Department of
CONSERVATION and ENVIRONMENT

AN INVENTORY OF RESEARCH AND AVAILABLE INFORMATION ON WETLANDS IN WESTERN AUSTRALIA

A.W. CHIFFINGS

MAY, 1977.

BULLETIN 25.

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1.0 INTRODUCTION

An interdepartmental committee, the Wetlands Advisory Committee, has been set up to review and advise the Environmental Protection Authority on aspects of wetland management. The definition of wetlands accepted by the Committee is:

> "Wetlands are areas of seasonally, intermittently or permanently water logged soils or inundated land whether natural or otherwise, fresh or saline, e.g. waterlogged soils, ponds, billabongs, lakes, swamps, tidal flats, estuaries, rivers and their tributaries."

Over the past year, the Committee has been collecting relevant information on Western Australian wetlands. It has become clear that a great deal of information (much in unpublished form), exists and also, many on-going research project on various aspects of wetlands are presently being undertaken. It would therefore seem that an inventory of wetland research, including a listing of departments or institutions involved, major personnel, the nature of the research project and the location could be of great value in assisting in the co-ordination of research effort and in increasing accessibility of information. The Department of Conservation and Environment has undertaken to have such an inventory compiled. The report which follows has been prepared as a result.

SCOPE:

It should be noted that although the definition of wetlands adopted includes estuaries (see above), a listing of published and unpublished information on estuaries in Western Australia has already been prepared by Hodgkin and Majer (1976)*. As a result, research on estuaries has not been included in the present inventory. In fact, where relevant research or data collection has already been reported by Hodgkin and Majer, this has not been duplicated in the present report, but reference is made to the appropriate section of the Hodgkin and Majer report.

* Hodgkin, E.P. & Majer, K. An Index to Ecological Information on Estuaries and Marine Embayments in Western Australia, C.S.I.R.O., Division of Fisheries and Oceanography Report, No. 70, 1976.

In addition, the C.S.I.R.O. Division of Land Use Research, has already published a review of literature and other information on wetlands in Western Australia (Smith, 1975). Smith's review was part of a nation-wide assessment of the status of knowledge on Australian wetland. This study was to be a first step in a systematic survey of Australian wetlands and it helped to demonstrate the existence of considerable but very fragmentary information about wetlands. Smith's review gives a brief account of some of the more prominent references on the natural features, flora and fauna of Western Australian wetlands. The review also includes a tabulation of areas of wetlands contained in national parks, flora and fauna reserves and their locations. Another table lists wetlands considered important as conservation areas [based almost entirely on Riggert (1974)]. A comprehensive bibliography and a brief listing of research activities by government departments and univerisities in Western Australia are given.

Because of limited time, Smith's review of present activities in Western Australia is far from complete. For this reason,the bulk of the present report is made up of a detailed listing of research and data collection activities relevant to Western Australian wetlands by goverment departments, university personnel and other individuals. This information was largely collected by interviewing the people directly involved in such activities.

STRUCTURE OF THE REPORT

As has already been indicated, the predominant part of this report is an inventory of the activities of, and types of data being collected by individuals or institutions. In the listings (Table 2) the name and address of the institution is given, followed by the names of relevant personnel. A brief descriptionis given of the research being done or the information being collected. This is parallelled by a statement on the types of data which is being derived or the actual parameters being measured.

The inventory is preceded by a subject index (Table 1) and followed by a listing of all the specific locations mentioned in the inventory and their geographic co-ordinates (Table 3).

A restricted bibliography has also been included. References have been listed alphabetically under subject headings. The bibliography is limited in two respects:

i) not all the references have been sighted, and

ii) time has not allowed a complete search to be made.

For the above reasons, a cross referencing of the bibliography has not been included.

ACKNOWLEDGEMENTS AND OMISSIONS

The author and the Department of Conservation and Environment wish to thank all those people who so generously gave their time and information during the compilation of this inventory.

Although every effort was made to contact all of the people involved in wetlands research in Western Australian, it is expected that omissions may have occurred. If this is the case, then the Department would be most grateful for notification of the same. Address as below:

The Chairperson,
Wetlands Advisory Committee,
Department of Conservation and Environment,
B.P. House,
Mount Street,
Perth,
W.A. 6000

T A B L E 1

SUBJECT INDEX TO TABLE 2

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TABLE 2

INVENTORY OF RESEARCH AND DATA COLLECTION ON WESTERN AUSTRALIAN WETLANDS

NOTE: In the Column Headed "Outline of Research" the prefixes below are intended to indicate:

"c" - the project is completed.

"o" - the project is ongoing at present.

"p" - the project is proposed for some time in the future.

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION		
1. Division of Land Resources Management, Underwood Avenue, Floreat Park. Dr A.J. Peck Mr E. Bettenay Dr F.J. Hingston Mr D.H. Hurle Dr M.L. Sharma Mr D.R. Williamson This study is being done in conjunction with P.W.D., Forests Department and Agriculture Department	o. Land use and stream salinity experiments. Changes in streamwater quality and hydrologic regime associated with changes in land use in nine instrumented catchments and four salt seeps in South-West W.A. Principally interested in the effects of agriculture and bauxite mining. LOCATION: Three basins and one seep at Bakers Hill Experimental Farm; one basin on Dell Park mining site, two basins in the immediate proximaty of Wellington Dam and three more 30 - 40 Km east of Collie in the Wellington Dam catchment. Other salt seeps are located at North Bannister, the Dryandera State Forest and East Popanyinning	Data resulting from 1 - 2 years monitoring in catchment areas as base-line data prior to changes in catchment land use. Monitoring expected to continue into the early 1980's. Ref: Hodgkin and Majer for other details.
2. Dr A.J. Peck	Member of the supervisory panel of projects on small stream salinity modelling (bauxite area) and paired catchment studies (bauxite and woodchip licence areas). o. Estimating the possible effects of bauxite mining on stream salinity using numerical models.	Ref: Hodgkin and Majer. Also have collected data for use in simulating the efects of bauxite mining in the South Dandalup catchment.

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
	Refer p.2 - 3, table 4 of Hodgkin and Majer for details of specific activities by other members of the group.	
3. Dr D. Bennett	o. Changes in water quality with changes in land use in Murray River catchment, South-West W.A. Modelling being devised to predict optional land use in terms of total economic yield of catchments with respect to water, forestry and agriculture.	Data for model supplied by Forestry Department, Agriculture Department, Metropolitan Water Supply, Sewerage and Drainage Board, Public Works Department. Theoretical treatment of this data only. The work is expected to be published by August, 1977 as a monograph by C.S.I.R.O.
4. Dr F. Honey Mr P. Hick	o. The development of reliable methods of mapping wetlands vegetation using remotely sensed satellite data and arial photography. LOCATION: Bunbury to Dandaragan plateau, W.A. and western N.S.W.	The system has been developed from basic mapping of wetlands in the S.E. planning corridor to a much more sophisticated technique which will use such factors as vegetation salinity tolerances to determine orders of magnitude of salinity in the water body. The system has shown high compatability with that developed by Marchant (see below) for classifying wetlands. The project is expected to be completed within the next six months and published in an international journal.

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
5. Mr B. Carbon Mr G. Bartel Ms A. Murray	o. The changes in nutrient status of several freshwater, metropolitan lakes in relation to their hydrological regimes and the effects of groundwater on the same, as well as the role played by bottom sediments in influencing both nutrient and hydrological changes. LOCATION: Perry Lake, Blue Gum Lake, Boorogoon Swamp and Lake Karinyup.	Have collected extensive water quality data, sediment chemistry, stratigraphy of lake beds and surrounding areas. Monitoring to now includes changes in peizometric gradient as well as more detailed investigations of bottom sediment chemistry and nutrient gradients. The project is of four years duration and is expected to be concluded in 1978. Results will be published in the scientific literature.
6. Dr M.J. Barrow Mr P.L. Sewell	o. To determine the effects of nutrients as limiting factors on the primary productivity of a number of local lakes and estuaries.	The project has only just commenced, with a literature survey of in situ nutrient assay techniques ("Lund" tubes) and infrared gas analyses techniques. The project is expected to be completed within three years.
7. Dr M.J. Barrow Mr B. Whelan	o. The mechanisms and capacities of different soils to act as filters for nutrients from septic tanks. LOCATION: Perth Metropolitan Area.	Nutrient gradients in proximity to septic tanks in different soil types have been determined. This is to be followed by the developement of a soils classification system for assessing the tanks. The project has been running for two years and is expected to be completed within the next ten months.

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
8. Mr R Parker	p. To study the bacteriological/ virus systems associated with groundwater systems as an aid in determining pollution sources.	The project is to commence shortly and is expected to take three years.

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
WESTERN AUSTRALIAN GOVERNMENT DEPARTMENT OF FISHERIES AND WILDLIFE, W.A. Wildlife Research Centre, Mullaloo Drive, Wanneroo, W.A. 9. Dr T. Riggert	o. Research on waterfowl with respect to their management for hunting and conservation. Present studies concentrating on the Black Duck (Anas superciliosa).	
10. Mr J. Lane	p. An assessment of the status of Lake M^{C}Leod for waterfowl breeding.	To be done by arial surveys and ground inspection. Ref: Hodgkin and Majer for estuarine project.
11. Dr A Burbidge	o. The biology of the short-necked tortoise (Pseudemydura umbrina Siebenrock) and management for its conservation. LOCATION: Twin Swamps Nature Reserve. Ellen Brook Nature Reserve.	Intensive population study throughout the winter period each year by mark and return. Total numbers, growth rates, recruitment, age to sexual maturity, breeding success. One water sample at Ellen Brook and four at Twin Swamps two to three times per year analysed for total nitrogen, nitrate nitrogen, total phosphorus, fluoride, sulphide, total dissolved solids, chloride and dissolved oxygen. (Unpublished)

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
Marine Research Laboratories, P.O. Box 20, North Perth, W.A. 6020		
12. Dr N. Morrissy	c. An investigation into the status of introduced trout (Salmo species) in Western Australia.	Distribution, abundance, and factors affecting these; fishing activity. Presented as a Fisheries and Fauna Report (No. 10) in 1972.
	o. The ecology of marron (Cherax tenuimanus) and their aquiculture, particularly in still water impoundments.	Ref: Fisheries and Wildlife publications.
Head Office, 108 Adelaide Terrace, Perth. 6000		
13. J. Goodsell	o. Managing and rehabilitating wetlands at the Broadwater Reserve (No. 27080) and Benger Swamp.	Assessing effects of water level and nesting material on breeding of swans. Obtaining detailed contour maps. Mapping vegetation of Benger Swamp.
	o. Managing the fauna refuge at Lake Dumbleyung.	Surveys of fauna and flora proposed.
	p. Investigating the feasability of maintaining the ecological integrity and rehabilitating lakes and streams that comprise the headwaters of the Arthur River. (In conjunction with Agriculture, Public Works and Forests Departments.)	Arial photography and vegetation mapping, and contour plotting proposed. Some piezometers installed.

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
WESTERN AUSTRALIAN MUSEUM, Francis Street, Perth, W.A.		
14. Dr D. Kitchener Mr A. Chapman Mr J. Dell Mr B. Muir	o. Vertebrate faunal and vegetation surveys of the W.A. wheat belt and associated coastal areas. Specific areas surveyed. LOCATION: Ref. Kitchener (1976)	Relationship between reserve size and structure (based primarily on vegetation structure and floristic diversity indices) and the mammal, bird, reptile and frog assemblages (including those reserves which have salt lakes - no concentrated attempt to document plants and animals of these seasonal lentic systems but some information is acquired routinely). Where the results of these surveys have not been published in Suppliments to the Records of the Western Australian Museum, they have limited availability.
15. Mr M. Jackson Mr K. Morris Mr G. Harold Dr D.J. Kitchener (compiled report)	c. A spring 1975, biological survey of the proposed Mussel Pool complex and recommendations for its future development. A study done for the M.R.P.A. in September-October 1975. Floristics were done by the W.A. Herberium.	Listings, tables and maps of vegetation, birds, mammals, reptiles, fish and invertebrates - principally molluscs and insects. Some interpretation is given of the importance of wetlands to these species (unpublished).
16. Dr R. George Mr D. Hembree Mr N. Sarti	o. Undertaking a limnological survey of the free standing waters of a number of lakes in the Wanneroo area. One lake is to be sampled in detail (Jandabup).	Sampling is being done using qualitative techniques e.g. netting for insects, molluscs, crustacea and fish and is being done every two to three months. The project started in April 1977 and is expected to take two years to complete.

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
	LOCATION: Jandabup; Joondalup, Loch McNess, Chandala, Bambun, Beermullah, a salt lake.	
17. Dr G. Storr Mr R. Johnston Mr G. Harold Mr G. Barron	o. A survey of the reptiles and birds of the wetlands in the Wanneroo area. LOCATION: As for (15) above.	Waterfowl counts, gut contents; frog, snake, lizard and bird species lists; habitat preference, etc.
18. Mr J. Stoddard Dr B. Wilson (in conjunction with Dr R. Lethbridge - Murdoch University)	o. The taxonomy, distribution and breeding biology of the fresh water snails of the Kimberleys region in comparison with the fauna of Australian and S.E. Asia. Specific reference to species implicated in the transmission of both veterinery and medical parasites.	The project commenced in December 1976 and is expected to conclude in July 1978. Information from the survey is not likely to be available before completion.
19. Dr G. Kendrick	o. The taxonomy, ecology and general biology of Western Australian fresh water molluscs; principally plecepods and gastropods.	A manuscript on the work to date is in preparation. Ref. to Kendrick (1976) for a description of the molluscs of the Avon River and a history of the ecological changes in the river since settlement.
20. Dr B. Wilson Mr P. Smith	c. A survey of the mollusc fauna of the Prince Regent River Reserve.	Description of sampling sites and a list of species and the sites at which they were collected.

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
21. Dr B. Wilson Mrs S. Slack-Smith	c. A survey of the mollusc fauna of the Drysdale River Reserve.	As for the Prince Regent River Report.
22. Dr G. R. Allen Mr J.B. Hutchins Mr N. Sarti	o. The Fish section of the museum has a large collection of freshwater fish from through out the State and this is available for use.	
	c. A survey of the Prince Regent River Reserve North-West Kimberleys in August 1974.	Annotated lists of species collected, including description, number collected, lengths, locations, behaviour and breeding. (unpublished).
	c. Similar surveys have been done on the Drysdale River and the Mitchell plateau and are in press.	
23. Mr N. Sarti	p. A survey of fish species present in nothern metropolitan lakes. A thesis for the Diploma in Applied Science, Mt Lawley Technical College.	Fish species present to be assessed seasonally and related to changes in water level and salinity.

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
W.A. HERBARIUM Department of Agriculture, Jarrah Road, South Perth, W.A.		
24. Dr N. Marchant	c. Surveyed eleven lakes on the Swan Coastal Plain. Developing a wetlands classification system based on detailed plant ecology and water quality. Classification criteria include size, salinity, seasonality of water level and percentage vegetation cover. LOCATION: Wanneroo Shire.	Water quality data includes pH, colour, total suspended solids (filtrate residue), Na+, Cl-, Ca, Mg, Ammonium nitrogen, nitrate nitrogen, total phosphorus and orthophosphate. A report on the project has been drafted.
	o. The taxonomy, distribution and ecology of aquatic vascular plants.	
	c. Chairman of a committee investigating problems associated with the water-weed Salvinia.	A paper has been prepared on the biology of Salvinia and is expected to be published in the Journal of the Royal Society of Western Australia this year.
	p. An investigation of the aquatic weeds of Lake Argyle and the Ord River.	

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
25. Dr N. Marchant Mr T.E.H. Alpin	o. Identification of blue-green algae as a service to the public and government bodies.	Records not normally retained?
26. Mr T.E.H. Alpin	c. Chairman of a committee to investigate the management of pesticide-like odours in Perth metropolitan wetlands. The odours were attributed to blue-green algal blooms and a 12 month study was undertaken of a number of physical and chemical factors in three lakes. LOCATION: Blue Gum, Booragoon, Monger.	Monthly samples of depth, temperature, pH, colour, total salts, chloride, potassium, phosphorus (total and "in solution"), nitrogen (ammonia and nitrate),dissolved oxygen and biological oxygen demand. As of the 5th month of the study, tested for algal indentification and counts, chorophyll a and orthophosphate phosphorus. These data and an assessment have been presented in a report to be released by the Department of Conservation and Environment.
27. Department of Conservation and Environment, 1 Mount St, Perth. 6000. Mrs K. Majer Mr N. Orr	o. Wetlands Advisory Committee - Chairperson and member respectively. An interdepartmental committee to review and advise the E.P.A. on the desirable allocation of wetland reserve resources and the adequacy of their management.	A large amount of published and unpublished data have been collected and reviewed. Much of these data, as well as management and policy recommendations, are being prepared at the moment for presentation to the E.P.A. in report format. (This present report will be part of the above submission to the E.P.A.

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
METROPOLITAN WATER SUPPLY SEWERAGE AND DRAINAGE BOARD, 2 Havelock Street, West Perth, W.A.		
28. Water Supply & Maintenance Branch.	c. 12 month study of E. coli, total coliform, Salmonella in service reserviors, hill reserviors and ambient waters at monthly intervals.	Study done in conjunction with State Health Laboratory (see below).
	p. The development of sampling methods for virus testing as a regular procedure in assessing the water quality of service reserviors. To be done in conjunction with State Health Department.	
	o. Twice weekly, total algal counts, using the millipore method, on all service reserviors.	Total counts done only. All records maintained in a manual filing system (unpublished).
	o. Monitoring the water quality of all hill reserviors and their catchment streams, down to primary streams. The number of sampling points is to be progressively reduced until sampling is only done on tertiary streams by 1980.	At present sampling some 1,000 locations for: salinity, total coliforms, E. coli. Turbidity has been done on an ad hoc basis to date - will be done regularly as of the 1977 winter. Some herbicide, hydrocarbon and pesticide data. Data is retained raw, in a manual filing system (unpublished).
	o. Chemical analyses of waters from all service reserviors once weekly.	pH, total dissolved solids, sodium chloride, estimate of clarity. Data stored manually at Leederville depot (unpublished).

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
	o. Twice yearly sampling of a large number of metropolitan lakes for a wide range of water quality paramenters: since 1970 for most of the lakes. Also sample a large number of stormwater drains prior to their discharge to the Swan and Canning estuaries, and Lake Richmond. LOCATION: Refer Table 4 and Figure 2.	Biological oxygen demand, suspended solids, methyl blue active substance, pH, phosphorus, fluoride, ammonia as nitrogen. organic nitrogen, total coliforms, E. coli, total organic carbon, specific conductivity, sodium chloride, and in the last two to three years, chromium, zinc, cadmium, lead, copper, mercury, iron and turbidity (unpublished).
29. Forward Planning and Computing	o.The investigation of groundwater resources and the planning of their use and management. Work in closely with the Geological Survey of the Mines Department.	Monitoring of changes in ground water levels over time for a large number of bores through out the metropolitan area. All data stored on the Department' own computer system.(unpublished).
30. Drainage Design	o. The measurement of water levels of lakes and swamps throughout the metropolitan area. LOCATION: Ref. Table 5.	At present mearsuring waterlevels at some 50 odd locations, with some records going back to 1907. Most recent data recorded at monthly or two-monthly intervals. All data being placed on computer (unpublished).

INSTITUTION / PERSONNEL	OUTLINE OF RESEARCH	DATA
GEOLOGICAL SURVEY OF WESTERN AUSTRALIA, 66 Adelaide Terrace, Perth, WA.		
31.	o. Collection and filing of all information data etc on all of the bores drilled in the State, including private bores where information can be obtained but not those of M.W.S.S.D.B. (refer above). Refer also p.21, table 4 of Hodgkin and Majer for details of specific project work, as well as Hydro reports in the Surveys annual report.	All data filed in an index card (manual retrieval) system. Data for each bore depends on purpose of bore but may include : location, total depth, stratigraphy, casing, screen types and levels, water quality. Data available on request through the Director, Geological Survey.
TOWN PLANNING DEPARTMENT, 22 St George's Terr., Perth, WA.		
32.	o. The preparation of planning policies and proposals (both conceptual and design) for government departments and other bodies.	Most data used and reported is collected by other goverment departments or consultant groups. Refer also p.19, table 4 of Hodgkin and Majer.
Mr J.P. Singleton	o. A study dealing with identification of the basic problems in the landscape planning of coastal wetlands. To use Lake Joondalup as a case study.	The study has commenced and shall be completed by December 1977.

	INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
	STATE HEALTH LABORATORIES, Public Health Department, Perth Medical Centre, Shenton Park, W.A. 6008		
33.		o. The monitoring of total coliforms, E. coli and Salmonella in a large number of ambient waters, service and hill reserviors and tip-sites in the Metropolitan area.	Sampling undertaken at monthly intervals for a 12 month period in conjunction with M.W.S.S.D.B. A report has been prepared for submission to the M.W.S.S.D.B. and the Commissioner for Public Health (unpublished).
	KINGS PARK BOARD, Fraser Avenue, Kings Park, W.A.		
34.	Mr G. Keighery Dr. N. Marchant (W.A. Herbarium)	o. A list of rare and endangered species of flora, including wetland species, for the entire state.	List of species and their status i.e. " rare, poorly collected, restricted distribution", and notes on their distribution. To be published as a Kings Park Research Note - work on the monocots is concluded and is now proceding on the dicots. Monocot list to be published in the immediate future.

	INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
	INSTITUTE OF FOREST RESEARCH, Cnr George & Thelma St's, Como, W.A.		
35.	Mr P. Hewitt	Member of a working group of the Water Purity Committee which has been studying catchment recreation management.	A report to the Water Purity Committee is being drafted. The group have been working since April 1974.
36.	Mr W. Schmidt	o. An assessment of amature marron fishing in the Murray Valley. On-site interviews have been conducted with fishing parties during the 1973 and 1977 seasons.	Includes number of fishing nights per person, number of marron caught per night per person, size of marron caught per night per person.
37.	Dr E. Matiske Mr J. Havel	o. Impact of ground water fluctuations on the flora of the Swan Coastal Plain. Have assessed natural fluctuations in level over the last 10 years. 1972 included extra transects to take in Lake Joondalup and Lake Jandabup.	Data from preliminary work to be published in the Forest Department Bulletin.
38.	Dr F. McKinnell Mr P. Stirling (Busselton Research Station)	o. Monitoring possible changes in quantity and quality of stream flow following pine planting in the Donnybrook Sunkland.	Seasonal changes in water table, surface run off, and stream water quality.

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
39. Mr P. Kimber Dr D. Whitely (Manjimup Research Station)	o. Monitoring possible changes in quantity and quality of stream flow. level and quality of groundwater and soil moisture regime, resulting from programmed wood chip cutting.	Measuring level of water table and ground water salinity, soil moisture and stream flow, salinity and turbidity.
40. Dr S. Shea Mr E. Herbert	o. To relate the hydrological patterns of a set of small forested catchments to factors such as topography, climate, soil and vegetation. o. To study the hydrological pattern of the South Dandalup catchment and to relate this pattern to the topography , climate, soils and vegetation of the catchment.	Salinity levels, stream flow, water yield with respect to seasonal rainfall, ground water salinity and water table levels. Stream water quality and flow data, distribution of soil salt, variation in depth and quality of sub-soil water.
41. Mr A.B. Hatch Dr S. Shea Mr P. Kimber Mr E. Herbert	o. To detect and quantify factors influencing the levels of sodium chloride in streams, in particular the effects of topography, soils, vegetation and land-use. LOCATION: Mundaring, Dwellingup, Busselton and Manjimup forest divisions.	Water samples collected weekly and analysed conductivity, selected sample analysed Ca, Mg, Na, K, HCO_3, Cl, SO_4, N and P. To be published in Forest Department Bulletin (inpress).

	INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
42.	Mr F. Batini	o. To evaluate the impact of replacing native hardwood forest by exotic conifer plantations on the quality and quantity of water yield form small catchments (600 ha). Using paired catchments, calibrated for three to four years prior to clearing and planting. LOCATION: Helena River catchment.	Soil moisture, groundwater recharge, salintiy of groundwater and surface water, water yield. Refer also p. 15 - 17, table 4 of Hodgkin and Majer for other studies in the Institute of Forest Research, particularly with respect to assessing the effects of wood chipping and bauxite mining.
43.	COMMUNITY RECREATION COUNCIL, Sir Thomas Meagher Pavilion, Perry Lakes Stadium, Floreat Park, W.A. Mr B. Bailey	c. A survey of the recreational usage of the lakes in the Northern Planning Corridor. Sampled one mid-summer weekend and one mid-summer week day. Information obtained by interviewing and the completion of a questionaire by visiting parties. LOCATION: Lakes Joondalup,Gnangara, Nowergup.	Age and sex composition of groups, group structure, distance travelled, frequency of visits, duration of visits, rank ordering of use pressure and facilities considered desirable (unpublished).

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
44. PUBLIC WORKS DEPARTMENT, 2 Havelock Street, West Perth, W.A.		
Water Resources Section	o. Recording of stream flows, rainfall and some water quality. State wide.	Stream flow records for the south-west of the State over the period 1939 to 1970 have been published (two volumes). Also annual catalogue of gauging stations, location, area gauged and period of record. A revised publication (to be available in July 1977) will supersede the above. All data will be given in metric units. A general description of each catchment will be included. Data reported till December 1975. Monthly tests of chloride and temperature are taken at most stations and at some total dissolved salts, hardness and conductivity are also taken. These data, as well as water quality data obtained from other sources, are stored in a computer based filing system. Availability is presently restricted to hard copy, but it is expected to be available shortly on magnetic tape (A.W.R.C. interchange format). Flow data is to be incororated into the same system within the next three to four months. It should also be noted that this section has the responsibility for allocation of the seven digit nambers used in identifying all stream gauging stations and observation bores.
	Refer also to p.12 - 14, table 4 of Hodgkin and Majer for other activities of the Public Works Department.	

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
UNVERSITY OF WESTERN AUSTRALIA, Nedlands, W.A. 6009 Zoology Department 45. Dr D. Edwards Dr T. Riggert (Fisheries and Wildlife Department)	c. Rottnest Island Lakes - sampled every two weeks for 12 months, for phytoplankton, zooplankton, benthic and marginal organisms, macroscopic plants and water quality. LOCATION: Bagdad, Pink and Negro.	pH, total soluble salts. At quarterly intervals full analysis, including N, P, K, colour, odour, Na, Cl, etc. (unpublished).
46. Dr B. Nott	o. The taxonomy, species diversity and general ecology of freshwater isopods, amphipods and eucarids LOCATION: Australia wide.	Work to be published in scientific journals.
47. Mr D. Bray	c. The larval development of two W.A. shrimps, Palaemonetes australis and Palaemonetes atrinubes, reared in the laboratory. Morphological development is related to species habitat. Refer also p. 44 of table 4, Hodgkin and Majer.	The number of the zoeal stages and the development of the pereiopods and pleopods are described, as is the morphology of the fifth abdominal somite.

INSTITUTION / PERSONNEL	OUTLINE OF RESEARCH	DATA
48. Mr B. Clay	o. Biology of the long-necked tortoise (Chelodina sp) including population dynamics, breeding biology, patterns of movement and effects of predation over the last four years. LOCATION: Banganup and Thompson Lakes.	Population estimates using mark and return techniques, body metrics, sex ratios, growth rates, nest structure, clutch size, incubation temperatures, egg sizes/ weights, hatching success, nesting and mating behaviour, general movements in relation to humidity and air temperature. Work to be published in scientific journals - one paper is in preparation and a second is to follow.
49. Mr J. Scott	o. Private research on the taxonomy, distribution and general ecology of Western Australian fresh water fish.	Activities todate limited to collection of material and compilation of own records.
50. Mrs J. Prince	o. Masters thesis under Dr R. Black on the resource sharing of four species of Black fly larvae (Simuliidae) which occur together in a small stream characterised by highly variable seasonal flow. LOCATION: Jane Brook, between Mt Helena and the Great Northern Highway.	Sampled 10 locations fortnightly, for 12 months. Determined occurence of larvae and substrate type. Also measured dissolved oxygen, temperature, pH, depth and flow rate.
51. Mr J. Trendal	o. PhD thesis under Dr M. Johnston on reproductive stategies using populations of the mosquito fish, Gambusia affinus.	Has only just commenced and is assessimg the suitablity of Gambusia for this work.

	INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
	Botany Department		
52.	Miss A.M. Baird	o. Yula Brook Botany Reserve Area - preparing relevant material from Spect (1952) and her own observations for publication in the Journal of the Royal Society of W.A. LOCATION: Area of approximately 34 ha bounded by Brook, Bickley and Boundary Roads, Kenwick.	Documentation of the plant communities, their changes with time and the possible reasons for these changes.
53.	Mr W.A. Loneragan	c. An ecological survey of Mersea Lake. An Honours project to document the floristics and community structure of a lower south-west swamp for comparison with the Yule Brook Botany Reserve. LOCATION: Portion of State Forest No. 37 between private property Loc. No. 2133 and the South-West Highway near Wilgarup.	
		o. The population structure of the tuberous plant, Tribonanthes variabilis, at Yule Brook Botany Reserve.	Recorded annually since 1968 the number of individuals More detailed work on population structure commenced 1976.
54.	Dr J.A. McComb Dr A.J. McComb	c. A preliminary account of the vegetation of Loch McNess, a swamp and fen formation. LOCATION: Within Yanchep National Park.	Published in the Journal of the Royal Society of W.A. 50, 105 - 112.

	INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
55.	Mr R.A. Congdon	c. Studies on the synecologyof Lake Joondalup and the autecology of Juncus species.	An Honours thesis.
56.	Mr P.L. Harris	c. Phytoplankton ecology of Lake Monger. Determined the pattern of seasonal occurence of algal groups and related these to physical, chemical and biological changes.	
57.	Mr G.G. Smith	c. Muchea-Mound Springs - notes presences of rare lycopod and liverwort at these springs.	Part of a census of the pteridophyta of W.A. (refer bibliography).
	Geography Department		
58.	Mr D. Blatchford	c. An Honours project on "The use of remote sensing techniques in the assessment of waterfowl habitat suitability". LOCATION: Mariginiup, Geogrup, Big Lake.	Thesis discusses the use of different remote sensing data namely Landsat, black and white and colour photography to assess vegetation patterns and water fowl habitats.

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
Department of Micro-biology, Perth Medical Centre, Shenton Park, W.A. 6008		
59. Prof. N.F. Stanley Dr M.P. Alpers Ms S. Paul Mr A. Wright Mr N. Hamilton Mr K.A. Chan	o. Arbo-virus ecology and epidemiology of the Ord River area. The projects objective is to determine and define changes in mosquito populations and to detect arboviruses by isolation and serological techniques. LOCATION: Ord River, as well as comparative work in the Pilbara and south-west of West Australia.	Accurate description and typing of Western Australian mosquitoes. Arbo-viruses are being isolated and identified from mosquitoes and the pattern of distrubution in man, animals and birds is being determined by antibody estimation.

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
MURDOCH UNIVERSITY, Murdoch, W.A. 6153 School of Environmental and life Sciences 60. Prof. D.C. O'Connor	o. The development of the use of infrared and colour photography for wetland (and arid zone) vegetation inventories. Particular emphasis on the use of light aircraft and 35 mm multispectral photography.	
61. Dr P. Newman Mr M. Bowman Mr M. Chambers Mr N. Dunlop Ms L. Hart Mr T. Hogan Mr D. Lievense Ms K. Maisey	c. An environmental study of the Cockburn wetlands. A two month study to compile an environmental inventory of the area and also determine management proposals for the future development of the area. An environmental quality index was developed for the area. LOCATION: Western chain from Lake Manning to Mt Brown Lake; Eastern chain from North Lake to Wattleup Lake.	Maps of ground water levels, physical features, vegetation. Tables of water quality data, water fowl distribution and vegetation classification. Also a large amount of descriptive information in the text and numerous colour photographs (unpublished).

	INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
62.	Dr P. Newman, and associated students	o. Collection of data on a swamp on the Murdoch University campus as a basis to understanding coastal plain wetlands. Transects of vegetation, water table and soils have been made and the overall pattern of vegetation mapped. A model to show hydrological and nutrient balances is being prepared.	Water quality (weekly)*, water depth of swamp and adjacent bores (daily), rainfall, evaporation, temperature, humidity (daily) at two sites. * dissolved oxygen, conductivity, pH, ortho-phosphate, nitrate nitrogen.
		o. A study of land classification techniques in the Lake Preston area as a basis for an environmental data bank.	Data unpublished.

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
WESTERN AUSTRALIAN INSTITUTE OF TECHNOLOGY, Hayman Road, Bentley, W.A. Department of Biology		
63. Mr J. John	o. The taxonomy and ecology of the marine and freshwater diatoms of Western Australia.	To be presented as a PhD thesis.
64. Mrs J. Osborne	o. Is currently carrying out a reconnaissance of the zooplankton and invertebrate, benthic fauna of five lakes in the Martin Tank chain, Yalgorup. Sampling has been carried out regularly every three to four weeks for the past 12 months in order to enable identification and documentation of the invertebrate fauna and seasonal changes. Some physico-chemical data is also collected.	Species lists, temperature, dissolved oxygen, depth, salinity, chlorinity. Some nutrient analyses to be done in the future (unpublished).
65. Mr P. Griffth	o. Preparation of a species check list and documentation of changes in species composition of the phytoplankton of Martin Tank, Yalgorup National Park.	To be presented as a thesis at the end of 1977. Sampling at fortnightly intervals.

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
CLAREMONT TEACHERS COLLEGE, Goldsworthy Road, Claremont, W.A.		
66. Mr P. MacMillan	o. The biology of Iridomyrmex conifer Forel, an ant which is commonly found in swampy areas throughout the south-west of Western Australia, particularly on the Swan Coastal Plain. Presently starting a Masters thesis on the relationship between seasonal nesting behaviour, water-balance and physical habitat.	A large amount of distribution and other information (unpublished).
	o. Student surveys of local wetlands, often as the result of a request from the Conservation Council. LOCATION: To date - Thornlie, Maylands, Dianella, White and Herdsmans Lakes.	Complete species lists of flora and vertebrate and invertebrate fauna.
GRAYLANDS TEACHERS COLLEGE, Mimosa Avenue, Graylands, W.A.		
67. Mr I.R. Lantzke	o. The water chemistry of metropolitan lakes. Proposed detailed studies of vertical stratification, diurnal and short period changes. (cont.)	12 - 24 months of data on water clarity, pH, dissolved oxygen, total and orthophosphate phosphorus, chloride ion, from drain into Herdsmans, the three Perry Lakes, Claremont, Bibra, White, and Coogee Lakes.

INSTITUTION / PERSONNEL	OUTLINE OF RESEARCH	DATA
	LOCATION: Jandabup, LittleBadgerup, Hazelmear, Bibra, Brown and the three Perry Lakes.	
	o. Student theses - a number of third year student projects have been done on different lakes throughout the metropolitan area. Refer bibliography.	
CONSERVATION GROUPS ENVIRONMENT 2000 68. Dr P. Weaver, c/- Department of Biochemistry, University of W.A.	o. The effects of ABATE on photosynthesis of planktonic algae. Laboratory experiments using Chlorella completed. Field experiments to be completed. c. Survey of recreational usage of seven metropolitan lakes in 1970 and 1971. c. Submission to M.R.P.A. on planning proposals affecting Herdsmans Lake.	
WESTERN AUSTRALIAN NATURALIST CLUB 69. Dr D. Serventy, 27 Everett Street, Nedlands, W.A.	o. Natural resources inventory of the Yunderup delta wetlands.	Records of birds, fish, invertebrates, and vegetation since 1968 on a seasonal basis. Once considered complete, will be published as a Club Handbook.

INSTITUTION / PERSONNEL	OUTLINE OF RESEARCH	DATA
70. THE NATIONAL TRUST OF AUSTRALIA (W.A.) Old Perth Boys School, 139 St. Georges Terr., Perth. 6000.	c. An 18 month survey to assess the resource value and recreational potential of the Peel/Harvey Estuaries and Lakes Clifton and Preston.	Mostly descriptive or presented on a map format. (unpublished).
71. THE WEST AUSTRALIAN FIELD AND GAME ASSOCIATION INC. 46 Rossmoyne Drive, Rossmoyne, W.A. 6155	o. Regional Wetland Scheme - purpose is to collect data on water fowl and wetlands over an area of the south-west of the State within a line from Geraldton to Esperance (including the Goldfields). LOCATION: Refer table 5 Kneebone and Burking.	The scheme commenced operation in 1974 with twice yearly surveys being carried out on specific wetlands. Records include species, number, size and age of eggs, water level, food availability, other fauna, and observations on drainage, clearing, salt increase and predators. (unpublished).
	o. Metropolitan Wetland Scheme - purpose is to collect data on water fowl and wetlands in the metropolitan area. LOCATION: Refer table 1 Kneebone and Burking.	Initiated October 1975 with the intention to survey at two-monthly intervals. Data as for Regional Scheme above. (unpublished).
	p. Yealering project - study of water fowl and management of an area for habitat improvement. LOCATION: A string of small lakes on private property running parallel to and east of Yealering Lake.	Only preliminary surveys undertaken to date.

INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
	o. Taylors Lake Wetland Conservation Project. A study of waterfowl and wetlands with particular attention being given to the effects of such management activities as installation of nesting boxes, and control of water level. LOCATION: Approximately 120 Km north of Perth, close to Wannamal Siding on the Perth-Moora railway line.	Description of area, vegetation and soil. Water fowl counts as of August 1973 as well as behaviour and breeding observations. Water depth, pH, total salts and sodium chloride monthly.(unpublished).
CONSULTING GROUPS		
72. ENVIRONMENTAL RESOURCES OF AUSTRALIA PTY LTD (no longer a company)	c. An assessment of environmental effects of the proposed peat removal from lagoons in the Lake Muir area, February 1971. Includes an assessment of mining methods and techniques and discusses some of the literature on regeneration of mined areas.	Detailed description of major plant communities and vegetation transects (maps and diagrams also). Description of drainage patterns and soil structure. Chemical analyses of soils and waters.
73. DAMES & MOORE 34 Richardson Street, West Perth, W.A.	o. Environmental assessments of a number of proposed dam sites and bore fields. LOCATIONS: Dogger George - Fortescue River, Kangan Pool - Shirlock River, 20 Km up stream of Pannawonica - Robe River, Booyeemala Creek-up stream of Fortescue River, Cooyapooya - Harding River.	Lists of species (some seasonal) of fish, invertebrates phytoplankton. All reports prepared for P.W.D.

INSTITUTION / PERSONNEL	OUTLING OF RESEARCH	DATA
	c. An assessment of the effects of flood drainage on Millstream.	Reports prepared for P.W.D.
74. Mr I. Maley	c. Surveys of seven south-west Western Australian rivers to assess the recreation potential of the rivers for canoeing. LOCATION: Rivers surveyed were: Deep Gardner, Shannon, Donelly, Kent, Frankland, Warren.	Surveys undertaken between 10th October 1975 and 20th November 1975. Photographs and descriptive notes on the suitability of each river in a report to the Department of Conservation and Environment (unpublished).
OTHERS		
*75. Dr D.L. Serventy, 27 Everett Street, Nedlands, W.A. 6009	Records of fauna (birds, fish and invertebrates) and salinity for some swamps and lakes throughout Western Australia; including fish records for the Pilbara region.	Data held by Dr Serventy to be published in the future. Some data has already been reported in other authors' works.
76 Dr D.E. Rosen, Department of Ichtheology, The American Museum of Natural History, Central Park West, At 79th Street, New York. NY 10024	Has collected freshwater fish from West Australia principally from the Kimberley Plateau.	

	INSTITUTION PERSONNEL	OUTLINE OF RESEARCH	DATA
77.	Dr R.M. McDowall, Division of Fisheries Research Development, P.O. Box 19062, Wellington, New Zealand.	Is studying the taxonomy of Galaxids and has material from Western Australia.	
78.	Dr G.F. Mees, Rijksmuseum Van Narurlijke Historie, Raamsteeg 2, Leiden, The Netherlands.	Is studying the world distribution of Gambusia. Has been sent material from Western Australia.	
79.	Mr B. Hutchinson, c/- Seconday Teachers College, Stirling Highway, Nedlands.	Studied the seasonal usage and breeding of birds at Herdsmans Lake.	Compiled species lists from 1970 to 1974; data has been sent to Environment 2000 and a bird list to the Royal Australian Ornithologists Union.

TABLE 3

LIST OF LOCALITIES NOTED IN TABLE 2 AND THEIR GEOGRAPHIC CO-ORDINATES.

NOTE: 1. Co-ordinates given for rivers are for the mouth of the river at its point of entry into an estuary or the sea. If a tributary, then the co-ordinate given is for the confluence with the major stream.

2. Co-ordinates for major geographic features e.g. Kimberley plateau, are approximately central to the region.

MAP	NO.	LOCATION	LATITUDE (°S)	LONGITUDE (°E)	REFERENCE TABLE 2	COMMENTS
1	1	Argyle, Lake	16°15'	128°50'	18,24,59	Formed by the Ord River Dam.
1	2	Arthur River	33°41'	116°44'	13	Tributary to Blackwood River.
2	1	Avon River	31°46'	116°01'	19	Becomes the Swan River.
2	2	Bagdad, Lake	31°59'	115°32'	45	Rottnest Island.
1	3	Bakers Hill	31°44'	116°27'	1	C.S.I.R.O. Experimental Farm.
1	4	Bamban, Lake	31°25'	115°53'	16,17	Fauna reserve.
2	3	Banganup, Lake	32°10'	115°49'	48	University of W.A.. Zoology Dept Mammal Breeding Station.
1	5	Beermullah, Lake	31°12'	115°46'	16,17	
1	6	Benga Swamp	33°10'	115°50'	13	
1	7	Big Lake	32°42'	115°43'	58	
2	21	Bibra Lake	32°05'	115°50'	67	
2	4	Blue Gum Lake	32°02'	115°51'	5,26	
2	5	Booragoon Swamp	32°03'	115°50'	5,26	
1	8	Booyeemala Creek	21°31'	116°43'	73	Tributary to Fortescue R.
2	6	Brown Lake	42°10'	115°46'	67,61	
1	9	Broadwater, The	33°39'	115°16'	13	
1	10	Bunbury	33°19'	115°39'	4	
1	11	Busselton	33°38'	115°21'	41	
1	12	Chandala, Lake	31°29'	115°47'	16,17	
1	13	Clifton, Lake	32°48'	115°40'	70	Yalgorup National Park.
1	48	Collie	33°21'	116°08'	1	
1	14	Cooyapoya	21°02'	117°07'	73	On the Harding River.
1	15	Dandaragan	30°40'	115°42'	4	
1	16	Deep River	35°01'	116°42'	74	Enters Nornalup Inlet.
1	17	Dell Park	32°36'	115°57'	1	Bauxite mining site.
2	7	Dianella Swamp	31°54'	115°53'	66	
1	18	Dumbellyung, Lake	33°20'	117°36'	13	
1	19	Dogger Gorge	21°33'	116°52'	73	On Fortescue River.
1	20	Donnelly River	34°28'	115°41'	74	Enters Braodwater Estuary.
1	21	Donneybrook	33°34'	115°49'	38	On the eastern fault of the Sunkland.
1	22	Dryandera	32°47'	116°57'	1	State Forest Reserve.
1	23	Drysdale River	14°00'	126°55'	21,22	
1	24	Dwellingup	32°42'	116°04'	41	Forest Division.
1	25	East Popanyining	32°39'	117°15'	1	

MAP	NO.	LOCATION	LATITUDE (°S)	LONGITUDE (°E)	REFERENCE TABLE 2	COMMENTS
1	26	Ellen Brook	31°43'	116°02'	11	Nature Reserve.
1	27	Esperance	33°51'	121°53'	71	
1	28	Frankland River	35°00'	116°45'	74	Enters Nornalup Inlet.
1	29	Gardner River	34°51'	116°07'	74	
1	30	Geogrup Lake	32°31'	115°47'	58	
1	31	Geraldton	28°46'	114°36'	71	
1	32	Gnangara	31°47'	115°52'	43	
1	33	Harvey Estuary	32°43'	115°41'	70	
2	8	Hazelmear, Lake	31°55'	116°00'	67	
2	9	Helena River	31°55'	115°58'	42	Enters Swan Estuary.
2	10	Herdsmans Lake	32°00'	115°55'	66,67,69	
2	11	Jandabup, Lake	31°45'	115°51'	16,17,37, 67	
2	12	Jane Brook	31°53'	115°59'	50	Enters Swan Estuary.
2	13	Joondalup, Lake	31°45'	115°46'	16,17,37, 43,55	
1	34	Kangan Pool	21°06'	117°38'	73	On Shirlock River.
1	35	Kent River	34°59'	117°00'	74	Enters Irwin Inlet.
2	14	Karrinyup, Lake	31°52'	115°47'	5	West of Karrinyup Swamp.
1	36	Kimberley Plateau	17°00'	127°00'	76	
2	15	Little Badgerup Swamp	31°47'	115°51'	67	
2	16	Loch McNess	32°14'	115°40'	16,17,54	Yanchep National Park.
1	37	McLeod, Lake	24°00'	113°45'	10	
1	38	Manjimup	34°14'	116°09'	39,41	Forest Division.
2	17	Manning, Lake	32°05'	115°46'	61	
2	18	Mariginiup, Lake	31°43'	115°48'	58	
1	39	Martin Tank	31°51'	115°41'	64,65	Yalgorup National Park.
2	19	Maylands Swamp	31°57'	115°54'	66	
1	40	Mersea, Lake	34°05'	116°12'	53	Part of Forest Reserve No. 37.
1	41	Millstream	21°35'	117°05'	73	On Fortescue River.
1	42	Mitchell Plateau	14°30	126°00'	22	
2	20	Mongers Lake	31°56'	115°48'	26,56	
2	6	Mount Brown, Lake	42°10'	115°46'	61,67	
1	43	Muchea	31°35'	115°58'	57	Mound springs.
1	44	Muir, Lake	34°30'	116°40'	72	
1	45	Mundaring	31°56'	116°10'	41	

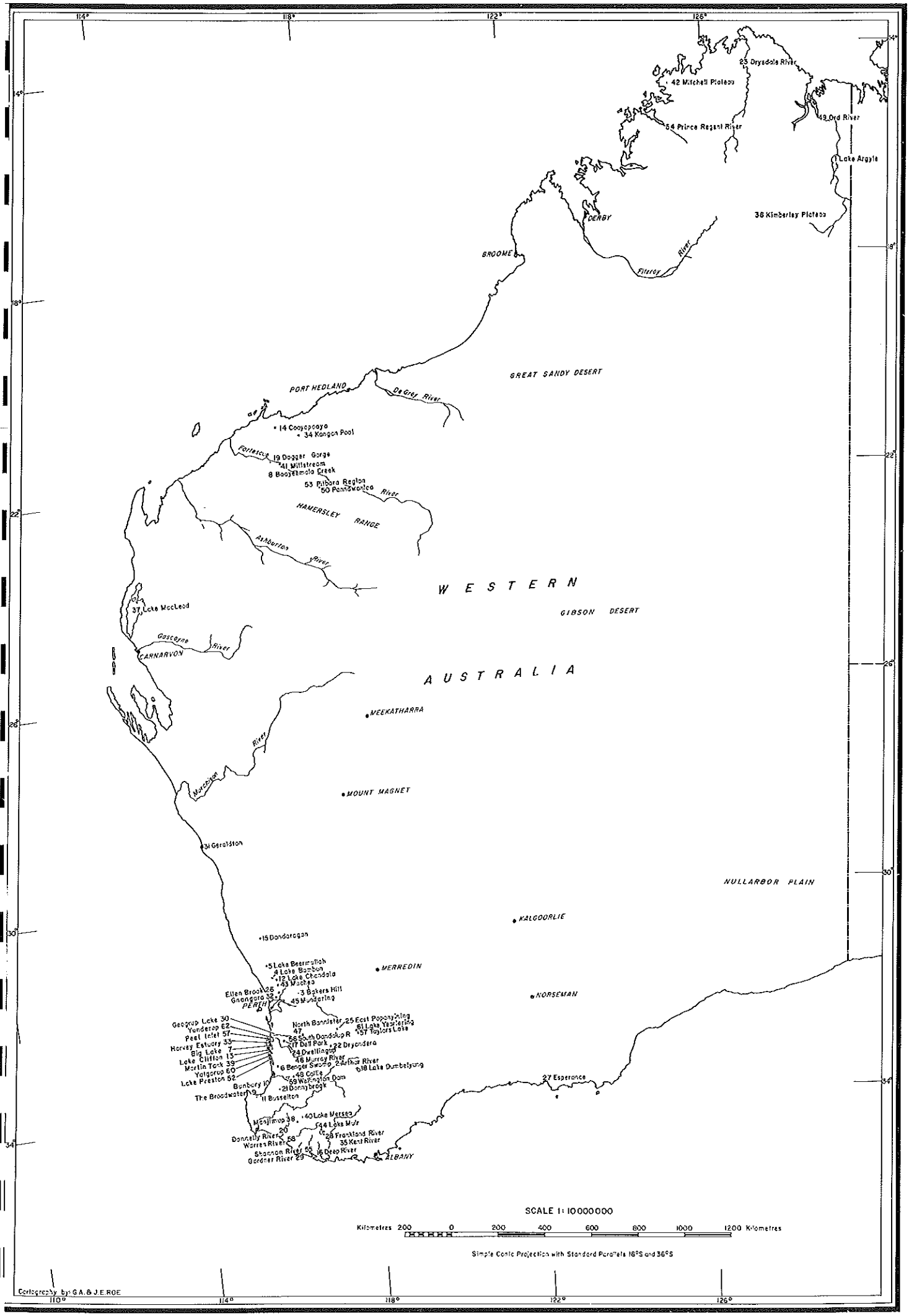
MAP	NO.	LOCATION	LATITUDE (°S)	LONGITUDE (°E)	REFERENCE TABLE 2	COMMENTS
1	46	Murray River	32°34'	115°45'	3	Enters Peel Inlet.
2	22	Mussel Pool	31°54'	115°58'	15	On the Swan Estuary.
2	23	Negri Lake	32°00'	115°30'	45	Rottnest Island.
1	47	North Bannister	32°34'	116°26'	1	
2	24	North Lake	32°04'	115°49'	61	
2	25	Nowergup	31°37'	115°44'	41	
1	49	Ord River	15°30'	128°20'	18,24,59	
1	50	Pannawonica	21°39'	116°19'	73	On Robe River.
1	57	Peel Estuary	31°36	115°43'	70	
2	26	Perry Lake	31°36'	115°43'	5,67	
1	52	Preston, Lake	32°58'	115°41'	62,70	Yalgorup National Park.
* 1	53	Pilbara region	22°00'	119°00'	59,75	
2	27	Pink Lake	32°00'	115°30'	45	Rottnest Island.
1	54	Prince Regent River	15°20'	124°50'	20,22	Fauna Reserve.
2	44	Richmond, Lake	32°17'	115°43'	28	
1	55	Shannon River	34°53'	116°23'	74	Enters Broke Inlet.
1	56	South Dandelup River	32°34'	115°52'	2,40	Enters Murray River.
1	57	Taylors Lake	32°36'	117°38'	71	
2	28	Thompson Lake	32°09'	115°48'	48	
2	29	Thornlie Swamp	32°04'	115°57'	66	
2	30	Twin Swamps	31°44'	116°02'	11	Nature Reserve.
2	31	Wanneroo	31°44'	115°48'	24,17	
1	58	Warren River	34°37'	115°50'	74	
2	32	Wattleup Lake	32°10'	115°49'	61	
1	59	Wellington Dam	33°24'	115°58'	1	On Collie River.
2	33	White Lake	32°17'	115°47'	66,67	Syn. Lake Cooloongup.
1	60	Yalgonup	31°50'	115°40'	62,64,65, 70	National Park.
1	61	Yealering Lake	32°36'	117°36'	71	
2	34	Yule Brook	32°01'	115°59'	52	Univ. of W.A. Botany Reserve.
1	62	Yunderup	32°34'	115°45'	69	

T A B L E 5

LOCATION OF WATER-LEVEL SAMPLING LOCATIONS, DRAINAGE DESIGN BRANCH, M.W.S.S.D.B.

LAKE/SWAMP	LOCATION*	LAKE/SWAMP	LOCATION*
Loch McNess	SWA 0229	Pheonix S.	PER 0809
L. Yonderup	SWA 0328	Hatch S.	PER 1108
L. Carabooda	SWA 0521	Parkes S.	PER 1107
L. Neerabup	SWA 0715	L. Yangebup	PER 1207
Coogee S.	SWA 0425	Princep S.	PER 1305
L. Nowergup	SWA 0520	Lukins S.	PER 1508
Little Coogee S.	SWA 1115	L. Ballanup	PER 1806
L. Adams	SWA 1113	L. Coogee	PER 0804
L. Mariginiup	SWA 1010	Kogalup L.	PER 1204
L. Jandabup	SWA 1108	L. Thompson	PER 1103
Little Dundarbar S.	SWA 1308	Dallison Road S.	PEE 0904
L. Gnangara	SWA 1303	Forrestdale L.	PER 1803
L. Joondallup	SWA 0908	L. Banganup	PER 1101
L. Goollelal	PER 1040	Banjup L.	PER 1501
Badgerup L.	SWA 1204	Wattleup S.	PEE 1140
Big Carine S.	PER 0936	Mandogalup L.	PEE 1139
L. Karinyup	PER 0934	L. Balmanup	PEE 1338
Careniup S.	PER 0935	Long S.	PEE 1037
L. Gwelup	PER 0933	Lyon S.	PER 1303
Emu S.	PER 1436	L. Cooloongup	PEE 0927
Star S.	PER 0735	Folly Pool	PEE 1224
L. Monger	PER 1127	L. Walyungup	PEE 0921
Perry L.	PER 0826	Maramanup Pool	PEE 1221
L. Claremont	PER 0822	Churchers S.	PEE 1117
Tomato L. (Craige S.)	PER 1722	Anstey S.	PEE 0814
Stammer's S.	PER 1015	Paganoni S.	PEE 0911
Blue Gum S.	PER 1215	Pike S.	PEE 1022
L. Booragoon	PER 1215	W.A.I.T. S.	PER 1519
North L.	PER 1111	Bibra L.	PER 1109

* Locations grid reference on 1:2,000 sheets.



LOCALITIES NOTED IN TABLE 2 - WESTERN AUSTRALIA
MAP 1

Cartography by I. GA & J.E.Ros

Two Rocks

16 Loch McNess

Yanchep

Yanchep Beach

25 Lake Nowergup

Yanchep Road

18 Lake Mariginup

11 Lake Jandabup

13 Lake Joondalup

31 Wanneroo

Burns Beach

15 Little Badgerup Swamp

Gnangara Lake

Marmion

14 Lake Karrinyup

7 Dianella Swamp

10 Herdsman Lake

20 Mongers Lake

City Beach

26 Perry Lake

19 Maylands Swamp

PERTH

27 Pink Lake

2 Lake Bagdad

23 Negri Lake

ROTTNEST ISLAND

Cottesloe

South Perth

Swan River

Canning River

4 Blue Gum Lake

5 Booragoon Swamp

FREMANTLE

24 North Lake

17 Manning Lake

21 Bibra Lake

Carnac Island

28 Thompson Lake

Mt Brown Lake

6

3 Lake Banganup

32 Wattleup Lake

GARDEN ISLAND

Kwinana

44 Lake Richmond

33 Lake Coolongup

White Lake

Great Eastern Highway

Muchea

Northern Ellen Brook Hwy

Bullsbrook East

Avon River

30 Twin Swamps

1 Avon River

Herne Hill

22 Mussel Pool

Bennett Brook

12 Jane Brook

Jane Brook

MIDLAND JUNCTION

Lake 8 Hazelmere

9 Helena River

Helena River

Kalamunda

34 Yule Brook

29 Thornlie Swamp

Brookton Highway

Armadale

Canning Reservoir

Albany Highway

Byford

South West Highway

Kenmont

SCALE 1:250 000

5 0 5 10 15 20 25

31°45'

32°00'

32°15'

116°45'

116°00'

B I B L I O G R A P H Y

HISTORIC

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