

# Centre for Ecosystem Management 2007 Annual Report



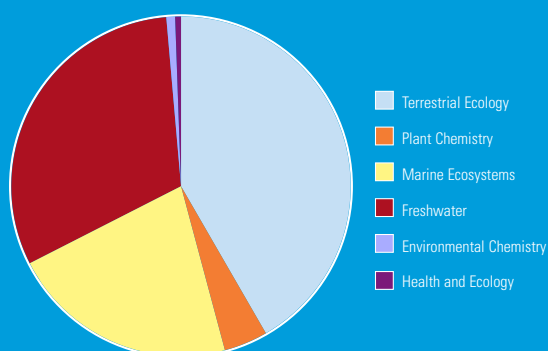


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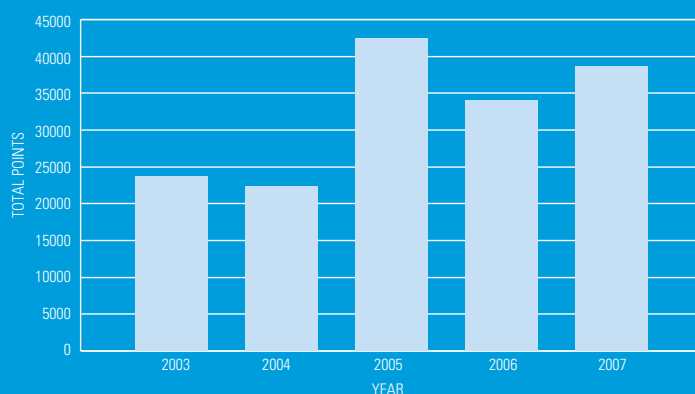
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# Statistics 2007

Proportion of research income earned by each research group



Research activity index points earned by CEM members for the past five years





## Director's Report



The Centre for Ecosystem Management has once again maintained its high research productivity during 2007 and continues to be recognised as one of the outstanding Research Centres at Edith Cowan University. Centre members were successful in attracting over \$1.46 million in grants and research consultancies which is an all time record. The magnitude of the research funding is a consequence of constructive engagement and research links between the researchers in the CEM and State, National and International government organizations and research agencies. All specialist research areas of the CEM, including groups in marine and estuarine ecology, freshwater systems, terrestrial ecology, health and ecology, environmental chemistry and forensics and plant chemistry, were successful in obtaining research funding.



Members of the CEM continued to produce high quality outputs in the form of book chapters, refereed papers, reports and conference proceedings. Centre members were responsible for 1 book chapter, a record 43 refereed papers, 5 refereed conference proceedings and 25 technical reports to supporting agencies and corporations. The breadth of research interests in the CEM can be seen from the research highlights and published outputs given later in this report. A pleasing feature of the outstanding number and quality of outputs is the significant contribution made by our international visiting fellows, post doctoral fellows and post graduate students. In 2007, the CEM hosted researchers Dr Fernando Tuya from Spain, Dr Johan Eklöf and Ms Kajsa Mellbrand from Sweden, Dr Mads Thomsen from Denmark and Professor Jon Odland from Norway. The CEM is fortunate to have such an array of talent available in pursuing its agenda of growing research activities locally and internationally amongst all staff and members.

Centre members also made significant contributions to professional and community activities outside ECU. Dr Andrea Hinwood continued her role as the Deputy Chair of the Environmental Protection Agency of Western Australia and was acting Chair for a three month period while a new Chair was sought for the agency. Dr Hinwood also received international recognition with the United Nations Environment Program (UNEP) awarding her "The Montreal Protocol TEAP Champion Award". This award is in 'recognition of extraordinary service to the Parties for the Montreal Protocol and the global effort to protect the ozone layer'.

The Champion Award acknowledges the role Andrea played in Chairing the UNEP Aerosols, Sterilants and Miscellaneous Uses Technical Working Group which reported directly to the Parties to the Montreal Protocol on options for phasing out ozone depleting substances on a global basis. Associate Professor Ray Froend was recognised for his contributions to environmental water requirements through his appointment to the State Wetland Coordinating Committee as well as the Aquatic Ecosystem Advisory Group of the National Water Commission. Professor Paul Lavery was consulted as an expert reviewer by the Albany Port and invited to speak at a Strategic Development Workshop for the Fremantle Port as a consequence of his innovative work assessing the impacts of dredging on seagrass meadows. Professor Will Stock and Dr Eddie van Etten were reappointed to the Minerals and Energy Research Advisory Committee of Western Australia and Eddie continued to represent WA as the Regional Councillor for the Ecological Society of Australia. Will Stock, Eddie van Etten and David Goodall were members of the organizing committee for the 11th Annual ESA conference in Perth which was a great success and attracted over 450 participants.

During 2007 CEM members were invited to referee over 40 papers for national and international journals, were editors of 3 journals, sat on 5 editorial boards and contributed to 27 professional or advisory boards or committees. The breadth and scope of the contributions made by members of the CEM is remarkable and reflects the strong research culture of the Centre.

A major function of the Centre is to provide support for postgraduate student activities and in 2007 some 53 PhD, MSc and honours students were members of the CEM. Financial support enabled 13 students to attend international or national conferences. Students performed well at these meetings. The Centre also provided equipment and field work grants to 5 students. Items ranged from custom designed field sampling equipment, local travel grants and funds for specialised analyses undertaken outside ECU.

Congratulations to Mark Lund and Glenn Hyndes on their promotion to Associate Professor.

I would like to congratulate all the CEM members on their contributions and achievements for 2007. From next year the structure of the CEM will change since the marine group has split off to form a new independent research centre. It is exciting to see the growth of the research effort in the environmental sciences at ECU. Having two active research centres will provide greater depth and more focus to our research profile both within and outside of the University.

Will Stock  
Director, Centre for Ecosystem Management

# Highlights 2007

## Invertebrate Assemblages of the Blackwood River

Groundwater is an important source of water for rivers, particularly in the relatively dry climate of Australia. Groundwater flows downstream but takes a complex path below and around the edges of rivers, welling up in some places and moving down into the substrate at others. The importance of these seepages for river health is well established, providing hydrological, physical, chemical and biological benefits to below-ground and surface water invertebrate fauna as well as fish. An important aspect, therefore, of river management is a good understanding of the interactions between groundwater and the river fauna. Research by Pierre Horwitz and Annette Koenders, funded by the Department of Water WA, focuses on characterising the invertebrate assemblages from surface water and below-ground habitats within the Blackwood River and selected tributaries in and around the Yarragadee Aquifer Discharge Zone. This information will enable documentation of ecological values of the river and its tributaries associated with the Yarragadee Aquifer, as well as determination of key biophysical indicators for the monitoring of these ecological values and their ecological water requirements.

The results of our work show the influence of the Yarragadee Aquifer discharge on the river and tributaries: within the zone surface and below-ground water is fresher, with lower conductivities and total alkalinities, significantly diluting the water coming from higher in the catchment. Well over 100 invertebrate species have been identified. Almost all are found in surface waters and about a quarter of species from sub-surface waters. Riffles generally have the largest number of species, whereas sub-surface waters generally have the highest number of unique species.

The tributaries in the area receive year-round Yarragadee input and their invertebrate assemblages are clearly differentiated from those of the Blackwood River. Tributaries such as Milyeannup Brook contain four freshwater crayfish species, a stonefly and a caddisfly of note, as well as an invertebrate assemblage that has low diversity but rather intriguing structure and composition. In addition, the sediments in Poison Gully have a high organic content and an exceptionally dense population of the restricted gilgie (*C. crassimanus*). The richness and abundance of invertebrates and habitat structure (particularly the sediment that enables predator avoidance for prey) suggest that the invertebrate communities of Poison Gully are not predator (fish) dominated. Poison Gully also contains at least 5 rare insect species of significance for management and two insect families with elevated richness.



The Blackwood River itself also has important ecological values in the Yarragadee Aquifer Discharge Zone. Pools in this zone function as base-flow or drought refuges. This stretch of the Blackwood River may be important for molluscan ecology and riverine ecology: in particular large Hyriidae mussels and the smaller gastropod snail in the Family Hydrobiidae (i.e. *Westrapyrigus* sp.) may need to be monitored more directly in the future. Work in this area is continuing, with more sampling being undertaken in additional sites upstream and downstream from the Yarragadee Aquifer discharge zone.

## Influence of reefs on seagrass ecosystems

During 2007 Fernando Tuya, who was funded through the Spanish Bureau of Education and Sciences, Glenn Hyndes and Mat Vanderklift (CSIRO) studied habitat connectivity in reef-seagrass meadow landscapes. They examined gastropods to test whether marine invertebrate assemblages inhabiting seagrass meadows are altered by the presence of rocky reefs. They showed that the gastropod (see picture) assemblages in both *Amphibolis* and *Posidonia* seagrass meadows were significantly altered close to reefs. This is likely to reflect the recruitment patterns of gastropods from reefs and also predation by consumers such as the Western rock lobster that move into seagrass to feed. The team were joined by Chris Doropolous, an honours student, who examined the potential role of the brown alga *Ecklonia* in influencing the gastropod abundances in seagrass meadows adjacent to reefs. *Ecklonia* is uprooted from reefs and moves through seagrass meadows where it could increase grazer abundance through the addition of an extra food resource. Chris found that two dominant gastropod species in seagrass meadows did not show a preference for grazing on *Ecklonia*, and that there was no clear, detectable benefit to grazers in seagrass meadows from the extra food resource.



## Black swans in the Swan River Estuary

The role of Black swans (*Cygnus atratus*) as grazers in seagrass meadows is not well understood, but that is about to change as a team from ECU has begun a project funded by the Ernest Hodgkin Trust for Estuary Education and Research to examine Black swans in the Swan River estuary. The study was carried out in the summer of 2007/08 by Paul Lavery, Kathryn McMahon and Helen Barwick together with a visiting fellow, Johan Eklöf, from the University of Stockholm in Sweden. From the 12 surveys (see photo) at 45 sites, an average of 78 Black

swans were found to be living in the lower Swan River Estuary. Black swans have two modes of feeding. They either crop and eat the leaves of plants, or dig into the sediment with their beaks and remove the plant material below the ground (rhizomes). The team observed both types of feeding in the Swan River Estuary, and estimated that up to 20% of the seagrass production was consumed by Black swans at Point Walter.



## Global warming and the resilience of temperate reefs

Thomas Wernberg is heading a team of researchers investigating how global warming could change ecological processes in kelp beds. The project is funded by an ARC Discovery grant. Together with Mads Thomsen and Fernando Tuya at ECU and Gary Kendrick from UWA, he has been using a comparative experimental approach to tease apart the impacts on recruitment, growth and resilience of kelps. Identical disturbance experiments (different levels of kelp canopy removal such as the complete removal shown in the photo) were set up at different latitudes, representing a range of climates. The project is currently in its final stages and is expected to come to an end in 2008. The results so far show that kelp beds in warmer climates have a reduced capacity to recover from intense physical disturbances compared to kelp beds in cooler climates. Suppressed recruitment and growth of juvenile kelps have been identified as the mechanisms behind this reduction in resilience. The results provide a clear signal to conservation biologists and managers that our current understanding of ecosystem sensitivity and vulnerability to human pressures may not apply in a future warm climate.



## Estimation of prenatal exposure to herbicide

Heather McQueen, a Masters student in the School of Natural Sciences, has been researching a project aimed at estimating the exposure of pregnant women to the commonly used herbicide – glyphosate – and to estimate the potential exposure of prenatal children. Herbicide formulations that contain glyphosate as the active ingredient are heavily used to control weeds in a range of Australian landscapes including agriculture, horticulture and home gardens. Although regulatory studies determined that glyphosate is practically harmless to humans, recent laboratory experiments have demonstrated the potential for glyphosate-containing products to disrupt fundamental biological processes in animal tissues. These studies suggest that the harmful effects of glyphosate formulations may also be due to a wetting agent either on its own or in combination with glyphosate. In spite of its widespread use, a study of the exposure of the general population to glyphosate has not been carried out. This project made use of questionnaires, diet diaries and the collection of food samples for glyphosate analysis. Heather recruited 43 women and has analysed 20 food samples. Preliminary results show that 75% of the samples analysed contained quantifiable residues of glyphosate, all of which were well below the Acceptable Daily Intake which is the relevant health standard. This research is the first of its type in relation to glyphosate in Australia and it is good to see that low levels have been found in food

## Impacts of groundwater abstraction on native vegetation

The Gngarara Groundwater Mound, located on the Swan Coastal Plain, remains an important source of drinking water for metropolitan Perth. Overlying this shallow aquifer is Banksia woodland vegetation, which can develop a dependence on groundwater. Aquifers are a particularly



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important water source for vegetation in Mediterranean climates, where it has been demonstrated that phreatophytes (plants that access groundwater) can survive summer drought by having extensive root systems. Any changes in groundwater availability through abstraction, climate change or changes in surrounding land-use have consequences for the overlying groundwater dependent vegetation.

In order to identify acceptable, or tolerable, changes in water availability that allow for the maintenance of phreatophytic vegetation, we need to unravel the mechanisms behind vegetation response to changed groundwater regimes. Research is currently being conducted by PhD student Caroline Canham, under the supervision of Ray Froend and Will Stock as part of an ARC linkage grant with the Water Corporation. This research will address whole plant response to changed groundwater availability, with an emphasis on root dynamics.

A glasshouse study is being undertaken in an effort to develop a better understanding of root growth in relation to the water table. Three *Banksia* species have been selected for study due to their differing dependence upon groundwater. In addition, and perhaps more importantly from a management perspective, a drawdown trial will be conducted in the glasshouse. This will determine the rate at which roots are able to follow a declining water table. In addition to the glasshouse study, roots of adult plants in the field are also being investigated to determine the seasonality of root growth. Seasonal root growth patterns can then be compared to water use and will be related to aboveground plant ecophysiological measurements and phenology. The data collected will be used to help quantify a conceptual model of whole plant response to different water availability scenarios.

## Treating acidic mine water with sewage water and green waste

Acidic mine pit lakes represent a potentially valuable resource to both the environment and the community if the water can be remediated to an appropriate standard. Additions of organic material to support sulfate reducing bacteria (SRB) may remove acidity and improve water quality to help achieve these end uses. A field-scale manipulative experiment in North Queensland, Australia, monitored pre- and post-dosing water quality of one treatment and three control pit lakes over 34 months. The 70 ML treatment lake was filled with dried sewage sludge (60 t), liquid sewage sludge (3,190 t) and municipal green waste (980 t). Control lake water chemistry was generally stable and could be explained by groundwater influx and heavy rainfall events. Following organic additions, treatment lake water chemistry displayed large pH increases. Water chemistry of the treatment lake was best explained by internal sulfate reduction processes. Nevertheless, pH increases declined after 12 months of increase. This decline may be due to surface water acidity inputs and mixing during heavy rainfall events, or to exhaustion of organic carbon. This study suggests that addition of low-grade organic materials shows promise for remediation of acid mine waters.



## Investigating Non Occupational Metal Exposure in a Developing Country

There have been few studies of metal exposure in communities adjoining mining activities in Zambia. Wesu Ndilila, a MSc student under the supervision of Andrea Hinwood and Halina Röllin, is investigating the relationship between environmental concentrations of metals and human exposure to establish which environmental, behavioural and lifestyle factors are most important.



A cross sectional study of 45 copper-mining town residents (exposed) and 48 non-mining town residents (unexposed) of similar socioeconomic and demographic characteristics aged between 20 and 30 was undertaken. This age group is most vulnerable to HIV/AIDS and therefore at an increased risk of adverse health impacts from elevated metal concentrations. Metal concentrations were determined in environmental (residential soil, indoor dust and drinking water) and biological (human toenails) samples provided by participants. A questionnaire was also administered to establish potential factors influencing exposure. The results of the study show large increases in environmental metal concentrations (soil, dust and water) in the mining areas. Human exposure was also significantly higher in the mining areas as shown by the toenail metal concentrations. The control area toenail metal concentrations were comparable to world averages reported from other studies.

Concentrations of individual elements such as arsenic (0.01mg/L, range <DL -0.02mg/L) and lead (0.05mg/L < DL-0.1mg/L) in drinking water are above recommended WHO drinking water guidelines in the mining area. This is a major concern since these metals are known to have adverse health effects even at concentrations below guideline levels. Toenail metal concentrations in the mining area are also much higher than world averages meaning these participants have a high internal body burden which is a cause for concern especially in a community which has a high proportion of HIV/AIDS immune compromised individuals.

## Jarrah Forest Regeneration

Jeff Cargill, a PhD, student in the Centre for Ecosystem Management, is undertaking a project examining the fate of jarrah (*Eucalyptus marginata*) seed from canopy store to emergence in shelterwood, a silvicultural treatment aimed at establishing regeneration. Investigating and understanding regeneration success (or otherwise) in shelterwood are the key aims of the project which contributes directly to improving management practices in the three-quarters of a million hectares of jarrah forest that is available for timber harvesting. Studies such as this are essential in managing for a sustainable future by balancing the need to conserve our precious and unique forests with the growing world demands for timber products.

Many pieces of the puzzle are currently being identified and examined including developing a system to assess the amount of seed stored in the canopy, measuring the impacts that different fire treatments have on the ecosystem, measuring the timing, amount and duration of seed fall post fire, the fate of that seed once on the ground and the overall seedling emergence within each site. Currently Jeff is expanding the study on postfire seedfall and undertaking an ambitious plan to measure seed fall from different aged trees and seed capsules by shooting them down or by hand-collecting them from a cherry-picker (see cover picture) in the crowns of jarrah trees more than 20 m tall.

Exciting results are already filtering through such as field assessments of jarrah seed crops that have devised a more precise and easier way to estimate the amount of seed stored in jarrah canopies. The development of these seed crop assessments has utilized a wide range of methods including tree felling, branch shooting and the use of tree harvesters. The successful implementation of methodologies includes fire retardant strings to measure flame heights and thermocolour crayons coupled with hydropryanometers to measure fire intensity. Up to this point 5 sites have been burned with all showing that mass seedfall begins 2-3 weeks post fire and rapidly declines in the weeks thereafter. Our controls (no fire) have also shown a significant increase in seedfall with the rise in temperatures over the summer months.



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## Conservation of the Hairy Marron

One of Western Australia's most critically endangered animals is a step closer to continued survival thanks to recent research in the CEM. The animal in question is the hairy marron (*Cherax tenuimanus*), a freshwater crayfish found only in the Margaret River. The hairy marron is under threat of extinction due to the introduction into the river of the more widespread species, smooth marron (*C. cainii*). The smooth marron has now replaced the native hairy marron in all but the upper reaches of this river system. PhD student John Bunn is studying the reasons why the introduced smooth marron has been so successful and come to replace the native hairy marron in the Margaret River. The project is supported by the Department of Environment and Conservation through the South West Catchments Council to further investigate the reproductive biology of hairy marron and smooth marron. From this research, habitat and conservation requirements for hairy marron will be developed. Initial findings have shown hairy marron are slow to reproduce. Hairy marron do not spawn until well after the introduced smooth marron has already begun its annual spawning period. These findings suggest that the success of the introduced species is a direct consequence of their substantial advantage in early recruitment which allows them to outcompete the native hairy marron.

John is also a member of the Hairy Marron Recovery Team, which is lead by the Department of Fisheries and has members from other government departments, non-government groups like WWF and the Cape to Cape Catchments Group and local community stakeholders. It is the recovery team's responsibility to develop and implement the immediate conservation strategies needed to prevent the extinction of hairy marron. The research undertaken by John at ECU is crucial in helping to avoid the loss of this unique species from the wild.



# Specialist Research Areas: Staff Achievements and Activities

The members of the Centre for Ecosystem Management are conducting research in the following specialist groups. In each group there is a wide variety of research expertise, links and activities as summarised below.

## ENVIRONMENTAL CHEMISTRY AND FORENSICS



Dr Andrea Hinwood

### RESEARCH INTERESTS

There has been little work in Australia exploring the relationships between environmental contaminants and human health. One of the major impediments is our inability to determine how much individuals are actually exposed to and how this information can be used to improve current health studies. Specific areas of interest relate to: the assessment of

biomarkers for use in health studies, the development of novel exposure metrics, and the investigation of the relationships between environmental exposures and health effects. Andrea is actively involved in several projects to investigate the relationship between pollutants and health including the health effects of heavy metal contaminated soil and drinking water. Andrea is interested in the role of community perception and engagement in the EIA process as well as the development of methods to assess environmental and human health risks associated with multi media exposure and complex mixtures and the role of health impact assessment.

### CURRENT PROJECTS

- Air pollution and health effects
- Acid sulphate soil disturbance, environmental heavy metal concentrations and human exposure
- Maternal exposures and risks of adverse health effects
- Further work on development of a biomarker for wood smoke exposure studies
- A novel approach to air pollution monitoring combining time integrated sampling

### RESEARCH LINKS

- Department of Environment and Conservation, (WA)
- Chemistry Centre, (WA)
- National Research Centre Environmental Toxicology
- United States Environmental Protection Agency
- National Measurement Institute
- Flinders University
- University of Western Australia
- Arctic Assessment and Monitoring Program

### COMMUNITY ENGAGEMENT

- Invitations to join the following Professional/Advisory Boards
  - Environmental Protection Agency WA (Deputy Chair)
  - Pacific Basin Consortium for Health and Environment
  - Editorial Board International Society Environmental Forensics
  - State of the Environment - WA. Steering and Working Group – Air



Dr Magda Wajrak

### RESEARCH INTERESTS

Magda has interests in heavy metal contamination of groundwater which is a serious environmental problem. Techniques which can be used to detect parts per billion (ppb) of arsenic in water are expensive and do not allow for field testing. A less expensive and simpler method is anodic

stripping voltammetry. Magda's research looks at the development of detection methods for heavy metals, in particular arsenic, that are reliable, relatively easy to implement in the field, capable of detecting below 5ppb, allow for speciation and overcome interference from other species found in groundwater. Magda's other interests include 'Chemistry as a visual subject'. To aid students in their understanding, a multimedia Acid-Base Titration Tutor's package has been developed, which includes animated molecular models depicting reactions occurring at the microscopic level using a number of common acid-base combination reactions. More recently, as a part of the Australian Chemistry enhanced Laboratory Learning (aCeLL) project, novel chemistry experiments have been designed which enhance students' learning, probe their deeper understanding, and are stimulating and industry relevant.

### CURRENT PROJECTS

- Validation of the aSV method for the detection of arsenic using ground water samples from various sites in WA, such as Spoonbill Reserve, Cedric Street, Ikea Site and Gwelup
- Analysis of groundwater from Bangladesh, India and Nepal using aSV method
- Investigating electrode surface – this is fundamental research which uses Scanning Electrode Microscopy to understand what happens at the surface of the working electrode

### RESEARCH LINKS

- Department of Environment and Conservation, WA
- Lab21 – Cambridge, UK
- University of Western Sydney, NSW
- Advanced Water Technologies, Melbourne

### COMMUNITY ENGAGEMENT

- NTEU representative on the Board of Federation of Australian Scientific and Technological Societies (FASTS)
- Chair of Radiochemistry Education Committee, Australian Institute of Radiochemical Engineering
- Siemens Science Experience
- 'Cool Scientist' – School visits
- Member of the Australian Enhanced Laboratory Learning Project

## FRESHWATER ECOSYSTEMS



### Associate Professor Ray Froend

#### RESEARCH INTERESTS

Ray's interests focussed on ecological water requirements and ecosystem management. Specific interests include the water regimes required to maintain and enhance conservation values of terrestrial, aquatic and riparian

ecosystems. Management of aquatic and groundwater dependent ecosystems are key issues as is allocation planning of water resources to meet environmental requirements. Much of his research involves the development of monitoring strategies and programmes for assessing effectiveness of environmental water provisions. He also studies the impacts of altered groundwater regimes on native plants including the ecophysiology of phreatophytic vegetation and the response of these plants to long-term changes in groundwater regime and climate. Other interests include the ecology and biology of wetlands and plant responses to altered water quantity and quality.

#### CURRENT PROJECTS

- Ecological water requirements of groundwater dependent ecosystems of the Swan Coastal Plain
- Ecological water requirements of terrestrial and wetland vegetation of the Southwest Yarragadee aquifer region
- Frameworks for identifying vegetation water requirements under a changing climate, Gngangara Groundwater Mound and Southwest Yarragadee.
- Ecological risk assessment of how mine dewatering impacts hydrological habitat and water use efficiency of Tuart in the southwest
- Determining ecologically sympathetic groundwater abstraction regimes on the Gngangara Mound
- Root response to fluctuating water tables
- Response of Banksia to experimental drawdown in the Gngangara Groundwater Mound region
- Predicting end of summer condition of wetland and terrestrial vegetation on the Gngangara and Jandakot Groundwater Mounds
- Ecology and biology of wetland plants: Wetland vegetation dynamics on the Gngangara Groundwater Mound
- Yate Swamp (Lake Bryde Recovery Catchment) vegetation response to altered water regimes

#### RESEARCH LINKS

- Australian Research Council
- Department of Water, (WA)
- Cable Sands (WA) Pty Ltd
- CSIRO
- Murdoch University
- The University of Western Australia
- University of Technology, Western Sydney
- Water Corporation
- Tiwest Joint Venture
- Department of Environment and Conservation, (WA)

#### COMMUNITY ENGAGEMENT

- Appointed to the State Wetland Coordinating Committee
- Appointed to Aquatic Ecosystem Advisory Group of the National Water Commission
- Member, Advisory Committee for the Institute of Water and Environmental Resource Management, University of Technology, Sydney
- Appointed to Western Australian EPA Reference Panel on natural Resource Management
- Appointed to the Western Australia Sustainable Diversion Limit Expert Panel by the Department of Water
- Refereed papers for:
  - *Aquatic Ecosystem Health and Management, Austral Ecology, Australian Journal of Botany, Ecological Management and Restoration, Journal of Vegetation Science*

## Associate Professor Mark Lund



#### RESEARCH INTERESTS

Wetland ecology covers the ecology of inland water bodies (rivers, lakes and swamps). Mark's particular interests are in how wetlands work and how this knowledge can be used to conserve and rehabilitate wetlands.

#### CURRENT PROJECTS

- Controlling acidity in mine lakes (flooded mine pits) using biological approaches
- Managing and preventing nuisance midge problems in urban wetlands
- Remediation of the impacts of acid sulphate soils on aquatic systems
- Understanding and managing the impact of urban storm water drainage
- Understanding and managing the impacts of irrigation on tropical rivers

#### RESEARCH LINKS

- Curtin University of Technology
- Murdoch University
- University of Western Australia
- Midge Research Group (City of Cockburn)
- Griffin and Wesfarmers Coal (CSML)
- Department of Environment and Conservation
- Department of Water (WA)
- Water Corporation
- Cities of Joondalup, Stirling and Wanneroo

#### COMMUNITY ENGAGEMENT

- Refereed papers for:
  - *Hydrobiologia, Chemosphere, Australian Mammalogy, International Journal of Mining, Reclamation and Environment.*



### Dr Annette Koenders

#### RESEARCH INTERESTS

Annette's interests focus on the conservation and systematics of freshwater crayfish in the south-west of Western Australia. She also has projects investigating the groundwater dependence of freshwater invertebrates and the molecular genetics and systematics of crustaceans. Other interests include the

molecular mechanisms of growth and regeneration of muscle tissue in crustaceans and the molecular genetics of native trees.

#### CURRENT PROJECTS

- Groundwater dependence of invertebrate assemblages in the Blackwood River and its tributaries
- Characterisation of fish usage of Yarragadee discharge based on water chemistry
- Molecular genetics of tuarts, *Eucalyptus gomphocephalus*, displaying varying growth forms
- Genetics of autosomal dominant retinitis pigmentosa in Western Australia
- Systematics and conservation of the restricted gilgie, *Cherax crassimanus*

#### RESEARCH LINKS

- Department of Environment and Conservation (WA)
- Department of Water (WA)
- Department of Fisheries (WA)
- Murdoch University
- Deakin University, Victoria
- Colorado State University, Ft. Collins, CO, USA
- The Norwegian University of Science and Technology, Trondheim, Norway

#### COMMUNITY ENGAGEMENT

- Member of Scientists in Schools, ( WA)

## Dr Clint McCullough



### RESEARCH INTERESTS

Clint's research interests include aquatic ecology, ecotoxicology, acid mine lake ecology and the chemistry and remediation of acid sulphate soils in urban and mining environments.

### CURRENT PROJECTS

- Development of an innovative treatment system for acidity problems in an urban lake resulting from acid sulfate soils
- Liming and nutrient enrichment to remediate mine lakes through enhanced primary production
- Environmental limitations to the marron fishery in acid pit lakes of Collie, south-west Western Australia
- Microcosm experiments for remediation of acid pit lakes with bulk organic materials
- Field-scale remediation of a tropical acid pit lake with green waste and sewage
- Bioassay toxicity assessment of mining pit lake water remediated with limestone and phosphorus
- Effect of mulching and addition of lime chip to contaminated lakes in Spoonbill-Shearwater Reserve, WA
- Impact of acid sulfate soils on water quality treatment in a constructed urban stormwater treatment wetland in Gwelup, Western Australia
- Sources of nutrients to Lake Joondalup arising from Beenypup Swamp nutrients
- Habitat requirement of black-striped minnow
- Ecological consequences of drought-induced acidification in coastal and inland freshwater systems

### RESEARCH LINKS

- Aquatic Eco-Technology, Hogeschool Zeeland Netherlands
- UFZ – Centre for Environmental Research, Germany
- Department of Water (WA)
- eriss (Environmental Research Institute of the Supervising Scientist, NT)
- Centre for Water Research, University of Western Australia
- Curtin University of Technology
- Colorado School of Mines

### COMMUNITY ENGAGEMENT

- City of Stirling
- Kemerton Silica Sand Pty. Ltd.
- Swan River Trust
- Xstrata Plc. Ltd.

## HEALTH AND ECOLOGY



## Associate Professor Pierre Horwitz

### RESEARCH INTERESTS

Pierre's primary research interests encompass the inter-relationship between human health, community well-being and ecological integrity, developing participatory approaches for the management of aquatic systems and the conservation of natural resources in

general. Sustainability and health; social and ecological resilience; poverty and health inequalities are also issues of concern. He has interests in freshwater, inland saline and estuarine fauna and flora as indicators of environmental change, the effects of fire, forestry, agriculture and urbanisation on inland aquatic systems and the contribution of flagships, keystones and other icon species to biodiversity conservation and the well-being of human communities.

### CURRENT PROJECTS

- Biological consequences of acidification of inland waters
- Developing curriculum materials for systems thinking
- Relationships between nature reserves and human well-being
- Relationship between water, drought and mental health
- Long term trends in monitoring data for wetlands on the Swan Coastal Plain

### RESEARCH LINKS

- Department of Water, (WA)
- Worldwide Fund for Nature (WWF)
- Department of Environment and Conservation, (WA)
- University of Hawaii
- University of British Columbia
- Consortium for Conservation Medicine
- University of Sunshine Coast, Queensland
- Murdoch University
- Curtin University
- WA Museum
- The Wilderness Society
- Greening Australia (WA)
- Friends of Fitzgerald River National Park
- University of Tasmania
- Deakin University

### COMMUNITY ENGAGEMENT

- Invited Keynote Speaker (on the theme of Biodiversity): Parks and Protected Areas Forum. Fremantle, September 2007
- Plenary speaker for Conservation Council's State Conference "Conservation in a Changing Climate" March 17th 2007 "Climate change water and wetlands"
- Co-editor of *Ecohealth*
- Media Commentator: Water and wetland issues (including regular contributor to RTR FM's understorey Program)
- Member, Rottneest Island Environment Advisory Committee
- Organising Committee Asia Pacific Ecohealth Conference 2007, Deakin University, Melbourne
- Member Department of Environment and Conservation Gngangara Sustainability Strategy Scientific Advisory Committee
- Member of WA Threatened Species Scientific Committee
- Invited to examine thesis from Monash University (PhD)
- Invited to review papers for:
  - *Ecohealth*, *Journal of Crustacean Biology*, *Restoration Ecology*, *Journal Environmental Management*, *Marine and Freshwater Research*, *Natural Areas Journal*

## Dr Bea Sommer



### RESEARCH INTERESTS

Bea researches wetland sediment/water interactions. She has broad interests in wetland ecology, aquatic macroinvertebrates and the impacts of climate change on these systems. Her particular interests include groundwater/surface water interactions, ecological water requirements of aquatic fauna and flora, wetland management and acid sulfate soils (particularly in relation to

drought-induced acidification of wetlands). Other interests include the impact of mining operations (mainly de-watering) on aquatic ecosystems, nutrient and carbon cycling in wetlands and the impacts of fire on the chemistry and ecology of humic wetland systems,

### CURRENT PROJECTS

- Impact of acid sulfate soils on freshwater ecosystems of southwest Western Australia
- Wetland biodiversity investigation
- Macroinvertebrate monitoring of the Gngangara Mound

### RESEARCH LINKS

- Department of Water (WA)
- Department of Environment and Conservation (WA)
- Curtin University of Technology
- Murdoch University Centre for Water Research
- University of Western Australia Centre for Water Research

### COMMUNITY ENGAGEMENT

- Invited speaker Lake Gwelup Groundwater and Drainage Forum (City of Stirling)
- Reviewed papers for:
  - *Pacific Conservation Biology*

## MARINE ECOSYSTEMS



## Professor Paul Lavery

### RESEARCH INTERESTS

The ecology and management of benthic marine ecosystems. Paul's research attempts to bring together the biology, chemistry and physics of systems to understand how they function, the ecosystem services they provide and how they might be affected by a variety of disturbances such as eutrophication and

dredging. Much of his research is applied to developing appropriate monitoring and management approaches.

### CURRENT PROJECTS

- Effects of dredging-related light reductions on seagrass ecosystems
- Assessing the ecosystem health of seagrass meadows
- The role of marine wrack in trophic connectivity of marine and terrestrial ecosystems
- Decomposition of seagrass wrack: factors affecting the rate and bioavailability
- Distribution and habitat use of dugongs in NW Australia

### RESEARCH LINKS

- Western Australian Marine Sciences Institute
- Geraldton Port Authority
- Department of Conservation and Environment (WA)
- CSIRO (Marine Research)
- Department of Defence (Navy)
- Stockholm Marine Research Centre
- Stockholm University
- Woodside Oil & Gas
- Department of Planning and Infrastructure (WA)

### COMMUNITY ENGAGEMENT

- Contracted Reviewer of Seagrass Monitoring Programme for Port of Melbourne (Port of Melbourne Channel Deepening Project)
- Expert Reviewer for Albany Port Environmental Studies on Channel Dredging Programme
- Invited speaker: Fremantle Ports Development Strategic Workshop
- Refereed papers for the following scientific publications:
  - *Marine Ecology Progress Series, Coasts & Estuaries, Estuarine, Coastal and Shelf Science*

## Associate Professor Glenn Hyndes



### RESEARCH INTERESTS

Coastal marine and estuarine environments are highly complex systems prone to high levels of human disturbance resulting from the concentration of Australia's population along the coastal regions. Therefore it is crucial to develop a high level of understanding of the complex ecological processes in these coastal environments. Glenn's research interests are broad and focus on various aspects of

marine ecology in coastal environments, with a particular focus on: links among the mosaic of habitats in the coastal, marine landscape, through the migration of fauna, particularly fish, and the transport of detrital macrophytes among habitats, tracking food sources through the food web using biomarkers, such as stable isotopes, examining the importance of different coastal habitats, particularly seagrasses, to fish communities and the biology of fish in coastal environments.

### CURRENT PROJECTS

- Ecological interactions in coastal marine ecosystems: Trophodynamics
- Ecological interactions in coastal marine ecosystems: Rock Lobster
- Examining coral trout *Plectropomus leopardus* at the Houtman Abrolhos Islands, mid-west region of Western Australia
- Return of ecological function in transplanted seagrass meadows

### RESEARCH LINKS

- Department of Natural Resources and Environment, Victoria
- Griffith University
- Fisheries Research and Development Corporation
- University of Queensland
- CSIRO Marine Research
- Oceanica Consultancy
- Department of Fisheries (WA)
- Albany Senior High School
- Western Australian Marine Sciences Institute

### COMMUNITY ENGAGEMENT

- Technical Advisory Committee, WA Fisheries Research Advisory Board for Fisheries Research and Development Corporation
- Marine Reference Group for the Swan Catchment Council
- Reviewed manuscripts for:
  - *Journal of Fish Biology, Estuaries, Marine Biology, Marine Ecology Progress Series*

## Dr Kathryn McMahon



### RESEARCH INTERESTS

Kathryn's main research area is coastal marine ecology, specifically focusing on seagrasses in both tropical and temperate environments. Topics of particular interest include seagrass health in respect to human impacts and natural disturbance, seagrass recovery processes and growth strategies, grazing interactions and seagrass population genetics and phylogenetics.

### CURRENT PROJECTS

- Effects of dredging-related light reductions on seagrass ecosystems
- Ecophysiology of seagrasses under reduced light conditions
- Species diversity in the *Posidonia* genus
- Long-term monitoring of seagrass health
- Grazing by swans on estuarine seagrasses

### RESEARCH LINKS

- Strategic Research Fund for the Marine Environment (SRFMe)
- Geraldton Port Authority
- Department of Environment and Conservation (WA)
- Cockburn Sound Management Council
- CSIRO Marine Research
- Department of Defence (Navy)
- James Cook University
- University of Queensland
- Great Barrier Reef Marine Park Authority
- Woodside Oil & Gas
- Department of Planning and Infrastructure (WA)

### COMMUNITY ENGAGEMENT

- Reviewed manuscripts for:
  - *Restoration Ecology, Marine and Freshwater Research, Estuaries and Coasts, Estuarine Coastal and Shelf Science*

## Dr Mat Vanderklift



### RESEARCH INTERESTS

Mat is a marine biologist with research interests in the ecological linkages between habitats, the use of stable isotopes to study trophic ecology, factors influencing the abundance of flora and fauna, the design and analysis of biological surveys and the effects of species loss on marine ecosystems.

### CURRENT PROJECTS

- Quantification of ecological linkages between reef and seagrass habitats in Australia and North America
- Effects of consumers on ecological processes and the effects of removing consumers (e.g. by fishing)
- Importance of grazing and predation as processes structuring reef and seagrass communities
- Importance of spatial subsidies in supporting populations of herbivores
- Honing the effectiveness of stable isotopes as a tool in trophic ecology

### RESEARCH LINKS

- CSIRO Marine Research
- Université de Nice, France
- University of Adelaide
- University of Western Australia
- University of South Alabama, USA
- Dauphin Island Sea Lab, USA
- Université P Sabatier – Toulouse III, France

### COMMUNITY ENGAGEMENT

- Reviewed manuscripts for:  
*Oecologia*, *Marine Ecology Progress Series*, *Marine & Freshwater Research*, *Aquatic Conservation*, *Bulletin of Marine Science*, *Botanica Marina*, *Marine Ecology*, *Austral Ecology*

## Dr Thomas Wernberg



### RESEARCH INTERESTS

Thomas has a range of research interests including the effects of climate change on temperate reef communities, the influence of scale, extent and environmental stressors on trajectories of recovery following physical disturbances to algal habitats, the morphological variation and architecture in canopy-forming algae and its consequences for the ecology of the understory, the trophic

linkages between kelp beds and adjacent habitats in the form of detached reef algae, the biomechanical properties of macroalgae and the prediction of physical disturbances and the ecology of invasive macroalgae and their impacts on native algal assemblages.

### CURRENT PROJECTS

- Effects of ocean climate and eutrophication on the resilience of kelp beds to physical disturbances
- Latitudinal variation in temperate reef communities and ecological processes
- The invasiveness and potential impacts of different species of *Caulerpa* from WA
- Effects of drift algae on seagrasses and associated biodiversity

### RESEARCH LINKS

- University of Western Australia
- CSIRO Marine Research
- University of Copenhagen, Denmark
- National Environmental Research Institute, Denmark
- University of Florida, USA

### COMMUNITY ENGAGEMENT

- Academic rating review for the National Research Foundation, South Africa
- Reviewed grant proposal for 'Graduate Women in Science', USA
- Reviewed manuscripts for:
  - *Marine Ecology Progress Series*, *Marine Biology*, *Aquatic Botany*
  - *Continental Shelf Research*

## Dr Christine Hanson



### RESEARCH INTERESTS

Christine's main research interests include marine food web dynamics, biophysical oceanography and benthic-pelagic coupling.

### CURRENT PROJECTS

- Ecological interactions in coastal marine ecosystems: Trophodynamics
- Assessing the spatial extent of reef production on the epifauna inhabiting adjacent seagrass meadows in south-west Australia
- Temporal and spatial dynamics in phytoplankton community composition off south-western Australia
- Benthic-pelagic coupling in an oligotrophic coastal marine system especially the role of suspension feeders

### RESEARCH LINKS

- CSIRO Marine Research
- Strategic Research Fund for the Marine Environment (SRFMe)
- University of Western Australia

## Dr Fernando Tuya



### RESEARCH INTERESTS

Fernando's research is driven by the need to develop rules and models to explain the patterns of organization of marine populations and communities from local to macroecological (biogeographical) scales. From this general interest, Fernando is particularly interested in ecological processes shaping temperate reefs from small togeographical scales, trophic linkages

between reefs and adjacent seagrass meadows, effects of human perturbations on natural communities and the role of Marine Protected Areas in preserving marine biodiversity and fishery resources.

### CURRENT PROJECTS

- The role of reefs on the top-down and bottom-up regulation of seagrass associated invertebrates
- Top-down effects of predators on the structure of food webs
- Consequences of physical disturbances on the colonization patterns of invertebrates
- Effect of the configuration of vegetated habitats on the distribution and diversity of associated invertebrates
- Aggregations of wild fishes around sea-cage fish farms
- Climatic effects on the resilience of kelp beds to physical disturbances

### RESEARCH LINKS

- University of Las Palmas de GC (Spain)
- University of Aalicante (Spain)
- CSIRO Marine Research

### COMMUNITY ENGAGEMENT

- Reviewed manuscripts for:  
- *Oecologia*, *Marine Ecology Progress Series*, *Journal of Experimental Marine Biology and Ecology*, *Marine Biology*, *Estuarine, Coastal and Shelf Science*, *ICES Journal of Marine Science*, *Ciencias Marinas*

## PLANT CHEMISTRY



## Dr Ian Bennett

### RESEARCH INTERESTS

Ian's areas of interest and expertise include the physiology of Australian plants, plant tissue culture, the genetics of Australian plants, horticulture and floriculture of native plants and the propagation and growth of plantation trees.

### CURRENT PROJECTS

- Influence of phenolics on micro propagation of Myrtaceous plants
- Clonal propagation of hazelnut for truffle production
- Micropropagation and clonal variation of teak *Tectona grandis*

### RESEARCH LINKS

- Ornamental Plant and Orchid Centre, Maejo University, Chiang Mai, Thailand
- Department of Biotechnology, Ramkhamhaeng University, Bangkok, Thailand
- Department of Horticulture, King Mongkut Institute of Technology, Bangkok, Thailand
- ALCOA Australia
- Murdoch University
- Department of Environment and Conservation (WA)
- Integrated Tree Cropping Ltd.
- The Wine and Truffle Company

## Dr Mary Boyce



### RESEARCH INTERESTS

Mary's research is directed towards the development and application of capillary electrophoresis and the application of analytical chemistry to the biological, environmental and nutrition fields.

### CURRENT PROJECTS

- Developing in-line concentration methods for capillary electrophoresis
- Analysis of natural antioxidants in food using capillary electrophoresis
- Collaborative project with the WA Maritime Museum involving chemical analysis of preserved wood
- Solid phase micro-extraction gas chromatography for characterization of Australian truffles
- Role of secondary metabolites in plant disease resistance
- Role of solid phase micro-extraction in authenticating sandalwood
- Problem oriented learning in the chemistry classroom

### RESEARCH LINKS

- University of Tasmania
- Rewards Group
- The Wine and Truffle Company
- Dublin City University

## RESEARCH IN SCIENCE TEACHING AND LEARNING



Associate Professor  
Adrienne Kinnear

### RESEARCH INTERESTS

The biodiversity and community structures of Western Australia's soil and litter fauna, and the impact of our land-use practices on these communities. Adrienne is researching Western Australia's soil mite (acarid) fauna by adding to our rudimentary knowledge of the distribution,

taxonomy and community structure of these little-known, but biodiverse soil and litter dwellers. Adrienne also has a strong interest in teaching and learning: assessment strategies to improve students' learning in science and to aid in student skill development.

### CURRENT PROJECTS

- Soil mites as indicators of soil health: Validation of molecular tools for the monitoring of disturbance effects on soil mite communities
- Impact of revegetation on soil mite communities in Mulga woodlands, Leonora
- Evaluating the efficacy of reflective teaching strategies in science for preservice primary teachers

### RESEARCH LINKS

- GhG-SSCP Research Group, Ministry of the Environment, Government of Japan
- Charles Darwin University
- Macauley Land Use Research Institute, Aberdeen, Scotland
- School of Education, Edith Cowan University

### COMMUNITY ENGAGEMENT

- Community member, Yellagonga Regional Park Advisory Committee
- ECU representative, Sustainability Sub-committee, City of Joondalup
- Contributor of FCHS Cool Scientist Program
- Science ambassador, SCITECH (WA)

## TERRESTRIAL ECOLOGY



Dr Eddie Van Etten

### RESEARCH INTERESTS

Eddie is interested in terrestrial plant ecology and management in arid zones, urban bushland remnants and forested ecosystems. He is particularly involved in research in fire ecology and restoration of terrestrial ecosystems.

### CURRENT PROJECTS

- Vegetation patterns and conservation assessments in arid and semi-arid zones
- Vegetation modelling and mapping using GIS
- Patterns of plant species turnover across landscapes and implications for biodiversity conservation
- Fire-drought-grazing interactions in arid and transitional rainfall vegetation
- Changes in biodiversity and ecosystem functioning following destocking of rangelands
- Fire-weed cycle of urban remnant bushlands
- Salt-marsh vegetation and salt lake ecology
- Improving restoration of mine sites, roadsides and other disturbed lands
- Jarrah forest ecology and management, including regeneration following logging

### RESEARCH LINKS

- Department of Environment and Conservation (WA)
- Forest Products Commission
- Curtin University of Technology
- Bush Heritage Australia
- Australian Wildlife Conservancy
- Fortescue Metals Groups
- ALCOA
- Main Roads, WA
- Fire and Emergency Services Authority
- Kemerton Silica Sands

### COMMUNITY ENGAGEMENT

- Regional Councillor, Ecological Society of Australia
- Minerals Research Advisory Committee
- WA Threatened Ecological Communities Scientific Advisory Committee

## Dr Kristina Lemson



### RESEARCH INTERESTS

Kristina uses phylogenetic methods to document and describe the diversity and evolution of plants. She is particularly interested in evolutionary patterns of diversity among species in the high rainfall south-west region and the semi-arid Coolgardie interzone. The Coolgardie interzone is far less intensively studied than the south-west 'biodiversity hotspot', but contains a large diversity of

plants that occur in a complex mosaic of unique woodlands, heath and saltlands. Kristina's research uses the methods of phylogenetic analysis to investigate diversity, and to complement ecologically based work. Her systematics research uses morphological methods, with an emphasis on plant architecture and inflorescence structure, floral morphology, and anatomy, and seeks to integrate morphological and molecular approaches to phylogeny reconstruction. Dr Lemson also curates the Robert Brown Herbarium (ECU), a facility that supports research and teaching activities within the School of Natural Sciences.

### CURRENT PROJECTS

- Systematics and taxonomy of *Andersonia* R.Br. (Ericaceae, subfamily Styphelioideae)
- Systematics and taxonomy of *Sphenotoma* Sweet. (Ericaceae, subfamily Styphelioideae)
- Evolution of tribe *Cosmelieae* (Ericaceae, subfamily Styphelioideae)
- Systematics and taxonomy of *Lambertia* Sm. (Proteaceae).
- Phylogenetic conspectus of the Western Australian flora

### RESEARCH LINKS

- Western Australian Herbarium
- Department of Environment and Conservation (WA)
- Royal Botanic Gardens, Sydney
- Australian Tropical Herbarium, James Cook University
- Dept Biological Sciences, Florida State University (USA)
- Lane Community College, Oregon (USA)
- Manaaki Whenua Landcare Research, New Zealand

### COMMUNITY ENGAGEMENT

- Convenor of the local chapter of the Australian Systematic Botany Society
- Visiting scientist in local primary schools

## Professor William Stock



### RESEARCH INTERESTS

Will's research is focused on understanding the structure and functioning of natural and human impacted terrestrial ecosystems in order to improve our ability to manage such systems. He has particular interests in biogeochemical cycling, ecological applications of stable isotopes, nitrogen pollution, ecosystem impacts of invasive species and global change biology. Will has

worked in systems ranging from heathlands, savannas, warm deserts, cold deserts (Antarctica) to commercial forestry plantations and agricultural plant selection.

### CURRENT PROJECTS

- Bottom up vs top down control of grassland states in a southern African savanna
- Ecosystem level effects of growing acacia and eucalyptus in mixed plantations
- Ecosystem impacts of atmospheric nitrogen enrichment in conserved bushland fragments of the Swan Coastal Plain
- Dendro-ecological investigation of water use by pines of the Gngangara Mound
- Impacts of fire on geophyte richness and abundance in Jarrah forests
- Shelterwood regeneration success in Jarrah forests
- Black cockatoo distributions in transformed landscapes
- Fire as a management tool for geophytic weeds
- Determining ecologically sympathetic groundwater abstraction regimes on the Gngangara Mound
- Root response to fluctuating water tables
- Response of *Banksia* to experimental drawdown in the Gngangara Groundwater Mound region

### RESEARCH LINKS

- University of Cape Town, South Africa
- Australian National University
- ALCOA
- Water Corporation
- Department of Conservation and Land Management (WA)
- Forest Products Commission
- Australian Research Council
- Bush Heritage Australia
- Australian Wildlife Conservancy

### COMMUNITY ENGAGEMENT

- Member of the Editorial Boards of *Austral Ecology* and the *African Journal of Range and Forage Science*
- Member of Conference Organising Committee Ecological Society of Australia – 'Adapting to Change'
- Foundation for Research Development, South Africa: evaluation of individuals for Research Quality Ranking
- Appointed by WA Premier to MERIWA - Minerals Research and Advisory Committee
- Stakeholder Steering Committee for ALCOA's 2nd Mining Environmental Plan
- Invited to examine a MSc for Rhodes University, South Africa
- Refereed manuscripts for:
  - *Oecologia*, *Ecology*, *New Phytologist*, *Plant and Soil*, *Plant Ecology*, *Functional Plant Biology*, *Restoration Ecology*, *Annals of Botany*, *Journal of Archaeological Science*.

## Emeritus Professor Harry Recher



### RESEARCH INTERESTS

Harry's interests lie in the structure of vertebrate communities, avian foraging ecology, the effects of fire on vertebrate populations, habitat fragmentation and the restoration of degraded landscapes, and the management and conservation of forest ecosystems. He has worked extensively with birds, mammals and forest invertebrates, but is primarily an avian ecologist. All projects are designed to provide guidelines for the

management of natural ecosystems.

### CURRENT PROJECTS

- The eucalypt woodlands, particularly the Goldfields of Western Australia, focusing on avian communities, foraging habits, nesting and movement cycles, and habitat requirements.

### RESEARCH LINKS

- Australian Wilderness Society (Wild Country Project)
- Australian National University
- Boston University, USA
- Curtin University of Technology

### COMMUNITY ENGAGEMENT

- Editor, Pacific Conservation Biology
- Adjunct Professor, Environmental Biology at Curtin University of Technology
- Public lectures and workshops on ecology, environment, environmental ethics, biodiversity, landcare and conservation policy
- Advice to individuals, community groups, industry, local and state governments and the Commonwealth on environmental issues



## Dr David Goodall

### RESEARCH INTERESTS

David, a botanist by training, has for many years concentrated his interest on vegetation particularly in arid areas. He was Editor-in-Chief of "Ecosystems of the World", a series of 38 volumes which was completed at the end of 2005. He also has a long-term interest in the use of numerical methods to classify

entities described by a great variety of attributes, such as plants, and areas of bushland. For this purpose he has developed a series of interlinked computer programs, which are still being improved and expanded.

### COMMUNITY ENGAGEMENT

- Member of the Environmental Advisory Committee of the City of Wanneroo

## Dr Graham Thompson



### RESEARCH INTERESTS

Australian native vertebrate fauna has developed a unique series of adaptations to survive and flourish in a diverse range of habitats that are very often harsh, unpredictable and undernourished. Graham has a broad range of interests in terrestrial vertebrate ecology and ecophysiology, particularly reptiles and frogs. This has led to an interest in the effects of body size

and shape on the ecology and physiology of vertebrates. His interest in the ecology of reptiles is currently being applied in the development of an index to assess rehabilitation success using reptile fauna as the bio-indicator. More recently his research has focussed on improving terrestrial fauna surveys for the preparation of environmental impact assessments.

### CURRENT PROJECTS

- Improved terrestrial fauna surveys for environmental impact assessment
- Rehabilitation and degradation index
- Temporal and spatial changes in small terrestrial vertebrate fauna diversity
- Effects of size and shape on the ecology and performance traits of dragon lizards and goanna

### RESEARCH LINKS

- Coffey Environments
- Fortescue Metals Group
- University of Western Australia
- Norilsk Nickel Pty Ltd
- Paddington Gold Pty Ltd

### COMMUNITY ENGAGEMENT

- Member of the Department of Environment and Conservation's Guidelines for Terrestrial Biological Survey Group

# Current Research Projects

## ENVIRONMENTAL CHEMISTRY AND FORENSICS

*Investigation of conditioning methods on the gold electrode surface employed in electro analyses of arsenic. Australian Institute of Nuclear Science & Engineering*

*Estimation of air quality and greenhouse benefits from the introduction of HFC152A to mobile air conditioning technology. Australian Greenhouse Office*

## FRESHWATER ECOSYSTEMS

*Impact of disturbed acid sulphate soils on freshwater ecosystems, Western Australia. Dept of Water WA*

*Effects of light reduction on seagrass meadows. Geraldton Port Authority*

*Remediation of acid coalmine lakes using biological processes and organic matter. Australian Coal Association Research Program*

*Gnangara Mound monitoring - macroinvertebrates, Dept of Water WA*

*Study of migration patterns, habitat and water requirements of fish and invertebrates in the Blackwood River. Murdoch University / Department of Water*

*Wetland vegetation monitoring: Environmental monitoring and investigations for Gnangara Mound. Dept of Water WA*

*Fish migration patterns in the Blackwood River. Murdoch University*

*Environmental water requirements of priority water resources in the South Coastal Region, Dept of Water WA*

*Fire, organic soils and acidification, Fire and Emergency Services Authority of WA*

*Environmental monitoring and investigations for Gnangara Mound - Wetland macroinvertebrate monitoring. Dept of Water WA*

*Monitoring program for the Collinsville Pit Lake remediation experiment. Xstrata Coal*

*EWR Framework Development. Dept of Water WA*

*Field studies into the reproduction biology and conservation requirements of Hairy Marron in the South West DEC region. Dept of Environment and Conservation*

*Development of a rehabilitation plan for the dredge ponds of the Kemerton Silica Sand Pty Ltd operational site. Kemerton Silica Sand Pty Ltd*

*Stygofauna research monitoring. Natural Resource Services Pty Ltd*

*Field studies into the biology and conservation requirements of Engaewa species in the South West and Warren DEC regions. Dept of Environment and Conservation*

*Vegetation monitoring - Swan Coastal Plain. Dept of Water WA*

*How do acid sulphate soils interact with stormwater and wetlands constructed to reduce nutrient loading: A case study of Brushfield Constructed Wetland in City of Stirling. Water Corporation / City of Stirling*

*Midge Desktop Audit Brief. City of Joondalup / City of Wanneroo*

## HEALTH AND ECOLOGY

*Biological assessment of the Milyeannup Heritage Site. Australian Bush Heritage Fund*

*A participatory approach to understanding and monitoring soil health. Agriculture WA*

## MARINE ECOSYSTEMS

*North West dugong population movement and habitat use. Department of Environment & Conservation / Department of Fisheries / Edith Cowan University*

*Seagrass health survey (Becher Point to Fremantle Region). Dept of Environment and Conservation*

*Biodiversity assessment, ecosystem impacts of human usage and management strategy evaluation Node 4.3, Western Australian Marine Science Institute / Edith Cowan University*

*Recovery of Amphibolis seagrass following periods of light reduction. Dept of Environment and Conservation*

*Dugong Research Proposal NW Cape - NT Border. Dept of Environment and Conservation*

*Western Rock Lobster in ecosystem processes of South-Western Australia. Dept of the Environment & Heritage*

*Trophic implications of seagrass habitat disturbance from reduced light. ANZ Executors & Trustee Company Limited*

*Habitat use by Black swans in the Swan River Estuary. Ernest Hodgkin Trust*

*Does the importance of food web connections between marine habitats change with protection from fishing? Australian Academy of Science*

## PLANT CHEMISTRY

*Micropropagation and Clonal Variation of Teak (Tectona grandis). Integrated Tree Cropping Pty Ltd*

*Determination of optimal storage conditions for the transportation of Western Australian grown Tuber melanosporum to international markets. Wine and Truffle Company*

*Clonal propagation of hazel (Corylus avellana) for increased nut and truffle production, Wine and Truffle Company*

## TERRESTRIAL ECOLOGY

*Mitigation of impacts on groundwater dependent vegetation through adaptive abstraction regimes. Water Corporation*

*Mitigation of impacts on groundwater dependent vegetation through adaptive abstraction regimes. Australian Research Council*

*Development and testing of an Australia-wide biodiversity conservation assessment and planning system. Australian National University*

*Black cockatoo use of extensive post-mining revegetated and agriculturally transformed landscapes. Dept of Environment and Conservation / Alcoa / Edith Cowan University*

*Plant water relations in rehabilitated residue areas and an analogue coastal vegetation community. Alcoa World Alumina Australia*

*Selection of groundwater-dependent ecosystem criteria sites in the Bunbury-Busselton-Capel groundwater areas and establishment of vegetation transects. Dept of Environment and Conservation*

*Vegetation monitoring of groundwater dependent ecosystems on the Southern Blackwood Plateau and Eastern Scott Coastal Plain. Dept of Water WA*

*The Influence of Two Different Silvicultural Treatments on Course Woody Debris and Saproxyllic Beetle Assemblages in Southern Forests of Western Australia. Dept of Environment and Conservation*

*The cause(s) and management of the Eucalyptus gomphocephala decline epidemic in Western Australia. Murdoch University*

*Fire and establishment of Jarrah seedlings in shelterwood. Dept of Environment and Conservation*

# Postgraduate Research Students

The following PhD, Masters and Honours students were supervised by members of the Centre – \* Completed 2007

## PhD

Melanie Baister – *R Froend/ W Stock/Ruthrof K*

The ecohydrology of *Eucalyptus gomphocephala* (Tuart) populations in the South-west of Australia.

David Blake – *P Horwitz/W Stock/M Boyce*

Fire induced hydro-biogeochemical responses in wetland sediments of the northern Swan Coastal Plain.

\*Muriel Brasseur – *G Hyndes/D Moro*

Population structure and management of the Humpback Whale *Megaptera novaeangliae* in Western Australia: investigation of the genetic status and structure of Stock D/Antarctic Area IV.

John Bunn – *P Horwitz/A Koenders*

Mechanisms affecting the replacement of *Cherax tenuimanus* (Smith 1912) by *Cainii* Austin 2002 from the Margaret River.

Quinton Burnham – *A Koenders/P Horwitz*

Biogeography of the Australian burrowing freshwater crayfish genus *Engaewa* (Decapoda : Parastacidae).

Caroline Canham – *R Froend/W Stock*

Phreatophyte root growth dynamics and relationships between growth phenology, plant water relations and groundwater.

Zoe Car – *P Horwitz*

Seeing with other eyes: Exploring western scientific and indigenous environmental knowledge.

Jeffry Cargill – *W Stock / E van Etten*

Fate of *Eucalyptus marginata* seed from canopy-store to emergence in the northern jarrah forests of Western Australia: a comparison between spring and autumn burns in shelterwood (retained overstorey) treatments.

May Carter – *P Horwitz*

Urban design, contact with nature and population health.

Suzanne Cumming – *M Lund/H.Recher*

Ecology and behaviour of an urban corvid: the Australian Raven.

\*Paul Drake – *R Froend*

Plant water relations and xylem hydraulic properties of *Eucalyptus gomphocephala* D.C. (tuart).

Graham Fulton – *P Horwitz/ T Perkins*

The nesting ecology of an endangered woodland avifauna.

Adam Gartner – *P Lavery*

Trophic Implications of Seagrass Habitat Disturbance from Reduced Light

Ute Goeft – *R Froend/ P Horwitz*

Identification of Social Water Requirements (SWR's) for water resource planning.

Nan Hewitt – *P Horwitz*

Education interventions for irrigators on the Gngangara Mound.

Jason How – *G Hyndes*

Assessing the potential benefits of marine protected areas to adjacent fished areas.

Pat Karatna – *P Horwitz*

Mangrove forest communities in south-eastern Thailand.

Rebekah Kenna – *G Hyndes/P Lavery*

Return of ecological function of transplanted seagrasses meadows.

\*S (Pao) Khwanboonbumpen – *M Lund*

Developing cost-effective catchment management strategies for established residential suburbs to reduce nutrient discharge.

Lachlan MacArthur – *G Hyndes/M Vanderklift/R Babcock*

Habitat use, movements and trophic linkages of the western rock lobster *Panulirus cygnus*, within the inshore coastal waters of Western Australia.

\*Rory McAuley – *G Hyndes*

Biology and stock assessment of the thick skin shark *Carcharhinus plumbeus* in Western Australia, and further refinement of the stock assessment for dusky shark *Carcharhinus obscurus*.

Sumitra Moopayak – *A Kinnear*

Biofertilisers: The biotechnology and soil conditioning properties of polysaccharide-producing soil algae.

Stephen O'Dwyer – *W Stock*

Nitrogen deposition impacts on the flora of the Swan Coastal Plain and the Burrup Peninsula.

Craig Pentland – *A Kinnear*

Behaviour and population dynamics of translocated populations of the black-flanked rock wallaby, *Petrogale lateralis lateralis*.

\*Bea Sommer – *P Horwitz/M Lund/M Boyce*

Factors controlling wetland sediment response to alternate drying and wetting and how this affects water quality.

Chongdee Srinoparatwatana – *G Hyndes*

Population dynamics and stock assessment of Notopteridae and Nandidae in the trap fishery of Beung Borapet, Thailand.

K Shan Sureshan – *M Lund/C McCullough*

A risk assessment framework for managing beneficial end-uses of mine pit lakes in the Northern Goldfields of Western Australia.

## MSc

Joel Andrew – *R Froend*

GPS based soil acidity monitoring as a land management tool

Muriel Bertuch – *E van Etten*

Mulga (*Acacia aneura* F.Muell.Ex Benth.) death adjacent to haul roads in the northern Goldfields

Rob Campbell – *P Horwitz*

Perceptions of soil health in the Bremer River Catchment

Stephen Danti – *A Kinnear*

The influence of different silvicultural treatments on saproxylic beetles in southwest forests of Western Australia

Vishal Darji – *M Boyce*

Development of a microemulsion electrokinetic chromatography method for the separation of antioxidants.

Belinda Delaney – *I Bennett*

Investigation of propagation methods for *Verticordia grandis* and other V. species to establish a successful protocol for hardening plantlets to field conditions to increase in situ survival.

Alicia Dudzinska – *E van Etten*

Grasstrees and mining: Understanding the distribution of *Xanthorrhoea preissii* in the jarrah forest.

Beatrice Franke – *P Horwitz*

Indicators of ecosystem health in a Western Australian recovery catchment.

\*Sandra Hall – *M Lund*

The contribution of industry and commercial activity to nutrient loads discharge from the Bannister Creek Catchment area.

\*Blair Hardman – *W Stock/D Moro*

Response to translocation of the endangered rufous hare wallaby, or mala *Lagorchestes fasciatus*, reintroduced to the arid Peron Peninsula, Shark Bay WA.

Sofie Harrison – P Lavery/G Hyndes/C Hanson

The influence of seabird-derived nutrients on island ecosystems in the oligotrophic marine waters of south-western Australia

\*Mark Hewitt – E van Etten

A process orientated approach in rehabilitating mine-damaged arid rangeland.

Carli Johnson – G Hyndes

The Western Australian charter industry: working towards long-term sustainability

Justin King - G Hyndes

Factors affecting *Artemia franciscana* culture and comparison between feeds and strains

Victoria Lazenby – A Hinwood

Personal Exposure of Children to Formaldehyde

Caroline McCormick – P Horwitz

Vulnerability of organic soils to fire on the Swan Coastal Plain.

Heather McQueen – A Hinwood

Estimating prenatal exposure to glyphosate formulations using maternal exposure assessment techniques - a preliminary investigation.

Lea McQuillan – P Lavery

Species richness, density and cover of sponge assemblages on temperate reefs off Perth, Western Australia

Michael Mulligan – P Lavery/K McMahan

The effect of light reduction on *Amphibolis griffithii* meadows by activities such as dredging and land reclamation where turbidity causes a light reduction at the seafloor through increased light attenuation by suspended particles.

Wesu Ndilila – A Hinwood

Investigating Heavy Metal Exposure on the General Populace of the Copper Mining Town of Kitwe, Zambia.

Nathan Rowe – A Koenders

Characterisation of structural and functional changes of mutant proteins in autosomal dominant retinitis pigmentosa: contributions from structural biology and bioinformatics.

Monica Russell – A Kinnear

Abundance, distribution and habitat requirements of the Tree-Stem Trapdoor *A. castellum* in the West Australian wheatbelt.

Amanda Spooner – K Lemson

Systematics and conservation of *Lambertia* (Proteaceae).

Marieke Weerheim – W Stock

How Black Cockatoos use their landscape: Habitat Characteristics at Multiple Spatial Scales.

## Honours

\*Sharyn Burgess – R Froend/W Stock

The effect of irrigation on soil water availability and the plant water relations of three species growing on revegetated bauxite residue disposal areas.

\*Chris Doropoulos – G Hyndes/P Lavery/F Tuya

The use of detached kelp (*Ecklonia radiata*) by seagrass-associated mesograzers in temperate south-western Australia.

\*Marie Short – Eddie Van Etten/Mark Lund

The value of oil mallee plantations and revegetated farm land in the Southern Wheatbelt region of Western Australia for the Conservation of the Western Pygmy Possum (*Cercartetus concinnus*).



# Publications

## Book Chapters

Waycott M, Collier C, McMahon K, Ralph P, McKenzie L, Udy J, Grech A. *Vulnerability of seagrasses in the Great Barrier Reef to climate change, 193-236. In Climate change and the Great Barrier Reef: A vulnerability assessment.* (Eds) Johnson J, Marshall P (2007) Great Barrier Reef Marine Park Authority & Australian Greenhouse Office, Australia

## Refereed Journals

Balding P, Boyce MC, Breadmore MC, Macka M (2007) Light-emitting diode-compatible probes for indirect detection of anions in CE. *Electrophoresis* 28: 3453-3460

Boyce MC (2007) Determination of additives and organic contaminants by CE and CEC. *Electrophoresis* 28: 4046-4062

Cambridge ML, How JR, Lavery PS, Vanderklift MA (2007) Retrospective analysis of epiphyte assemblages in relation to seagrass loss in a eutrophic coastal embayment. *Marine Ecology-Progress Series* 346: 97-107

Collier CJ, Lavery PS, Masini RJ, Ralph PJ (2007) Morphological, growth and meadow characteristics of the seagrass *Posidonia sinuosa* along a depth-related gradient of light availability. *Marine Ecology-Progress Series* 337: 103-115

Crawley KR, Hyndes GA, Vanderklift MA (2007) Variation among diets in discrimination of  $^{13}\text{C}$  and  $^{15}\text{N}$  in the amphipod *Allorchestes compressa*. *Journal of Experimental Marine Biology and Ecology* 349: 370-377

Crawley KR, Hyndes GA (2007) The role of different types of detached macrophytes in the food and habitat choice of a surf-zone inhabiting amphipod. *Marine Biology* 151: 1433-1443

Franks PJ, Drake PL, Froend RH (2007) Anisohydric but isohydrodynamic: seasonally constant plant water potential gradient explained by a stomatal control mechanism incorporating variable plant hydraulic conductance. *Plant Cell and Environment* 30: 19-30

Hanson CE, Waite AM, Thompson PA, Pattiaratchi CB (2007) Phytoplankton community structure and nitrogen nutrition in Leeuwin Current and coastal waters off the Gascoyne region of Western Australia. *Deep-Sea Research Part II-Topical Studies in Oceanography* 54: 902-924

Hanson CE, Pesant S, Waite AM, Pattiaratchi CB (2007) Assessing the magnitude and significance of deep chlorophyll maxima of the coastal eastern Indian Ocean. *Deep-Sea Research Part II Topical Studies in Oceanography* 54: 902-924

Fromont J, Vanderklift MA, Kendrick GA (2007) Marine sponges of the Dampier Archipelago, Western Australia: patterns of species distributions, abundance and diversity. *Biodiversity and Conservation*. 15: 3731-3750

Forrester DI, Schortemeyer M, Stock WD, Bauhus J, Khanna PK, Cowie AL (2007) Assessing nitrogen fixation in mixed-and-single species plantations of *Eucalyptus globulus* and *Acacia mearnsii*. *Tree Physiology* 27: 1319-1328

Fulton GR, Rose AB (2007) Food remains in nests of Rainbow Bee-eaters (*Merops ornatus*) in old-growth woodland of south-western Australia. *Australian Field Ornithology* 24: 37-43

Goodall DW (2007) Excerpta Bontanica - a valuable bibliographical source for vegetation science. *Journal of Vegetation Science* 18: 453-454

Horwitz P (2007) Aquatic ecosystems, indicators, and adaptive management. *Ecohealth* 4: 117-118

Hinwood AL, Rodriguez C, Runnion T, Farrar D, Murray F, Horton A, Glass D, Sheppard V, Edwards JW, Denisons L, Whitworth T, Eiser C, Bulsara M, Gillett RW, Powell J, Lawson S, Weeks I, Galbally I (2007) Risk factors for increased BTEX exposure in four Australian cities. *Chemosphere* 66: 533-541

Ince R, Hyndes GA, Lavery PS, Vanderklift MA (2007) Marine macrophytes directly enhance abundance of sandy beach fauna through provision of food and habitat. *Estuarine Coastal and Shelf Science*, 74: 77-86

Jackson J, Moro D, Mawson P, Lund M, Mellican A (2007) Bait uptake and caching by red foxes and nontarget species in urban reserves. *Journal of Wildlife Management* 71: 1134-1140

Kojima T, Saito N, Tanaka Y, Hamano H, Kato S, Tahara K, Takahashi N, Yamada K (2007) Behaviour of Nutrients in Sap of *Eucalyptus camaldulensis* in Arid Land of Western Australia. *Journal Japan Society Hydrology and Water Resources* 20: 340-346

Lavery PS, Reid T, Hyndes GA, Van Elven BR (2007) Effects of leaf movement on epiphytic algal biomass of seagrass leaves. *Marine Ecology-Progress Series* 338: 97-106

Lyons MN, Halse SA, Gibson N, Cale DJ, Lane JAL, Walker CD, Mickle DA, Froend RH (2007) Monitoring wetlands in a salinizing landscape: case studies from the Wheatbelt region of Western Australia. *Hydrobiologia* 591: 147-164

Mackey P, Collier CJ, Lavery PS (2007) Effects of experimental reduction of light availability on the seagrass *Amphibolis griffithii*. *Marine Ecology-Progress Series* 342: 117-126

MacArthur LD, Hyndes GA (2007) Varying foraging strategies of Labridae in seagrass habitats: Herbivory in temperate seagrass meadows? *Journal of Experimental Marine Biology and Ecology*. 340: 247-258

McAuley RB, Simpfendorfer CA, Hyndes GA, Lenanton RCJ (2007) Distribution and reproductive biology of the sandbar shark, *Carcharhinus plumbeus* (Nardo), in Western Australian waters. *Marine and Freshwater Research* 58: 116-126

McCullough CD (2007) Approaches to remediation of acid mine drainage water in pit lakes. *International Journal of Mining, Reclamation and Environment* 21: 1-15

Olavarria C, Baker CS, Garrigue C, Poole M, Hauser N, Caballero S, Florez-Gonzalez L, Brasseur M, Bannister J, Capella J, Clapham P, Dodemont R, Donoghue M, Jenner C, Jenner MN, Moro D, Oremus M, Paton D, Rosenbaum H, Russell K (2007) Population structure of South Pacific humpback whales and the origin of the eastern Polynesian breeding grounds. *Marine Ecology-Progress Series* 330: 257-268

Paoletti MG, Osler GHR, Kinnear A, Black DG, Thomson LJ, Tsitsilas A, Sharley D, Judd S, Neville P, D'Inca A (2007) Detritivores as indicators of landscape stress and soil degradation. *Australian Journal of Experimental Agriculture* 47: 412-423

Rodriguez C, Tonkin R, Heyworth J, Kusel M, De Klerk N, Sly PD, Franklin P, Runnion T, Blockley A, Landau L, Hinwood AL (2007) The relationship between outdoor air quality and respiratory symptoms in young children. *International Journal of Environmental Health Research* 17: 351-360

Schultz M, Smith S, Richardson AMM, Horwitz P, Crandall K, Austin CM (2007) Cryptic diversity in Engaeus Erichson 1846, Geocharax Clark 1936 and Gramastacus Riek 1972 (Decapoda: Parastacidae) revealed by mitochondrial 16S rRNA sequences. *Invertebrate Systematics* 21: 569-587

Stukely MJC, Crane CE, McComb JA, Bennett IJ (2007) Field survival and growth of clonal, micropropagated *Eucalyptus marginata* selected for resistance to *Phytophthora cinnamomi*. *Forest Ecology and Management* 238: 330-334

Svensson CJ, Hyndes GA, Lavery PS (2007) Food web analysis in two permanently open temperate estuaries: Consequences of saltmarsh loss? *Marine Environmental Research* 64: 286-304

Thomsen MS, McGlathery KJ (2007) Stress tolerance of the invasive macroalgae *Codium fragile* and *Gracilaria vermiculophylla* in a soft-bottom turbid lagoon. *Biological Invasions* 9: 499-513

Thomsen MS, Wernberg T, Staehr P, Krause-Jenson D, Risgaard-Petersen N, Silliman BR (2007) Alien macroalgae in Denmark - a broad-scale national perspective. *Marine Biology Research* 3: 61-72

Thompson GG, Thompson SA (2007) Usefulness of funnel traps in catching small reptiles and mammals, with comments on the effectiveness of the alternatives. *Wildlife Research* 34: 491-497

Thompson GG, Thompson SA (2007) Using species accumulation curves to estimate trapping effort in fauna surveys and species richness. *Austral Ecology* 32: 564-569

Thompson GG, Thompson SA (2007) Are backfilled burrows a predator protection strategy for the Spinifex Hopping Mouse? *J Royal Soc WA* 90:111-113

Thompson GG, Thompson SA, Withers PC, Fraser J (2007) Determining adequate trapping effort and species richness using species accumulation curves for environmental impact assessments. *Austral Ecology* 32: 570-580

Thompson GG (2007) Terrestrial vertebrate fauna surveys for the preparation of environmental impact assessments; how can we do it better? A Western Australian example. *Environmental Impact Assessment Review* 27: 41-61

Tuya F, Cisneros-Aguirre J, Ortega-Borges L, Haroun RJ (2007) Bathymetric segregation of sea urchins on reefs of the Canary Archipelago: Role of flow-induced forces. *Estuarine Coastal and Shelf Science* 73: 481-488

Vanderklift MA, How J, Wernberg T, MacArthur LD, Heck KL, Valentine JF (2007) Proximity to reef influences density of small predatory fishes, while type of seagrass influences intensity of their predation on crabs. *Marine Ecology-Progress Series* 340: 235-243

Valentine JF, Heck KL, Blackmon D, Goecker ME, Christian J, Kroutil RM, Kirsch KD, Peterson BJ, Beck M, Vanderklift MA (2007) Food web interactions along seagrass-coral reef boundaries: effects of piscivore reductions on cross-habitat energy exchange. *Marine Ecology-Progress Series* 333: 37-50

Waite AM, Thompson PA, Pesant S, Feng M, Beckley LE, Domingues CM, Gaughan D, Hanson CE, Hol CM, Koslow T, Meuleners M, Montoya JP, Moore T, Muhling BA, Paterson H, Rennie S, Strzelecki J, Twomey L (2007) The Leeuwin Current and its eddies: an introductory overview. *Deep-Sea Research Part II-Topical Studies in Oceanography* 54: 902-924

Webb RE (2007) Description of grinding patches found on granite bedrock near Cue, in central Western Australia, and a description of their significance. *J Royal Soc WA* 90: 115-125

Yelenik SG, Stock WD, Richardson DM (2007) Functional group identity does not predict invader impacts: differential effects of nitrogen-fixing exotic plants on ecosystem function. *Biological Invasions* 9: 117-125

## Non-Refereed Journal Articles

Campbell R (2007) Cover essay: Fragile abundance. *Ecohealth* 4: 236-238

## Book Reviews

Horwitz P (2007) Environmental Impact Assessment in Australia: Theory and Practice, 4th Edition - by Ian Thomas and Mandy Elliott. *Geographical Research* 45: 110-2.

## Refereed Conference Proceedings

Hinwood A, Rogan R, Willmott A, Horwitz P (2007) Acid sulphate soil disturbance, heavy metals and human exposure. *Epidemiology* 17: S490-S491

Horwitz P (Ed) (2007) Ecology and Health: People and Places in a Changing World: Five Essays. Organising Committee Asia Pacific EcoHealth Conference.

Lazenby V, Hinwood A, Franklin P (2007) Personal exposure of children to formaldehyde in Perth, Western Australia. *Epidemiology* 17: S405-S406

Masubelele ML, Bond WJ, Stock WD (2007) How savanna grasses decompose? *South African Journal of Botany* 73: 301

Ndilila W, Hinwood AL, Rollin HB (2007) Investigating nonoccupational metal exposure in a developing country. *Epidemiology* 18: S96-S96

## Non-refereed Conference Proceedings

Bertuch M, Froend RH, Stock WD, Eamus D, Smettem K, Martin M, Xu C, McHugh S, Canham C (2007) Mitigation of impacts on groundwater dependent vegetation through adaptive abstraction regimes. International Association of Hydrogeologists 35th Congress. Groundwater and Ecosystems, Lisbon September 2007.

Froend RH, Bertuch M (2007) A Shift in the Ecohydrological State of Groundwater Dependent Vegetation due to Climate Change and Groundwater Drawdown on the Swan Coastal Plain of Western Australia. International Association of Hydrogeologists 35th Congress. Groundwater and Ecosystems, Lisbon September 2007.

Horwitz P (2007) Requirements for the reservation of biodiversity in space and time. Parks and Protected Areas Forum. A sense of place for all people for all time. Fremantle, Australia, September 2007.

Loomes R, Froend RH (2007) Management Implications of Wetland Vegetation Response to Climatic Change and Groundwater Drawdown on the Swan Coastal Plain, Western Australia. International Association of Hydrogeologists 35th Congress. Groundwater and Ecosystems Lisbon September 2007.

## Reports

Loomes R, Ogden G, Froend R. WA Dept of Water.

Selection of Groundwater Dependant Ecosystem Criteria sites in the Bunbury/Busselton Groundwater Areas and Establishment of Vegetation Transects.

Loomes R, Ogden G, Canham C, Froend R. WA Dept of Water.

Vegetation Monitoring of Groundwater Dependant Ecosystems – Southern Blackwood and Eastern Scott Coastal Plain

Pettit N, Loomes R, Froend R. WA Dept of Water.

2006 Vegetation Monitoring of Groundwater Dependent Ecosystems – Southern Blackwood Plateau and Eastern Scott Coastal Plain. Feb – 2007

Pettit, N, Loomes, R and Froend, R. WA Dept of Water.

Wetland Vegetation Monitoring 2006 Survey of Gngangara Wetlands.

McCullough CD, Lund MA, van Etten, E. Unpublished commercial in-confidence report.

Synthesis of existing data and knowledge gap for the rehabilitation of Kemerton Silicia Sand mine dredge ponds.

Loomes R, Froend R, Pettit N, Ladd P. WA Dept of Water.

End of summer assessment of condition of Gngangara and Jandakot criteria of groundwater dependent systems.

McCullough C D, Lund M. Unpublished commercial in-confidence report.

Recommendations for water quality sampling of Kemerton silica sand dredge ponds and wetlands.

Sommer B, Horwitz P. WA Dept of Water.

Annual Report for the Wetland Macroinvertebrate Monitoring Program of the Gngangara Mound Environmental Monitoring Project –Spring 2006 to Summer 2007.

Lund MA. Cities of Joondalup and Wanneroo and WA Dept Environment and Conservation.  
Midge Desktop Audit.

McMahon K, Lavery P, Barwick H, Alport W. Ernest Hodgkin Trust for Estuary Education and Research - 2006/07 Summer Scholarship Project.

Black Swan (*Cygnus atratus*) Habitat Use in the Lower Swan River Estuary.  
Lavery P, McMahon K. Cockburn Sound Management Council and WA Dept Environment and Conservation.

A Survey of Selected Seagrass Meadows in The Fremantle - Warnbro Sound Region 2007.

McMahon K. Jurien Bay Marine Park, WA Dept Environment and Conservation.  
Seagrass Health Report for Jurien Bay Marine Park, 2007.

Mac Arthur L, Hyndes G, Babcock R. Dept Environment and Water Resources (Commonwealth), Western Rock Lobster in Ecosystem Processes in South Western Australia. Sept 2007

Bertuch M, Ogden G, Loomes R, Froend R. WA Dept Environment and Conservation  
Investigations of Yate Swamp Hydroperiod Requirements.

McKay K, Loomes R, Horwitz P, Froend R, Wilson J. WA Dept of Water.  
Environmental Water Requirements of Priority Water Resources in South Coast Region.

Froend R, Horwitz P, McKay K, Loomes R, Wilson J. WA Dept of Water  
Environmental Water Requirements of Priority Water Resources in the South Coast Region - Progress report.

Pettit NE, Edwards T, Boyd TC, Froend R. WA Dept of Water.  
Ecological Water Requirement Interim Framework Development: A Conceptual Framework for the Maintenance of Groundwater Dependent Ecosystems Using State and Transition Modelling.

Loomes R, Wilson J, Froend R. WA Dept Water.  
Vegetation Monitoring - Swan Coastal Plain

Lavery P, McMahon K. Dept of Defence.  
Monitoring of seagrass meadows on the eastern shore of Garden Island, Western Australia,

Creagh S, Storey A, Froend R, Boyd T. WA Dept of Water  
Lower Ord: Design of an Environmental Water Provision Monitoring and Assessment Program. Wetland Research and Management, Perth.

Sommer B, Horwitz P. WA Dept Environment and Conservation  
Annual Report for the Gngara Mound Environmental Monitoring Programme.

Horwitz P. Natural Resource Services Pty. Ltd.  
Preliminary Stygofauna Taxonomy Report for Newcrest Mining Limited (NCM), Telfer Operations - Stygofauna Monitoring.

Horwitz P. Bush Heritage Australia.  
Final Report – Property Assessment for Location 680 Sussex – Milyeannup.

Newport M, Scarfone A, et al. Greening Australia (WA)  
Preliminary Bioassessment of the Hutt River, Western Australia.

Koenders A, Geldart K, Horwitz P. WA Dept of Water  
Yarragadee Aquifer and the Blackwood River: Invertebrate Assemblages During Base-flow Conditions.



# Conference Attendance & Presentations

\* Members of organizing committees

## Staff

*ACEL Workshop, Sydney NSW, Feb-07*

Mary Boyce

*International Society for Vegetation Science, Palmerston North, New Zealand, Feb-07*

David Goodall

*Workshop on Biodiversity Offsets for the Minerals Industry, Perth, Australia, Mar-07*

Will Stock and Eddie van Etten

*19<sup>th</sup> International Seaweed Symposium, Kobe Japan, Mar-07*

Thomas Wernberg

*Linnean Tercentenary -- Anglo-Swedish Excursion to Gotland, Jun-07*

David Goodall

*Australian Marine Science Association, Melbourne, Australia, Jul-07*

Kathryn McMahon and Thomas Wernberg

*International Association of Vegetation Science 50<sup>th</sup> Annual Symposium, Swansea, Wales, Jul-07*

Eddie van Etten

*Royal Australian Chemical Institute – Chemical Education Conference 2007, Auckland New Zealand, Jul-07*

Magda Wajrak

*International Association of Landscape Ecology World Congress, Wageningen, Netherlands, Jul-07*

Eddie van Etten

*Australian Research Alliance for Children and Young Children's Environmental Health, Melbourne, Australia, Aug-07*

Andrea Hinwood

*Healthy Wetlands, Healthy People Workshop, South Korea, Aug-07*

Pierre Horwitz,

*International Society of Limnology Congress, Montreal Canada, Aug-07*

Mark Lund and Clint McCullough

*42<sup>nd</sup> European Marine Biology Symposium, Kiel, Germany, Aug-07*

Fernando Tuya

*Medecos XI Conference, Perth, Western Australia, Sept-07*

Will Stock and David Goodall

*14<sup>th</sup> IUPPA World Conference, Melbourne, Australia, Sep-07*

Andrea Hinwood

*9<sup>th</sup> International Weeds Conference, Perth, Sep-07*

Will Stock

*Air, Water and Earth Interactions, Perth WA, Sep-07*

Mary Boyce

*15<sup>th</sup> Improving Student Learning Symposium, Dublin Ireland, Sept-07*

Adrienne Kinnear

*International Association of Hydrogeologists Congress - Groundwater and Ecosystems, Lisbon Portugal, Sept-07*

Ray Froend and Robyn Loomes

*Ecohealth 07 Conference, Deakin University Victoria, Nov-07*

Pierre Horwitz

*National Workshop on Implications of Climate Change for High Conservation Value Ecological Water Requirements, Adelaide, Nov-07*

Ray Froend

*18th Biennial Conference of the Estuarine Research Federation, Providence Rhode Island, USA, Nov-07*

Glenn Hyndes and Kathryn McMahon,

*Ecological Society of Australia, Perth, 11<sup>th</sup> Annual Conference, Nov-07*

\*Will Stock, Paul Lavery, Kristina Lemson, Glenn Hyndes, Kathryn

McMahon and David \*Goodall

## Postgraduate Students

\*Received CEM funding to present a paper or poster

*Australian Marine Science Association, Melbourne, Australia, Jul-07*

\*Adam Gartner

*Workshop for the Bardi Jawi Ranger Group and Dugong Steering Committee, Shark Bay WA, Jul-07*

David Holley

*17<sup>th</sup> International Arachnology Congress, San Pedro, Brazil, Aug-07*

\*Monica Russell

*Medecos XI Conference, Perth, Western Australia, Sept-07*

\*Caroline Canham and \*Jeff Cargill

*9<sup>th</sup> International Weeds Conference, Perth, Sep-07*

\*Steve O'Dwyer

*International Association of Hydrogeologists Congress - Groundwater and Ecosystems, Lisbon Portugal, Sept-07*

Muriel Bertuch

*Clean Air Society of Australia and New Zealand (CASANZ) and the Union of Air Pollution Prevention and Environmental Protection Association (IUAPPA) Joint Conference, Brisbane, Australia, Sept-07*

\*Victoria Lazenby

*8<sup>th</sup> International Conference and Workshop on Lobster Biology and Management, Charlotte Town Canada, Sept-07*

\*Lachlan MacArthur

*19<sup>th</sup> Annual Conference of the International Society for Environmental Epidemiology (ISEE), Mexico City, Mexico, Sept-07*

\*Wesu Ndilila

*Australian Coral Reef Society (ACRS) Conference, Fremantle, Australia, Oct-07*

\*Jason How

*AATAMS Acoustic Telemetry Workshop, Sydney, Nov-07*

Dave Holley

*Ecohealth 07 Conference, Deakin University Victoria, Nov-07*

\*David Blake, \*May Carter, \*Robert Campbell, Wesu Ndilila and \*Ute Goeft

*Ecological Society of Australia, Perth, 11<sup>th</sup> Annual Conference, Nov-07*  
Caroline Canham, Jeff Cargill and Maree Weerheim,

## Student Fieldwork Equipment/ Expenses and Travel Support

In 2007, \$4,580 was allocated to 5 postgraduate research students who applied for fieldwork equipment and expenses. Preference was given to applications for equipment which directly benefits a number of CEM members and/or postgraduate students. To this end, joint applications are encouraged. A further \$13,614 was used to support student presentations at conferences.

# Seminar Series

Brian R. Silliman

University of Florida

'Drought, Snails, and Large-Scale Die-Off of Southern U.S. Salt Marshes.'

Johan Eklöf

Department of Systems Ecology, Stockholm University (Sweden)

'What's the real price for a grilled fish and an ice-cream? Effects of seaweed farming and fisheries in Western Indian Ocean seagrass ecosystems.'

Alexander Watson

The Wilderness Society, WA

'Conserving Biodiversity in the Great Western Woodlands.'

Charlie Bond

School of Biomedical, Biomolecular and Chemical Sciences, University of Western Australia

'Hot and Sleepy: Structural Studies of Enzymes from Thermophilic Archaea and Trypanosomatid Parasites.'

Dave Holley

Centre Ecosystem Management, ECU

'Movement Patterns and Habitat Usage of Shark Bay Dugongs.'

Kevin Thiele

Curator, DEC Western Australian Herbarium

A/Prof Centre for Biological Information Technology, University of Queensland

'Lucid and IdentifyLife - identifying the living world.'

Peter Daszak

Executive Director, Consortium for Conservation Medicine, NY, USA

'Ecological Approaches to Emerging Diseases of Wildlife and Humans'

Richard Silberstein,

CSIRO Land and Water

'Do pines take groundwater from the Gnamagara Mound?'

Bea Sommer

School of Natural Sciences, ECU

'Drying and re-wetting of organic wetland sediments: geochemistry and implications for wetland management.'

Chris Hallett

Murdoch University

'Fish as Indicators of Estuarine Health.'

Dr Jackie Alder

Fisheries Centre, The University of British Columbia

'Does Fisheries have a Future?'

Paul Lavery

Centre for Ecosystem Management, Edith Cowan University

'Managing the Effects of Dredging on Seagrass Ecosystems – effects and indicators of light reduction.'

Dr Ute Mueller

School of Engineering and Mathematics, Edith Cowan University

'Geostatistical Modeling of Scallop Density Distribution in Shark Bay from Survey Data.'

Dr S. Ursula Salmon

School of Environmental Systems Engineering, University of Western Australia

'Predicting the potential for carbon-driven pH amelioration in acid-impacted systems.'

David Blake, Rob Campbell, May Carter, Wesu Ndilila and Pierre Horwitz

School Natural Sciences, ECU

'Exploring interdisciplinary research into environment, community and health.'

A/Prof Marianne Holmer

Institute of Biology, University of Southern Denmark, Denmark

'Stable sulfur isotope signals in seagrass derived from sediment sulfides.'





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**FOR FURTHER INFORMATION CONTACT**

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