ANNUAL RESEARCH ACTIVITY REPORT

July 2005 – June 2006

Science Division

Discovering the nature of WA
http://www.naturebase.net/science/science.html

Government of Western Australia

DEPARTMENT OF Conservation AND LAND MANAGEMENT
Conserving the nature of WA

Context

In 1982 an extensive outbreak of *Uraba lugens* occurred on Jarrah throughout the southern Jarrah forest and persisted for nearly 10 yrs.

In line with Corporate Strategy 1.5 (protect biodiversity from threatening processes), Corporate Priority 12, KRA 2 and 3 and sub output SFM 3K.

Aim

To understand the biology of GLS in WA and monitor population levels of the outbreaking insect.

Summary of progress and main findings

- Data on population levels (using a cherry picker) are yet to be incorporated into an internal report.

Management implications

- Although an outbreak of GLS has occurred only once in the history of Jarrah forest management, this insect has the potential to increase in population to 110 larvae per kg dry weight of host foliage or more. This can cause serious defoliation in the Jarrah forest. Two consecutive warm winters can induce a 2-generation per year population which contributes to a rapid population increase and thus a potential for population outbreak.

Future directions (next 12-18 months)

- Prepare an internal report to enable finalization of the project. This achievement has been given low priority.
- To incorporate findings from this study into the development of a forest health surveillance program.

CALM Region

Warren.

IBRA Regions

Jarrah Forest, Warren.

NRM Regions

South Coast, South West.

State Salinity Strategy wetland monitoring

SPP # 1998/0018

Team members

Fauna - S Halse (0.1), D Cale (0.5), K Sutcliffe (0.2); Flora - M Lyons (0.4), N Gibson (0.05), D Mickel (0.5); Surface water - J Lane (0.35), G Pearson (0.1), A Clarke (0.2), S Elscot (0.1), Y Winchcombe (0.3), B Johnson (0.05); Groundwater - S Halse (0.05), contracts; Total (3.3).

Context

Substantial loss of biodiversity is known to have occurred across the Wheatbelt of Western Australia over the past 100 yrs. The most pronounced physical changes at wetlands have been associated with clearing and salinization. Clearing has more or less ceased but salinization will continue to be expressed or many decades. While it is known that salinization is a major threat to wetland biodiversity, the relationship between its physical expression and loss of biodiversity are poorly documented and understood. This project began in 1997 and is intended to be a long-term project.

It addresses Corporate Priority 3, KRA 2 and 3 and Sub-outputs NC 2D and 3NC E, F and G.

Aim

To monitor changes in biodiversity, surface water quantity and quality, and groundwater levels at selected Wheatbelt wetlands in relation to increasing dryland salinity and land-use changes to provide information that will lead to better decision-making.

Summary of progress and main findings.

- Program summary presented at Wetlands Co-ordinating Committee in March resulted in WCC statement of support and intra-departmental review of program at workshop in April endorsed continuation of the project in current form.
- Fauna monitoring – 2004 monitoring completed, A4 sheets on waterbird results to date circulated, work began on scientific paper reporting whole of project results for Paperbark Swamp and Eganu Lake.
- Surface water monitoring – Finalized analysis of 1977-2004 depth, salinity and pH data of 152 wetlands and commenced preparation of report.
- Wetland bathymetry – assisted CALM Wheatbelt Region in arranging field surveys and mapping of lake bed, shoreline, inflow and outflow contours of Lakes Brown and additional areas of Mollerin Lake.
- Vegetation monitoring for 2004 completed, vegetation history at Paperbark and Eganu documented from aerial photographs as part of scientific paper, another scientific paper on 5 yrs monitoring of vegetation monitoring in the Lake Muir-Unicup wetland system published in the *Journal of the Royal Society of Western Australia*.
- Ground water monitoring for 2004 completed, shallow groundwater monitoring bores and vegetation quadrated surveyed to DLI benchmarks and thereby to depth gauges.
- Management – contributed to Bryde, Buntine-Marchagee, Drummond, Muir, and Toolibin TAGs and provided advice to Warden Biodiversity Recovery Catchment, put together scheme for assessing the suitability of wetlands to receive drainage for Wetlands Co-ordinating Committee (endorsed by Cabinet Sub-Committee for the Environment).

Management implications

- Analyses of trends in depths, salinities and pH of 60 wetlands monitored for 20 or more yrs have revealed a number of wetlands undergoing diverse changes that warrant further investigation and corrective management.
- The loss of vegetation is continuing even at long-saline wetlands where the physical expression of salinity in water is more or less stable. Such wetlands also show declines in faunal use.
- Surface water management is as important in some wheatbelt wetlands (such as Coomalbidgup Swamp) as groundwater management in maintaining wetland health and greater focus on surface water is required.

Future directions (next 12-18 months)

- Continue monitoring according to current protocols.
- Report on trends in depth, salinity and pH (acidity/alkalinity) of monitored wetlands from 1978-2004 to be completed.
- Investigations into causes of changes in depths and/or salinities of several monitored wetlands to be initiated.
- Complete paper analysing trends in surface and groundwater salinities, vegetation condition and fauna at Paperbark Swamp and Eganu Lake.
- Arrange to publicize results of the monitoring to date through media and presentation to NRM groups.
- Complete preparation of bathymetric maps and depth-volume calculators of Lakes Brown and Campion.

CALM Regions

Midwest, South Coast, Wheatbelt, South West, Swan, Warren.

IBRA Regions

Avon Wheatbelt, Esperance Plains, Geraldton Sandplains, Jarrah Forest, Mallee.

NRM Regions
Avon, Northern Agricultural, South West, South Coast.

Monitoring stream biodiversity (KPI 20 for Forest Management Plan)

SPP # 2006/002

Team members
S Halse (0.05), B Smith (0.8), H Barron (0.05) Total (0.9).

Context
Key Performance Indicator 20 of the Forest Management Plan requires that monitoring of aquatic macroinvertebrates be undertaken in a selection of streams to provide information on trends in aquatic biodiversity across the forest, particularly in relation to logging and associated forest management. It is intended that no widespread and sustained loss should occur as a result of human activities.

This project was initiated in 2004/05 to meet KPI 20 and aligns with Corporate Priority 9 and KRA 2.

Aim
To monitor richness of aquatic macroinvertebrate families (and species richness within selected orders) at 50 sites in south-west Jarrah and Karri forest each spring.

Summary of progress and main findings.
- Sites were selected, groups to be identified to species level were determined, and a sampling protocol adopted (the AusRivAS box-sampling method).
- The first round of sampling was completed in 2005. Macroinvertebrate identification and water chemistry analysis have been completed for these samples.

Management implications
- None to date.

Future directions (next 12-18 months)
- Data from the first round of sampling to be analysed using the AusRivAS model.
- Second round of sampling to begin in spring 2006. Three additional sites will be added to the sampling regime in this round to provide information about possible impacts of groundwater extraction from the Yaragadee aquifer.
- Publish a paper describing typical biodiversity of forest stream sites.

CALM Regions
South West, Swan, Warren.

IBRA Regions
Jarrah Forest, Warren.

NRM Regions
Swan, South West, South Coast.

Efficacy of stream buffer zones in protecting stream biodiversity and water quality in Jarrah forest subject to timber harvesting

SPP # not allocated

Aim

To investigate the hydrologic impacts of timber harvesting and associated silvicultural treatments in the intermediate rainfall zone (IRZ, 900 – 1100 mm/yr) of the Jarrah forest.

Summary of progress and main findings

- Overstorey crown density, basal area and stocking were remeasured in spring/summer 2005.
- Monitoring of groundwater levels, stream flow, stream salinity and stream turbidity in the 2 treatment catchments and in the control catchment has continued throughout the year.
- Groundwater levels have continued to rise, relative to the control catchment, and do not appear to have reached a peak response 5 yrs after the harvesting and silvicultural treatments and 3 yrs after the silvicultural burn. Groundwater has risen an average 1.18 m in the intensive-treatment catchment and an average 0.84 m in the in the standard-treatment catchment.
- The treatments have had no measurable effect on water quantity or quality in either the intensive- or the standard-treatment catchments.

Management implications

- Results will enable an informed assessment of the adequacy of Jarrah forest silvicultural practices in protecting water quality from the impact of timber harvesting and a sound basis on which revision of the practices can be made.

Future directions (next 12-18 months)

- Monitoring of groundwater levels, stream flow, stream salinity, stream turbidity and rainfall should be continued for at least another year or until the responses to the treatments have peaked.
- Apply WEC-C hydrological model to simulate hydrological responses to alternative timber harvesting and silvicultural treatments, and to different climate patterns.
- Continue data analysis and writing-up of the response in the first 5 yrs following treatment.

CALM Region

Swan.

IBRA Region

Jarrah Forest.

NRM Regions

South West, Swan.

Directory of important wetlands in Australia: revised editions

SPP # 1999/0014

Team members

J Lane (0.15), G Pearson (0.2), A Clarke (0.6), S Elscot (0.25); Total (1.2).

Context

The first edition of *A Directory of Important Wetlands in Australia* was published in 1993, as a co-operative project between the State, Territory and Commonwealth Governments of Australia. Second and third editions were published in 1996 and 2001. The *Directory* provides a listing of wetlands identified as being of national significance. It is an ongoing project; more wetlands are added as knowledge of Australia wetlands and their many values grows and as circumstances change. The *Directory* provides a basis, but not the only basis, for prioritizing wetland conservation activities in Western Australia and nationally. The Team leader has had responsibility for this project in WA since its inception.

This study aligns with Corporate Priorities 5, 6, KRA 3 and sub-output NC 3C. Current work (commenced 2003) is on wetlands of remote and under-represented IBRA Regions of WA.

Aims

- To prepare revised editions of the Western Australian Chapter of *A Directory of Important Wetlands in Australia*, incorporating additional wetlands and information as knowledge increases and circumstances change.
- To periodically update the national database of Directory wetlands.

Summary of progress and main findings

- Site managers and others with substantial relevant knowledge of remote wetlands have been contacted and site visits and surveys conducted to collect field data and other information to support site listings.
- Aquatic invertebrate specimens have been sorted in preparation for specialist taxonomic identification.
- Botanical specimens have been identified and mounted for lodgment in the WA Herbarium collection.
- Waterbird data has been analysed and synthesized for inclusion in site descriptions.
- Information concerning cultural values, site management, threats and related issues has been collated.
- Preparation and enhancement of descriptions of candidate and existing remote Directory sites has largely been completed.
- The Western Australian component of the National Directory will be updated in 2006 to include new sites and enhanced site descriptions.

Management implications

- Literature search, field survey results and interviews has led to identification of nationally important wetlands, values and threats and provide a basis for conservation and wise management of these wetlands.

Future directions (next 12-18 months)

- Specialist taxonomic identification of aquatic invertebrate from remote wetlands will be completed, data analysed and information synthesized.
- Descriptions of proposed new sites for the Directory will be finalized, together with enhanced descriptions of existing sites.
- The Western Australian component of the Directory will be updated in 2006 to include new sites and enhanced site descriptions.

CALM Regions

The Directory is an important resource document for all CALM Regions. Current work is focused on the Kimberley, Pilbara, Goldfields, Midwest, South Coast and Wheatbelt CALM Regions.

IBRA Regions

The main focus at present is on Central Ranges, Coolgardie, Gibson Desert, Great Victoria Desert, Hampton, Little Sandy Desert, Mallee, Nullarbor, Ord Victoria Plains, Tanami and Yalgoo.

NRM Regions

The Directory is an important resource document for all NRM Regions. Current work is focused on the Rangelands NRM Co-ordinating Group.

Management of the Vasse - Wonnerup wetlands

SPP # 1999/0017

Team members

J Lane (0.15), Y Winchcombe (0.1), Total (0.25).

Context

There is a long history of mass fish deaths in the lowest reaches of the Ramsar-listed Vasse-Wonnerup wetland system. The incidence and severity of deaths can be reduced by timely openings of the entrance sandbar and 2 sets of floodgates. Careful management of flows and water levels is needed to prevent adverse impacts on fringing vegetation, waterbirds and adjoining properties. Following a mass fish kill in 1997, CALM led the establishment of an inter-agency technical working group to co-ordinate relevant agency activities. This lead role is being maintained.

This project aligns with Corporate Priorities 3, 5 and 12, KRA 2 and sub-output NC 2D.

Aims

- To perform a lead role in the management of water levels, flows and salinities in the Vasse-Wonnerup wetland system.
- To undertake monitoring programs that will enable impacts of Vasse-Wonnerup water level, flow and salinity regimes to be assessed. The principal issues of interest in this project are impacts on waterbird populations, fringing plant communities and adjoining properties and the occurrence of mass fish deaths.

Summary of progress and main findings

- A meeting of the inter-agency Vasse Estuary Technical Working Group was convened to decide arrangements for 2005/06 summer opening of the sandbar at the wetland system mouth; for water level, water quality and fish monitoring, and for floodgate openings to release fish and manage water levels.
- Monitoring of fish activity and water levels at the floodgates was undertaken by team members with CALM Blackwood District backup during 2005/06. The Vasse estuary floodgates 'fish gate' was opened for periods in summer-autumn to maintain the target water level, allow fish to pass and kill potentially toxic algal blooms. The Wonnerup estuary floodgates fish gate was opened periodically to maintain a minimum level sufficient to allow fish to be released if necessary.
- Advice was supplied in response to public queries about management of the wetland system and places to see waterbirds. Scientific advice was provided to the Busselton Shire concerning its proposal to establish a Busselton Wetlands Interpretive Centre and associated wetland experiences.

Management implications

- Water levels, flows and fish movements were successfully managed throughout summer-autumn of 2005/06. There were no mass fish deaths, and adverse impacts on waterbird populations and fringing plant communities that would result from excessive water levels and salinities were avoided.

Future directions (next 12-18 months)

- The VETWG will be convened as necessary to decide on management, monitoring and other responsibilities during 2006/07.
- Monitoring of water levels and fish activity during summer-autumn will continue. Gates will be opened as necessary to manage water levels and release fish.
- Public enquiries concerning management of the wetlands will continue to be responded to.
- A concise report will be prepared, recording water levels, floodgate openings, fish releases and mass fish death incidents in the Vasse-Wonnerup system since the December 1997 report of Lane, Hardcastle, Tregonning and Holtfreter.

CALM Region

South West.

IBRA Region
Swan Coastal Plain.

NRM Region
South West.

Monitoring post-fire effects from the 2001 Nuyts wildfire

SPP # 2006/001

Team members
G Liddelow (0.1), B Ward (0.05), R Cranfield (0.05) P Van Heurck (0.1) L McCaw (0.05), R Smith (0.05) Frankland District Staff as required; Total (0.4).

Context
Understanding the effects of different fire regimes is important for developing and implementing ecologically appropriate fire regimes and for managing fire for the protection of life and property. This study was established to take advantage of the opportunity presented by an unplanned fire that was ignited by lightning in March 2001 following an extended period of below average rainfall.

The study aligns with Corporate Priority 10, KRA 2 and 3 and sub-output NC 3K.

Aim
To monitor impact of severe wildfire in Karri / Tingle forest on plants, invertebrates, vertebrate fauna and stand structure.

Summary of progress and main findings
- Fourth year of post-fire data collected for plants, mammals, reptiles, amphibians and stand structure.
- Crown condition and seedling regeneration were assessed in December 2005. Crown condition of mature Karri and Red Tingle has stabilized, although isolated mortality of trees continues. Karri, Red Tingle and Marri have regenerated vigorously in areas where the overstorey canopy has been fire damaged, with dominant saplings up to 5 m tall.
- Vascular plant species richness and abundance data were collected for the fourth year post fire in early May 2005. Species from 20 1x1m quadrats per plot ranged in number from 15 to 35 per plot depending on landform. Vouchering of species was done at time of measurement and less than 10% of species were flowering.
- The number of bird species recorded in the study area has varied between 31 and 39 over the 5 yrs since fire. Some of the birds typical of open country that were present in the early post-fire stages have disappeared as the understorey has become denser. The normal suite of birds associated with dense forest understorey Karri/Tingle forest have become well established in the area and the densities of birds appears to be the same as similar types of forest. The red-eared firetail finch became widespread in the study area in the third year after fire.
- Quokka have become established in all the suitable habitat within the burn area, and currently occupy some sites that could be considered marginal habitat. This is probably a temporary consequence of fire-induced changes in vegetation structure.

Management implications
- This study contributes to the development of ecologically appropriate fire regimes for tall forests in southern Western Australia. Results to date have indicated that long-term fire exclusion can result in very severe fire impacts on many components of the forest ecosystem and that large scale high intensity fires can have undesirable ecological outcomes including simplification of plant population structure and depletion of seed banks.

Future directions (next 12-18 months)
- Spring field trip to collect voucher specimens for vascular plants.