects.

Primary Objectives

HARDWARE AND SOFTWARE

To provide an integrated environment where the capture, processing, analyses and dissemination of information is fully automated, ie. elimination of mundane manual workloads.

TRAINING

To develop computing skills and expertise within the Research Division and provide expert knowledge in systems and softwares tailored to meet specific research requirements.

7. REVISION

This Five Year Research Plan plan is a rolling plan and will be revised each year from 1988-89 during the period October - December, before the annual financial year estimates are required.

M. Dillon	Dwp	40%
J. Alford	Wdvl.	5%

Rehabilitation

Professional, Total = 3.55

J. Bartle	70%
G. Brennan	10%
P. Brown	100%
A. Hopkins	15%
R. Mazanec	40%
R. Moore	20%
P. Ritson (contract)	100%

Technical, Total = 4.7

T. Birmingham	40%
J. Bopp	10%
G. Butcher	10%
B. Read	20%
T. Goff	100%
B. Hingston	10%
P. Jenkins	20%
G. Maranta	20%
M. Mason	40%
P. Albone	100%
N. Pettit	100%

Wetlands and Waterbirds

Professional, Total = 1.7

J. Lane, PRS	Woodvale	70%
S. Halse, RS (Contract)	Woodvale	100%

Technical, Total = 1.85

D. Munro	Woodvale	95%
G. Pearson	Woodvale	90%

Research Computing

Professional, Total = 3.0

M. Choo,	Woodvale	100%
P. Gioia,	Woodvale	100%
D. Ward, RS	Como	100%

Technical, Total = 2.15

P. Walsh	Manjimup	90%
Y. Woods	Manjimup	90%
P. Somerford	Dwellingup	10%
K. Witford	Dwellingup	10%
B. Read	Busselton	15%

2h. + to determine the growth rate of P. radiata, P. p range of densities and arrangements and to identify problems and demonstrate practices to Esperance farmers. R. Moore Ag Dept. 43/82.

3a 1. revegetation with native species after sands mining at Eneabba. A. Hopkins. RS 35.

Wetlands and Waterbirds

Current research projects and current involvements of a non-research nature are listed separately.

Current Research Projects

1. Annual assessment of conditions for waterfowl breeding. J. Lane, RS 116.

2. Publication of results of 1981-85 RAOU Survey of Waterbird Usage of Wetland Nature Reserves. R. Jaensch and J. Lane, RS 116.

3. Annual assessment of abundance of ducks, swans and coot. J. Lane, RS 117.

4. Assessment of waterbird usage of remote wetlands of probable international importance. J. Lane, RS 118.

5. Assessment of seasonal usage by waterbirds of a number of important, poorly known, wetland sites in south-western Australia. J. Lane, RS 118.

10. Breeding status of Egrets (Egretta spp.) in Western Australia. J. Lane, RS 118A.

11. Development of procedures for monitoring of chironomid (midge) larval numbers of Forrestdale Lake Nature Reserve. J. Lane, RS 114.

13. Ingestion of lead shot by waterbirds. J. Lane, new.

14. Preliminary analysis of opening day bag check (duck shooting season) data. J. Lane, RS 113.

15. Transequatorial migratory wader studies (technical and logistic assistance to RAOU). J. Lane, RS 114.

8. Analysis of Riggert/Fisheries and Wildlife 1960-1975 duck banding data. S. Halse, RS 49.

6. Interactive analysis of results of RAOU Waterbird Survey Project and CALM wetland monitoring project. S. Halse, RS 47.

9. Diet of ducks in fresh and saline wetlands. S. Halse, RS 48, developmental.

7. Conservation status of aquatic invertebrate fauna. S. Halse, RS 48.

12. Herdsman Lake pesticide study, S. Halse, new.

16. Maintenance of Map and index of Western Australia's Wetland Nature Reserves. J. Lane.

Current Non-research Involvements

1. Provision of advice concerning management of duck hunting in W.A. J. Lane, RS 113.

2. Liaison with pro-hunting, non-hunting and anti-hunting associations and individuals concerning management of duck hunting in W.A. J. Lane, RS 113.

3. Provision of scientific advice to government and non government organizations and individuals concerning protection and management of wetlands. J. Lane RS 113 and S. Halse.

4. Participation in various government and non-government committees concerning particular wetland management problems. J. Lane, RS 113 and S. Halse.

5. Involvement in acquisition, management and management planning of certain areas of CALM (wet)land. J. Lane, RS 113 and S. Halse.

6. Membership of CONCOM working group on Treaties relating to Migratory Birds and Wetlands of International Importance. J. Lane.

7. Preparation of Wetland of International Importance nominations. S. Halse, RS 46.

8. Involvement in preparation of Herdsman Lake management plan. S. Halse.

DEPARTMENT OF CONSERVATION
AND LAND MANAGEMENT

RESEARCH PLAN

JULY 1987 - JUNE 1992