



# About the NCSSA

The Nature Conservation Society of South Australia is a voluntary organisation. It has members drawn from all parts of the State and all walks of life. One of the primary objectives of the NCSSA is to "foster the conservation of the State's wildlife and natural habitats".

**Its activities include:** protecting and managing habitats, particularly native vegetation, researching threatened species and habitats, working to ensure adequate park dedication, management and legislation, educating the community and all tiers of government, and cooperating with other conservation groups and land managers.

The Society has taken action on many varied environmental issues since its formation in 1962.

## Surveys to support new reserve dedications

A major objective of the NCSSA has been to ensure that South Australia has a comprehensive and representative reserve system. This is a vital part of the system needed to ensure that the State's native plants and animals are conserved in their natural environment.

The Society has sought the addition of new reserves and opposed the withdrawal of existing reserves when necessary. It has been Society policy to put its case objectively, based on the facts available. Since 1966, in most years, there has been a major biological survey carried out by members and other volunteers to support the case for dedication of a new reserve in a particular area or to promote conservation in an area by a range of landholders.

## Promoting conservation more widely

The Society has played a strong role in the formation and development of environmental legislation such as the original Native Vegetation Management Act in 1985 and the Native Vegetation Act 1991. It is now obvious that conservation reserves alone will not ensure the survival of all of the State's plants and animals, and that as much native habitat as remains is needed to conserve the biological diversity of South Australia. The Society has played a major role in the promotion of biodiversity conservation on a range of land tenures including Heritage Agreements and in integrating biodiversity objectives into the whole range of land management decisions.

## Research about environmental issues

The Society conducts scientific research related to environmental protection and management. Studies done by, or on behalf of the Society, are published as reports and made available to the public through sale and distribution to libraries and government institutions. Grant funding supports this work, awarded on scientific merit from a number of grant sources.

## Education and skill development about ecological matters

The Society is also active in public education through activities such as an extension program of biodiversity understanding and management workshops for rural landholders, biological skill and knowledge development for members, informative general meetings open to the public, and through its newsletter Xanthopus.

## Getting involved with NCSSA activities

An elected Committee handles the Society's affairs. However it is not necessary to be a Committee member to play an active role in pursuing particular issues or topics of research on behalf of the Society. There are many opportunities to volunteer, such as assist on a survey, help manage a project, lead a members activity, or to promote the organisations activities.

The Society has its offices at **260 Franklin Street, Adelaide, 5000**. The NCSSA is financed by subscriptions, sales of its publications, private donations, and State and Federal Government grants. Much of the work is voluntary, while a few part time staff ably support this volunteer work. Donations are always welcome and fully tax deductible

For more information please contact the office on **(08) 7127 4630**, or by email [ncssa@ncssa.asn.au](mailto:ncssa@ncssa.asn.au).

## NCSSA people

### Management Committee

**President:** vacant

**Vice-President:** Helen Vonow

**Secretary:** Susan Graham

**Assistant Secretary:** Caroline Taylor

**Treasurer:** Richard Winkler

### General Committee

Nerissa Haby, Robert Lawrence, Blair Grace, Michael Stead, Jason Tyndall, Andrew Crompton (co-opted)

### Staff

**Conservation Ecologists:** Anthelia Bond and Georgina Mollison

**Administrative Manager:** Elizabeth Lonie

**Project Manager:** Tim Milne

**Temperate Woodland Campaigner:** Penny Paton

**Threatened Plant Action Group Coordinator:** Tim Jury

**Woodland Bird Survey Coordinator:** Tina Gillespie, Kelly Mackenzie

**Mokota Conservation Park survey coordinator:** Meg Robertson

**Database & Website Project Officer:** Lesley Parton

**Other ongoing project staff:** Kerry Gilkes and Peter Mahoney

### Regular volunteers

Sara Boulton: **Activities sub-committee**

Keith Lloyd: **General office support and library**

Christina Robertson: **General support**

Rachel Gein: **General support**

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# Conservation Ecologist Report

## Native Vegetation Clearance and safety on public roads

The Society has provided feedback to the Native Vegetation Council Secretariat regarding the development of a framework for native vegetation clearance for safety on public roads. As it currently stands the framework could allow for the clearance of a substantial amount of native vegetation on the State's road network, in many cases without the requirement for a Significant Environmental Benefit offset.

We are concerned that the draft framework which has been developed to provide guidance on native vegetation clearance has not been based on a sound and objective evaluation of the risks for biodiversity and the risks and benefits for road safety. The decisions have been made and guidelines developed without any modelling or investigation to evaluate their potential impact on the extent and quality of native vegetation on road sides.

By removing the requirement for a Significant Environmental Benefit offset when vegetation is cleared for road safety purposes, the disincentive for vegetation clearance is removed, making it more likely that vegetation clearance is the cheapest option and thus will be preferred in place of more expensive alternative road safety risk mitigation measures (eg barriers). The draft framework does not require road managers to exhaust all other potential risk mitigation measures prior to instigating clearance. Thus the removal of the requirement for Significant Environmental Benefit offsets in these circumstances undermines the effectiveness of the offset scheme which is intended to minimise the loss of native vegetation, and the framework does not in any way compensate for this.

We are also extremely concerned that the working group that have been developing this framework has been composed only of Department of Environment and Natural Resources staff, local Councils and the Department of Energy, Transport and Infrastructure. The latter two bodies have a clear driver to minimise costs and accountability and maximising the amount of clearance that would not require offsetting. These bodies should have been kept at arms length from the process, rather than oversee framework development. We are seeking far greater involvement of conservation interests, and, at the time of printing, have now been invited to participate in developing the framework.

## Draft Park Management Planning

The Society is currently undertaking a review of the Draft Management Plans for Ediacara Conservation Park and Lake St Clair Conservation Park. Public comments close on the 17th of December and the documents can be downloaded from the DENR website [www.environment.sa.gov.au](http://www.environment.sa.gov.au) for any of our members who are interested in providing comments.

## Development (miscellaneous) Variation Regulations 2010

With the help of Mark Parnell MLC the Society has been looking into the proposed Development (Miscellaneous) Variation Regulations 2010.

Mark Parnell gave Notice on Thursday October 14 that he would move to disallow these Regulations in Parliament on Wednesday 27th October due to concerns over the lack of transparency and consultation that would occur if the Regulations were put in place.

Changes brought about by these new Regulations include additions to the list of the type of government (or government-supported) developments that will not require any Development Approval under the current Development Act. Put simply, these types of development can be approved by the government with no consultation with the local council or the wider community. Under the changes, Local Councils must be notified, but have no right to any further engagement in the process after the initial notification.

Additions to the list of developments include:

1. Boat ramps
2. Tramways
3. Local desalination plants
4. Developments in National Parks
5. Iteration to existing dams for the purpose of increasing capacity

We will keep the membership up to date as any further information arises.

## Victoria Park Survey

We had an excellent turn out for our survey of Victoria Park remnant vegetation on the first weekend of November. Over the two days we completed two biological survey vegetation quadrats and collected measures of native plant density from over 60 points in the area. It was fantastic to see the flowering spear grass, wallaby grass, native wheat grass and chocolate lilies in the areas protected from mowing. Andrew Allanson, Survey Coordinator, is currently collating the survey results and we look forward to reporting more details when they are available.



Victoria Park survey volunteers. Photo: Annie Bond



# Conservation Ecologist Report (continued)

## National Park Australia Council AGM

This year our busy schedule of events in November included hosting the National Parks Australia Council AGM. We were joined by delegates from the National Parks Associations of Queensland, New South Wales, the Australian Capital Territory, Victoria and Tasmania for a weekend of meetings to celebrate, review and plan campaigns, share our skills and experience and of course, the usual business of an AGM.

It is always wonderful to meet and work with the good people involved in the National Parks Associations interstate. A particularly exciting outcome of the meeting is our plan to draft a joint, national policy statement regarding visitor, tourism and recreation management in parks.

Other highlights included interesting and informative presentations from John Schutz (Executive Director, Regional Services Department of Environment and Natural Resources) and Paul Donatiu (Executive Coordinator, National Parks Association of Queensland). John spoke about the important role of community organisations and volunteers in managing parks and biodiversity, and the implications of the recent merger of the departments DEH and DWLBC (including the regional NRM Boards). Paul gave us a report about his recent Churchill Fellowship study tour, in which he investigated the role of reserves for protecting rare flora from the impacts of climate change.

Our interstate visitors were also treated to a tour of threatened flora restoration sites, visitor facilities development sites and off track cycling impacts in Belair National Park, with witty commentary and insightful interpretation by our very own Tim Jury.

Many thanks to our speakers, leaders and behind the scenes organisers for an excellent event, and to Friends of Belair and DENR for the meeting facilities in Belair National Park.

## Development (Regulated Trees) Amendment Act

The Society recently reviewed the Development (Regulated Trees) Amendment Act which was passed in late 2009, although the associated regulations are yet to go through Parliament.

Changes to the Act include re-classifying the definition of a significant and regulated tree, effectively making it easier to remove large trees. At present all trees with a trunk circumference of 2 metres, measured at 1 metre above the natural ground level, are protected as significant. Under the proposed changes, significant trees must have a trunk circumference of at least 3 metres.

Twenty two species, including Box Elder, Silver Maple, White Poplar and Weeping Willow, won't be considered significant or regulated regardless of size, while only a handful of species will be protected if they are within 10m of an existing dwelling or pool.

We will keep the membership updated on the ongoing status of the regulations.

## NCS Strategic Planning

Over the past few months a significant amount of time has been put into the research and development of a strategic planning document to aid the Conservation Ecologists and NCSSA in developing planning policies, advocacy and scientific priorities for 2011. This document is still in its early stages and will be completed in early 2011.

**Annie Bond and Georgina Mollison**  
**Conservation Ecologists**

**Email: [scientific@ncssa.asn.au](mailto:scientific@ncssa.asn.au)**

## XANTHOPUS

The views presented in this newsletter are not necessarily those of the NCSSA

Copy deadline for the SUMMER edition is 18th December 2010.

Contributions in a variety of formats will be considered, but electronic submissions are preferred.  
Editorial Team for this issue: Sue Graham, Rachel Gein, Elizabeth Lonie and Helen Vonow.



# NATURE CONSERVATION SOCIETY OF SOUTH AUSTRALIA

## 2009-10 ANNUAL REPORT



Musk Lorikeets (*Glossopsitta concinna*) Photo by Tina Gillespie

### Achievements this year:

- Our advocacy for protection of our state's precious habitats and biodiversity, with a focus over the past year on our state's "protected" areas
- With the support of our volunteers we have surveyed important remnant vegetation on the Adelaide Plains and provided information to assist in advocating for its protection
- The successful negotiation by the Threatened Plant Action Group with landholders to protect critical habitat for threatened plant species including *Spyridium coactilifolium* and *Acacia retinocarpa*
- Our collaboration in significant biodiversity monitoring projects, including monitoring Mount Lofty Ranges woodland birds with the University of Queensland, and Bushland condition Monitoring with multiple NRM Boards
- Our continued support of conservation based research through our Conservation Biology Grant, this year funding work on native bee conservation and buffel grass invasion
- Topical and interesting public meetings with presentations on vital conservation issues such as *the Crisis of SA's freshwater fish* and *Mount Lofty Ranges woodland birds in decline*



## ABOUT THE NATURE CONSERVATION SOCIETY OF SOUTH AUSTRALIA

The Nature Conservation Society of South Australia is a not-for profit voluntary conservation organisation working to promote and protect South Australia's wildlife and natural habitats.



Leafy Greenhood (*Pterostylis cucullata*).  
Photo by Tim Jury

The NCSSA has a history of almost 50 years as a leader in advocacy for the environment and is a respected source of scientific information and informed comment on the biodiversity of South Australia.

One of the primary objectives of the NCSSA is to "*foster the conservation of the State's wildlife and natural habitats*", and the Society has taken action on many varied environmental issues since its formation in 1962.

Our activities include:

- promoting, protecting and managing native habitats
- researching and protecting threatened species and their habitats
- advancing the protection, management and strategic expansion of the state's reserve system, and
- educating the community and all tiers of government about environmental matters

## 2009-2010 MANAGEMENT COMMITTEE, STAFF & VOLUNTEERS

### Management Committee

**President** Helen Vonow  
**Vice-President** Katie Fels  
**Secretary** Susan Graham  
**Assistant Secretary** Caroline Taylor  
**Treasurer** Richard Winkler

### General committee

Ben Taylor  
 Nicole Lewis  
 Nerissa Haby  
 Robert Lawrence  
 Susan Gehrig  
 Hugh Kneebone (co-opted)

### Staff

**Conservation Ecologists** Anthelia Bond, Georgina Mollison and Tim Milne  
**Administrative Manager** Elizabeth Lonie  
**Project Manager** Tim Milne  
**Threatened Plant Action Group Program Coordinator** Tim Jury  
**Temperate Woodlands Campaigner** Penny Paton  
**Eastern Flanks Grassy Ecosystems Officer** Bill New  
**Mt Lofty Ranges Woodland Bird Survey Coordinator** Tina Gillespie  
**Mokota Conservation Park Vegetation Survey** Meg Robertson  
**South East Cemeteries Project Officer** Kerry Gilkes  
**Database & Website Officer** Lesley Parton  
**Bushland Condition Monitoring Evaluation Officer** Peter Mahoney

### Volunteers

**Regular:** Max Possingham (database), Keith Lloyd (general), Christina Robertson (general), Sara Boulton (activities), Rachel Gein (general) and many others who generously contributed their time throughout the year to various NCSSA conservation projects and activities

## 2009 -2010 FUNDING

NCSSA activities are funded by membership subscriptions, donations, book sales, investment interest, government grants and external funding agencies that fund many of our conservation projects.

Funding bodies for the 2009-2010 financial year included;

Adelaide & Mount Lofty Ranges Natural Resource Management Group, Australian Government Grants to Voluntary Environment and Heritage Organisations (GVEHO) Program, Department of Education and Children's Services, Department of Environment and Natural Resources, Eyre Peninsula Natural Resource Management Group, Murray Darling Basin Natural Resource Management Group, Native Vegetation Council Department of Environment and Natural Resources, Northern & Yorke Agricultural Districts Natural Resource Management Group, SA Water



Our part-time Conservation Ecologist position (the new title given to the Scientific Officer) augments the work of the NCSSA committee in our biodiversity advocacy role.

Tim Milne and Annie Bond continued in the role to January 2010, when Georgina Mollison returned from parental leave. Georgina and Annie now share the position.

Key areas of input include nature conservation and biodiversity protection, public land and sustainable natural resource management and natural heritage conservation.

In the last year we have:

- Continued to argue for improvements to the Department of Environment and Natural Resources' (DENR) visitor and recreation planning processes. We have been calling for:
  - \* Early, representative stakeholder involvement as part of accountable, transparent, and inclusive consultation processes.
  - \* A process to negotiate agreed 'first principles' that will underpin the planning for recreation in protected areas.
  - \* A landscape scale approach to planning that provides for the proper consideration of conservation objectives.
  - \* Decision-making informed by the results of an agreed environmental risk assessment process.
  - \* Scientifically sound monitoring and evaluation to support adaptive management and inform future planning.
- Made a submission to a Local Government Association inquiry into the management of trees on public land, and provided advice to the Native Vegetation Council about their draft framework for native vegetation clearance for road safety.
- Provided comment on the terms of reference for strategic assessment (under the EPBC Act) of DENR's fire management policies and procedures. We have also provided feedback on DENR fire management plans such as the Draft Fire Management Plan for Reserves of the Onkaparinga Valley.
- Provided advice to DENR regarding the determination of the 2010 Duck and Quail hunting season. We advised that a conservative approach should be adopted, due to the long period of dry conditions that preceded this season, and the uncertainty about recovery timeframes.



Arkaroola Wilderness Sanctuary Photo by Georgina Mollison

- Provided information and advice to the Native Vegetation Council (NVC) seeking to protect biodiversity from impacts of recent changes to the Regulations under the Native Vegetation Act. We are asking for measures to ensure the minimum impact on biodiversity from native vegetation clearance for fuel reduction; that communications are revised to present a balanced and factual representation of the relative risks from native vegetation; and that the NVC monitor and report on the impact of the regulation changes
- Argued for comprehensive protection for Arkaroola's biodiversity and landscape, by commenting on *Seeking A Balance: Conservation and Resource Use in the Northern Flinders Ranges*.
- Continued to support local native flora experts and concerned residents to highlight the significance of remnant vegetation in Victoria Park.
- Advocated for protecting the few remaining remnants of coastal vegetation in the Adelaide region from damaging development. We were particularly concerned by planned developments on the more significant remnants of sand dune systems, both at the Minda Incorporated site and on Torrens Island.
- Prepared a report on the management and status of South Australia's public protected areas. We presented this report to a symposium in Canberra titled "National Parks, can they take the heat?" which was convened by the National Parks Association of the ACT and attended by a diverse audience.

# ADVOCATING





# RESEARCHING

## MOUNT LOFTY RANGES WOODLAND BIRDS SURVEY

The Mount Lofty Ranges Woodland Bird Monitoring Program is a long-term project initiated by Professor Hugh Possingham, University of Queensland in 1999. It aims to assess the evidence for declines in woodland birds through repeated surveys of sites throughout the Mount Lofty Ranges.

Survey data is gathered annually from September to December, dependent upon funding. Each site is independently surveyed 3 times per year using the Bird Atlas' 2 ha / 20 min methodology. During the spring and summer of 2009, 163 sites were surveyed.

The NCSSA manages and coordinates the survey as well as securing funding for the project.

A paper by Judit Szabo *et al*, University of Queensland, using the data to describe changes in abundance of species, has just been accepted for publication in the refereed journal *Emu*.

DEH/DENR have provided funding to support the development of a précis document which summarises this program, the results obtained to date, and prospects for the future.

The Microsoft Access database used to collate all of the bird records has also been updated to allow for simple transfer of data from this project to the state system Biological Databases of SA, to ensure records are broadly accessible.

Ongoing funding for this project has been provided by the Adelaide and Mount Lofty Ranges Natural Resources Management Board.

A special thanks to all the surveyors who have helped gather data for the project this year, to Brian Knill for his assistance in maintaining and updating the database, and to Tina Gillespie for survey coordination.



Eastern Spinebill Photo by Brian Furby

## MURRAY DARLING BASIN WATERHOLES

We were contracted by the SA Murray Darling Basin NRM Board to collect baseline biological data at eight permanent water sites on the eastern flanks of the northern Mount Lofty Ranges, as there is only patchy information regarding the state and function of these waterways. This included the Burra, Baldina, Brady and Newikie Creeks.

A combined total of 374 indigenous plant species and 158 introduced plant species were found on the survey, including 106 species, or 28%, of some conservation significance. In terms of indigenous fauna, there were five

species of mammals, two species of frogs, eighty-five bird species (including three of conservation significance) and forty species of macroinvertebrates recorded. The data indicated that these permanent waterholes do provide significant refuge value for water dependent species.

This survey has been written up as a formal survey report, and is available from the NCSSA offices. Its reference is "Moise, D. and Milne, T. (eds) (2010). *A Biological Survey of Permanent Water Sites within the South Australian Murray Darling Basin Rangelands*. Nature Conservation Society of South Australia, Adelaide."

## CONSERVATION BIOLOGY GRANT

Each year we offer honours and post-graduate students the opportunity to apply for grant funding of up to \$1000 to support their research into aspects of conservation biology.

Funds are available for research which is aimed at:

- improving understanding of the conservation status of

species or ecological communities

- providing recommendations for improvement of some aspect of biodiversity conservation
- understanding the ecology of species or communities
- understanding threats to biodiversity and management of those threats.

This year we funded the following research projects:

Scott Groom, *Flinders University of South Australia* "South Australian native bee conservation in the face of combined habitat fragmentation and climate change"

Victoria Marshall, *University of Adelaide* "Mapping/ modelling the distribution of invasive weed, Buffel grass (*Cenchrus ciliaris*)"



## BUSHLAND CONDITION MONITORING

The Bushland Condition Monitoring project provides training and resources to allow community and professionals to score and monitor the condition of native vegetation. Field observations are made on ten condition indicators that are scored regularly. These indicators are measurable and dynamic attributes of bushland. They demonstrate how the bushland is changing, the magnitude of changes, and whether the condition or health of the bushland is improving, deteriorating or remaining stable. The resultant suite of observations is then compared to a set of Vegetation Community-specific Condition Benchmarks developed for each region by NCSSA.

We have provided training workshops to 28 people across the state, including on the Eyre Peninsula, in the Mount Lofty Ranges and in the Murray Darling Basin.

These workshops not only introduce people to the monitoring method, but have also been demonstrated through evaluation to significantly build attendee's understanding of the



Galahs (*Cacatua roseicapilla*) Photo by Dragos Moise

function of their local ecosystems.

The Society also completed a presentation on native vegetation condition indicators at a Federal Government workshop that was reporting on Caring for our Country outcomes.

We are working collaboratively with projects across a number of regions, including in the Mount Lofty Ranges, Murray Darling Basin, Eyre Peninsula, and Northern and Yorke. Since last year 289 additional sites have been established

across the state using this methodology. We have compiled data and prepared summary reports, including an ongoing protocol for monitoring for the Northern and Yorke Natural Resource Management Board, and SA Murray Darling Basin NRM Board.

Support for this project has been provided by the Adelaide and Mount Lofty Ranges NRM Board, the Northern & Yorke NRM Board, the Eyre Peninsula NRM Board, and the SA Murray Darling Basin NRM Board.

## WILDEYRE



Pygmy Possum (*Cercartetus concinnus*)  
Photo by Peter Bird

In the last year, NCSSA has continued as a partner in the WildEyre project.

WildEyre aims to protect the complex and unique habitat areas of western Eyre Peninsula through collaborative landscape scale conservation planning and action.

Collaborators in the WildEyre project include Greening Australia, The Wilderness Society, Department of Environment and Natural Resources, Eyre Peninsula Natural Resources Management Board and the NCSSA.

We are extremely pleased with the outcomes this project is providing, with over four hundred thousand dollars for on-ground works in the region being sourced in the last two years.

INFLUENCING





# VOLUNTEERING

## THREATENED PLANT ACTION GROUP (TPAG)

During 2009-10 TPAG continued with threatened flora recovery and stewardship work throughout South Australia's fragmented agricultural regions for around 60 threatened plant species and six threatened ecological communities.



Behr's cowslip orchid (*Diuris behrii*) Photo by Tim Jury

Over 2500 hours of on-ground work by more than 50 volunteers contributed to recovering species populations and improving the condition of critical habitat at around 50 sites.

Implemented recovery actions included: Abatement of serious weed threats; pest control; fencing to protect habitat; plant population monitoring; flora surveys; revegetation; stakeholder liaison; and public education.

Effective working partnerships with landholders, environment agencies and other community groups continue to develop. One grant was obtained and two others assisted to implement on-ground work. Working bees

and field days continue to be productive with some excellent results gained from actions undertaken to regenerate and restore threatened flora. TPAG continue to make a real and tangible contribution toward improving the *in-situ* conservation prospects for South Australia's threatened flora.

Thanks to our partners and supporters including NCSSA, Regional NRM Boards & DENR, Adelaide Botanic Gardens, Friends of Parks, SA Water, Forestry SA, District Councils, Australian Plant Society, and numerous private landholders.

Once again, our thanks goes to Tim Jury for his great work as Program Coordinator.

## REEVES PLAINS BIOLOGICAL SURVEY

The 2009 NCSSA Volunteer survey was of the remnant flora of eight remnant vegetation sites within the area known as Reeves Plains, north of Gawler in the Adelaide Mount Lofty Ranges (AMLR) region. The work was undertaken to address knowledge gaps in baseline data on vegetation that is at risk from sand mining.

Fourteen keen volunteers assisted to gather data across two days in September 2009.

A total of 155 species were found in the vegetation survey quadrats in the eight sites. Of these, 104 were native and 51 were introduced. Of the native species, one was Vulnerable at state level and 34 were rated as significant at regional level, made up of one Endangered, six Vulnerable, 16 Rare and 11 Uncommon species.

Whilst there were a relatively large proportion of weeds at most sites, the survey revealed a significant diversity of native species still exist in the Reeves Plains area. Many species of conservation significance were also noted.

Given the close proximity of this area to the highly

denuded Adelaide metropolitan area, and the fact that only 3% of native vegetation remains in the Mallala region, these remnants should be prioritised for protection.

This survey was done in conjunction with the Gawler Environment and Heritage Association Inc.



Reeves Plains survey site

## PUBLIC INFORMATION MEETINGS

Our general meetings are held bi-monthly and are open to NCSSA members and the general public.

The meetings usually involve an update of current issues that we are working on, and any general business of the organisation, followed by a talk from a guest speaker invited to discuss an environmental topic of current interest.

Over the past year we have run several of our meetings in partnership with the *Biology Society of South Australia*. These meetings have been well-attended and interesting and much thanks goes to Joel and Laura from BSSA and Sara Boulton and our Activities sub-committee for their efforts in organising these meetings.

Talk topics over the 2009-2010 year were:

- *Crisis of South Australia's freshwater fishes*, by Dr Michael Hammer, Native Fish SA.
- *A decade of satellite tracking seals and seabirds in SA*, by Dr Bradley Page, SARDI.
- *Are river red gums being pushed to the edge?* by Dr Anne Jensen, Environmental Consultant, Wetlands and Natural Resource Management.

- *The Million Trees program – A glance at this program and its impact on the urban landscape*, by Chris Gibson, Million Trees Program, Urban Biodiversity Unit, Department of Environment and Natural Resources.
- *Conservation on South Australia's offshore islands* by Jason Van Weenen, Regional Ecologist, Department of Environment and Natural Resources.
- *Are Mount Lofty Ranges woodland birds declining?: a snapshot of 10 years of monitoring data*, by Tina Gillespie, Mount Lofty Ranges Woodland Bird Project Officer.
- *Pollination biology and ecology of saltmarsh communities in S.A. (with a focus on the impacts of introduced plants, *Limonium* spp.)*, by Melissa Schlein, PhD candidate, Flinders University.
- *Rabbits on the rebound: dire consequences for biodiversity*, by Dr Ron Sinclair, Senior Research Officer NRM Biosecurity Unit, Department of Environment and Natural Resources.

We would like to express our appreciation to all those who spoke at the above meetings.



River Red Gums in trouble. Photo by Anne Jensen

## NCSSA PRESENTATIONS

Through its projects, staff and volunteers, we continue to educate the community about the significance of biodiversity.

In the past year, presentations have been given to a broad spectrum of people on a wide variety of topics, including:

- to the Local Government Association on the impacts of climate change on biodiversity
- two presentations on the plight of Mount Lofty Ranges woodland birds, and the NCSSA's ongoing monitoring program
- a series of presentations to over 200 primary school students at the Appila Springs field day on the importance of habitat and biodiversity
- two presentations to field naturalist groups on the reptiles of the Mount Lofty Ranges region
- a talk on South Australia's biodiversity to Mercure Grosvenor staff
- written articles and presentations on South Australia's threatened plants

EDUCATING

# Diet analysis and phylogeographic structure of the locally extinct Ghost Bat *Macroderma gigas* of southern Australia.

## Background

The Nature Conservation Society of SA has provided support for one aspect of my PhD, which is examining the diet and phylogeographic structure of the locally extinct Ghost Bat *Macroderma gigas* in southern Australia.

A leading hypothesis for this extinction is that key prey species became extinct at the same time.

Collection of fossilised Ghost Bat scats and bone remains was conducted in the Flinders Ranges, SA, and in the Northern Agricultural Region north of Perth, WA, in the latter half of 2009.

I have undertaken molecular analysis of these scat and prey remains to determine which species the southern Ghost Bats were feeding on, as well as to investigate the phylogeographic relationship of the extinct populations to modern day colonies.

## Introduction

The Ghost Bat *Macroderma gigas* is an iconic species of carnivorous bat endemic to Australia.

Their geographic distribution has been contracting northwards during the past few hundred thousand years (see Figure 1), but the exact timing of the extinction of southern Ghost Bat populations, and their genetic relationship to extant populations in northern Australia, is not known.

Whatever the timing of these events, the reasons behind the extinctions of the southern populations, which are separated from the northern populations by 1000's of kilometres, is intriguing.

One possible explanation for the extinction of the Ghost Bat in southern Australia is that certain prey species declined at the same time.

An aim of this project is to investigate this hypothesis by genetically identifying the prey species of southern Ghost Bats using their sub-fossil scats in cave deposits.

By determining the diet of the Ghost Bat in southern Australia, this project will provide important information for their management and conservation nationally, by establishing which prey species are important to the long-term persistence of populations.

## Aims

- Identify the proportion of extinct, or currently declining, prey species in Ghost Bat scats from each region.
- Determine the phylogeographic relationships of extinct southern and extant northern populations, using an existing dataset from northern colonies.

## Field Work Sites

### Flinders Ranges, South Australia (SA)

Since the early 19th century, when bat guano was mined for fertilizer, the Flinders Ranges was known to support extinct ghost bat colonies (Churchill & Helman 1990).

Medlin (1993) identified specific cave sites previously occupied by Ghost Bats, based on their fossilised scats.



**Figure 1.** Past and present populations of the Ghost Bat in Australia. Labelled populations are extant colonies; small shaded circles show extinctions since European settlement; small filled squares show extinct populations known only from fossils; large circles show populations featured in Figure 4. Adapted from Worthington Wilmer et al. (1999).





**Figure 2.** Photo of Ghost Bat scat deposit - collected from a near Leigh Creek, SA (Photograph by Author).

As part of my project, Ghost Bat remains were collected from several of these cave sites in Chambers Gorge, as well as another cave near Leigh Creek (see Figure 2).

This fieldwork was conducted in late October 2009 with the assistance of Aaron Camens (University of Adelaide).

Samples of Ghost Bat scats and subfossil remains of prey species were collected from three cave sites for further analysis at the South Australian Museum (SAM) and the Australian Centre for Ancient DNA (ACAD).



**Figure 3.** Photo of Ghost Bat skull with prey skull for scale - collected from E-24 cave (Photograph by Robert Susac).

## **Northern Agricultural Region (NAR), Western Australia**

Cave sites in the Western Australian NAR and near Margaret River, also contain evidence of Ghost Bat occupation (Armstrong & Anstee 2000; Douglas 1967; Susac 2009).

Scats and bone remains (see Figure 3) were collected from six caves in the NAR (caves J-3, E-3, E-22, E-24, E-52, and M-1) to extend the geographic range of the study.

This fieldwork was undertaken in early December 2009, with the assistance of Greg Thomas, Robert Susac, and Barbara Zakrzewska from the Western Australian Speleologists Group (WASG).

A visit to the Western Australian Museum (WAM) in the same trip also allowed sampling of some Ghost Bat scats collected from the region in the mid-1970's.

## **Molecular methods**

The genetic material contained in scats is increasingly employed as a means to study a wide variety of questions in ecology and molecular ecology.

DNA from the Ghost Bat scats and skeletal remains will be extracted using standard ancient DNA protocols (Rohland and Hofreiter 2007) in the ACAD lab.

Initially, universal primers will be used so that DNA from all of the prey species present in the scats can be amplified.

The DNA sequence of each of these species will be separated from each other using Second generation sequencing techniques.

Control region primers specific to Ghost Bats will also be used to amplify Ghost Bat DNA from the bone remains, as well as the scats.

The addition of Ghost Bat DNA sequences, from numerous individuals across the southern populations, will allow comparison of genetic diversity across all Ghost Bat populations, past and present (Worthington Wilmer et al. 1994; Worthington Wilmer et al. 1999; Armstrong unpublished).



## Diet analysis and phylogeographic structure of the locally extinct Ghost Bat *Macroderma gigas* of southern Australia cont.

### Results

#### Diet

So far the extraction of DNA from Flinders Ranges' Ghost Bat scats has been unsuccessful.

Neither Ghost Bat primers, nor primers designed to amplify prey species have yielded any amplifiable DNA.

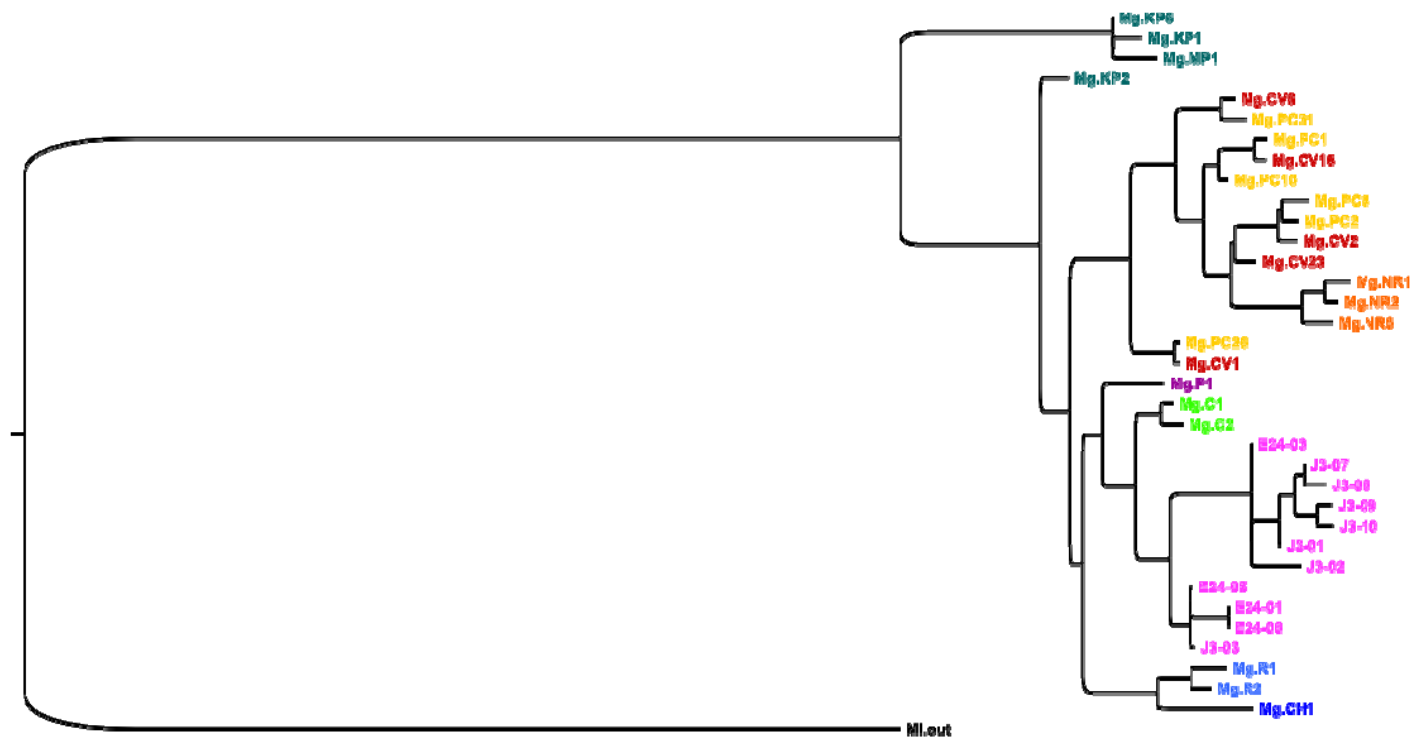
#### Phylogeography

Ghost Bat bones and teeth from the WA cave sites have yielded well preserved DNA, and sequences have been obtained from at least 11

specimens sampled from caves E-24 and J-3 in WA (see Figure 4).

Interestingly, these extinct Ghost Bat populations in the NAR are more closely related to modern populations at Camooweal in Queensland (located 2,500km away) than the geographically closer populations in the Pilbara (located 1,000km away).

However, these populations do form a southern clade, together with the Cape Hillsborough and Rockhampton populations in Queensland, that is separate from all the more northern Australian populations.



**Figure 4.** Consensus Ghost Bat phylogeographic tree constructed in MrBayes showing 11 sub-fossil specimens from WA sampled in this study, and compared to sequences from Genbank (Worthington Wilmer 1999). Sample codes from Genbank data: Mg.PC - Pine Creek; Mg.CV - Claravale Station; Mg.NR - Nourlangie Rock; Mg.KP - Kings Palms Station; Mg.MP - Mitchell Palmer; Mg.R - Rockhampton; Mg.CH - Cape Hillsborough; Mg.P - Pilbara; Mg.C - Camooweal; Ml.out - *Macroderma lyra* used as an outgroup. Sample codes for specimens analysed in this study refer to cave code (J03 or E24).

### Conclusions

Ancient DNA data, obtained from the WA cave, indicate that gene flow across the centre of the country occurred between the more southerly Queensland and Western Australian populations.

Cave remains from extinct populations near Alice Springs may illuminate the gene flow patterns more fully across the centre of Australia.

Accordingly, Ghost Bat specimens from Alice Springs are being sourced from the SAM to investigate connections across central Australia.

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