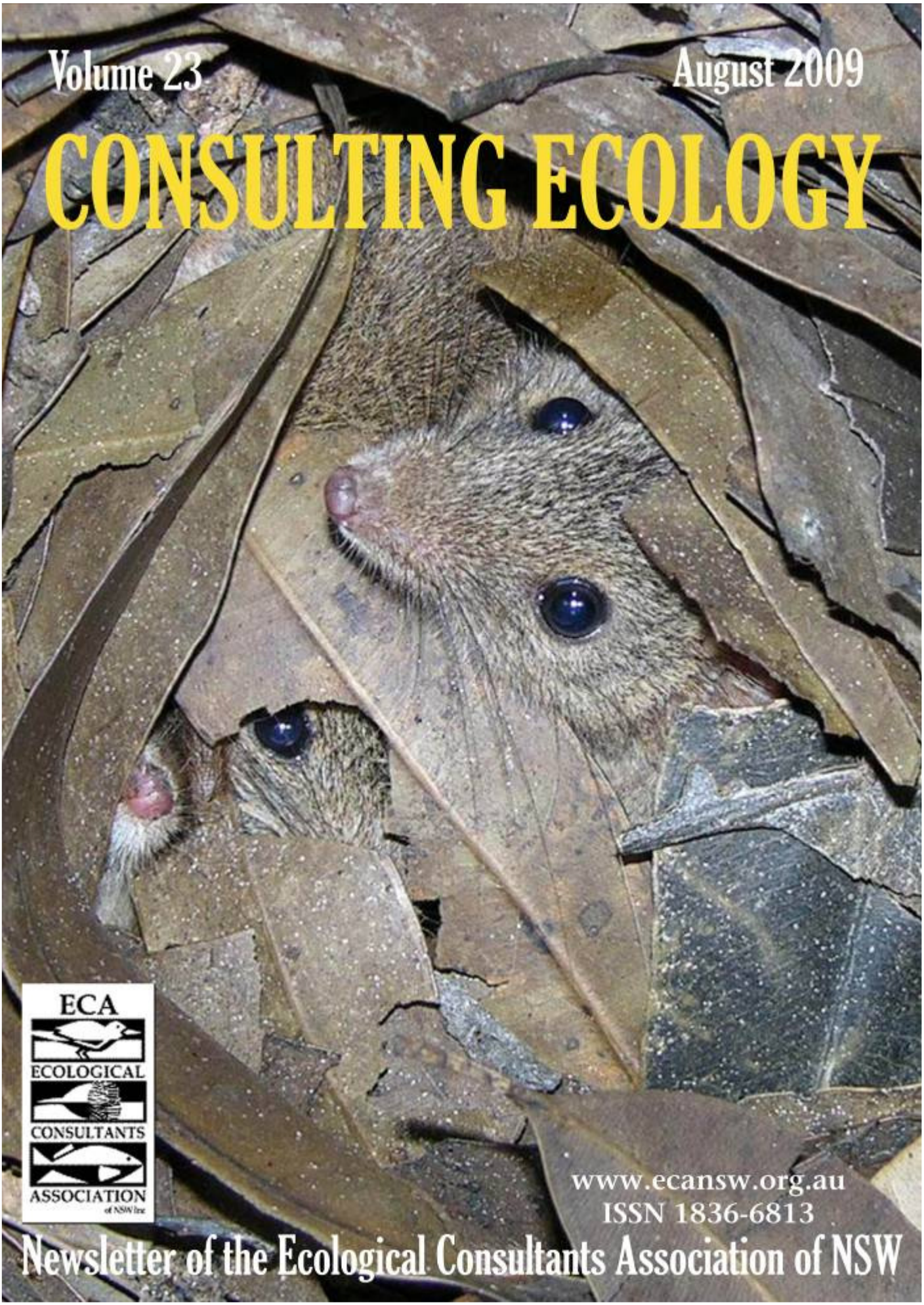

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ECA ECOLOGICAL CONSULTANTS ASSOCIATION of NSW Inc

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Left: Moored yachts in the Parramatta River (**See Page 11**). **Below:** Little Penguin (*Eudyptula minor*) (**See Page 14**). *Photos courtesy of Stephen Ambrose.*

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Right: Sandplain or Crowned Gecko (**See Page 73**) *Photo courtesy of Phil Cameron.*

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Front Cover Photo: Brown Antechinus (*Antechinus stuartii*) family residing in an nest box. *Photo courtesy and Copyright of Narawan Williams*

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Message from the President

Dr Stephen Ambrose

ECA Conference, 4 September 2009

The ECA's annual conference and annual general meeting will be held at The Harbourside Function Centre, Queen's Wharf in Newcastle on Friday, 4 September 2009. The theme of the conference is "*Ecology at the Rural/Urban Interface*" and discusses some of the ecological issues that are faced by consultants, planners, councils, land managers, community groups, and state and commonwealth government bureaucrats as urban development extends further into rural and natural environmental areas.

The main issues dealt with by the conference are:

(i) urban expansion and bushfire management;
(ii) climate change and its implications for vegetation management, ecological restoration and biodiversity conservation at the urban/rural interface;
(iii) urban expansion and endangered/critically endangered ecological communities;
(iv) the changing landscape and the roles of BioBanking, community advocacy and environmental legislation; and
(v) ecology of specialized urban (mining and major highway)/farmland interfaces.

Among the distinguished speakers at the conference are Dr Alan York (Melbourne University) and Duncan Maughan (Terramatrix Pty Ltd), who are recognized internationally as experts on bushfire management and ecology. They are part of a team of bushfire experts who are currently advising governments on bushfire policies in the light of the February 2009 bushfires in central Victoria. Other speakers provide a blend of expertise direct from the coal-face of ecological consultancy, academic research, government administration and community advocacy for the protection of the natural environment.

Annual ECA conferences provide consultants, students, and government and general community representatives with a vital opportunity to keep abreast of the latest issues, research and techniques that are essential for our industry, an opportunity to network with friends and colleagues, government authorities and potential client, and voice your opinions on matters relevant to the conference theme. Therefore, if you plan to attend the conference,

please help the conference organizers by registering early, rather than leaving it until the last minute. So, I hope to see you there!

Accreditation of Ecological Consultants in NSW

A really important issue that seems to be on the minds of all ecological consultants is accreditation. Dr Martin Denny (1st Vice-President of the ECA) published a very comprehensive paper on this topic in the February 2009 issue of *Consulting Ecology*. His paper describes: (i) the long-term planning for accreditation of ecological consultants by the DEC(C), during which the ECA played a major role in designing a draft accreditation model; and (ii) in the light of inaction by DECC on this issue over the last two years, a proposal for an accreditation system that could be run by the ECA for ecological consultancy in NSW.

The DECC's explanation to the ECA for its recent inaction in developing an accreditation scheme is that this issue is no longer high on its list of priorities. This is frustrating because ECA Councils over the last six years have recognized the need for accreditation of consultants and have devoted a lot of time, resources and intellectual energy into working with DECC to help set up an accreditation scheme.

The publication of Martin's paper has invoked some discussion about accreditation on the forum on the ECA website (www.ecansw.org.au), but to date, the vast majority of ECA members has been ominously silent on this issue. Therefore, it is hard to know if the general membership is in favour of, against, or indifferent to the ECA running an accreditation scheme.

Parallel to these events, the Environment Institute of Australia and New Zealand Inc. (EIANZ) has had its own Certification of Environmental Professionals (CEnvP) Scheme since 2004. Some ecological consultants in NSW, some of whom are members of the ECA (as well as other environmental professionals), have sought and received this certification. I have heard that many other ecological consultants have chosen not to be certified through the CEnVP Scheme because (i) the application process was too cumbersome and (in their opinion) unnecessary, adding considerably to the time already taken up in completing other bureaucratic tasks (e.g. completion of annual return forms associated with scientific licensing, animal ethics committees and forestry permits; (ii) costs associated in applying for certification; and (iii) the generalized nature of certification, rather than one that is tailored specifically for ecological consultants. The latter point is being addressed by the recently formed special-interest Ecology Group of the EIANZ, which is drafting a CEnvP Scheme especially for ecological consultants, as indicated by former ECA member, Simon Mustoe on the ECA Discussion Forum (*Accreditation of Ecological Consultants*, 18 March 2009). However, the details of such a scheme have not yet been finalized.

So where does the ECA go from here? There are a number of important issues and questions that I think should be discussed by members at our annual general meeting on 4 September 2009. Here are just a few that immediately come to my mind, and I'm sure that you can add to the list:

1. Should there be a voluntary accreditation scheme for ecological consultants in NSW?
2. If so, are you in favour of a government-run (i.e. DECC or DEWHA) or an industry-run accreditation scheme? If the former, how can we encourage government departments to put the development of an accreditation scheme high on their list of priorities? If the latter, should the ECA implement its own accreditation scheme, or should we encourage our members to be certified through the EIANZ's CEnvP Scheme, or is there another industry body that is better suited to accrediting consultants?

3. If you think that the ECA should run an accreditation scheme, is the model proposed by Martin Denny appropriate, or are there alternatives? If there are alternatives, what are they?

In answering these questions, there are many other issues to consider. For instance, the cost of implementing an accreditation scheme would have to be passed onto those consultants who wish to be accredited. These costs are likely to be met easily by larger companies who wish to accredit their employees, but could be a financial burden to sole traders and owners of small companies with several employees. Therefore, costs need to be reasonable and affordable so that they do not discourage ecological consultants from becoming accredited.

Secondly, what would be the legal liability of the ECA in accrediting consultants? For instance, would the ECA be exposed to being sued if it does not accredit a consultant who is seeking accreditation, or if an accredited consultant is subsequently found to be negligent in performing his/her professional duties?

Thirdly, what are the real environmental benefits of accreditation? Any accreditation scheme would have to be voluntary unless there is government legislation that made it compulsory. Voluntary accreditation has the potential to benefit accredited consultants in terms of acquiring consultancy work, but there is still a risk of inadequate and unprofessional consultancy work being conducted by both accredited and non-accredited consultants.

Finally, should an accredited consultant be disciplined by the accrediting body if that consultant has been found negligent or unprofessional in conducting consultancy work? If not, what is the point of accreditation? If so, what investigation procedures should be employed, who should conduct the investigations, what avenues would a consultant have in answering allegations of negligence or unprofessionalism, and what disciplinary actions could be employed? Would the threat of disciplinary action discourage some competent consultants from seeking accreditation? And if an accredited consultant is disciplined, would it actually have any real impact on that individual's consulting activities?

These are just a few of the issues that I hope you will discuss at the ECA's agm in September. It's not likely that they will be resolved at the meeting, but your viewpoints will provide considerable guidance to the newly-elected ECA Council as to what direction it should be heading over the next 12 months with respect to accreditation. If you are unable to attend the agm, but would like to contribute to the discussion, you can email them to Amy Rowles at admin@ecansw.org.au, phone me on 02 9808 1236, or contribute to the discussion on the ECA forum, and all points will be tabled at the agm.

Future ECA Policies and Activities

Past and present ECA Councils regularly (and frequently) ask ECA members what they want from their membership, but few members respond. A very small number of people chose not to renew their memberships this year, and the reason they cited was that the ECA was not living up to their expectations. So, once again, I extend an invitation to everyone to let the present and future ECA Councils know what you want from your membership, because it is very difficult to read peoples' minds. The ECA forum is also a great way to put some ideas out there, and to get feedback from others. However, as I've mentioned previously, be prepared to help your ECA Council to implement your ideas.

Finally, although the ECA's *Rules of Association* does not specify a maximum term for membership of the ECA Council, some long-term

council members are also in need of a break from ECA governance. So, I hope that some of you with some drive and enthusiasm for the ecological consulting industry will "throw your hat in the ring" and stand for election to the ECA Council at the annual general meeting on 4 September 2009. I'm sure that most ECA Councillors (past and present) have found their time on Council both rewarding and satisfying (and a fine feather in the cap of your resume), and a very special comradery definitely develops between council members. So, have a go, and bring some fresh new ideas onto the ECA Council.

PHOTO COMPETITION

Congratulations! to ***Narawan Williams*** for winning the last photo competition with his photograph of the Brown Antechinus *Antechinus stuartii*, featured on the front cover. This family were inhabiting a nest box designed for Squirrel Gliders.

Thank you to everyone who entered our photo competition. All entries have been included in the ECA Photo Gallery on the back cover.

Email your favourite flora or fauna photo to admin@ecansw.org.au to enter a competition and have your photo on the cover of the next ECA newsletter. Win your choice of one year free membership or free entry into the next ECA annual conference. The winner will be selected by the ECA council. Runners up will be printed in the photo gallery

EUROKY

Euroky: ***ability of an organism to adapt to changes in the environment***

If you have any interesting observations or useful hints and information that you would like to share in the euroky column, please forward them to the newsletter editor or administration assistant to be included in the next edition.

Reported Lethal Effects of Disposable Gloves on Tadpoles

Amy Rowles
ECA Administrative Assistant
Ecotone Ecological Consultants

During a lab experiment, Cashins et.al, (2008) found that latex and nitrile gloves had a lethal effect on *Litoria genimaculata* tadpoles, however vinyl gloves did not appear to have an adverse effect. Later in the field, the authors found vinyl gloves to have a lethal effect on a proportion of tadpoles, suggesting that there is chemical variation between boxes of gloves. Cashins et al (2008), modified their protocol to include the rinsing of vinyl gloves in water, prior to handling a tadpole. Since adopting this protocol Cashins et al (2008), have had no further fatalities. There are no known deleterious effects of disposable gloves on juvenile and adult amphibians (Cashins et al, 2008).

References:

Cashins S., Alford R. and Skerratt L. (2008). Lethal Effect of Latex, Nitrile and Vinyl Gloves on Tadpoles. *Herpetological Review* 39(3):298-301

Trip to the West – Report on the Australian Mammal Society Meeting in Perth.

Martin Denny
Biodiversity Monitoring Surveys
ECA Member and 2nd Vice President

I was fortunate to be able to take time out to travel to Perth to attend the 55th meeting of the Australian Mammal Society. It was 50 years since the society was established (in Perth) so it was a good time to attend. About 100 people attended, coming from all parts of Australia and the meeting was spread over three days (no concurrent sessions, hooray) with a visit to Karrakamia Sanctuary (Australian Wildlife Conservancy) one afternoon. Some 52 papers were presented and 19 posters displayed. These covered a wide range of topics clustered under reproduction, physiology, morphology and taxonomy, conservation genetics, conservation and translocation, ecology, predators and parasites and the flavour of the month: climate change. Mammals discussed ranged from several Western Australian species, to shrews, rock-wallabies, foxes, platypus and dolphins. Some of the more interesting talks included the use of pesticides for locusts affecting *Sminthopsis*, dietary overlap between native and introduced predators, Brush-tailed Rock-wallaby habitat, and different teat numbers on Agile Antechinus. I was able to give a talk on the difficulties on identifying some species of *Antechinus* in the field and this gave rise to the use of a "Denny Index" in future management strategies (whether species was fluffy or flouncy).

Apart from the interesting papers and the chance to catch up with many colleagues, there was an excellent post-conference tour that took about a dozen of us to the south-west of the state. We visited an area in the Dryandra Woodland, which is a relatively open woodland dominated by heathy understorey. We stayed at two field stations run by the WA Department of Environment and Conservation (unlike NSW, they still believe in conservation, instead of climate change). At both places we were able to see and trap (in the field) rare species such as Brush-tailed Bettongs (Woylie), Western Quoll (Chuditch) and Common Brush-tailed Possums (uncommon over there). At the Dryandra field station, we were tracking a radio-collared Numbat when one came out of the bush and walked between our legs into it's burrow. No wonder these animals are rare, with such a trust of humans.

Overall, a great trip and a good 'shot in the arm' to keep the enthusiasm going as a consultant zoologist, still able to undertake a limited amount of research.

The Numbat at Martins feet

August 2009 Theme:

Marine and Estuarine Ecology

***Newsletter Theme**: Each edition of **Consulting Ecology** will include a collection of articles on a similar topic, creating a newsletter theme.*

*The theme for February 2010 is **Aquatic and Riparian Ecology.** If you have knowledge and expertise in this area we encourage you to contribute to the next edition of **Consulting Ecology.***

Seagrass beds offshore in Pittwater, Sydney

Identification and Threats to NSW Seagrass Communities

Alison Hunt
Alison Hunt & Associates Pty Ltd
ECA Council Member

Seagrasses are flowering plants which occur in marine and estuarine environments, large beds of which can still be found near most of our coastal cities. An increasing awareness of their importance in stabilising coastal sediments, improving water quality and providing habitat for important commercial fisheries species and nursery habitat for many marine species has highlighted the need for these areas to be protected from the impacts of both terrestrial and aquatic development. In the past, bays and estuaries have been reclaimed and dredged for development and many have been indirectly impacted by poor catchment management practices (Keough & Jenkins 1995).

Of the six species of seagrass found along the NSW coastline, *Zostera capricorni* (Ribbonweed), *Halophila ovalis* (Paddleweed) and *Posidonia australis* (Strapweed) are the most common, although *P. australis* occupies fewer habitats than the *Zostera* and *Halophila* species along the NSW coast. *P. australis* only grows in marine dominated conditions where the sediments are more stable. Other species which occur along the NSW coastline include *Zostera muelleri*, *Heterozostera nigricaulis* and *Halophila decipiens* (NSW DPI 2007).

Direct impacts on seagrasses as a consequence of development may include destruction of beds for erection of jetties, retaining walls and other structures, damage from the movement of boats across the beds and other water based human activities. Whilst such impacts are relatively quantifiable, the indirect impacts associated with development, including terrestrial based development, is often more difficult to quantify, both spatially and temporally. Seagrasses are particularly sensitive to changes in water quality through increases in turbidity as they require a certain level of water clarity for sunlight penetration to allow for photosynthesis. Similarly, raised nutrient levels allow epiphytic algae to grow on the fronds of seagrass plants which also

Zostera capricorni beds in the Hastings River Estuary, Port Macquarie

reduces the plant's ability to photosynthesise (Butler & Jernakoff 1999).

Assessing the degree of impact a development may have on seagrass beds can often be difficult as spatial and temporal impacts also need to be assessed. The spatial extent of impacts associated with changes in water quality may not necessarily be easily quantifiable, although modelling of predicted outcomes may assist. The impacts may also vary temporally in line with stormwater discharge and run-off associated with weather related events as the ability of seagrasses to deal with influxes of often high volumes of nutrient enriched freshwater and increased movement of sediments may also vary seasonally.

Seagrass beds and encroaching mangrove seedlings, Batemans Bay

The importance of considering all aspects of potential impacts of development is highlighted by the slow recovery of seagrass beds that have been affected by human induced causes. Even though advances have been made into the restoration of seagrass beds through transplantation and reseeding, this process is costly and not always successful.

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Butler A and Jernakoff P 1999 *Seagrass in Australia: Strategic Review and Development of an R & D Plan*. CSIRO Publishing. CSIRO Marine Research, Hobart Tasmania, 225 pp.

NSW DPI 2007 Primefact 629. Seagrasses. NSW Department of Primary Industries, September 2007, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0019/203149/seagrasses-primefact-629.pdf

Keough MJ & Jenkins GP 1995 Seagrass meadows and their inhabitants. In Coastal Marine Ecology of Temperate Australia. AJ Underwood & MG Chapman (eds.) UNSW Press, Sydney.

Rock pool with the Red Waratah Anemone (*Actinia tenebrosa*)

This photo was taken in the Torres Strait, where Alison has been working recently. Photo courtesy of Alison Hunt.

Recreational Boating and Waterbirds

Stephen Ambrose
Ambrose Ecological Services Pty Ltd
ECA President

Many Australians engage in recreational boating on coastal and inland waterways, yet there is little consideration of the impacts of this activity on waterbirds (shorebirds, seabirds and waterfowl) that also use these areas. Dr Stephen Ambrose examines the mounting global evidence that shows how boating activities can have a significant impact on the survival of waterbirds.

Introduction

Waterbird species are under increasing pressure globally from recreational boating. Until recently, recreational boating was considered to be relatively harmless to waterbirds. However, a few studies have shown that disturbances from boating and associated activities can significantly affect the long-term survival of waterbird populations.

Boating activities are known to disturb waterbirds in four ways:

1. Immediate disturbance to feeding and loafing routines (e.g. Burger & Gochfeld 1998, Fitzpatrick & Bouchez 1998, Lafferty 2001).

2. Long-term disturbance to territorial occupation, and feeding and loafing routines (e.g. Goss-Custard & Verboven 1993, Klein et al. 1995, Fox & Madsen 1997, Robinson & Cranswick 2003). If disturbance is severe enough to make resident species leave their territories for hours at a time, the birds can desert them altogether and perhaps fail to re-establish elsewhere.

3. Long-term disturbance to breeding and consequent reduction in breeding success (e.g. Mendall 1958, Ames and Mersereau 1964, Mickelson 1975, Reichholf 1976, Titus and van Druff 1981, Rodgers & Smith 1995). Disturbance during the breeding season can cause birds to leave their nests unattended for long periods, increasing the chance of predation and decreasing the likelihood of successful hatching. Disturbances that scatter broods would increase the chances of losses from predation and exposure, and thus decrease breeding success.

4. Energetic impacts on migratory birds. A number of studies have shown that disturbance may not always impact on individual birds or their populations. For instance, when disturbances occur over the short-term, estuarine birds are able to compensate for lost feeding time or poor conditions by feeding at different times (for example, at night, Belanger & Bedard 1990), increasing their feeding rate (Swennen et al. 1989, Fitzpatrick & Bouchez 1998, Atkinson et al. 2007), feeding for longer (Stillman & Goss-Custard 2002) or feeding elsewhere or in different habitats (Goss-Custard & Verboven 1993, Gill et al. 1996, Smart & Gill 2003, Geering et al. 2007).

However, repeated (long-term) disturbance can have significant impacts on the energetics of estuarine birds, their condition and ability to survive the post-breeding period, as well as the potential knock-on effects on their ability to migrate and breed (Goss-Custard & Durrell 1990, Belanger & Bedard 1990, Davidson & Rothwell 1993, Madsen 1995, Atkinson et al. 2007). Such

impacts are equivalent to habitat loss (Cayford 1993, Madsen 1995, Hill et al. 1997, Stillman et al. 2007), which is known to reduce the survival of displaced birds and affect population size (Goss-Custard et al. 1995, Burton et al. 2006).

Responses of Birds to Watercraft

The speed and manner in which a boat approaches wildlife can influence the nature of wildlife responses (DeLong 2000). For instance, Knight & Cole (1995) state that rapid movement directly towards wildlife frightens them, while movement away from or at an oblique angle to the animal is less disturbing.

Dahlgren & Korschgren (1992) categorised the following human activities in order of decreasing disturbance to waterfowl:

1. rapid movement and loud noise (power-boating, water skiing, aircraft);

2. over-water movement with little noise (sailing, wind surfing, rowing, canoeing);

3. little over-water movement or noise (wading and swimming); and

4. activities along shorelines (fishing, bird-watching, hiking and traffic).

Studies conducted by Hume (1976) in Britain support the findings of Dahlgren & Korschgen (1992). Common Goldeneyes (*Bucephala clangula*) often flew when people on shore approached closer than 200m, but settled elsewhere on the water. However, a single sailing dinghy was sufficient to cause more than 60 Common Goldeneyes to take flight and leave the vicinity within a few minutes. Birds that remained then flew up each time the boat approached to within 400 m and generally left the wetland within one hour. The appearance of a motorboat caused instantaneous flight by most birds. If the motorboat traversed the length of the reservoir, all remaining birds left within minutes. Hume reported that waterfowl abundance decreased over the longer-term as a result of increased frequency of boating.

Tuite et al. (1983) found that fishing, sailing and rowing reduced the abundance of most waterfowl on inland waters in England and Wales, while on-shore activities such as bird-watching had the least impacts.

A number of studies have shown that there are differential tolerances by species to boating activities. Tuite et al. (1983) showed that wintering Green-winged Teal (*Anas carolinensis*), Northern Shoveler (*Anas clypeata*) and Common Goldeneye were the most susceptible to disturbances, while Mute Swan (*Cygnus olor*), Tufted Duck (*Aythya fuligula*), Common Pochard (*Aythya farina*) and Mallard (*Anas platyrhynchos*) were the most tolerant. Parr (1974) found that Mallards were generally tolerant to sailboats, but the abundance of Green-winged Teal in the post-sailing period declined by half. Jahn & Hunt (1964) also found that the American Coot (*Fulica americana*), Blue-winged Teal (*Anas discors*), Mallard and Wood Duck (*Aix sponsa*) were more tolerant than other species.

Tuite et al. (1983) and Knight & Knight (1984) claim that a single boat might be just as disturbing to waterbirds as many boats. However, in Germany, Bauer et al. (1992) and Kaiser & Fritzell (1984) noted that the wintering waterbirds on lakes and rivers decreased significantly as the number of canoes and rowboats increased.

Hulbert (1990) found that the number of people in a canoe can influence the degree of disturbance to waterbirds. For instance, he observed Ruddy Shelducks (*Tadorna ferruginea*) fly greater distances when canoes were occupied by up to 20

people, compared with when they were occupied by a single person.

In comparison with other boats, canoes and rowboats can penetrate further into shallow water and therefore cause considerable disturbance to nesting waterbirds (Speight 1973). Vos et al. (1985) reported that canoes or slow-moving boats caused disturbance to nesting Great Blue Herons (*Ardea herodias*) and recommended buffer zones of 150m on water and 250m on land during the breeding season. Conversely, Vermeer (1973) noted that motorised boating caused nesting failure of Common Loons (*Gavier immer*), whereas canoeing did not (Titus & van Druff 1981).

Bamford et al. (1990) found that racing model powerboats did not significantly impact on the numbers and types of waterbirds using Herdsman Lake in Perth in the long-term. On days when model boats were on the lake, some species vacated the lake, some moved to other parts of the lake and some sheltered in rushes while motor boat racing was in progress. However, numbers of waterbirds returned to pre-boating levels once the boats left.

Collins et al. (2000) extrapolated the impacts of boating activities on Northern Hemisphere waterbirds to predict impacts on Australian waterbird species that occupy similar ecological niches. The predicted impacts during the breeding and non-breeding periods are shown in Tables 1 and 2, respectively.

Flush distances of waterbirds that have been disturbed by boating activities are well documented. For instance, Paton et al.(2000) recorded flush distances of 17-54m for sandpipers, 8-128m for large waders (stilts, avocets, godwits, curlews and oystercatchers) and 85-347m for other waterbirds (ibises, ducks, cormorants and swans) in response to disturbances from canoeing and jet-skiing in the Coorong, South Australia. ARA (2005) recorded flush distances of between 4-56m for waders (herons and egrets), 17-51m for diving ducks, 10-52m for dabbling ducks and 7-28m for gulls in response to canoeing activities on a Californian lagoon. ARA also noted that larger flocks of diving ducks tended to flush more readily than smaller ones and individual birds. Similar variability in flush distances has been recorded in other studies (e.g. Burger 1991, Cayford 1993, Smit & Visser 1993, Rodgers & Smith 1995, 1997, Fernandez-Jurisic et al. 2001, Rodgers & Schwikert 2002, 2003).

Investigations into flush distances have been used to determine the sizes of buffer zones for reducing the impact of disturbances on foraging, loafing and nesting waterbirds. Erwin (1989) used a formula based on the mean flushing distance (± standard deviation) to determine appropriate buffer distances for terns. Rodgers & Smith (1995, 1997) and Rodgers & Schwikert (2002, 2003) determined set-back distances using a formula based on the mean plus 1.65 standard deviations of the observed flushing distance (i.e. the distance at which only 5% of flocks would have taken flight) plus 40 metres. Paton et al. (2000) found that this latter formula was inadequate for determining buffer zones for waterbirds in the Coorong and thus set buffer zones equal to the maximum distance at which the most skittish species responded to a disturbance.

Recreational activities may have compounding effects when occurring simultaneously. For instance, Bell & Austin (1985) found that sailing caused little disturbance to waterfowl on a reservoir in Wales because it occurred in deep waters, while most waterfowl preferred shallow areas. However, when there was human activity on the shoreline (e.g. bank fishing and/or launching of boats), waterfowl retreated to the deeper central waters where they encountered the sailboats. Consequently, birds were displaced from the reservoir.

The consequences of boating impacts on aquatic vegetation (a food source for many waterfowl species) depends on the time of the year that boating occurs in relation to the phenology of the plants and animal activities (Liddle & Scorgie 1980). For instance, many aquatic plants spend the winter in a dormant stage and are less likely to be damaged at that time. However, in spring and summer, boating may help disperse plant reproduction structures or vegetative plant fragments, thus aiding in their survival. This latter process could be beneficial when dealing with locally native aquatic plants, but detrimental when dealing with exotic species, i.e. aquatic weeds (DeLong 2002).

Motorboats increase substantially the turbidity and phosphorous concentrations in shallow lakes (Yousef *et al*. 1980). Wall & Wright (1977) reported that 3.3 grams of oxygen are consumed in the oxidation of 1.0 gram of engine oil. Oxygen content of the first few centimetres of water can be depleted in this process and reduce phytoplankton production in lakes (DeLong 2002). In addition, about 20-30% of all fuel used by two-stroke engines fails to combust and is flushed into the water (U.S. Environment Protection Agency 1991, cited by DeLong 2002). Contaminants include benzene, toluene, ethyl benzyne, xylene, methyl tertiary butyl ether and polycyclic aromatic hydrocarbons (Waller *et al*. 1999).

Response to Motor Vehicles

Recreational boating is usually accompanied by an increase in onshore vehicular activity, such as motor vehicles access to boat ramps and onshore spectator areas. Rodgers & Smith (1995) and Hill *et al*. (1997) claim that most waterbird species readily become habituated to vehicle traffic. This is supported by a number of studies which show that vehicular traffic was less disruptive to waterbird behaviour compared with people walking. For instance, Klein (1993) found that the foraging behaviours of Blue-winged Teal and Great Blue Herons were disrupted more by human pedestrians than the presence of motor vehicles. Henson & Grant (1991) observed the same trend among breeding Trumpeter Swans (*Cygnus buccinator*). This latter species only reacted to vehicle traffic when vehicles stopped along roadways or sounded their horns. Rees *et al*. (2005) observed a similar response in Whooper Swans (*Cygnus cygnus*), which showed a short alert response to vehicle traffic, but remained alert for long periods of time when people passed on foot. This is probably because pedestrians take longer to traverse the same distance as a moving vehicle (DeLong 2002, Rees *et al*. 2005) or the birds perceive humans as a potential predator once they leave the vehicle (Gill *et a*l. 1996, Frid & Dill 2002, Robinson & Cranswick 2003).

Other Onshore Disturbances

Pfister *et al*. (1992) and Burger and Gochfeld (1998) showed that the presence of people walking or jogging in the vicinity of waterbirds resulted in lower species richness and abundance, and abandonment of preferred roosting or feeding areas. However, these responses are reduced as the distance between the visitors and waterbirds is increased (Burger 1981, West *et al*. 2002, Rees *et al*. 2005).

Moored yachts in the lower reaches of the Parramatta River, Sydney.

Table 1 Predicted Impacts of Boating Activities on Australian Waterbirds During the Breeding Season (adapted from Collins *et al*. 2000).

* *Australian equivalent is a species occupying a similar ecological niche*

Source	Species	Australian Equivalent*	Activity	Impacts
Burger (1998)	Common Tern	Crested Tern Caspian Tern Little Tern Fairy Tern	Jet-skis	Increased absence from nests, physical destruction of nests by watercraft.
Kury & Gochfeld (1975)	Double-crested Cormorant	Great Cormorant Little Black Cormorant	Boating, sailing	Increased predation of eggs.
Pfluger & Ingold (1988)	Eurasian Coot	Eurasian Coot	Boating	Reduced attendance of nests.
Vos *et a*l. (1985)	Great Blue Heron	Great Egret	Boating	Reduced attendance of nests.
Batten (1977)	Great Crested Grebe	Great Crested Grebe	Sailing	Increased nest failure.
Pfluger & Ingold (1998)	Great Crested Grebe	Great Crested Grebe	Boating, walking	Reduced nest building.

Table 2 Predicted Impacts of Boating Activities on Australian Waterbirds Outside the Breeding Period (adapted from Collins *et al*. 2000).

Source	Species	Australian Equivalent*	Impacts
Lok & Bakker (1988)	Great Cormorant	Great Cormorant	Avoidance of lakes with water-based activities.
Hulbert (1990)	Common Shelduck	Australian Shelduck	Repeated disturbance made birds move outside area.
Galhoff *et al*. (1984)	Common Pochard	Hardhead	Changed day-time roost in response to boating and surfing.
Hume (1976)	Smew	Chestnut Teal	Powerboats disturbed birds 200 m away.
Korschgen et al. (1985)	Ducks	Ducks	Boating sometimes caused ducks to abandon area.

Cornelius *et al*. (2001) found that the presence of humans impacted on waterbirds all year round, changing both the normal spatial and temporal distribution of birds. Larson (1995) and West *et al*. (2002) recognise this as a similar effect as habitat loss, leading to population declines and colony abandonment.

Habituation

Habituation is a learned behaviour in which the bird stops responding to human disturbance (Knight & Temple 1995, DeLong 2002). This response may require repeated predictable patterns of human activity that pose no threat to birds (Burger & Gochfeld 1991, Lafferty 2001). If birds do not perceive human activities as a threat, this may potentially reduce the frequency of flushing or flushing distance (Lord *et al*. 2001). However, those species that do not habituate may leave the area if the disturbance is persistent.

Some waterfowl species are able to habituate to the presence of boats. For instance, Kahlert (1994) found that Red-breasted Merganser (*Mergus serrator*) broods in Denmark were quite resilient to moderate disturbance levels caused by fast-moving boats (fishermen, windsurfers and motor boats), resuming normal behaviours within 1.5 hours of the disturbances. Keller (1989) found that Great-crested Grebes (*Podiceps cristatus*) displayed reduced flush distances at sites frequently visited by humans. However, intraspecific variation has also been observed in some species, even at the same site. For instance, Klein *et al*. (1995) found a resident Snowy Egret (*Egretta thula*) population to comprise two subsets, one highly habituated to human presence which allowed close approach, while the second avoided humans altogether.

In Wisconsin, Kahl (1991) noted that an average of 1.0 and 1.1 boating disturbances (hunting and fishing) per hour had an increasing effect on the Canvasback (*Aythya valisineria*) flock reaction to each successive disturbance. After several days of frequent disturbance, Canvasbacks established mid-lake loafing sites where disturbance was minimal. Most Canvasbacks flew directly to these loafing sites after a disturbance, and these birds attracted other small groups of Canvasbacks. Thus, a smaller proportion of the entire flock successively returned and was exposed to the greater levels of disturbance at feeding sites.

In analysing the effects of human disturbance, only a few studies (e.g. Burger & Gochfeld 1998, West *et al.* 2002) have investigated the time taken for waterbirds to resume pre-disturbance behaviours. Yet such an approach is critical to our understanding of the habitat needs of waterbird populations that are exposed to people.

How Can Disturbances to Waterbirds be Reduced?

The creation of buffer zones, which are out-of-bound areas for human activities, has been the usual way of reducing the disturbance effects of boating activities on waterbirds.

To avoid pedestrian and outboard motorboat disturbance to breeding activity, Rodgers & Smith (1995, 1997) recommended a minimum buffer distance to nesting colonies of 100m for wading birds, 180m for mixed tern/skimmer colonies and 100m for foraging and loafing waterbirds for pedestrian, terrestrial vehicle and motorboat approaches in Florida. In relation to the use of outboard-powered vessels and jet skis, Rodgers & Schwikert (2002) recommended buffer zones around foraging and loafing sites of 180m for wading birds, 140m for terns and gulls, 100m for plovers and sandpipers and 150m for ospreys. With respect to airboat approaches, Rodgers & Schwikert (2003) recommend distances of between 130 and 365m for aquatic raptors and up to 255m for wading birds. Distances of between 50-200m for nesting tern species (Buckley & Buckley 1976, Erwin 1989) and 100-250m for herons and egrets (Vos *et al*. 1985, Erwin 1989) have also been recommended, while Anderson

Little Penguin (*Eudyptula minor*): commonly seen swimming in Sydney Harbour and in the estuarine areas of the Lane Cove and Parramatta Rivers where there are a lot of recreational boating activities.

(1988) suggested a distance of 600m to protect a Brown Pelican colony in Mexico. Paton *et al*. (2000) also recommended a buffer distance of 150-200m around waterbirds foraging in the Coorong-Murray mouth estuary in South Australia.

Habitat manipulation and enhancement through the development of refuge areas in preferred nesting, foraging and/or loafing sites of waterbirds, provides another way of mitigating the detrimental effects of human disturbance (Boyle & Samson 1985, Hockin *et al*. 1992, Pienkowski 1992, Klein *et al*. 1995, Rehfisch 1996, Burger & Gochfeld 1998, Cornelius *et al*. 2001, Erwin *et al.* 2003, Stolen 2003, Duriez *et al*. 2005). For instance, Suesse (2005) proposed the creation of an island in a wetland that would be suitable as a refuge for Grey Teal (*Anas gracilis*) and out-of-bounds to people. Provision of undisturbed refuge sites for waterbirds can potentially reduce energy expenditure which occurs through flight (Rehfisch 1996), allowing more time for the birds to feed (Hockin *et al*. 1992).

Public education can also help alleviate the impacts of human disturbances on waterbirds. For effective conservation, visitors need to appreciate and understand the potentially detrimental impacts of their activities (Olsen & Olsen 1980, Pienkowski 1992, Kirby *et al*. 1993, Klein *et al*. 1995, Orams 1996, Kuo 2002). Visitors who understand the negative effects of their activities on waterbirds are more likely to accept imposed conservation restrictions (Klein 1993, Orams 1994). In return, this can facilitate a more enjoyable recreational experience for the visitor (Kuo 2002).

An intertidal area near Newcastle that provides foraging and roosting habitat for migratory shorebirds and seabirds at low tide

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- **PROPOSED ECA WORKSHOPS 2009 - 2010**
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Details: http://www.seri2009.com.au

- **Land Use Conflict Risk Assessment Training Workshops (Living and Working in Rural Areas)**

Date: 18th (Port Macquarie), 19th (Armidale) and 20th (Ballina) August 2009.
Venue: Port Macquarie, Armidale & Ballina
Contact: Eileen.tucker@dpi.nsw.gov.au

- **Sydney's Little Brown Birds (Birds Australia)**

Date: 12th and 20th September 2009 (7.30am – 2.00pm).
Venue: Castlereagh Reserve, Windsor
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Contact: basna@birdsaustralia.com.au or call Pixie at BASNA office (02) 9647 1033

- **Atlassing Workshop (the how, when and where of Birds Australia Continuing Atlas) (Birds Australia)**

Date: 14th November 2009 (9am – 2.00pm).
Venue: Sydney Olympic Park
Cost: free for members and $10 for non-members.
Contact: basna@birdsaustralia.com.au or call Pixie at BASNA office (02) 9647 1033

- **Slitherers and Croakers (Birds Australia)**

Date: 28th November 2009 (9am – 5pm).
Venue: Sydney Olympic Park
Cost: $59 for members and $69 for non-members.
Contact: basna@birdsaustralia.com.au or call Pixie at BASNA office (02) 9647 1033

- **Innovations in Ecological Restoration**

Date: 11th September 2009
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Contact: info@restoringbiodiversity09.org.au or call Rosanna Luca 0419 985 175

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Date: 8th (Wollongong) and 15th (Newcastle) October 2009. 8.30am – 12.30pm.
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Commences:	Registration 8:00am - 8:50 am

For conference enquiries and **registration** contact Amy, ECA Administration Assistant at admin@ecansw.org.au or Phone 9651 2557 & 0418 451 488

The Harbourview on Queens Wharf is located on Wharf Road overlooking Newcastle Harbour and adjacent to the CBD and Newcastle Railway Station. Newcastle is approximately 2.0 hours by car north of Sydney and has good transport links by rail, air and road. Abundant accommodation, good cafes and restaurants are nearby and cater for a range of prices. Why not make a weekend of it and take in the Hunter Vineyards or Port Stephens only 45 minutes away.

2009 Conference Program

8:00 – 8:50am Registration

Welcome and Introduction

9.00 – 9.10 Stephen Ambrose, ECA President

Keynote Address

9:10 – 9:40 *Climate change and its implications for vegetation management, ecological restoration and biodiversity conservation into the future*
Dr Michelle Leishman Department of Biological Sciences Macquarie University

Urban Expansion and Bushfire Management

9:40 – 10:10 *Managing the Bushfire Risk*
Duncan Maughan, Terramatrix Pty Ltd, Victoria

10:10 – 10:40 *Effects of Fire on Ecosystem Processes and Biodiversity*
Dr. Alan York, Department of Forest and Ecosystem Science, University of Melbourne

10:40 – 11:00 MORNING TEA

Urban Expansion and Endangered / Critically Endangered Ecological Communities

11:10 – 11:40 *Plant population dynamics following vegetation fragmentation - implications for persistence and restoration*
Dr. Linda Broadhurst, CSIRO

11:40 – 12:10 *EECs and Urban Expansion along the Northern NSW Coast: Issues and Challenges*
Greg Elks, Idyll Spaces

12:10 – 12:40 DISCUSSION /QUESTION TIME FOR MORNING PRESENTATIONS

12:40 – 1:30 LUNCH

The Changing Landscape

1:35 – 2:05 *Comments on the Accreditation of BioBanking Specialists*
Danny Wotherspoon, Abel Ecology

2:05 -2:35 *Community Advocacy Leading to Ecological Outcomes*
Michael Osborne, Councillor, Newcastle City Council & Coordinator, Green Corridors Coalition

2:35 – 3:05 *Implications of the Native Vegetation Act at the Rural/Urban Interface*
David Russell from the Hunter / Central Rivers CMA

3:05 – 3:30 AFTERNOON TEA

Rural Landscapes: The Farmland Interface.

3:35 – 4:05 *Novel approaches to the assessment of impacts on aquatic ecology due to coal mining.*
Peggy O'Donnell, The Ecology Lab.

4:05 - 4:35 *Linking Urban Centres in Rural Landscapes: The Highway/Farmland Interface*
Case Study: Widening the Hume Highway and its Impacts on Threatened Woodland Birds
Stephen Ambrose, Ambrose Ecological Services Pty Ltd

4:35 – 4:50 DISCUSSION /QUESTION TIME FOR AFTERNOON PRESENTATIONS

4:50 – 5:00 Summing Up (ECA President)

5:10 -6:30 ECA of NSW Inc. AGM

A pre-conference dinner will be held on **Thursday, 3 September** at a nearby location and is a great opportunity to exchange experiences, talk shop or just catch up with long lost colleagues over a glass of wine or beer and dinner. The conference dinners in the past have been well attended and are an entertaining night out.

Recent Literature and New Publications

Book Review

`*Flower Hunters*' by Mary and John Gribbin

Flower Hunters *is written by Mary and John Gribbin, published by Oxford University Press.* ***It retails for approximately $30.00****.*

How far will we go for our clients? Our science? Our own enjoyment of the natural world? Are we willing to sacrifice our family lives, our creature comforts, our sight, even our lives? Is it worth traipsing through scorching heat, knee high mud or soft snow without appropriate clothing just so the people that pay our wages can marvel at our findings? In the 1700's and 1800's, the answer to these questions were a resounding "*yes*!". The world was opening up and shrinking, interest in things beyond one's coastlines was increasing, and the new science of botany was coming into its own.

"*Flower Hunters*" is the story of eleven "botanists" who played key roles in the development of this new science. This book covers such well known identities such as Carl Linnaeus and Joseph Banks, as well as "unknowns" such as Robert Fortune and Marianne North. The stories of each botanist provides details on their background, education and class status, as well as their exploits, achievements and relationships with other members of the scientific community. This book endeavors to put the findings of these botanists in sequence, combining their stories with those historical facts and events of the time.

Flower Hunters is an enjoyable and enlightening read, one that provides an insight into the developing stages of the botanical sciences and how things we take for granted (for example the taxonomic system we use on a daily basis) came into being.

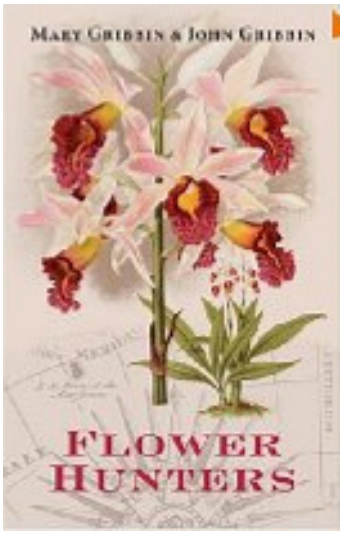
As each chapter deals with a different botanist, and as there is limited overlap from chapter to chapter, *Flower Hunters* is a book that can be read from cover to cover, or on a chapter by chapter basis. Comments I did find interesting whilst reading about one of the botanists, Marianne North, was that she said "*They were gradually sawing them up for firewood, and the trees would soon be extinct, it broke ones heart to think of man, the civilizer, wasting treasures in a few years to which savages and animals had done no harm to in centuries*" and "*it is curious how we have introduced all our*

ECA 2009 Conference Book Stall

A book stall will be held at this years conference (a very popular event at last years conference). A range of titles relevant to Ecological Consulting will be available at discounted prices. Titles include:

- Floyd's Rainforest Trees of Mainland South-eastern Australia
- Nan & Hugh Nicholsons publications on Australian Rainforest Trees I-VI.
- Van Klaphakes field guides
- Gwen Hardens Rainforest Books
- David Keith's Ocean Shores to Desert Dunes
- The latest version of the Flora of the Sydney Region
- Marian Anstis Tadpole Field Guide.
- Gerry Swan's Reptile Field Guide.
- Tom Grant's Platypus Book.
- Sue Churchill's latest edition of Australian Bats
- 'Chasing Birds' documentary (DVD)

weeds, vices and prejudices into Australia, and turned the natives (even the fish) out of it". Marianne North started her botanical career at the age of 40 (around 1870).



For those interested in botany, and even for those who aren't, this book is an enjoyable read and does leave you wondering how far you'll go just to confirm the identity of that species that is on the other side of the highway, paddock, lake, ravine, world.

Deryk Engel
Lesryk Environmental Consultants
ECA Council Member

Recent Journal Articles / Literature

Proceedings of the Stormwater Conference 2009. Contact Julie McGraw to purchase a copy. Ph: 02 9744 5252 or jmcgraw@gemspl.com.au.

Goldingay R (2009). Characteristics of tree hollows used by Australian birds and bats. *Wildlife Research* **36**(5): 394-409.

Vine S. et al (2009). Comparison of methods to detect rare and cryptic species: a case study using the red fox (Vulpes vulpes). *Wildlife Research* **36**(5): 436-446.

Sharpe D. and Goldingay R. (2009). Vocal Behaviour of the Squirrel Glider. *Australian Journal of Zoology* **57**(1): 55-64

Campbell S. (2009). So long as it's near water: variable roosting behaviour of the large-footed myotis (*Myotis macropus*). *Australian Journal of Zoology* **57**(2): 89-98.

Goldingay R. and Taylor B. (2009). Gliding performance and its relevance to gap crossing by Squirrel Glider (*Petaurus norfolcensis*). *Australian Journal of Zoology* **57**(2): 99-104.

Jones E. (2009) Hybridisation between the dingo, *Canis lupus dingo*, and the domestic dog, *Canis lupus familiaris,* in Victoria: a critical review. *Australian Mammalogy* **31**(1): 1-7

Namekata S. and Geiser F. (2009) Effects of nest use, huddling, and torpor on thermal energetics of eastern pygmy-possums. *Australian Mammalogy* **31**(1): 31-34

Lindenmayer D., Wood J. and MacGregor C. (2009) Do observer differences in bird detection affect inferences from large-scale ecological studies. *Emu* **109**(2): 100-106.

Zharikov Y. and Milton D. (2009) Valuing coastal habitats: predicting high-tide roosts of non-breeding migratory shorebirds from landscape composition. *Emu* **109**(2): 107-120.

Ashley L., Major R. and Taylor C. (2009) Does the presence of grevilleas and eucalypts in urban gardens influence the distribution and foraging ecology of Noisy Miners? *Emu* **109**(2): 135-142.

Devney C. and Congdon B. (2009) Testing the efficacy of a boundary fence at an important tropical seabird breeding colony and key tourist destination. *Wildlife Research* **36**(4): 353-360.

Lunney et al (2009) Combining a map-based public survey with an estimation of site occupancy to determine the recent and changing distribution of the Koala in New South Wales. *Wildlife Research* **36**(3): 262-273.

Recher H., Lunney D. and Mathews A. (2009) Small mammal populations in a eucalypt forest affected by fire and drought. I. Long-term patterns in an era of climate change. *Wildlife Research* **36**(2):143-158.

Thomas R. Regent Honeyeater Habitat Restoration Project Lurg Hills, Victoria. *Ecological Management & Restoration* **10**(2): 84-97.

Manning A. and Lindenmayer D. (2009) Paddock trees, parrots and agricultural production: An urgent need for large-scale, ling-term restoration in south-eastern Australia. *Ecological Management & Restoration* **10**(2): 126-135.

MacRaild L., Radford J. and Bennet A. (2009) Box Mistletoe (*Amyema miquelii*) parasitism is not detrimental to the health of Grey Box (*Eucalyptus microcarpa*) trees at a regional scale. *Ecological Management & Restoration* **10**(2): 148-150.

Ecological Management & Restoration **Volume 10** Issue s1 – Special Issue: Science supporting threatened species conservation.

Including articles such as:

Kendall P and Snelson B. (2009) The role of floristic survey data and quantitative analysis in identification and description of ecological communities under threatened species legislation: A case study from north-eastern New South Wales. *Ecological Management & Restoration* **10**(s1): S16-S26.

Larkin P. (2009) Bright lines on fuzzy boundaries? How the law of New South Wales deals with the existence and extent of endangered ecological communities. *Ecological Management & Restoration* **10**(s1): S35-S43.

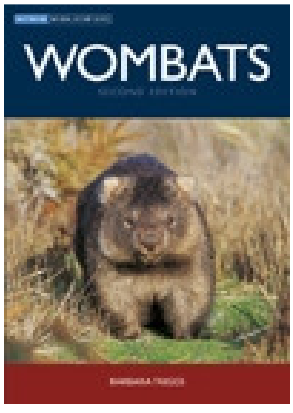
Stokes et al (2009) Invasion by *Rattus rattus* into native coastal forests of south-eastern Australia: are native small mammals at risk? *Austral Ecology* **34**(4) : 395-408.

Kubiak P. (2009) Some fire responses of bushland plants after the January 1994 wildfires in northern Sydney. *Cunninghamia* **11**(1): 131-165

Recent Book Releases

Information Source: CSIRO Publishing Website http://www.publish.csiro.au

Title: Wombats
Author: Barbara Triggs
RRP: $39.95
No. **Pages**:160
Publisher:CSIRO Publishing
Date: July 2009

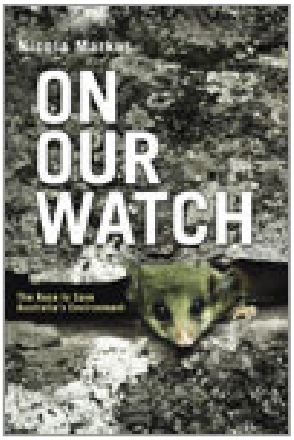


Title: Hair ID
Author: Hans Brunner, Barbara Triggs, Ecobyte Pty Ltd
RRP: $195
No. **Pages**: CD-ROM

Title: Australasian Nature Photography ANZANG Fifth Collection
Author: Ed. Stuart Miller
RRP: $39.95
No. **Pages**: 136
Publisher: CSIRO Publishing
Date: October 2008

Title: Australasian Saltmarsh Ecology
Author: Neil Saintilan
RRP: $99.95
No. **Pages**: 248
Publisher: CSIRO Publishing
Date: February 2009

Title: Boom and Bust: Bird Stories for a Dry Country
Author: Ed. L Robin, R. Heinsohn and L. Joseph
RRP: $39.95
No. **Pages**:312
Publisher: CSIRO Publishing
Date: March 2009



Title: On Our Watch: The Race to Save Australia's Environment
Author: Nicola Markus
RRP: $35
No. **Pages**:240
Publisher: Melbourne University Publishing
Date: February 2009

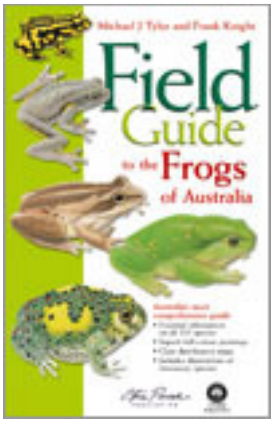
Title: Meanderings in the Bush: Natural History Explorations in Outback Australia
Author: R and B MacMillen
RRP: $49.95
No. **Pages**: 208
Publisher: CSIRO Publishing
Date: July 2009

Title: Sydney Birds: and where to find them
Author: Peter Roberts
RRP: $35
No. **Pages**:208
Publisher: Allen & Unwin
Date: October 2009

Title: Adaptive Environmental Management: A Practitioner's Guide
Author: Ed. C Allen & G. Stankey
RRP: $120
No. Pages: 392
Publisher: CSIRO Publishing / Springer
Date: August 2009

Title: Australian Bats
Author: Sue Churchill
RRP: $45
No. Pages: 256
Publisher: Allen & Unwin
Date: February 2009 (revised edition)

Title: Field Guide to the Frogs of Australia
Author: M Tyler and F Knight
RRP: $49.95
No. Pages: 200
Publisher: CSIRO Publishing
Date: May 2009



Title: Grasses of New South Wales
Author: S Jacobs, R Whalley & D Wheeler
RRP: $49.95
No. Pages:450
Publisher: University of New England
Date: December 2008

Title: Grassfires
Author: A Cheney & A Sullivan
RRP: $39.95
No. Pages: 160
Publisher: CSIRO Publishing
Date: November 2008

2009 ECA Membership Report

Amy Rowles
ECA administrative assistant

In total we have 132 members, of which 116 are currently financial. Fourteen members have cancelled or become uncontactable. We have 15 new members since the last edition of the newsletter, including: 9 practising; 2 practising (regional); 2 non-practising; and 2 student. The new members are introduced below:

Name: Andre Olson
Membership Status: Practising
Qualifications: B. Sc. (acquatic Science)
Company: Dragonfly Environmental Pty Ltd
Position: Ecologist / Director
Location: Avalon

Name: Antony Von Chrismar
Membership Status: Practising
Qualifications: B. Applied Science
Company: Eco Logical Australia Pty Ltd
Position: Ecologist
Location: Hamilton East

Name: Daryl Harman
Membership Status: Practising
Qualifications: B. App. Sc. (Env Sc)
Company: Wildthing Environmental Consultants
Position: Ecologist
Location: Wallsend

Name: Deborah Gleeson
Membership Status: Practising (Regional)
Qualifications: B. Sc. (Hons) (PhD)
Company: Gleeson Ecology
Position: Ecologist
Location: Sandgate, QLD

Name: Isaac Mamott
Membership Status: Practising (Regional)
Qualifications: B.Sc.; B. A.
Company: Orogen Pty Ltd
Position: Senior Botanist
Location: Tuncurry

Name: Jane Webster
Membership Status: Practising
Qualifications: B. Sc. (Env Mgt); Bush Regeneration Cert II.
Company: Hyder Consulting
Location: North Sydney

Name: Kirsten Velthuis
Membership Status: Non-practising
Qualifications: B. App. Sc. (Parks Rec Heritage) / B Env Sc (Hons).
Company: Transgrid
Position: Environmental Officer
Location: Horsley Park

Name: Kristy McQueen
Membership Status: Practising
Qualifications: B Sc. (Hons); PhD
Company: Coast Ecology
Position: Ecologist
Location: Wamberal

Name: Martin Sullivan
Membership Status: Practising
Qualifications: B. Sc (biodiversity and conservation)
Company: Sinclair Knight Merz
Location: St Leonards

Name: Matt Richardson
Membership Status: Practising
Qualifications: B. Sc. (Hons 1)

Name: Nathan Smith
Membership Status: Practising
Qualifications: B. Sc.; Cert IV Bush Regeneration
Company: Eco Logical Australia Pty Ltd
Position: Ecologist
Location: Dee Why

Name: Rebecca McCue
Membership Status: Student
Qualifications: B. Env. Sc. (Currently undertaking)
Company: Urban Bushland Management Consultants
Location: Richmond

Name: Sarah Warner
Membership Status: Non - Practising
Qualifications: B. Env. Sc; B. Biol (Hons).
Company: Lake Macquarie City Council
Location: Speers Point

Name: Steven Cox
Membership Status: Practising
Qualifications: B. App. Sc. (Hons)
Company: Ecotone Ecological Consultants
Position: Senior Ecologist
Location: Waratah

Name: Yvette Bortoli
Membership Status: Student
Qualifications: B. Marine Sc. (Currently undertaking)
Company: SMEC
Position: Senior Project Administration Officer
Location: North Sydney

The ECA Forum

Compiled by Jason Berrigan

The ECA Forum on the ECA's website is one of the many privileges of membership, and is intended:

- *To encourage discourse within the membership.*
- *To enable a forum for members to raise issues that affect members, the industry and the ecologist.*
- *To provide a venue for depositing information eg anecdotal sightings, interpretation of legislation, etc.*
- *To inform members of changes to legislation, upcoming events, draft reports, etc on public exhibition.*
- *To reduce some of the email generated by in-house chat within the membership.*
- *To provide a means of archiving information shared within the membership for future reference.*

The Forum features a range of issues from legal to anecdotal, comments and questions by some members seeking some clarity on some issues or assistance in a work-related matter or some hotly debated issues.

If you haven't had time to log on and catch up, here's a summary of some of the recent and most commented on topics up to the 19th July 2009:

1. Blacks Snakes Eating Brown Snakes:

Seeded by: Amy Rowles (19/4/09)

Amy advised that an information email was sent out to members in March about a 6ft black snake consuming a decent sized brown snake head first. The onlookers watched the snake finish ingesting the brown. However, the brown snake later pulled itself out of the black snake - head first, by latching onto the lower jaw of the black snake and pulling the rest of its body out. Both snakes were apparently well after the incident, however the effects of a venomous bite from the brown snake would not be immediate. This story was originally printed in the Tumut and Adelong Times (23/1/09)

Phillip Cameron emailed Amy with the following observation:
"When working at Western Plains Zoo in Dubbo a guy (a local farmer) came in with a similar size black that had all but asphyxiated eating a brown that was just as big as it. We managed to save the black but the brown certainly seemed to have remained alive long enough to knock around inside the poor old black before it (the brown) died. My advice to people on properties these days is to leave the blacks alone as they will eat the brown ones. This seems to be accepted as practical wildlife management in rural areas thus save a few black snakes that would otherwise be knocked on the head."

Responses:

Jason Berrigan:
Jason commented that he heard a similar saying as a kid growing up on a farm, and was told to leave any black snake he came across in the barn to keep the browns out. What his father didn't know however, was that Jason was catching the blacks and throwing them in the barn just before his older sister collected hay for the cows.

2. Miscellaneous Observations:

Seeded by: Jason Berrigan (17/3/09)

Jason began this topic to collect a range of observations which may escape being recorded in reports, beginning with the following:
"Last night while spotlighting in some underscrubbed dry sclerophyll, I came across a group of about 20 Noisy Miners. While seeing these birds commonly roosting in pairs or up to 6, I was surprised to see this group sitting in a small (6m) she-oak like Xmas decorations. Birds sat as low as 1.5m above ground to the crown (high enough for a clever fox to get a feed) and did not move even when I was <1m away."

Responses:

Liz Ashby:
Liz commented that she had seen the same behaviour exhibited by this species in a small patch of remnant trees in open farmland in the Wyong area, and postulated it had something to do with the type of roosting habitat available (no tall trees in that instance) and safety in numbers.

Jason added the following observation on the 23/4/09:
"This morning I witnessed an interesting interaction between a Pee-Wee (aka Australian Magpie-Lark or Mudlark) and a male Eastern Grey. I don't know who or what started the argument, but essentially my eye was drawn from watching Sunrise to the Pee-Wee dive-bombing the roo, and the roo rearing up on its hind legs and pawing at the bird. This continued for about 10 seconds with various dives by the bird and sky-raking by the roo, till the Pee-Wee roosted on a nearby powerbox on the adjacent vacant Lot. The roo ambled up to the box, and continued goading the Pee-Wee in the classic Looney Tunes boxing pose, intermittently with some half-hearted grazing. This persisted for about another 30 seconds before the Pee-Wee lost interest and flew away."

3. Removing Tapes from Hair Tubes:

Seeded by: Mark Couston (1/4/09)

Mark commented on the difficulty of removing double sided tape from hair-tubes, often resorting to gouging a knife blade underneath the tape yet trying to get it out of the hair-tube without dislodging hairs or distorting the tape too much.

He remarked that the brand of double sided tape is important. Some are very poor and stretch readily when you try to remove them while others are just OK. This also depends upon how long they have been left in the field and the weather.

Mark reported that he tried something different last month on a few of the hair-tubes after speaking to Michael Murray and Barbara Triggs. Instead of double sided tape, he used stick-on Velcro. He stuck the furry side (possibly called the hook side) onto the hair- tube and put the rougher side (the loop side) over it leaving a sticky site up to collect hairs.

He didn't envisage any loose synthetic fibres causing problems to the analysis of the sample (ie due to ready identification and separation from the true samples), and thought it might be better to stick the furry side in the tube and send the sticky side with the rougher (loop) part off to with be analysed. He found removal of the upper tapes (with the collected hairs) from the hair-tubes simple, and sent the tapes off to Barbara Triggs, asking her specifically if she had any problems from her perspective. She seemed to think they were OK, and got the usual Swamp Wallaby and Long-nosed Bandicoot hairs. Mark states that he will continue to use this method.

Responses:

Liz Ashby:
Liz stated that she always uses Faunatech hair funnels, thus avoiding the double sided tape dilemma. Acknowledging their reported problem with reptile by-catch, Liz advised in her experience she has only caught one small *Lampropholis*., and Faunatech are now using a new formula now for the "fauna-goo" in response to the by-catch problem.

Liz commented that some ecologists consider that bandicoots aren't detectable by the funnels, but she has always got *Perameles nasuta* in places she expected them to be with the method. Conversely, she reported she has not detected *Isoodon obesulus* yet, and suggested this could be a possible species-specific issue, though she has not had extensive experience in this species habitat to test this theory. Regardless, she considered the funnels a fine tool and are a LOT easier to handle than the double-sided tape, but to be careful in preparation to avoid contamination (eg. by curious pets).

Jason Berrigan:
Jason commented that he used both as the hair funnels are so expensive, and has ample supply of free pipe. He finds that using the rectangular gutter attachment at one end makes them more stable to mount on the ground or a platform and that he can also mimic a hair funnel a bit by having tapes in the bigger rectangle cavity, or in the smaller circular cavity. He also reported that he uses single sided cloth tape (as masking tape and brown packing tape leave too much glue on the hairs which makes ID labour intensive), but mounts it by joining the ends together to form a circle, then puts his finger in the middle to stick it to the inside, and flatten it out as needed to make a hole in the centre of the tube. This means:
(a) Small things like skinks and frogs can navigate through the loops of tape to avoid getting stuck.
Big things like Quolls to gliders have to brush against several tapes to enter the traps.

Jason acknowledged that this doesn't work for small species like Planigales, but uses hair funnels for this species, with by-catches of rats, bandicoots, wallabies, cats and dogs.

4. Consultancy Fee Proposals:

Seeded by: Stephen Ambrose (10/5/09)

Stephen raised a very controversial and sensitive issue which plagues all service industries from construction to scientific services, such as ecological consulting.

Stephen commented that in times of global financial uncertainty, many ecological consultants competitively and legitimately offer discounts to potential clients when formulating fee proposals. However, it has been brought to the attention of the ECA Council that one ecological consultancy firm is allegedly advertising that it would out-bid other consultants if the potential client provided it with a copy of the written fee proposal of the competitive bidder with the lowest quote.

While it is acceptable and not uncommon for consultants to negotiate lower consultancy fees with potential clients, Stephen stated the he believed it unprofessional for a consultant to request a copy of a written fee proposal of a competitor for the purposes of out-bidding them for a project. Such practice gives the consultant an unfair advantage over others, and also risks plunging the ecological consultancy industry (and the consultant) into disrepute.

Stephen suggested that all consultants consider marking their written fee proposals as "*Confidential - For Client/Project Manager Only*" (or similar wording) to minimise the risk of these proposals reaching the hands of unauthorised third parties.

Stephen's concerns were echoed further by John Travers, Jason Berrigan and Liz Ashby, many of whom reported similar occurrences, with John Travers adding further on the necessity of specifying the nature and quantity of proposed works within a fee proposal to inform a client that they are getting what they are paying for, ie. the investigations necessary for their development application.

Of further concern, Stephen later added of another unprofessional practice which was possibly a breach of the ECA's Code of Practice. Stephen advised that he had learnt that an ecological consultancy firm was successful in winning a large government tender on the premise that it had appropriate ecological expertise to conduct the work. It is alleged that this firm does not have the required specialist expertise among its staff to conduct the project adequately, but had planned to sub-contract much of the work to a specialist ecologist if awarded the contract. The apparent problem is that the potential sub-contractor who this consultancy firm had in mind allegedly did not know they were being considered for the project work until after the government had awarded the contract to the firm. Consequently, the potential sub-contractor is unavailable to participate in the project because of other project commitments.

Stephen stated that if this allegation is valid, then in his opinion, the consultancy firm has won a contract under false pretences. Unless it can find another specialist ecologist to conduct this work, it is probable that the project work will not be completed satisfactorily. Not only will this risk the reputation of the consultancy firm, but it will risk tarnishing significantly the professional integrity of the ecological consultancy industry. From this perspective alone, if some members of the ECA engage in this type of activity, then in the ECA President's view, they are clearly in breach of the ECA Code of Business Practice, Professional Conduct and Ethics.

To avoid this sort of thing happening, Stephen suggested that any consultancy firm or individual planning to sub-contract a part of project work for which they are competitively tendering to:

1. Identify clearly in its fee proposal who and what part of the project work would be sub-contracted, including the sub-contractor's relevant qualifications and experience; and

2. Include the sub-contractor's signature in the fee proposal, thus validating the content of the proposal before it is submitted to the potential client.

In doing this, potential clients are more likely to choose a consultant who is capable of producing a high standard of work and the reputation of the ecological consultancy industry in NSW should remain intact.

5. Taxonomy and Legislation: The Dilemma of *Nyctophilus timoriensis*:

Seeded by: Deryk Engel (8/5/09)

Deryk advised that in his reading of the latest version of Churchill's bat book, he noticed *Nyctophilus timoriensis* has been "dropped" as an Australian bat, with a comment in the book stating "Taxonomic revision of the genus…shows that *N. timoriensis* does not occur in Australia and that the Australian form represents a species complex.

Nyctophilus timoriensis has therefore been renamed *Nyctophilus* species 2. Deryk thus queried that as *Nyctophilus timoriensis* is listed under the TSC Act, does that mean *Nyctophilus* species 2 is automatically listed under the Act, or, in instances where you record what you previously thought was *Nyctophilus timoriensis*, do you now assume it is *Nyctophilus* species 2 and treat it as a "protected" species, but not do a 7 part test?

Responses:

Liz Ashby:
Liz advised the she had also noticed quite a few taxonomic changes that had an influence on her impact assessment work (eg Churchill's changes to *Mormopterus*). When consulting renowned bat expert and ECA member, Ray Williams, he advised that Churchill has used a lot of new taxonomy that is on the verge of being published but has not yet been published. Hence many of the names are not yet valid but known to the bat world from conference presentations, etc. Liz commented that until they are valid names, we are in a difficult area with the TSC Act, and the authorities are not quick to pick up on bat taxonomy (eg. the Atlas of Wildlife has only recently changed *Macropus adversus*).

Liz considered that if a taxon has been shifted in its entirety to a new name, then its conservation status should be carried along with it, and in her opinion, our reports should note the dual names and point out the nomenclatural conflict, so that in the future the report will still make sense to somebody who has only ever known the new name. However, if only part of a taxon has been reassigned, then it is much trickier, but the logic from above should also apply as best we can. If the changes have a clear geographic basis, then that is much easier (e.g. all southern forms of species X have become species Y and the site is within the range of the southern form) but if it has been split or moved on features that occur in overlapping populations, then we have a big mess and have to very carefully identify our critters (not so easy with bats) and read the taxonomic literature (yuk).

Liz also added that this is an ever-present problem for unstable plant groups (e.g. *Persoonia*, *Grevillea*) and unfortunately these are full of listed threatened "species". Liz gave an example of a population of a plant species listed under both TSC and EPBC Acts, where the plants they'd found had important distinguishing characteristics of both the common and the threatened species. A swag of specimens were sent to the scientist who published the names for adjudication and they were equally as confused as they were. The expert informed her that when describing this group, they had very few specimens from the northern part of its range and

none from the area she was working in. Therefore, the characters they had relied on that were distinct in their sample were blurred by those in her sample, and would probably not have been relied on to distinguish the taxa if they had been able to work with a more geographically complete sample. However, the names have been published and have a life in the conservation legislation and every time she is working in its habitat, she worries it will cause confusion.

In regards to *Nyctophilus timoriensis*, Liz considered it may currently be the valid name, and as it is the legal entity that is listed on the TSC Act, anything that may be regarded as this taxonomic entity should be assessed as being listed. Eventually, if the proposed taxonomic change is accepted and published in the scientific literature, then it looks like all of the bats in Australia known as *Nyctophilus timoriensis* should be called the new name and so its TSCA conservation status should also apply, and it should be shown in a new schedule of the Act (eventually). Hence the Precautionary Principle applies, and a Seven Part Test should be undertaken, noting these limitations.

6. Tadpole Traps:

Seeded by: Stephen Ambrose (30/11/08)
Discussion on this topic has continued on, with further responses as follows:

Responses:

Jason Berrigan:
Jason added that the traps Stephen mentioned from the US were similar to the plastic cylindrical bait traps used to capture live mullet for fishing, and were readily available at tackle shops, but yabbie traps may also work.

Stephen Ambrose:
Stephen added that Marion Anstis confirmed using mesh-type yabbie traps.
Jason Berrigan:
Jason advised caution on use of such traps as the opera-style yabbie traps for instance, were banned within the range of the Platypus due to drowning of this and other native species eg Water Rat and tortoises.

Anthony Saunders:
Noting how some consumer products can have adverse impacts on wildlife, Anthony Saunders reported the availability of mosquito larvae insecticide pellets, for use in bird baths (and possibly outdoor fish ponds). He noted that the product did not mention any warnings for impacts on tadpoles or birds, and failed to find any satisfactory information on the internet.

7. Pollution Law:

Seeded by: Anthony Saunders (4/5/09)

Anthony recommended ECA members pick up a copy of "*Pollution Law in Australia*", by Zada Lipman and Dr Gerry Bates (2002). Anthony considered that the authors have written an amazingly thorough review of environmental laws pertaining to environmental practices. The book is available through Lexis Nexis @ $173.00 and contains plenty of case law pertaining to relevant ecological incidents.

Anthony considered that this book is relevant to ECA members as Ecological Consultants are in the business of addressing environmental impact, hence a relevant claim against them may fall under the broad heading of *Pollution Law* in Australia. Hence, a "Pollution" exclusion appearing in a Professional Indemnity Insurance policy may provide an insurance claims manager the excuse to argue or deny liability under their policy.

8. Ants: The Natural Enemy of the Nest Box:

Seeded by: Jason Berrigan (17/3/09)

Jason related that after years of recommending their use, he'd finally got a job where he could

erect a decent number of nest boxes (25) specifically for the Squirrel Glider as part of a suite of ameliorative measures for a development in Port Macquarie.

Noting the practical difficulties of erecting nest boxes in dense forest, he related how he had recently performed a quick check of 7 boxes (most readily accessible). To his disappointment, he found only one had a Squirrel Glider nest in it (literally only days old), with another containing an Antechinus. Of greater concern was that all the other nest boxes were infested with several thousand very aggressive ants. Most had the entrance blocked with a resin-based material, and ants were happily nesting in the saw dust placed by the supplier in the bottom. He also found the sawdust to be hosting an abundance of native cockroaches, and holding moisture which may induce rot of the bottom. He thoroughly discouraged use of sawdust in nest boxes as a result, and recommended drilling drain holes >15mm to ensure free drainage at all costs.

Jason advised that he is holding off checking the rest of the nest boxes until a means of keeping the ants out is obtained. He considered insecticide, but dismissed the use of spray due to limited longevity, potential adverse impacts on gliders, etc, and of course adverse smell which may deter occupation by the target species. Investigations were being undertaken for practicality of a kind of plastic bait station and called for advice.

Responses:

Anthony Saunders:
Anthony noted the chemical methoprone is sold to control ants, but queried its potential impacts on insectivores. Jason echoed this concern as being a further deterrent to use of artificial insecticides in nest boxes. The issue remains open.

9. Vegetation Management Plans:

Seeded by: Jenny Lewis (4/3/09)

As consultants, Jenny reported that her firm is often asked to prepare Vegetation/Bushland/Flora and Fauna Management Plans - usually at the request of Council (or because a consultant has recommended it in the impact assessment). She noted that some clients are reluctant to commit to ongoing management, particularly if they are on-selling subdivided lots or similar (and thus won't own the land they are expected to manage). She remarked that these plans are written with the best intentions but often spend their lives collecting dust on a shelf somewhere because no follow up occurs (eg. because Councils and other determining bodies have limited funds).

Jenny asked what do people see as the role of the ecological consultant when it comes to preparing these management plans? Should ecological consultants be preparing them at all, or is it best left up to the developer to negotiate a contract with a bush regeneration firm in order to fulfill their consent conditions? If consultants are to prepare these plans, how prescriptive should they be, and how do we address the sticky issue of costing and ongoing payment for management activities that may be carried out years after the developer has moved onto other projects? Should we get involved in the money side of things at all?

Responses:

Jason Berrigan:
Jason added that a similar problem occurs with Koala Plans of Management. In his opinion, he considered that consultants need to play a major role to the end, as we are in effect managers and the experts in regards to what the outcome is to be, and how it is to be achieved. Ethically, he believed that it is important to follow through, and we've all seen the developers "quick fix, sell out and walk away" management plans.

Jason also considered that preparing portions of Landscape Management Plans and VMPs in regards to costings is very difficult if not a consultants field, and the best thing to do is simply subcontract that part, ring around, or Google. To keep them paying, he finds bonds lodged with Council with portions refunded at various stages (ie construction certificate, Subdivision certificate, etc) matched with milestones, work well - so long as Council follows up and actually gets the money first. This can secure works funding for 5yrs - including monitoring reports to check compliance for Council, and ensure works are done to get their money back, or its defaulted to pay for the work to be done properly.

Mark Couston:
Mark advised that in his experience. Council's or State Government departments often require plans to be prepared either as documents to be submitted with Development Applications (DA) or as part of DA consent conditions. They are often referred to as Vegetation Management Plans, Ecological Sustainability Plans (in Pittwater) or Bushland Management Plans but basically they have the same intention.

In many cases when they are prepared as part of the DA, they often demonstrate the intended ecological compensatory measures and in some cases compensatory measures relating to threatened species, communities or populations. The plans become essential parts of a DA when they are referred to in Flora & Fauna assessments. They typically should outline works that are required before construction commences, works and performances measures during the construction process and works and performance measures at the completion of construction. This provides criteria that can be assessed should site audits be conducted by the consent authority or consultant. In some cases the consent authority conditions that monitoring/audit report be provided pre, during and post construction. Breaches of non compliance with the plan can therefore be non compliance with conditions of consent.

As for on-going maintenance, Mark remarked that if weed control commences pre-construction and continues during development, that's typically more than 10 months even for residential developments. At post-construction, the developer usually needs to get an Occupation Certificate or some sort of legal sign off and which would include implementation of the plan, pre, during and post construction. In his experience, Council's often condition a 2 year maintenance clause in the consent but he's not sure that this sort of condition is valid after the development has been signed off or certified as being complete.

He advised that his experience with the Dept of Environment and Water (DEW) is a different matter. When Vegetation Management Plans are prepared for "*waterfront land*", DEW require a 2 year maintenance period to be specified in the plan, and DEW can place bonds, issue orders to rectify land, etc. These conditions of approval may carry more weight but he is sure their compliance auditing some years post construction, like many things, may not be adequate, unless there are some bond monies withheld. Even then, the site may just get "touched up" once rather than continual maintenance during the 2 year period.

In terms of how prescriptive they should be, Mark believes that they should have clear performance measures and general procedures with a smattering of specifications. He doesn't think they should include the herbicide dilution rates for every weed on the site and actual weed control treatment methods for every weed on site. These should be left up to the bush regeneration contractor. To deal with these sorts of things, simple statements such as "*Herbicide used in accordance with the product label*", and "weed *control in accordance with standard bush regeneration techniques*" can be used. Structural engineers don't

tell carpenters which end of the hammer to use, so why should we go into detail work practices.

As for the cost of on-going maintenance, he states that all we can do is estimate the cost based upon standard rates and what we see as being adequate. Usually the cost estimate is for the purposes of releasing part of the bond monies.

On reasonably large or medium size jobs, Mark thinks that it is appropriate to have a consultant prepare such plans. The client can get quotations that are based on a defined scope of works; the plans could be part of compensatory measures relied upon in the flora & fauna assessment; and it is good practice to have a third party auditing the implementation of the works.

Martin Fallding:
Martin believes that ensuring appropriate ongoing ecological management is an important role for ecological consultants. Usually the only way that this can be done is through some sort of management plan, which is normally either a commitment by a development proponent or a legal requirement forming part of a development consent.

Martin advised that he has assessed and prepared many management plans for land, bushland and wildlife, with various names including vegetation MP, ecological MP, wetland MP, Koala MP, fauna monitoring plan, habitat MP, restoration plan, bush fire MP, or land MP. He finds they can have many different purposes and forms, and come in all shapes and sizes.

Some organisations have guidelines around to explain what is expected of such a plan, including Hornsby Council, NSW Department of Water and Energy, and Brisbane City Council. However, most of these are for specific purposes and will not be applicable generally.

Martin advised that some general tips for what should be included in management plans are included in an article he wrote for *Ecological Management and Restoration* Vol 1(3): 185 - 194 with the title "*What makes a good natural resource management plan*". A copy of this can be viewed on the Land & Environment Planning website at the following link:
http://www.calli.com.au/cgi-bin/CALremdm.pl?Do=logon&User=anon&Pass=pass&Page=PNum17

In his experience, if these management plans are to be effective, they need to be specifically written for the people who will be doing the work or looking after the land. They must also be practical. He thought the most effective land management plan he had ever produced is a 1 page summary diagram, which is still being used after 13 years.

Plans are quite different to an ecological assessment reports, although both may share common data. He thinks that ecological consultants need to promote ecological management plans to development proponents as having an important role in ensuring good ecological outcomes.

Liz Ashby and *Anthony Saunders* both added supportive comments to Martin's post, with emphasis on clarity, consistency, succinctness and measurable milestones in management plans and associated monitoring plans.

10. Biobanking Assessor Accreditation:

Seeded by: Danny Wotherspoon (18/3/09)

Danny seeded this very interesting and relevant topic, following the initial round of Biobanking Assessor accreditation. The accreditation training scheme costs >$1000, and was the subject of discussion in earlier posts on biobanking. Many have held out on doing the course given the slow (and some say pointless) implementation of the biobanking scheme.

Danny advised that to date in the Biobanking assessor accreditation process, that of about 60

people who did the course, 43 applied for accreditation and 27 were accepted. Danny considered this is an extremely low success rate, and suggested the process may be faulty. He considered that an applicant would want to know that they were acceptable on qualifications and experience before spending a large sum of money on doing the TAFE course.

Responses:

Liz Ashby:
Liz advised she was one of the applicants who qualified, and considered that the failure rate was more an indication of the quality control nature of the process and limitations of the applicant's qualifications and skills. She believed that for BioBanking to work, it must be handled well by enthusiastic and competent accredited assessors that will apply the process without fear or favour. She also advised that there is nothing to stop the non-accredited but trained assessors in applying the methodology under the tutorship of an accredited assessor. As long as the accredited assessor is convinced that the methodology has been applied correctly, they are entitled to sign off on the unaccredited assessor's behalf. This of course will be under a commercial arrangement, but is acceptable in our industry (ie. like using a specialist).

Danny added a further comment that his primary concern was about the order of events in the process. He believes that an applicant is entitled to know that they had acceptable experience and qualifications before doing the course to avoid wasting time and money.

Kath Chesnut:
Kath advised that she too has attended the course, but has failed accreditation due to insufficient experience, despite assurances during the course from DECC that this was not a limitation. Acknowledging that senior ecologists are more appropriate to be accredited, she echoed Danny's comments that insufficient clarity was provided to allow an applicant to choose whether or not to risk taking the course.

Anthony Saunders:
Anthony advised that ECA members should not worry too much about getting accredited given the limitations of the scheme from a commercial point of view.

11. Infra Red Remote Cameras:

Seeded by: Stephen Ambrose (30/4/09)

Stephen requested for recommendations for an inexpensive, but effective, remote sensor digital camera that is suitable for taking still photos of nocturnal mammals at bait stations, ideally from an Australian source. He added that he was looking at purchasing several cameras (and sensors) but was not prepared to buy really expensive equipment that could be stolen while it is in the field. This equipment would be left in the field for up to 2 weeks at a time without being checked, so would like something with enough battery power and large enough memory card.

Responses:

Michael Murray:
Michael recommended going to www3.interscience.wiley.com, and click on *Ecological Management and Restoration* and go to Vol 9 (1), to review an article by Towerton *et al* (2008) on remote cameras on malleefowl mounds. They used a camera costing $600.00, but had some issues with the installation of the camera on trees. He also suggested contacting the RTA who used remote digital cameras on fauna underpasses.

Why Coastal Floodplain Forests and Freshwater Wetlands on coastal dunes, swales, sand plains & beach ridge plains of the north east NSW bioregion are not Endangered Ecological Communities

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Introduction

The NSW Scientific Committee (1999, 2004) has listed six native vegetation communities occurring on coastal floodplains of the north east, Sydney basin and south east bioregions as endangered ecological communities under the NSW Threatened Species Conservation Act 2005. Collectively these communities (see Table 1 below) are referred to here as coastal floodplain EECs.

Table 1. Coastal Floodplain EEC's

Coastal Floodplain Endangered Ecological Communities		**Gazetted**
LR	Lowland Rainforest on Floodplain in the NSW North Coast Bioregion	13 Aug.1999.
RFEF	River-flat eucalypt forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregion	17 Dec. 2004
SOF	Swamp Oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner Bioregion	17 Dec. 2004
SSF	Swamp Sclerophyll Forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregion	17 Dec. 2004
SCFF	Subtropical coastal floodplain forest of the NSW North Coast, Sydney Basin and South East Corner Bioregion	17 Dec. 2004
FW	Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregion	17 Dec. 2004

Together these communities form part of a complex of forested and treeless wetland communities found throughout the coastal floodplains of NSW. These communities may intergrade and collectively include all remaining native vegetation on the coastal floodplains of NSW (NSW Scientific committee final determination for Swamp Sclerophyll Forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions, 17 December 2004). Thus any native vegetation occurring on alluvial floodplains in north east NSW can be expected to belong to one or more of the above EECs (referred to here as Coastal Floodplain EECs) regardless of its degree of similarity in floristic (plant species) composition to various descriptions provided in the final determinations for these communities.

Coastal floodplain vegetation is listed as endangered because it occurs on fertile level land which has been extensively cleared and modified for agriculture. The best examples of Coastal Floodplain Wetlands now occur not on the open plains but further up the valleys on small flats amid undulating terrain, where fingers of alluvium extend up intermittent creek lines and carry distinctive forests of *Casuarina glauca* and various *Melaleuca* (paperbark) species (Keith 2004). Possibly for this reason, the description of coastal floodplain EECs also includes vegetation "associated" with coastal floodplains, which can include vegetation on terraces, small flats, and alluvium in drainage lines that run onto coastal floodplains for distances up to 50 metres and sometimes up to 250 metres above sea level.

Other forests, which are similar in floristic composition to Coastal Floodplain EECs and which may be dominated by the same tree species, including *Casuarina glauca* and *Melaleuca quinquenervia,* can occur on other low lying coastal landforms such as coastal sands, beach ridges and swales, lagoons, tidal flats and sand plains. These communities, while similar in species dominance to some Coastal Floodplain EECs, are not

identified as endangered ecological communities by Keith and Scott (2005) because they do not occur on coastal floodplains. However, some ecologists (Parker 2005, Kingston 2008) have claimed that such communities should be considered coastal floodplain EECs where they occur on coastal sand plains, particularly in areas below the mapped 1 in 100 year flood levels. Differences of opinion between ecologists over definitions of coastal floodplain EECs have resulted in a number of disputes between Councils and developers proceeding to the NSW Land and Environment Court. Two recent judgements by the Land and Environment Court (Preston CJ (2007): Motorplex Australia v Port Stephens Council NSW LEC 74, and Preston CJ (2008): Gales Holdings Pty Ltd v Tweed Shire Council NSW LEC 209) have now resolved many of the ambiguities and uncertainties in definition and mapping of coastal floodplain EECs.

The following review was submitted to the Land and Environment Court as part of the evidence (which also encompassed floristic, soil, geomorphological and hydrological data) considered in the case of Gales Holdings v Tweed Shire Council. It specifically outlines the case for why native vegetation communities with the floristic and structural characteristics of coastal floodplain EECs should not be classified as EECs where they are located on coastal sand plains and certain landforms other than alluvial drainage lines and floodplains. The arguments presented in this case were generally accepted by Preston CJ in his judgement on this matter, and now provide some guidance for ecological consultants wishing to more reliably map the boundaries of coastal floodplain EECs.

Floristic Differences Between Coastal Floodplain Forests and Coastal Sandplain Forests.

Keith and Scott (2005) carried out a statewide floristic analysis of coastal vegetation communities on coastal floodplains, estuaries and sandplains. They identified and described five floristic communities associated primarily with coastal floodplains, which provided the type descriptions and classification of the following EECs: Swamp Sclerophyll Forest (SSF), Swamp Oak Floodplain Forest (SOF), Sub-Tropical Coastal Floodplain Forest (SCFF), River Flat Eucalypt Forest (RFEF), and Lowland Rainforest (LR) located on coastal floodplains of the NSW north coast bioregion. A dendrogram showing floristic relationships between all vegetation communities sampled (Figure 1) shows that these five EECs form a super-group that are all more closely related to one another than to floristically similar communities found on coastal sand plains and estuaries. The dominant species in these groups are, however, also found in many other non-EEC communities. For example Keith and Scott (2005) found that the EEC Swamp Sclerophyll Forest on Coastal Floodplains (Group 1 in Figure 1) "*also share some of their dominant species and structural features with Groups 9,10, 11, and 29 which occupy analogous habitats in poorly drained depressions and flats on sandplains*". Groups 10,11, 12 are described as Swamp Sclerophyll Forest on Coastal Sandplains and Group 29 is described as Sand Swamp Forest in Dune Swales. None of these sandplain communities forms the basis of, or are listed as Endangered Ecological Communities in the north coast bioregion. The descriptions of these sandplain communities in Table 1 of Keith and Scott (2005) indicates that they can be distinguished from EEC Coastal Floodplain communities primarily in being located on "swales and flats on coastal sandplains". Similarly, the dendrogram and descriptions of Keith and Scott (2005) show that the EEC Swamp Oak Floodplain Forest (Group 2 in Figure 1) shares dominant species (*Casuarina glauca*) with Group 17 Estuarine Fringe Forest, but that the latter may be distinguished by its location on estuarine fringes rather than floodplains.

It may be concluded from the study of Keith and Scotts (2005), that position in the landscape, particularly occurrence on alluvial soils and floodplains, is the critical determinant of Coastal Floodplain EECs rather than tree species dominance. Therefore vegetation communities should not be considered Coastal Floodplain EECs simply on the basis that they share dominant tree species with these EECs unless they also:

a) occur on coastal floodplain landforms, or
b) are associated with coastal floodplain landform in the manner specified in Scientific Committee Determinations

Soil and Landscape Differences Between Coastal Floodplain Forests and Coastal Sandplain Forests.

Soil and landscape requirements for Coastal Floodplain EECs are specified in part 1 of the Scientific Committee determinations. These requirements are summarized in Table 2 below.

Specifications in Table 2 indicate that coastal floodplain forest EECs (SSF, SOF, SCFF, and RFEF) must be located on alluvial flats or drainage lines associated with alluvial flats. Floodplains, alluvial plains and alluvial flats are level landforms created by active erosion and deposition (aggradation) of soils deposited by channelled or overbank stream flow (Speight and Isbell p166, 1990). Floodplains and terraces are characterized by the presence of alluvial soils which can be distinguished by distinct layers of silts and sediments and water sorted particles of different size deposited in different layers by freshwater. Floodplains differ from other level coastal landforms such as sand plains, sand sheets, beach ridge plains, lacustrine plains, and tidal flats which are not created by sediment deposition from channelled and overbank stream flow. Sand plain landscapes can be readily distinguished from alluvial landscapes by the presence of Podzols. Podzols do not occur on alluvial soils. Podzols are sandy soils with little or no clay and a conspicuously bleached horizon beneath a humic or peaty upper layer.

Table 2. Soil and landform requirements of Coastal Floodplain EECs.

EEC	Soil	Landform
SSF	Humic clay loams and sandy loams	On waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains up to 50 m elevation. Or where larger floodplains adjoin lithic substrates or coastal sand plains.
SOF	Grey black clay loams and sandy loams where ground water is saline or subsaline	On waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains up to 20m elevation.
SCFF	Clay loams and sandy loams	On periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains up to 250m elevation.
RFEF	Silts, clay-loams and sandy loams	On periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains up to 250m elevation.
FW	Silts, muds or humic loams	Periodically or semi-permanently inundated (where standing water persists for at least part of the year in most years) depressions, flats, drainage lines back swamps, lagoons and lakes associated with coastal floodplains. Also occurs in backbarrier landforms where floodplains adjoin coastal sandplains. Fresh water wetlands on coastal sandplains are excluded from this determination. Artificial wetlands created on previously dry land specifically for purposes such a sewage treatment, stormwater management and farm production are not regarded as part of this community.

Sandplains and beach ridge plains are characterized by level or gently undulating sand sheets on which channels are absent or extremely rare (Speight and Isbell 1990), and on which natural drainage is generally by a infiltration and sub-surface flow (Morand 1996). Sandplains and beach ridges may be formed by wind, water, sheet flow, tides and wave action. Lacustrine plains are aggraded by waves and deposition of sediment from suspension in standing water, and tidal flats are aggraded by tides (Speight and Isbell 1990). Sandplains, beach ridges lacustrine plains and tidal flats differ from coastal floodplains in lacking alluvium. They mostly comprise colluvium (sediment transported by gravity, creep or sheet flow), marine sediments (sediment mass deposited by transport by waves and from solution in suspension in sea water) or lacustrine sediments (sediment mass deposited by transport by waves and from solution and suspension in still water in a closed depression on land) (Speight and Isbell 1990).

Speight (1990) defined "beach ridge plains" and "sand plains" as follows.

- Sandplain: "*level landform pattern with extremely low relief, typically without stream channels, aggraded by rarely active sheet flow and modified by wind, waves, and soil phenomena*";

- Beach Ridge Plain: "*level to gently undulating landform pattern of extremely low relief on which stream channels are absent or very rare, it consists of relict parallel beach ridges. Typical elements: beach ridge (co-dominant) swale (co-dominant)*".

These landforms are marine and aeolian in origin and distinctly different from Floodplain or Alluvial Plain landforms which comprise alluvial (layered) soils deposited by overbank streamflow (Speight 1990). Both floodplains and sandplains may include sandy soils but only sand plains and non-alluvial soils have sand Podzols. Sandy soils on alluvial floodplains and drainage lines are typically layered with particles of different size in different layers including clays and gravels.

Meaning of the Term Associated with Coastal Floodplains

The meaning of the term "associated with coastal floodplain" is not defined within EEC Scientific Committee Determinations, other than to specify elevation limits above which the classification does not apply. However, a reasonable ecological interpretation of this term for Coastal Floodplain Forests would include vegetation communities that are:

> a) on a floodplain; or
> b) on alluvial soils in periodically inundated drainage lines that are connected with a floodplain, below elevation limits specified in EEC determinations.

This definition limits the term "associated with" to areas in the landscape that meet the soil type (alluvial) and landform type (periodically inundated flats and drainage lines) criteria specified in Scientific Committee Determinations as well as being continuously connected with a coastal floodplain via a drainage line.

The above definition is essentially that adopted by Preston (2007) in the case of Motorplex Australia v Port Stephens Council NSW LEC 74. While noting that the term "associated with" could include areas in physical, hydrological or ecological proximity, Preston (2007) limited interpretation in the Motorplex case to inclusion of native vegetation on alluvial soils in drainage lines with a continuous (fluvial) connection to coastal floodplain. This approach is consistent with the criteria used by Keith and Scott (2005) to identify EECs. Keith and Scott (2005) included only communities on alluvial substrates within Coastal Floodplain EECs. They provided a map

showing the extent of coastal floodplain plant communities (EECs) in the Tweed valley (Figure 2) which does not include coastal sand plains and associated coastal sandy land forms, including those on Gales Holdings near Kingscliff, but does include creek flats and upper level terraces and alluvial deposits along drainage lines connected to coastal floodplains. Floristically similar communities on aeolian, estuarine, lacustrine, marine, beach ridge plains, dune swales and sandplain landforms that may directly abut or adjoin coastal plains, or that may be ecologically connected by mobile faunas, were not included in Coastal Floodplain EECs.

Definition of the term "associated with" to include alluvial soils along drainage lines satisfies fundamental ecological and conservation planning goals in that it prioritizes protection of the riparian zone which is a key ecosystem, refuge area and connecting corridor network within most landscapes.

Advice from the Scientific Committee also indicates that vegetation communities associated with coastal floodplains need not be "continuous" along drainage lines but may occur in discrete patches and may occur some distance (kilometres) away from coastal floodplains. Hughes (2005) states "*the description of Swamp sclerophyll Forest on Coastal Floodplains does not stipulate that all stands of the community must be continuous with coastal floodplains, only that the drainage lines are associated with coastal floodplains. Thus a discrete alluvial flat or drainage line would be associated with a coastal floodplain if the drainage line flowed onto the floodplain and the site was in proximity to the floodplain, irrespective of whether the assemblage was continuous throughout its occurrence along the drainage line*". Hughes (2005) also indicates that the occurrence of alluvial soils is the key to determination of EECs in drainage lines in noting that "small [unmapped] occurrences of shallow alluvial soil may be expected to occur within [upstream] areas mapped as having lithic [non alluvial] substrates.

The Scientific Committee description for Freshwater Wetlands includes natural depressions, flats, backswamps, lagoons and lakes associated with coastal floodplains. If the same approach to interpretation of the term "associated with coastal floodplain" is adopted for FW as for other coastal floodplains EECs this community would include only those natural depressions, backswamps, lagoons, and lakes with alluvial soils that are on coastal floodplains, directly connected with floodplains along drainage lines. This definition would exclude natural depressions, flats, backswamps, lagoons and lakes on non-alluvial soils such as sand plains, dunes, beach ridge plains, estuaries and tidal flats. Support for this interpretation is provided within the Scientific Committee Determination itself which explicitly states (section 9) that "*freshwater wetlands on coastal sandplains …. are excluded from this Determination*." Details of the drainage line (fluvial) association that may occur between lagoons and coastal floodplains is provided by Keith (2004) who states that: "*Lagoons form on floodplains in quite a different manner to those on sand plains. River bends become isolated (or nearly so) from the main river channel by deposited sands, leading to the formation of backswamps and floodplain lagoons. Unlike lagoons on sand plains, the waters and sediments of floodplain lagoons are enriched by nutrients and sediments transported by the river*".

The Scientific Committee determination for Swamp Oak Forest on Coastal Floodplains (SOF) specifies that the community can be on or associated with drainage lines and alluvial flats, but also includes lake margins and estuarine fringes associated with coastal floodplains where the groundwater is saline or sub-saline. If the same approach to interpretation of the term "associated with coastal floodplain" is adopted for SOF as for Freshwater Wetlands and other Coastal Floodplains Forest EECs this community

Figure 1. from Keith and Scott (2005) showing floristic relationships between coastal floodplain, sandplain and estuarine communities. Communities identified as coastal floodplain EECs are listed in bold (Groups 1,2,3, 7 and 8).

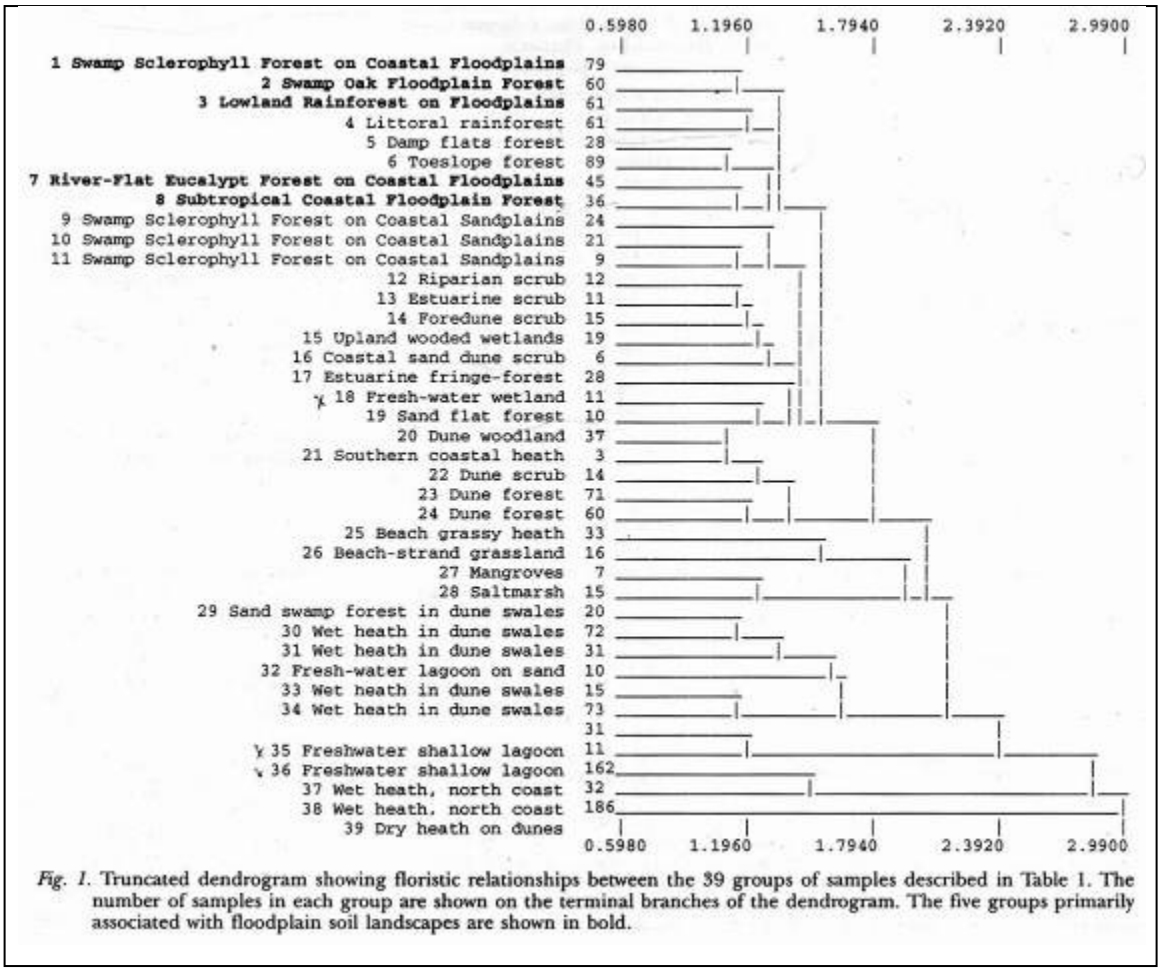

Fig. 1. Truncated dendrogram showing floristic relationships between the 39 groups of samples described in Table 1. The number of samples in each group are shown on the terminal branches of the dendrogram. The five groups primarily associated with floodplain soil landscapes are shown in bold.

Figure 2. Showing the distribution of coastal floodplain soil landscapes and historical records of coastal floodplain communities on the Tweed River floodplain.

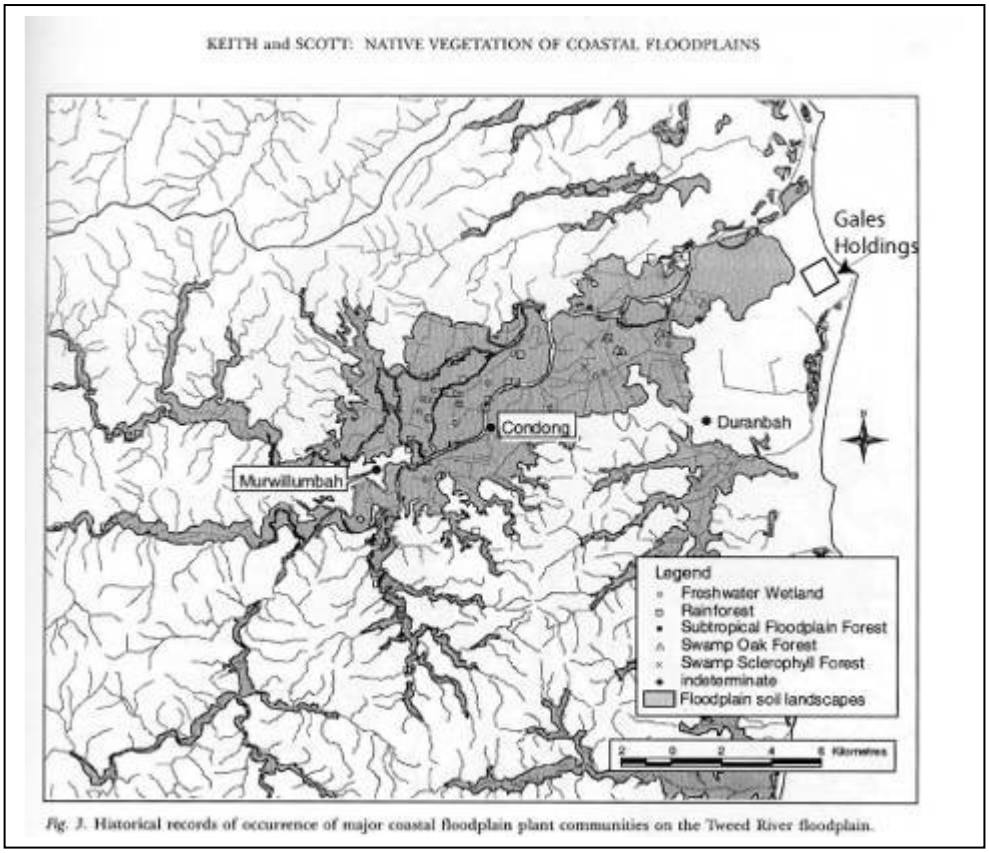

Fig. 3. Historical records of occurrence of major coastal floodplain plant communities on the Tweed River floodplain.

would also include lake margins and estuarine fringes with alluvial soils, where the ground water is saline or subsaline, that are on coastal floodplains or are connected with floodplains along drainage lines. This definition would exclude lake margins and estuarine fringes on non-alluvial soils such as sand plains, dunes, beach ridge plains and tidal sand flats. This interpretation is consistent with Keith and Scott (2005). They exclude SOF EEC vegetation communities dominated by Swamp Oak (group 13, Estuarine Scrub, and group 17 Estuarine Fringe Forest) that are not located on coastal floodplains, but which occur on floodplain margins and estuarine fringes. Similarly Griffith *et al*. (2003) describe a community found on sand plains (community 37) which includes Swamp Oak and Paperbark, but which is not considered to be endangered and is not included within the SOF EEC.

Further evidence that vegetation on sand plains and dune swales is excluded from Coastal Floodplain EECs is provided by the Scientific Committee Determination for Sydney Freshwater Wetlands. This EEC encompasses vegetation in the Sydney Newcastle region analogous to that found in SOF, SSF and FW EECs on coastal floodplains. The species list for Sydney Freshwater Wetlands includes Swamp Oak (*Casuarina glauca*) and Swamp Paperbark (*Melaleuca quinquenervia*) which are indicators of SOF and SSF. However, Sydney Freshwater Wetlands is specifically described as being located "*in swales and depressions on sand dunes and low nutrient sandplain sites in coastal areas*". A separate Determination for these communities where they occur on sandplains, sand dunes and swales is only necessary if they are otherwise excluded from Coastal Floodplain EECs.

Differences in Conservation Status Between Coastal Floodplain Forests and Coastal Sandplain Forests.

Conservation status is also an important determinant of EECs. Scientific Committee Determinations for EECs include reasons for listing that generally refer to the extensive clearing of these communities since European settlement and/ or poor representation in conservation reserves. Remnant Coastal Floodplain Forests and Wetlands are considered to have a high conservation status because:

a) they have been extensively reduced by clearing;
b) only a small minority of the remaining area occurs in reserves and on public land;
c) remaining areas are highly fragmented and disturbed.

On the Tweed lowlands, less than 3% of the original floodplain forest remained in 1985 (Pressey and Griffith 1992). and similar estimates are thought to apply to coastal floodplains in other parts of NSW (NSW Scientific Committee Final Determination Dec 2004). The comprehensive destruction of native vegetation on coastal floodplains has left few good examples intact and little area protected in reserves. Isolated trees and small clumps can be seen on most floodplains today, but there is usually no native understorey remaining. However, some pockets of semi-natural coastal floodplain plant communities remain tucked away on small creek flats (Keith 2004). The high clearing level and poor representation of coastal floodplain forest in nature reserves can be attributed to its location on soils of high agricultural value which were extensively cleared early after European settlement and before expansion of the National Parks system.

The same is not true of coastal swamp forests and wetlands located on sandy soils on sand plains, dunes, beach ridges, estuaries and tidal flats. Swamp Forests on coastal sandplains form

mosaics with Wallum Sand Heaths, Coastal Heath Swamps and Coastal Freshwater lagoons. These communities have only been moderately disturbed since European settlement and are extensively represented in coastal National Parks and reserves such as SEPP 14 Wetlands. Reserved examples are represented from Sydney to Moreton Bay in Queensland in a chain of coastal National Parks including Broadwater, Bundjalung, Tyaggarah, Yuragir, Crowdy Bay, Hat Head, and Myall Lakes (Keith 2004). The much higher level of protection afforded native vegetation in these communities can be attributed to low soil fertility and unsuitability for agriculture. The principal and limited threats to these communities are sand mining and urban expansion. In 1968, the NSW Parliament held an inquiry into conflicts between sand mining and nature conservation, and as a result examples of sand plain (wallum) communities along the North Coast were set aside for conservation. Extensive areas of relatively undisturbed wallum and associated vegetation are now reserved in national parks and nature reserves in north east NSW, in addition to many regenerating mine paths (Griffith *et al* 2003). Griffith *et al* (2003) reviewed the conservation status of Wallum vegetation in the NSW north coast and they did not recommend the general inclusion of all sand plain vegetation communities in EECs in the manner that has occurred for coastal floodplain vegetation communities. They recommended conserving entire coastal landform patterns rather than simply small elements of landforms such as just a swamp supporting sedgeland in the lowest part of the plain. This approach requires protection of large, relatively undisturbed continuous vegetation remnants, and is not appropriate in heavily disturbed, and fragmented small urban remnants. Most of the former areas are now protected in existing reserves, SEPP 14 wetlands or other public lands.

Swamp forests and wetlands on coastal beach ridge plains, sandplains and associated landforms (tidal flats, estuaries and beach ridges and dune swales) have been only moderately cleared and disturbed since European settlement, are generally well represented in nature reserves, and unlike vegetation on coastal floodplains do not require blanket protection as Endangered Ecological Communities. Any conservation of these communities should be on an individual basis and should aim to incorporate entire landform processes rather that individual fragmented elements that may not survive in isolation (Griffith *et al* 2003).

Sydney Freshwater Wetlands EEC

Forests on sandplains and beach ridges in the Sydney region provide an example of a localized sandplain vegetation community that may require regional protection as an EEC due to high urban development pressures. Justice Talbot (2007) in the matter of Rocla v the Minister for Planning and Sutherland Shire Council found that Swamp Oak Forest and Swamp Sclerophyll Forest on the Kurnell Peninsula were EECs on the grounds that:

1. first and foremost the vegetation on the site was floristically similar to that described in the Final Determinations for SOF and SSF,
2. there was no suggestion that these vegetation groups commonly occur in places other than floodplains; and
3. there was no suggestion that when they do occur on places other than floodplains they are less endangered.

It appears that there was no evidence before Justice Talbot in relation to the above three points that could lead to an alternative decision. That is not the case on Gales Holdings or in the north coast region of NSW for the following reasons:

1. Firstly the study of Keith and Scott (2005, Figure 1) clearly establishes that floristic similarity is not conclusive proof membership of an EEC. Some vegetation

communities can be floristically similar to and dominated by similar plant species to EECs without being EECs, especially when they are located on soils or landforms not included by EEC Determinations.

2. Secondly, there is clear evidence (eg Keith and Scott 2005, Keith 2004, and Griffith *et al* 2003) that Swamp Sclerophyll Forest and Swamp Oak Forest communities occur in places other than coastal floodplains. In particular, they occur on coastal sand plains, beach ridges and swales, estuaries and lagoons.

3. Thirdly, there is conclusive evidence that native vegetation including Swamp Sclerophyll Forest and Swamp Oak Forest communities on sand plains and associated estuarine and sandy coastal landforms are less endangered than those on coastal floodplains. As previously outlined, sand plain and associated landforms are well represented in coastal national parks and have only been moderately cleared and disturbed since European settlement due to their occurrence on soils of low fertility and unsuitability for agriculture.

The decision reached by Justice Talbot (2006) in the Rocla Matter may have been appropriate for the Kurnell region because Swamp Oaks (an indicator of Swamp Oak Forest) and Swamp Paperbarks (an indicator of Swamp Sclerophyll Forest) on swales and depressions on sand dunes and low nutrient sandplains such as those on Kurnell Peninsula are characteristic species for the Sydney Freshwater Wetlands EEC. This EEC appears to have been specifically defined to protect swamp forest and wetland vegetation communities on sandplains, dunes and swales in the Sydney to Newcastle region due to their localized rarity and depletion by urban expansion. However, this EEC does not apply to northern NSW where such communities are well represented in nature reserves and less threatened by urban expansion.

Conclusion

The judgements of Justice Preston in Motorplex v Port Stephens Council NSW LEC 74 and Gales Holdings v Tweed Shire Council clarify many of the uncertainties and ambiguities in the identification of coastal floodplain EECs. Together these judgements along with the information on which they were founded (Smith 2006a, 2006b, 2007, 2008 and others) have determined that:

a) any native vegetation on alluvial soils (comprising sediments deposited by overbank stream flow) in drainage lines below elevation limits (50-250 m AHD) specified in Scientific Committee determinations, that drain onto a coastal, alluvial floodplain landforms in eastern NSW, will belong to one or more of the listed coastal floodplain EECs;

b) any native vegetation in drainage lines below elevation limits (50-250 m AHD) specified in Scientific Committee determinations on non-alluvial soils or on sandplain landforms will not qualify as EECs, even if they are floristically consistent with descriptions in Scientific Committee determinations; unless they are otherwise expressly specified to be included within Scientific Committee determinations (eg by reference to existence mapped vegetation units).

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* available on request from the author.

EIANZ 'Breaking the Barriers: Engineering Solutions to Ecological Problems Symposium' Brisbane

Cassandra Thompson
SMEC Australia
ECA Member

The ecological impact of linear infrastructure, particularly roads, has been widely researched. It is clear that these structures generally have an adverse impact on biodiversity causing its fragmentation, degradation and the creation of barriers to movement (both physically and genetically) (van der Ree *et al*, 2007).

The EIANZ (Environment Institute of Australia and New Zealand) hosted a three-day symposium in Brisbane in early May 2009 discussing the use of engineering solutions to mitigate the ecological impacts of linear infrastructure developments. The symposium addressed the challenges currently facing road authorities, State and local governments, engineers, consultants and ecologists attempting to meet ever increasing environmental standards associated with such infrastructure often without access to proven methods or approaches.

Attended by local, State and Commonwealth regulatory bodies, research scientists, consultants and community group members, conference presentations were given by national and international experts who examined many case studies highlighting the successes and

shortcomings of existing wildlife mitigation measures.

Dr Edgar van der Grift of Wageningen University in the Netherlands opened the first session detailing successful methods for connecting fragmented areas from a European perspective. Edgar provided numerous examples of innovative ways to provide access for fauna across infrastructure, including amphibian overpasses consisting of a series of small ponds and wetland zones, and the use of modelling to set priorities for connecting habitat. He also highlighted the importance of measuring the viability of populations on either side of crossing structures and not just monitoring the structures and their use. Dr Andrew Hammer from the University of Melbourne discussed monitoring the impacts of the Pakenham Bypass, a new 20km road in Victoria, on the Growling Grass Frog (*Litoria raniformis*). Despite monitoring of populations over a 6 year study, the use of the underpass structures implemented to mitigate impacts on this species was not confirmed. On the up side, the frogs were using artificial ponds installed as part of the road upgrade.

Dr Rod van der Ree, in collaboration with SMEC, discussed a recent report commissioned by the Commonwealth Department of Environment, Water Heritage and the Arts (DEWHA) that reviewed national mitigation measures for addressing habitat fragmentation caused by major infrastructure. It reviews the effectiveness of measures already instated to mitigate habitat and population fragmentation caused by linear infrastructure. One of the main findings was a lack of co-ordination and minimum research standards in this area, which has so far meant that there is little transfer in information about successes and failures from one project to the next. The report also found that there is sufficient evidence to demonstrate that many species of terrestrial vertebrates, particularly mammals, will use a range of crossing structures, though this might be an artefact of sampling methods. DEWHA are finalising the report, with copies becoming available for public distribution soon (see DEWHA website).

The main focus of the conference was fauna crossing structures such as land bridges, underpasses, glider poles and fishways across roads. Of interest, only five fauna land bridges have been designed and constructed in Australia (in comparison to 3,000 in Europe alone). SMEC, an industry partner for the symposium, have been involved in the design of three of these in NSW, in consultation with local ecological experts including Chris Moon, Rod van der Ree (Royal Botanic Gardens Melbourne), Khaalyd Brown (EcoPro), David Rohweder (Sandpiper) and Ben Lewis (Lewis Ecological).

SMEC's ecology group presented two posters at the symposium. The first looked beyond mitigating fauna connectivity, which has been a focus in the past, to concentrate on habitat and ecosystem connectivity and health. Maintaining hydrological regimes and including plant and invertebrate ecology (particularly pollinators) is an integral part of mitigating the impacts of new roads. Such measures are often neglected in the design and mitigation of linear infrastructure. One of SMEC's projects includes the provision of wasp movement structures (culverts/underpasses in strategic locations along a new road) for maintenance of pollination in a north coast threatened plant.

The second examined the planning, design and construction processes/activities involved in the Tugun Bypass project. The poster included details on standard and innovative measures put in place for the management of the Wallum Sedge Frog (*Litoria olongburensis*) and the Wallum Froglet (*Crinia tinnula).* These included specific fencing designed to stop frogs from getting onto the road, and strategically placed under and over-passes. A further "frog friendly" measure was the

installation of frog ponds which were designed to link existing habitat on the side of and across the new road. Monitoring is currently being undertaken to determine the effectiveness of these measures. The posters can be viewed at the symposium website shown at the end of this article.

The conference provided some clear direction for improving mitigation measures, and ensuring research and information on the success and shortcomings of such structures is shared for future planning and design. A theme throughout most of the talks was the importance of continued maintenance of engineering structures to ensure their efficacy and the investigation of retrofitting existing structures where possible in known road kill hotspots.

The conference also identified the need for a nationally consistent framework to apply to linear infrastructure for mitigating the impacts of fragmentation on population viability. This framework would be based on what is found to be effective. As such, data sharing (including 'grey' literature) needs to be investigated to provide advice and guidance to ecologists and designers alike. Professor John Bissonette of the Utah State University, discussed a web-based decision guide currently being utilised in the United States as a basis for mitigation decisions. The guide is based on ecological information and research on the effectiveness of measures currently employed within North America (see website at end of this article).

The recognition of the need for a knowledge base or 'hub' such as this was one of the key outcomes of the symposium workshop held after the presentations. It is anticipated that the EIANZ will coordinate and assist in forming such a resource, however input from the ecological knowledge base (that's you) to feed into such a framework will be crucial. Keep an eye on the EIANZ website for future information on this.

Rod van der Ree's & SMEC's review of measures to minimise habitat fragmentation provides a starting point for the preparation of this proposed knowledge base. Further to this, the QLD Department of Main Roads has a guideline on fauna sensitive road design and is planning to publish the second volume of this document very soon. It is also worth noting that the NSW Roads and Traffic Authority has commissioned the preparation of a similar guideline for the State, although this is still some time away from being published. The integration of these guidelines and sharing the knowledge base within the ecological and engineering community will be the key to national consistency and efficacy of linear infrastructure measures into the future.

For further information or discussion on the conference, mitigating the ecological consequences of roads or SMEC's ecology team, please contact Cassandra Thompson at Cassandra.Thompson@smec.com.

You can also access conference proceedings at: http://www.eianzseq.org/Breaking%20the%20Barriers%203.htm.

John Bissionette's web-based decision tool can be accessed at: www.wildlifeandroads.org.

References:

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Squirrel Glider review for Morisset Structure Plan area, Lake Macquarie City Council

Martin Fallding
ECA Member

Many ecological studies are site specific and do not include detailed investigation of landscape scale issues such as habitat connectivity and population viability. The ecological implications of strategic land use planning options are also often not evaluated.

A good example of considering these issues is a recent review of land use options for the Morisset Structure Plan area in the Lake Macquarie City Council area near Newcastle. This included a strategic review of landscape scale impacts of land use options on the Squirrel Glider using a GIS analysis of detailed vegetation mapping data. The review covered an area of approximately 3,500 ha.

The Squirrel Glider *Petaurus norfolcensis* is a listed threatened species which is widely distributed within Lake Macquarie local government area in NSW. The Morisset Structure Plan area forms part of the habitat for a population of the species occurring within the Wyong – Lake Macquarie area which is of state and national significance. This population is being adversely affected by habitat clearing and fragmentation arising from urban development.

The biology of this species is sufficiently well understood to be able to take into account its habitat requirements in determining future land use. Studies show that density and probability of occurrence of Squirrel Gliders in native vegetation remnants increases significantly with increasing remnant size, decreasing distance to the nearest remnant, increasing size of the nearest remnant, and the occurrence of habitat corridor links.

Squirrel Glider population, size and distribution, viability and habitat connectivity in the area were reviewed to inform decisions on options for future land use, and the preparation of a structure plan for future urban development covering an area of 746ha.

A GIS analysis was undertaken to review conservation significance and to identify realistic land use options and their implications for the future of this species. Minimum habitat sizes for maintaining population viability were calculated, as well as minimum connectivity requirements. Likely barriers to connectivity were identified to enable the design of a land use pattern to maintain long term connectivity.

The assessment of Squirrel Glider habitat in the Morisset Structure Plan area showed about 361ha of suitable habitat in the area, with an estimated population of about 140 individuals, forming part of a larger population. The population within the Structure Plan area contributes to the long term viability and range of the regional population and is currently connected by a network of Habitat Fragments. Many of the Habitat Fragments are tenuous and may potentially be lost in the short to medium term as a direct result of land use change. Most (74%) of the population of the species occurs in six Major Habitat Fragments (>100 ha) which comprise about 60% of the vegetated area. Long term viability of populations relies on protecting sufficient Major Habitat Fragments, which are physically connected to other Minor and Small Habitat Fragments (4ha–100ha) by movement corridors which will facilitate dispersal and breeding.

The study identified the minimum criteria that need to be satisfied in the Morisset Structure Plan area to retain Squirrel Gliders as follows:

- A minimum of 217ha of habitat in conservation zonings (preferably in secure land tenure) in Habitat Fragments of >4ha in area. As far as possible, at least 75% of the total area of Habitat Fragments should be in

large fragments of >100 ha (to maintain the existing population).

- The Habitat Fragments being connected in a pattern such that each >4ha Habitat Fragment is not further than 1000m from another >4ha Habitat Fragment, and connected by a vegetated corridor providing suitable habitat with an average width of not less (and desirably much more) than 20m, with not more than two gaps of >35m where possible.
- Each >4a Habitat Fragment shall be linked to other habitat by at least two or more suitably vegetated movement corridors. Desirably, there should be more links and alternative routes from, and to, each habitat fragment.

The results of the review have now been included in land use planning principles and included in strategic land use planning documents.

References

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* electronic copies are available from Lake Macquarie City Council, email mfallding@lakemac.nsw.gov.au

Member Profile - *Alison Hunt*

1. **Name, qualifications, employer and ECA membership status**: Alison Hunt, Bachelor of Science (Honours), PhD in marine ecology and population genetics of marine populations from the University of Wollongong. Self employed. ECA Practicing Member and Council Member.

2. **Specialties, preferred field, interests, obsessions**: All things wet although I have professional skills in fauna and flora gleaned from working on consulting projects during my undergraduate years and built on over 25 years.

3. Why did you decide to become an ecological consultant? After a number of years in academia, including a large chunk of the 1990s working initially as a post-doctoral fellow and then research scientist in the USA, I finally decided that I really did like and missed the fast paced and manic lifestyle of ecological consulting.

4. What would you be doing now (to pay the bills) if you weren't an ecological consultant? Academic.

5. What would you *wish* you could be other than an ecological consultant? Cowgirl.

6. What is the *best* part of being an ecological consultant? Travelling to far flung and near flung places and seeing landscapes and places that people don't regularly get to experience has to be the best bit. Also being involved in lots of projects, especially the large infrastructure projects, as these are the ones that are shaping our cities, towns and countryside.

7. What is the *worst* part of being an ecological consultant? Clients with unrealistic expectations, although working with them to achieve ecologically sustainable development is also one of the best parts.

8. What's the worst thing you've seen in a report from a consultant? sweeping statements drawn from too little data, poorly collected data and incorrectly analysed data. We all have our bad days but hey, get those reports technically reviewed before making them a public document.

9. **If the NSW Premier gave you absolute power for one day, what would you do/change?** I would abolish Assessments of Significance (TSC Act) as those seven part tests are tedious and mostly uninformative. Now what would I replace them with? Well that is the **really** tough question. I'll get back to you on that.

10. What is the strangest, cutest, funniest or most embarrassing thing you've seen or done as a consultant? I will leave that up to others to remember all my bloopers, blunders and the other cringe worthy moments of my career. They are many and varied and best shared over a bottle of wine.

11. **Which came first: the chicken or the egg?** The egg of course. Otherwise how did the chicken evolve?

The platypus and the environmental impact assessment process: Some cogitations of a consultant.

Tom Grant
Education and Environment Services Pty. Ltd.
Member of ECA Council

The map shows the current distribution of the platypus (*Ornithorhynchus anatinus*). Apart from South Australia, where the species apparently used to occur in the Adelaide Hills and Mount Lofty Ranges, its distribution appears to be much the same as it was prior to the occupation of Australia by Europeans (Grant 2007). Until around the turn of the 20th Century, the platypus was hunted both for its fur and in biological investigations, particularly attempts to confirm its reputed oviparity. Some early Europeans, and the indigenous inhabitants, already knew the platypus laid eggs but it was not until after the slaughter of hundreds of platypuses and echidnas by expatriate Europeans, that William Caldwell announced the fact to the scientific world in 1884. Despite these early depredations, platypus populations seem to have bounced back. The International Union for the Conservation of Nature and Natural Resources (IUCN) lists the platypus as a species of 'least concern'.

Conservation status – not listed

Although it could be argued that the platypus should be designated as a 'Data deficient' species under the IUCN Red Data categories (Figure 2), probably enough is known to be able to consider at least the broad requirements for allocation of the species to one of the other categories (Figure 3). Although declines and fragmentations of populations have been recorded in a number of parts of its distribution, including the Wimmera-Avon and Portland river systems in Victoria (Australian Platypus Conservancy [APC] data), the Eden-Bega area (Lunney *et al*, 1998) and Richmond River system (Rohweder and Baverstock, 1999) in NSW and the lower Murray and Murrumbidgee Rivers (APC data, Grant 1993, NPWS National Parks and Wildlife Service data) in the far west of Victoria and NSW, the platypus does not currently fall into either the Critically Endangered, Endangered or even Vulnerable categories. By default it becomes a species of 'Least concern' (Figure 3). The Commonwealth (*Environmental Protection and Biodiversity Conservation Act* [EPBC Act 1999]) and individual states use only slightly varied categories of those of the IUCN, but the default is 'not listed' on the threatened species schedule. Except for South Australia, where the species is considered Endangered and now is only occasionally reported from the upper Murray River and from the Glenelg River where its waters flow briefly through South Australia, the platypus is not listed on any threatened species schedule under State or Commonwealth legislation (Table 1).

Effects of not being listed

Not being listed means the platypus is not considered a threatened species, which is good news - yes? Well, actually that is debatable. In the current system there are some serious disadvantages of not being listed. Unlisted species are given low priority in:

- Planning Decisions
- Land Use Planning and Management
- Research Funding
- Conservation and Management Funding
- Environmental Impact Assessment

As a consultant who has the luxury of semi-retirement permitting him to work almost exclusively on projects relating to the platypus, the last disadvantage in this list is of most interest to me. Apart from providing less work for me in my dotage, the failure of the platypus to make it onto a schedule has potentially serious consequences for the species itself. In the Environmental Impact Assessment (EIA) process, the platypus and its habitat requirements may not

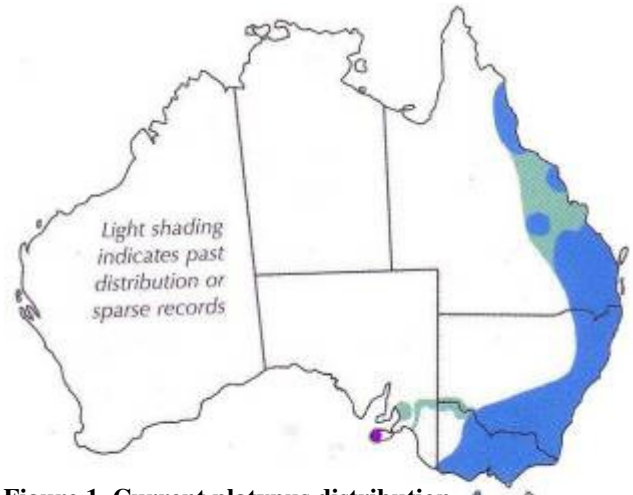


Figure 1. Current platypus distribution. Purple colouration shows the population introduced to Kangaroo Island. Van Dyck and Strahan, 2007.

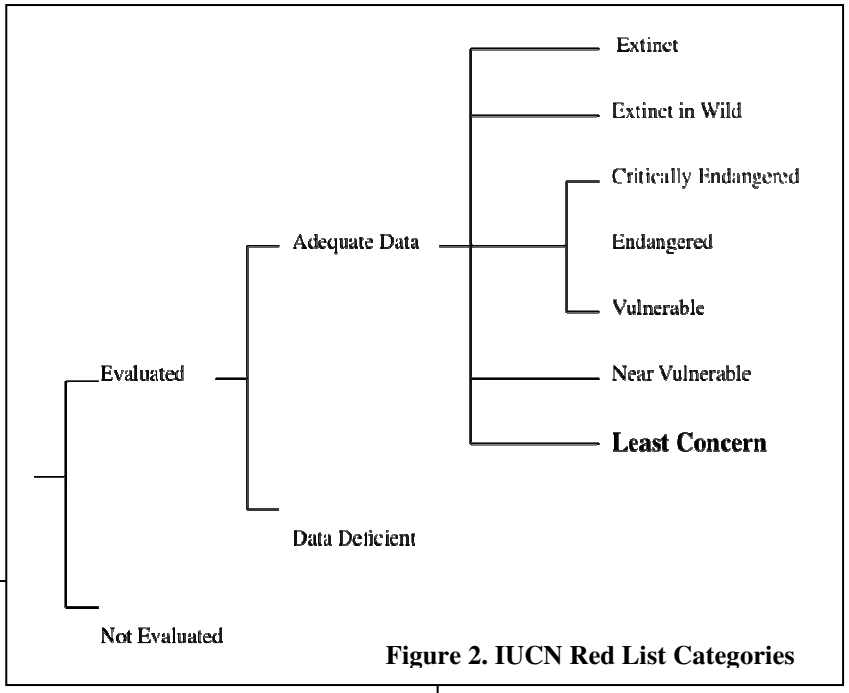


Figure 2. IUCN Red List Categories

Very severe reduction in numbers

Distribution **very restricted**

Very high decline in number of mature animals

Extremely low number of mature individuals

50% probability of extinction in immediate future

→ **CRITICALLY ENDANGERED**

NO

Severe reduction in numbers

Distribution **restricted**

High decline in number of mature animals

Very low number of mature individuals

20% probability of extinction in immediate future

→ **ENDANGERED**

NO

Substantial reduction in numbers

Distribution **limited**

Limited decline in number of mature animals

Low number of mature individuals

10% probability of extinction in immediate future

→ **VULNERABLE**

NO

NOT LISTED /LEAST CONCERN

Figure 3. Criteria for IUCN Red List Categories

be given consideration, other than its appearing (or not appearing) on a list of species seen during the fauna survey for an Environmental Impact Statement (EIS). Exceptions to this may be where the riparian part of its habitat is important from the point of view of a buffer, contains other threatened species of flora or fauna, perhaps the stream margins include a threatened plant community, or where local community interest has drawn the species to the notice of the authorities and/or project proponent. Where the species is given consideration, often the fact that it commonly occurs in other places in the local government area, the State, bioregion or even the country means it is very susceptible to a common concern of environmental consultants and conservationists, summarised by "even if the project did adversely affect this population, there are plenty of other populations which are not under threat and, anyway the species is not listed on any schedule and/or is considered to be common". The potential is often there for the platypus to be exposed to the 'death by a thousand cuts' scenario!

A platypus-biased view

The platypus is not the only species of plant or animal which is in this predicament, so why am I bothering to write this article for *Consulting Ecology*? The platypus is an Australian icon but is it a special case, or more special than other unlisted indigenous species? If not more special, perhaps its uniqueness give some impetus for its consideration in the environmental impact assessment of any project with a potential impact on any body of water or its riparian margins within the current distribution of the platypus. Why? Here are a few reasons, which spring to the keyboard of a slightly biased observer.

- The species is only found in Australia, so therefore we have the sole stewardship for its continued conservation.
- It is one of only 5 extant species of egg-laying mammals [Order Monotremata]
- It represents the sole extant Genus and Species in the Family [Ornithorhynchidae]
- It is an integral part of many Australian freshwater ecosystems in southeastern Australia.
- Because of its mixture of reptilian, avian and mammalian features, it has great significance and importance in evolutionary studies.
- Because of the conservation of such features from earlier stages of evolution, the importance of the platypus to an understanding of gene function and evolution has been more recently realised.
- Besides it is VERY CUTE!!

Figure 4. Two nestling platypuses unearthed from a bank being excavated during the middle of the four month period when nestlings are confined to burrows in the stream bank and dependent on mother's milk. Image: Faye Bedford.

Potential environmental impacts affecting the platypus

A number of studies in various parts of eastern Australia have identified habitat characteristics that are most often associated with the presence of platypuses. These have been summarised in Grant and Bishop (1998), Grant (2004a) and Grant (2007), where the original references are given. Table 2 lists these common habitat variables and

summarises the known or probable benefits or disadvantages of these in relation to the biological requirements of the platypus. Almost all of these relate to food supply and/or to shelter, especially for nesting burrows, where dependent young are confined for 4 months after hatching from eggs. Disturbances to streams and/or to riparian corridors need special consideration during the extended lactation period, when females with dependent young consume prodigious amounts of food (Holland and Jackson, 2002) and when young first emerge from the burrows and begin to take solid food for themselves.

Dam construction and/or water extraction projects are the first which spring to mind in terms of consideration of the platypus and EIA. However, the platypus may need to be considered in other proposed projects where streams or their riparian margins may not be directly affected but may be subject to indirect effects including pollution, sedimentation and erosion, due to run off from surrounding areas.

If the proposal looks a bit dodgy for the platypus, is monitoring the answer?

Too often projects are given the nod but with the caveat of on-going monitoring to assess any actual impact of the project on species or their environment. This approach of course results in three important questions:

1. Will the proposed monitoring actually be carried out? Given adequate funding, expertise and enforcement, the answer to this question should be a definite yes.
2. Should a monitoring program detect significant adverse impacts of the project, can these effects be mitigated or reversed? The answer to this question is variable, but potentially the answer could be a resounding no. It is unlikely that a large dam would be taken out, a mine (on which the local economy depends) closed. or even a large sporting event cancelled. The politicians and the community, rather than consultants, need to confront the answer to this question.
3. With the funding, expertise and methods available, can a monitoring program succeed in detecting the presence of adverse impacts or their absence? This is the most important question from the point of view of a consultant.

Platypus monitoring depends on either the use of the capture of individuals in various types of nets or observations around dawn and/or dusk, when platypuses are most often active during daylight hours.

Observations. While the presence/absence data are readily gathered by observations, numerical estimates of population size or indices of abundance (e.g. abundant, common, rare) are much more difficult to achieve using observations. Observations require little in the way of equipment and can be undertaken by large groups not requiring various permits and licences (i.e. community-based surveys) but observations do not yield other important data, often critical to the detection of population changes. Important information such as body condition, reproduction and recruitment, cannot be gained from observational data. The platypus is a species known to survive and breed for up to 21 years in the wild (Grant 2004b), so that the numbers of animals sighted in an area could suggest all is well, when in fact those seen may not represent a sustainable breeding population.

Unfortunately, both occurrence (numbers of sites, observation sessions, kayak transects, etc, in which at least one platypus is seen) and numerical (numbers of individual platypuses seen per site, observation session, kayak transect) data arising from observations may be extremely variable.

Table 1. Conservation status of the platypus

STATE	YEAR PROTECTED	LEGISLATION	STATUS	LEGISLATION
South Australia	1912	Animals protection Act	**Endangered**	*National Parks and Wildlife Act 1972*
Victoria	1892	-	**Not Listed**	*Flora and Fauna Guarantee Act 1988*
Tasmania	1907	Animal and Bird Protection Act	**Not Listed**	*Threatened Species Protection Act 1995*
New South Wales	1901	Amendment to Bird protection Act	**Not Listed**	*Threatened Species Conservation Act 1995*
Queensland	1906	Native Animal Protection Act	**Not Listed**	*Nature Conservation Act 1992*
Australia	-	-	**Not Listed**	*Environment Protection & Biodiversity Conservation Act 1999*
IUCN			**Least Concern**	

Table 2 Habitat variables identified as being important to the platypus. Regular font indicates beneficial effects and *italics* font indicates detrimental effects on important habitat variables.

Habitat Variable	Known or potential effects on the platypus
Consolidated bank	maintenance of resting and nesting burrows
Bank vegetation (especially native) Large-medium sized trees on bank Overhanging vegetation	shade, bank consolidation, shelter while foraging, organic input to stream ecosystem
Presence of macrophytes	organic input to stream ecosystem; habitat for macroinvertebrate prey species
Presence of willows	*willow root mats can inhibit burrowing; low oxygen due to decomposition of leaf fall.* Consolidation of stream banks
Pool length	foraging habitat availability
Pool depth (<2-5 metres but >1 metre)	energetic demand of foraging increases with depth; risk of predation in shallow water
Benthic habitat complexity	habitat for macroinvertebrate prey species
Large woody debris (LWD)	habitat for macroinvertebrate prey species
Coarse organic matter Coarser benthic substrates Absence of sand accumulation Absence of silt/clay	habitat and food for macroinvertebrate prey species
Riffle length	most productive foraging habitat availability
Concave/undercut bank	shelter during foraging and entry and exit from burrows
High stream flows	*increased energetic demand in foraging; erosion affecting burrow availability; sedimentation affecting benthic macroinvertebrate productivity*
Low stream flows	*pool/riffle sequences not maintained; reduced foraging areas*
Water temperature	beneficial or *detrimental* effects productivity of macroinvertebrate food species
Water salinity	*changed macroinvertebrate prey availability, osmoregulatory demands*
Dissolved oxygen	*productivity of macroinvertebrate food species*

Figure 5 shows such variability in transect counts of platypuses in the lower Hastings River (Grant, 2008). Such intra-site variability indicates that data arising from observational monitoring must be interpreted cautiously and that the selection of control sites, especially outside the stream being monitored, may be impractical.

Captures. The presence of large numbers of fish, including feral (e.g. common carp) or indigenous species, can make platypus netting impractical, This is due to constant disturbance of the nets to remove fish, indigenous fish species dying in nets, or the increased chance of drowning platypuses where the nets are held down by the weight of captured fish. Increases in flow and rising water levels after rain, or in areas where water is transferred along natural watercourses, can often result in netting efforts having to be abandoned. Despite this, valuable information on body condition, reproduction and recruitment can be achieved by mark and recapture studies.

However, again great variability in capture rates is typical of such studies on the platypus, probably indicating the considerable mobility of certain individuals within platypus populations. Figure 6 shows the numbers of platypuses captured using mesh nets during a single session of netting in one pool during March and December in the upper Shoalhaven River during eight non-drought years (1984-1991). At each sampling period, river and climatic conditions were comparable[1] and in all instances three 25m nets were used and were in the water for the same period of time[2]. Such variability in capture rates commonly occurs when capturing platypuses using mesh nets, so that conclusions based on capture data from sampling before and after a project must be interpreted cautiously.

The maximum number of platypuses captured per night at four sites on the upper Nepean River in the southern tablelands of New South Wales was four, with zero captures occurring at some sites (Fig. 7)(Grant, 2006). While captures during the breeding season can provide useful information by confirming breeding (lactating females and/or emerging juveniles present) and captures at other times can provide information on body condition, very low capture rates make the interpretation of population data very tentative indeed.

For example, would a mean number of three (3) platypuses captured in sampling before a project, and a mean of two (2) after the project, indicate that the project was having a significant effect? In small streams, such as the upper Nepean River example above, total population and foraging mobility of platypuses in the system mean that total numbers of platypuses caught at any sampling period are likely to be too low for statistical analysis of the data, irrespective of netting effort. In such instances, positive capture data only serves to show that the species still occupies the water body.

In summary then, the ability of monitoring studies to reliably detect adverse impacts of a project on platypus populations must be very carefully considered during the decision-making process.

Conclusion

This article represents not just a "*cri de Coeur*" for the platypus and other species, which are let down by the current emphasis on threatened species in environmental impact assessment process, but also to use the platypus to highlight an important problem with the "monitoring caveat" so often used in the decision-making.

[1] December 1988 value deleted as some flow at that time was lifting nets slightly above the bottom.
[2] 1 hour before dark until 5 hours after dark.

Figure 5. Numbers of platypuses observed in 1.5km kayak transects in the lower Hastings River upstream (Control site) and downstream (exposed site) of the water offtake for the Port Macquarie-Hastings water supply scheme in the period leading up to and after the commencement of augmented water extraction from the river (from Grant, 2008).

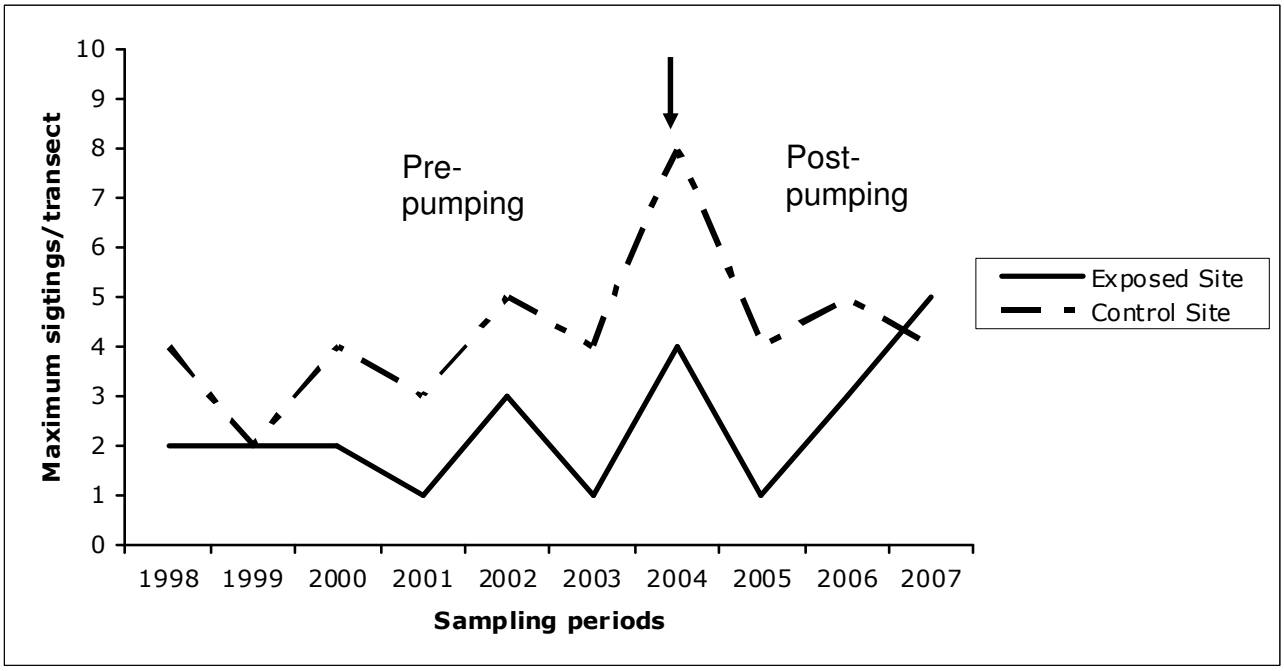


Figure 6. Variation in numbers of platypuses captured in standard netting in a single pool in the upper Shoalhaven River during non-drought years. Data for December 1988 was deleted due to the occurrence of higher flows during the sampling on that occasion. Grant, unpublished data.

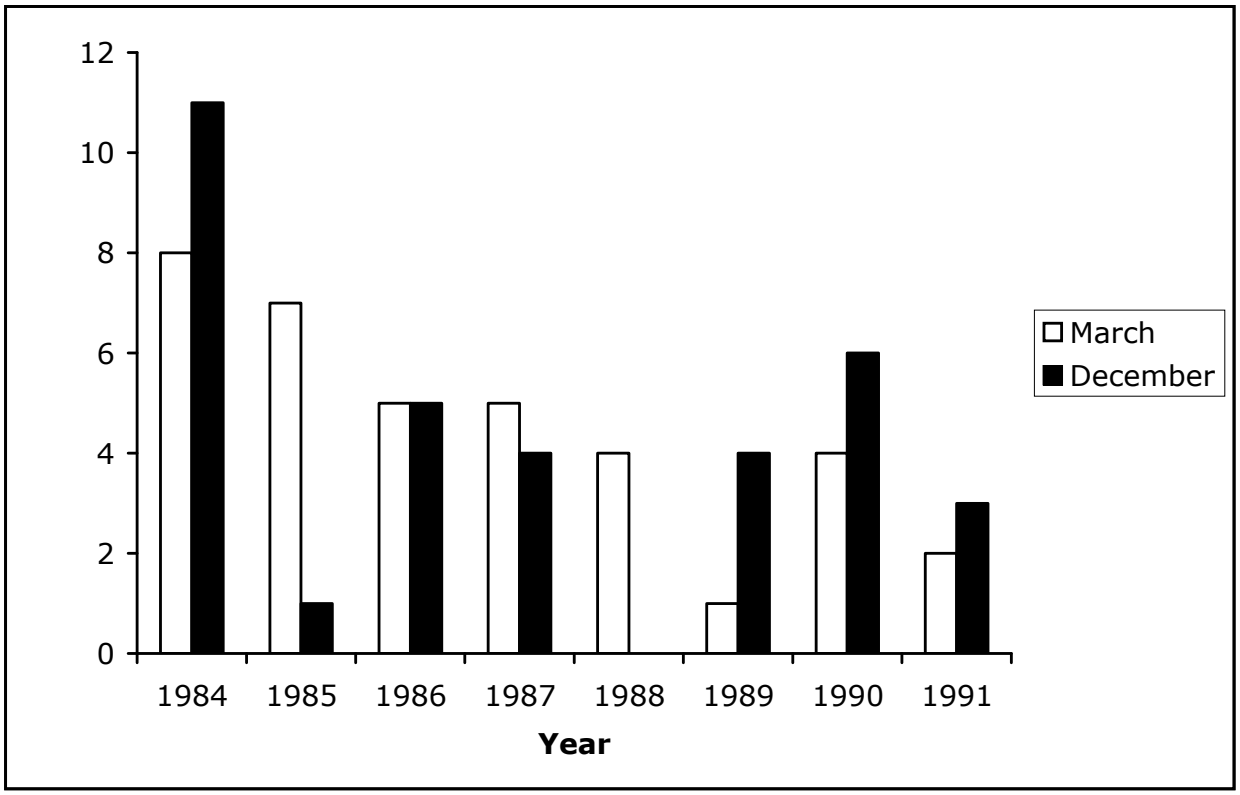
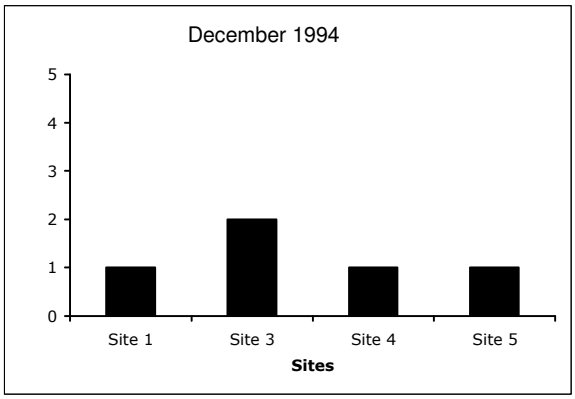
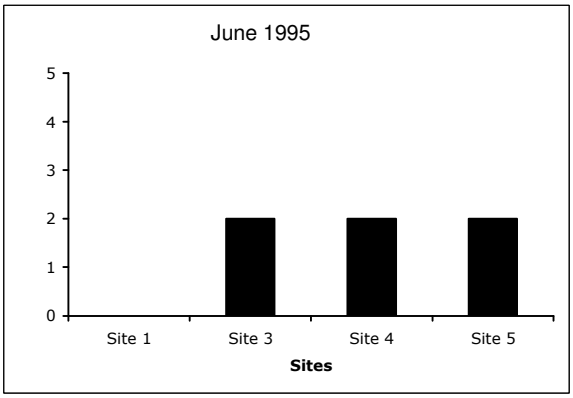
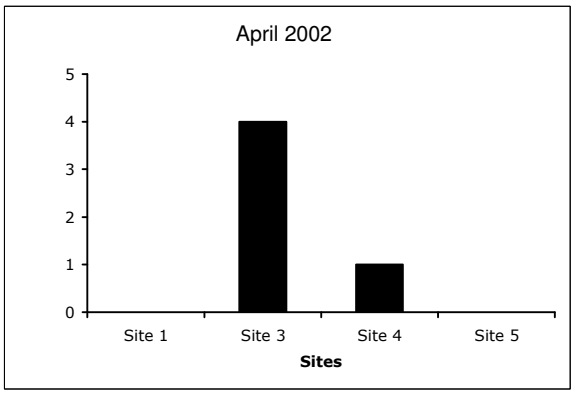
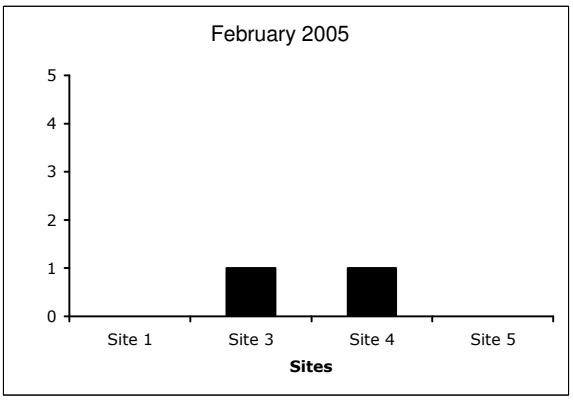


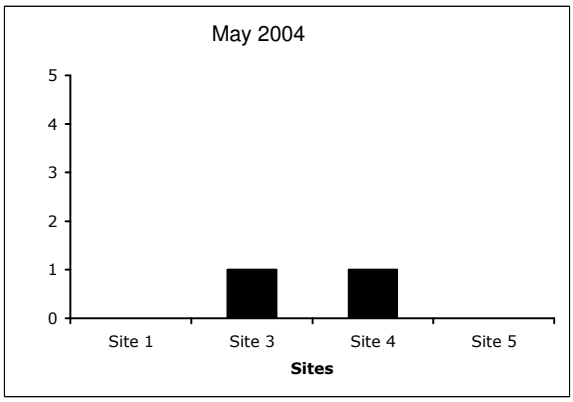
Figure 7. Numbers of platypuses captured in a single netting session at four separate sites on the upper Nepean River in NSW during sampling trips between 1994 and 2006. All sites were sampled on each trip; i.e. no data column in a graph represents zero captures in that netting session.
From Grant, 2006.

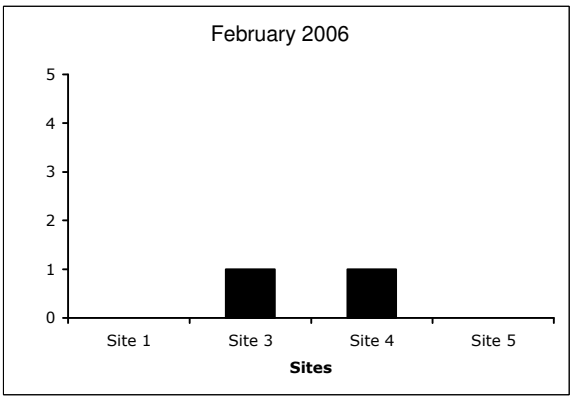












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An overview of bird assemblages within arid shrubland and woodland habitats of western New South Wales

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Introduction

Environmental and ecological consultants are often faced with the task of undertaking a limited amount of field survey work in their assessment programs largely the result of financial or time constraints. This leads to the greater consideration of appropriate literature, web searches and past reports for information on the biodiversity of their study area or particular habitats. However, in western New South Wales, the general information base becomes much smaller in comparison to the coastal areas of the state, likely as a result of lower survey effort. While bird data is usually considered the most readily available from databases such as the NSW Atlas of Wildlife, no specific information on habitat is provided, leaving consultants with potential knowledge gaps in their desktop reviews.

This paper documents the bird assemblages recorded within six widespread habitat types in western New South Wales (Chenopod Shrubland, Mallee, Mixed Woodland, Acacia Shrubland, Riparian Woodland, Bimble Box Woodland) including notes on threatened species as listed under the NSW *Threatened Species Conservation Act 1995* (DECC 2008). While the data presented can only be considered a 'snapshot' of the bird assemblage within each habitat, it does provide a valuable resource for desktop review, threatened species assessment and future survey and research programs.

Methods

Vegetation communities with similar habitat attributes based on the knowledge of the author and on-ground validation were pooled resulting in the formation of six general habitat types (Table 1). Bird surveys by the author between 2002 and 2008 are the basis of the data presented here, and are the result of around 15 hours of bird surveys within each habitat type. Surveys were undertaken between the Kidman Way, which dissects New South Wales through the towns of Jerilderie, Griffith, Cobar and Bourke in a roughly north-south direction and the South Australian border.

Results

A total of 119 bird species were recorded during this study (Table 2). The highest level of species richness was within Riparian Woodland habitat with a total of 77 species recorded, closely followed by Bimble Box Woodland with 69 species. Table 2 provides details on the remaining habitats.

Fourteen threatened species as listed under the NSW *Threatened Species Conservation Act 1995* (DECC 2008) were recorded across these six habitats. These were the Southern Scrub-Robin (Mallee), Rufous Fieldwren (Chenopod Shrublands), Shy Heathwren (Mallee), Chestnut Quail-Thrush (Mallee), Superb Parrot (Riparian, Bimble box), Painted Honeyeater (Acacia Shrublands), Regent Parrot (Mallee), Malleefowl (Mallee), Gilbert's Whistler (Mallee), Redthroat (Chenopod Shrublands), Grey-Crowned Babbler (Bimble Box, Acacia Shrublands), Pink Cockatoo (All habitats), Pied Honeyeater (Acacia Shrubland, Mixed Woodland) and Hooded Robin (Mixed Woodland).

Table 1: Habitat types in this study

Fauna Habitat	Vegetation Community Derived from
Riparian Woodland	River Red Gum forest, Black box woodland, Lignum shrubland, Sedge swamp and wetland
Chenopod Shrubland	Chenopod shrubland
Mallee	Deep sand mallee, East west dune mallee, Chenopod Mallee
Bimble Box woodland	Bimble Box woodland, Cypress Woodland, Red-box woodland
Mixed woodland	Belah rosewood woodland, Mixed shrubland, *Melaleuca* shrubland
Acacia shrubland	Mulga shrubland, Prickly Wattle shrubland, *Acacia loderi* shrubland

Discussion

The semi-arid shrublands and woodlands of western New South Wales support a highly diverse assemblage of bird species, with this study revealing a total of 119 species from approximately 90 hours of surveys.

Throughout the Chenopod Shrublands, 29 bird species were recorded of which three species were recorded only within this habitat. These were Red-Kneed Dotterel and the threatened Redthroat and Rufous Fieldwren. One other threatened species, the Pink Cockatoo, was also recorded in Chenopod Shrublands. Redthroats were particularly common around the drainage lines that dissect this habitat.

The Mallee woodland provided a structurally complex habitat of varied shrub layers at most survey sites and in many cases, a dominated understorey of Spinifex grass (*Triodia scariosa)*. This habitat revealed 56 species with 11 of these found in no other habitats. These were the Spotted Nightjar, Malleefowl, Regent Parrot, Spotted Pardalote (sub-species *xanthopygus*), Shy Heathwren, White-Eared Honeyeater, Grey-Fronted Honeyeater, Southern Scrub-Robin, Chestnut Quail-Thrush, Gilberts Whistler and Grey Currawong (six of these listed as threatened species). With many mallee eucalypts flowering at the time of the study, seven species of honeyeater were recorded. This represents 58% of the total number of honeyeater species recorded in this study with two species (White-Eared Honeyeater and Grey-Fronted Honeyeater) recorded only in mallee habitats.

In Mixed Woodland a diverse shrub layer, leaf litter layer and good quantities of fallen timber provided a diverse microhabitat structure where grazing intensity and other disturbance have been low. During this study, 43 bird species were recorded in Mixed Woodland with three species recorded in no other habitat. These were the Chestnut-Crowned Babbler, Silvereye and the Hooded Robin (the latter species is listed as a threatened species). Two other threatened species, the Pink Cockatoo and Pied Honeyeater, were also recorded in Mixed Woodland.

Bimble Box Woodland also supported a high species richness with 69 species recorded in total. Interestingly, Bimble Box Woodlands in the Cobar Peneplain bioregion generally had higher species richness than those in the far west. Only one species, the Olive-Backed Oriole showed signs of habitat specificity towards Bimble Box Woodland. Large numbers of this species were recorded north-west of Cobar with an extensive flowering event of *Eremophila*. Threatened species recorded in Bimble Box Woodland were the Pink Cockatoo, Grey-Crowned Babbler and the Superb Parrot. The Superb Parrot record was made near Cobar where a flock of more than 50 individuals were observed travelling at a moderate height (>50m above the ground) in a northerly direction during a winter survey.

Acacia Shrubland was also quite diverse, with 58 species recorded. These included the threatened Painted and Pied Honeyeaters, Grey-Crowned Babbler and Pink Cockatoo. Pied Honeyeaters were extremely common in Mulga when mistletoe was in flower at numerous sites (eg, Broken Hill, Willcannia). Painted Honeyeater were also observed where flowering mistletoe was present, but in much lower numbers.

Riparian woodland habitat recorded the highest number of bird species in this study; a total of 77 species. It is well documented that Riparian Woodlands in semi-arid areas are resource rich environments, with slightly higher moisture levels supporting increased vegetation cover and invertebrate biomass. The importance of these resources in a semi-arid landscape to bird fauna is further highlighted with 16 species recorded in no other habitat type during this study. The additional resource of water in some areas of this habitat was likely to have contributed further to this diverse assemblage of birds. Two threatened species, the Pink Cockatoo and Superb Parrot, were recorded in this habitat.

Several species were recorded in this study that have been previously considered as species of Conservation Concern in western NSW or as declining woodland birds (Smith *et al* 1994, Reid 1999). These were the Buff-Rumped Thornbill, Caspian Tern, Whiskered Tern, Dusky Woodswallow, Crested Bellbird, White-Browed Babbler, Red-Capped Robin, Jacky Winter and the Chestnut-Rumped Thornbill. Many of these species were commonly recorded during this study. For example, Crested Bellbird was recorded at almost every survey site within Mixed Woodland and Mallee habitats. Further, in many

instances, it was the most abundant species at these sites. While these species have no legal status under threatened species legislation (at the time of writing), many are likely to share similar habitat requirements to listed threatened species, and their presence at a survey site does provide some evidence of habitat quality.

Despite an extensive number of bird species being recorded, the results are unlikely to provide an exhaustive list of those species present within each habitat type. Rather, this paper should be regarded as an overview of the bird assemblages recorded across a variety of widespread habitats in western New South Wales. It also provides an additional resource for Environmental and Ecological Consultants as well as Natural Resource Managers and Researchers to use in desktop review, threatened species assessments and future survey and research projects.

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Bimble box woodland north-west of Cobar, western NSW

Chenopod shrubland near Lake Mungo, north of Balranald, south-western NSW.

Mallee shrubland west of Mount Hope, central western NSW.

Belah Rosewood Woodland north of Wentworth in far south-western NSW.

Mixed Woodland dominated by Mulga between Wilcannia and Cobar, western NSW.

Riparian woodland dominated by River Red Gum and Black Box on Booberoi Creek, north-west of Lake Cargelligo, central western NSW.

Table 2: Bird species recorded within each habitat type (*= Recorded, C=Chenopod Shrubland, MW=Mixed Woodland, M=Mallee, BB=Bimble Box Woodland, RW= Riparian Woodland, AS=Acacia Shrubland). Bold is a threatened species under TSC Act 1995

Scientific Name	Common Name	C	MW	M	BB	RW	AS
Dromaius novaehollandiae	Emu	*	*	*	*	*	*
Chenonetta jubata	Australian Wood Duck				*	*	*
Cygnus atratus	Black Swan					*	
Anas gracilis	Grey Teal					*	*
Poliocephalus poliocephalus	Hoary-Headed Grebe	*			*	*	
Anhinga melanogaster	Darter				*	*	
Phalacrocorax sulcirostris	Little Black Cormorant					*	
Phalacrocorax melanoleucos	Little Pied Cormorant				*	*	
Pelecannus conspicillatus	Australian Pelican					*	
Threskiornis molucca	Australian White-Ibis					*	
Milvus migrans	Black Kite	*	*			*	
Haliastur sphenurus	Whistling Kite				*	*	*
Accipiter cirrhocephalus	Collared Sparrowhawk					*	
Accipter fasciatus	Brown Goshawk		*		*		
Aquila audax	Wedge-Tailed Eagle		*	*	*		*
Falco berigora	Brown Falcon			*	*	*	*
Falco cenchroides	Nankeen Kestrel	*	*		*	*	*
Falco peregrinnus	Peregrine Falcon	*	*	*	*		
Porphyria porphyria	Purple Swamphen					*	
Gallinula ventralis	Black-Tailed Native-hen	*			*	*	
Erythrogonys cinctus	Red-Kneed Dotterel	*					
Erythrogonys melanops	Black-Fronted Dotterel	*			*		
Vanellus miles	Masked Lapwing					*	
Vanellus tricolour	Banded Lapwing	*			*		
Lorus novaehollandiae	Silver Gull					*	
Chlidonias hybrida	Whiskered Tern	*				*	
Sterna caspia	Caspian Tern	*				*	
Geopelia striata	Peaceful Dove			*	*	*	*
Phaps chalcoptera	Common Bronzewing			*	*	*	*
Leipoa ocellate	**Malleefowl**			*			
Ocyphaps lophotes	Crested Pigeon	*	*	*	*	*	*
Cacatua leadbeateri	**Pink Cockatoo**	*	*	*	*	*	*
Cacatua roseicapilla	Galah	*	*	*	*	*	*
Nympicus hollandicus	Cockatiel				*	*	
Platycercus elegans flavcolus	Yellow Rosella					*	
Polytelis swaisonii	**Superb Parrot**				*	*	
Polytelis anthopeplus monarchoides	**Regent Parrot**			*			
Barnardius barnardi	Eastern Ringneck	*	*	*	*	*	*
Northiella haematogaster	Blue Bonnet	*	*	*	*	*	*

Scientific Name	Common Name	C	MW	M	BB	RW	AS
Psephotus haematonotus	Red-Rumped Parrot				*	*	
Psephotus varius	Mulga Parrot			*	*		*
Eurostopodus argus	Spotted Nightjar			*			
Tyto alba	Barn Owl				*	*	
Dacelo novaeguineae	Laughing Kookaburra			*	*		
Todiramphus sanctus	Sacred Kingfisher					*	
Todiramphus pyrrhopygia	Red-Backed Kingfisher				*		*
Merops ornatus	Rainbow Bee-Eater		*	*	*	*	*
Climacteris affinis	White-Browed Treecreeper		*			*	
Climacteris picamnus	Brown Treecreeper			*	*	*	
Malarus splendens melanotus	Splendid Fairy-wren				*		*
Malarus lamberti assimilis	Variegated Fairy-wren				*	*	
Malarus leucopterus	White-Winged Fairy-wren	*				*	
Pardalotus striatus	Striated Pardalote		*	*	*	*	*
Pardalotus punctatus	Spotted Pardalote			*		*	
Pardalotus punctatus xanthopygus	Spotted Pardalote			*			
Pyrrholaemus brunneus	**Redthroat**	*					
Sericornis campestris	**Rufous Fieldwren**	*					
Hyacola cauta	**Shy Heathwren**			*			
Gerygone fusca	Western Gerygone			*	*		*
Acanthiza apicalis	Inland Thornbill	*	*	*	*		*
Acanthiza reguloides	Buff-Rumped Thornbill		*	*	*	*	*
Acanthiza uropygialis	Chestnut-Rumped Thornbill	*	*	*	*	*	*
Acanthiza chrysorrhoa	Yellow-Rumped Thornbill		*		*		
Acanthiza nana	Yellow Thornbill			*		*	*
Smicronis brevirostris	Weebill		*	*	*	*	*
Aphelocephala leucopsis	Southern Whiteface		*		*		*
Philemon corniculatus	Noisy Friarbird					*	
Oriolus sagittatus	Olive-Backed Oriole				*		
Acanthagenys rufogularis	Spiny-Checked Honeyeater	*	*		*	*	*
Grantiella picta	**Painted Honeyeater**						*
Certhionyx variegatus	**Pied Honeyeater**		*				*
Plectorhyncha lanceolata	Striped Honeyeater			*	*		
Entomyzon cyanotis	Blue-Faced Honeyeater				*	*	
Manorina flavigula	Yellow-Throated Miner		*	*		*	
Manorina melanocephala	Noisy Miner				*	*	*
Lichenostomus virescens	Singing Honeyeater		*	*	*	*	*
Lichenostomus leucotis	White-Eared Honeyeater			*			
Lichenostomus plumulus	Grey-Fronted Honeyeater			*			
Lichenostomus ornatus	Yellow-Plumed Honeyeater		*	*			
Lichenostomus pencillatus	White-Plumed Honeyeater				*	*	*

Scientific Name	Common Name	C	MW	M	BB	RW	AS
Melithreptus brevirostris	Brown-Headed Honeyeater		*	*	*		*
Epthianura tricolour	Crimson Chat	*				*	*
Epthianura aurifrons	Orange Chat	*				*	*
Microeca fascinans	Jacky Winter	*	*	*	*		*
Petroica goodenovii	Red-Capped Robin	*	*	*	*		*
Melanodryas cucullata	**Hooded Robin**		*				
Drymoides brunneopygia	**Southern Scrub-Robin**						
Pomatostomus superciliosus	White-Browed Babbler			*		*	*
Pomatostomus t.temporalis	**Grey-Crowned Babbler**				*		*
Pomatostomus ruficeps	Chestnut-crowned Babbler		*				
Psophodes cristatus	Chirruping Wedgebill	*	*			*	
Cinclosoma castanotus	**Chestnut Quail-Thrush**						
Oreocica gutturalis	Crested Bellbird		*	*	*	*	*
Pachycephala inornata	**Gilberts Whistler**						
Pachycephala rufiventris	Rufous Whistler		*	*	*		*
Colluricincla harmonica	Grey Shrike-thrush		*	*	*	*	*
Rhipidura leucophrys	Willie Wagtail	*	*	*	*	*	*
Coracina novaehollandiae	Black-Faced Cuckoo-shrike		*		*	*	*
Lalage sueurii	White-Winged Triller				*	*	*
Daphoenositta chrysoptera	Varied Sitella			*	*		*
Artamus personatus	Masked Woodswallow		*		*	*	*
Artamus cinereus	Black-Faced Woodswallow					*	*
Artamus cyanopterus	Dusky Woodswallow		*	*	*		*
Craciticus torquatus	Grey Butcherbird		*	*	*	*	*
Craciticus nigrogularis	Pied Butcherbird	*		*	*	*	*
Grallina cyanoleuca	Magpie Lark			*	*	*	*
Gymnorhina tibicen	Australian Magpie		*	*	*	*	*
Strepera versicolor melanoptera	Grey Currawong			*			
Corvus coronoides	Australian Raven		*	*	*	*	*
Struthidea cinerea	Apostlebird		*	*	*	*	*
Corcorax melanorhamphos	White-Winged Chough				*	*	*
Taeniopygia guttata	Zebra Finch				*	*	*
Hirundo neoxena	Welcome Swallow				*	*	*
Cheramocca leucosternus	White-Backed Swallow					*	
Hirundo ariel	Fairy Martin					*	
Acrocephalus stentoreus	Clamorous Reed-Warbler					*	
Cincloramphus mathewsi	Rufous Songlark					*	
Zosterops lateralis	Silvereye		*				
**Turdis merula*	Common Blackbird					*	

Regional Reports

This new column of Consulting Ecology, encourages those regional members to let the rest of us know what issues they are facing in their area. If you are a regional member and have something you would like to share with the membership, please consider contributing to this column.

Koalas in South East Queensland – Population Decline and Regulatory Changes

Deborah Gleeson
Gleeson Ecology
ECA Member

Koala numbers have been declining in South East Queensland (SEQ). The recently released *Decline of the Koala Coast Koala Population: Population Status in 2008* report, prepared by the QLD Department of Environment and Resource Management (DERM, 2009), estimates that the current 'Koala Coast population' (located approximately 20 km south-east of Brisbane) now consists of only 2,279 individuals. This finding represents a rather startling 51% decline in less than three years and a 64% decline during the past ten years (DERM, 2009).

Counter intuitively, larger declines in Koala numbers occurred in bushland areas (59%) compared to urban areas (30%) (DERM, 2009). The large reduction of Koalas in otherwise secure bushland was reportedly a flow on effect from excessive habitat loss and mortality in urban areas (DERM, 2009). The report concluded that, without conserving a viable urban Koala population, adjacent bushland Koala populations will continue to decline and this may have consequences for the viability of the entire Koala Coast population.

The QLD Premier's 'Koala Taskforce' was formed in late 2008, and in response to their recommendations, the QLD State Government has committed to introducing several measures to protect the SEQ Koala population (DIP, 2009a). These measures include a new Koala State Planning Policy and powers to enable compulsory acquisition of Koala habitat and areas suitable for re-establishment outside the SEQ urban footprint (DIP, 2009a). In addition, around 170,000 ha of QLD State lands cannot be sold or cleared until their Koala values can be assessed (excluding land urgently required for social infrastructure) (DIP, 2009a).

The draft SEQ Koala State Planning Regulatory Provisions (draft SEQ Koala SPRP) came into effect on 12 December 2008 as an interim measure in response to the recommendations of the Premier's Koala Taskforce to provide additional protection on the clearing of Koala habitat in SEQ (DIP, 2009a). For development within the SEQ urban footprint, the draft SEQ Koala SPRP replaces the Koala protection measures under the *Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006 - 2016* (known as the 'Koala Plan') (DIP, 2009a).

Addendum: Since the time of writing, further regulatory changes have taken place. The SEQ Koala SPRP took effect on 1 July 2009, replacing the draft provisions released in December 2008 (DIP, 2009b).

References:

Department of Environment and Resource Management (DERM) (April, 2009) *Decline of the Koala Coast Koala Population: Population Status in 2008*. http://www.epa.qld.gov.au/publications/p02966aa.pdf/
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Department of Infrastructure and Planning (DIP) (1 June, 2009a) *SEQ Koala State Planning Regulatory Provisions*. Website: http://www.dip.qld.gov.au/regional-planning/seq-koala-state-planning-regulatory-provisions.html. Accessed 29 June, 2009.

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Cameron's Corner Controversy: Mid North Coast Update.

Brian Hawkins
Flametree Consulting
ECA Member

A big issue in this part of the world in recent months has been the proposal by the RTA to upgrade sections of the Waterfall Way, the main road linking Armidale with Coffs Harbour and the coast.

In particular, locals have been unhappy with the RTA's decision to modify Cameron's Corner, a sweeping bend bordered to the north by paperbark forest and wetlands, both of which are listed as Endangered Ecological Communities. Someone was killed on this bend in 1990. In order to improve road safety, the RTA intends to reduce the curve of the bend, which will necessitate the destruction of some paperbark forest and wetland.

When word of the proposal got out, many locals were outraged. Cameron's Corner is a beloved and iconic piece of forest, where Black-Necked Storks are regularly seen foraging, and the general feeling was that road safety could be improved without impinging on the paperbarks or wetland (e.g. by lowering the speed limit along that section of road). The Bellingen paper was full of letters on the issue, mostly deploring the RTA's proposal. Public meetings were held, an action group was formed, petitions were got up, and surveys found that sentiment in the Bellingen Shire was running 85% or more against the roadworks. A Coffs Harbour TV crew came out and filmed a Black-Necked Stork in the wetland, capturing and swallowing an eel; I believe the story also got an airing in the Sydney media. Under intense community pressure, the local council unanimously passed a motion calling for the RTA to find another option for improving road safety – one that will not result in the destruction of the swamp forest or wetland. We are still awaiting the RTA's decision but at the moment, it seems likely that Cameron's Corner will be saved.

The moral of this story is the folly of entering upon a large project without incorporating community consultation and ecological expertise *from the earliest stages*. Apparently, the RTA's preferred proposal was one of three suggested around 10 years ago by the local council; a consultant was then hired to choose the option that best satisfied criteria provided by the RTA. Ecological considerations were not among these criteria. Finally, when the project was ready to go, an ecological consultancy was hired to perform an Assessment of Significance for the proposal. The consultancy found – correctly in my view – that the project was unlikely to have a significant impact on threatened flora or fauna. However, whether the roadworks can satisfy the relevant environmental legislation is not the point. The point is, that it is quite feasible to improve road safety at Cameron's Corner without causing *any* damage to the EECs – and this should have been a consideration from the start.

Hopefully, by the next newsletter I will be able to report that Cameron's Corner has been saved.

Excitement and adventure in the sand hills of an ancient lake 150km south of Broken Hill, NSW

Phillip Cameron
OzArk Environmental & Heritage management
ECA Member

Alternative title: *How the hell can you manage impacts to small cryptic species that are notoriously difficult to detect in the field, that won't flee in the face of mechanised disturbance?*

The following article provides an interesting account of the inherent challenges in detecting and managing poorly studied cryptic species within the majestic rolling dunes of far western NSW. This case study also demonstrates the value of showing how interesting your job is to guys 'on the tools' (the work crew), and having faith that they can be your eyes on the ground.

Project: Coombah Shoulder Widening, Silver City Highway (HW22) 136 to 123km south of Broken Hill, NSW. The Study Area is located near the centre of the Far South Western Plains Botanical Division of NSW. It is also located within the Murray-Darling Depression in the Lower Murray Darling Catchment Management Area.
This assessment specifically examined the impacts to ecological values of proposed works to widen shoulders on HW22 from the unincorporated Local Government Area (LGA) border with the Wentworth LGA 13km north (toward Broken Hill).

Background: The Proponent's environmental representative rejected the conclusions of a REF where it was stated that vegetation clearing or archaeological sites would not occur within the Project Area. Of particular concern was the archaeological potential of the 'cut' for 'fill' areas (dunes) as it is a very similar landform to that in which Mungo man was located (not too far away as the crows fly's from this Study Area).

The Study Area is on the edge of an ancient lake which is several kilometres in diameter when full. Unfortunately, due to the development of irrigation upstream Lake Popiltah, according to the locals, it will never fill again. Prior to changes in local hydrology, the lake would fill every 25 years and have permanent water for up to five years. Archaeologically, these landforms are highly sensitive and retain potential for human burials. It was also the last known area in NSW where an Aboriginal family of 35 people lived a traditional life as hunters and gathers before being settled onto a property in the Study Area (see below). Ecologically, they are landforms at the very epicentre of biodiversity boom and bust. Further, during initial phone consultation, a quick BioNet search showed multiple records of Painted Burrowing Frog and Blue Bush Daisy in or very close to the Study Area.

The interesting interlude (transcript from the associated OzArk archaeology report – thanks to Dr Jodie Benton). Harry Nanya (c.1835-1895), a Maraura of the lower Darling and his family, were the last of the Barkindji to live by traditional hunting techniques, ranging from around Lake Victoria and along the Great Anabranch of the Darling (ANU ADB online; Cupper 2007: B14). Nanya's childhood through 1839-46, coincided with the incursions of European explorers, which were accompanied by expeditions that killed most of his people, notably in the 1841 Rufus River massacre by South Australian police led by Thomas O'Halloran. Around 1860, Nanya left his camp at Popiltah station, 60 km north of Pooncarie, with two women and a steel axe. He went into the waterless mallee country between the Darling Anabranch and the South Australian border, where he lived for over thirty years. Notes from amateur ethnographers suggest Nanya's self-imposed exile may have been due to having eloped with a woman of his own Makwarra moiety, an offence considered incestuous and meriting death (ANU ADB online).

Although Nanya's mob kept themselves well hidden, by the early 1890s, the press reported more frequent sightings of the 'wild tribe'. Tracks left around water holes showed that Nanya's family was increasing in numbers, causing anxiety and fear amongst the white settlers (ANU ADB online). In 1893, Aboriginal stockmen tracked down the family and persuaded them to return to the river. The twelve men, eight women and ten children, all in good physical condition, arrived at Popiltah Station and Nanya still had his steel axe, now worn wafer-thin. The Aborigines Protection Board selected a site at Travellers Lake, near Wentworth, for them to settle, but Nanya's people preferred hunting-camps in the vicinity of Pooncarie.

Ecological constraints faced: As a draft REF had been accepted by the Proponents Project Manager prior to sign off by the Proponents Environmental Team, he had organised men and machinery to start the work within the current fiscal year. The most desirable outcome and use of resources was to have an appropriate level of assessment undertaken in the same area prior to scheduled works starting. The project brief included being able to undertake an archaeological and ecological assessment and have all reports and the REF written within three weeks. As we all balance several projects at once, being able to slot in the field work alone almost immediately was an issue in itself. The timing and length of the survey was not conducive to finding many species. Mid February in the blistering heat and the team could only meet for one late afternoon and evening (ecologist and archaeologist), and the following full day (ecologist, archaeologist and Aboriginal community), for the assessment plus travel. Therefore the precautionary principle needed to be applied liberally after habitat values present could be determined. Due to the archaeological and ecological sensitivity of the area, the Proponents senior environmental representative accompanied the ecologist and archaeologist.

Background information prior to field assessment. To determine the potential for threatened species or communities to occur in the Study Area, the following desktop searches were undertaken:

- A search of BioNet was used to reveal that at least three species of rare plants were regarded as likely to occur in similar landforms (over about 100km^2) or in one case had been recorded very close to the Study Area (Blue Bush Daisy).
- Similarly, the same BioNet search and interpretation was used for predicting the potential for rare fauna to occur in the Study Area.
- The EIS for the Snapper Mineral Sands Project (fauna component undertaken by the ECA's own Dr Martin Denny – if your reading this, thanks a million it was the most useful and relevant information available) was also reviewed given the paucity of other relevant information in the region. On a broader perspective, at least 19 species of rare birds had potential to be (or have been) recorded in the Study Area, one species of frog (the Painted Burrowing Frog has been recorded in the Study Area), seven species of reptiles are likely to occur, and four species of mammals (two bats and two species of marsupial mouse) have been previously recorded or have potential to occur in the Study Area. No rare flora was recorded in the Snapper Mineral Sands Project (50 km southeast) and it was in (*sic* nearly) identical vegetation communities (the only exception was that our Study Area is very close to and includes the ecotones between a Lake Foreshores landform).
- The substantial list of threatened species derived from the desktop search was taken in the field and narrowed down to identify 'affected species'. Affected species are those which were considered likely to: occur in the current drought conditions; had critical

habitat elements within the impact footprint; were likely to occur (based upon habitat values present) but remain undetected; and would be unable to flee in the face of mechanised disturbance. These species are identified in the executive summary below.

- A search of the EPBC Act Database was carried out for listed Matters of National Environmental Significance within a 5 km radius of the study area.
- A search of the NSW DPI Noxious Weeds List was carried out and returned 58 class 4 and 5 weeds.

The executive summary of the ecological assessment

Authors Note: (The executive summary of the ecological assessment has been slightly modified and provided as it gives a snap shot of the assessment and glimpse for future management).

Seven vegetation communities previously described by DECC (BioMetric vegetation units) were recorded in the Study Area. Each community had an association with dune or inter-dune areas:

Inter-dune areas:

- Narrow-leaved Hopbush/Scrub Turpentine/Senna shrubland of semi-arid and arid sandplains and dunes (Benson 143), on the sandplains in the south and the lake foreshore.
- Black Box grassy open woodland of rarely flooded depressions in southwestern NSW (Benson 16), between the dunes on grey cracking clays in the playas and basins.
- Canegrass swamp of drainage depressions, playa lakes and pans of the inland plains (Benson 24), between the dunes on grey cracking clays in the playas and basins. Extremely restricted in the Study Area to a few longitudinal table drains near and between culverts 271004 and 271005.
- Sand hill wattle tall open shrubland on sand ridges in the arid zone (Benson 124), on the sandplains in the south and the lake foreshore.
- White Cypress Pine open woodland of sand plains, prior streams and dunes (Benson 28), on the lake foreshore.
- Corkscrew grass grasslands/forbland on sandplains and plains in the semi-arid (warm) climate zone (Benson 165), on the lake foreshore and low elevation almost indistinct dunes to the north. (Note: likely to be unnatural/modified community that was once callitris or black oak community).

Dunes:

- Narrow-Leaved Hopbush/Scrub Turpentine/Senna shrubland of semi-arid and arid sandplains and dunes (Benson 143), on the sandplains in the south and the lake foreshore.
- Black Oak/Western Rosewood open woodland on deep sandy loams (Benson 58), on the sandplains in the south and the lake foreshore.
- Sand hill wattle tall open shrubland on sand ridges in the arid zone (Benson 124), on the sandplains in the south and the lake foreshore.
- White Cypress Pine open woodland of sand plains, prior streams and dunes (Benson 28), on the lake foreshore.
- Corkscrew grass grasslands/forbland on sandplains and plains in the semi-arid (warm) climate zone (Benson 165), on the lake foreshore and low elevation almost indistinct dunes to the north. (Note: likely to be unnatural/modified community that was once callitris or black oak community).

It is considered that the Blue Bush Daisy (*Cratystylis conocephala*) was the only plant with potential to be present and remain undetected. This plant has been recorded several times locally in similar landforms to those found in the Study

Area, however it was considered more likely to occur in the red mallee dunes north of the Coombah Road House. Given the Study Area was assessed by foot, the potential for this species to occur and remain undetected was considered low. Low potential occurrence reflects the obvious limitation when walking a Study Area i.e. one can only assess one side of a road at a time. Further assessment was not considered necessary as the viable local population known to occur in the area is not within the current Study Area. Further recommendations were provided to ensure protection of any isolated individual plants that remain undetected in the Study Area.

Twelve species of microbats were recorded using Anabat equipment (one night) during the investigation, of which three (3) are listed as threatened in NSW: the Yellow-Bellied Sheathtail Bat (*Saccolaimus flaviventris),* Inland Forest Bat (*Vespadelus baverstocki),* and Beccari's Freetail Bat *(Mormopterus beccarii)* (Thank you to Lesryk Environmental Consultants, another ECA member for the prompt professional analysis). Key habitat elements for these three species of threatened bats would not be affected by the proposed works and as such no further assessment was considered necessary.

Twenty-two species of birds, seven species of mammals (only one native mammal) and four species of reptiles were recorded during the assessment: none of these are listed as threatened. However, the Rainbow Bee Eater is listed as a migratory species under the EPBC Act 1999. With respect to DEWHA migratory species, the only direct threat to Rainbow Bee-Eaters would be any proposed extension of the borrow pit walls (where nesting burrows may occur) by more that 100mm. As only deepening of the pits was required, any impact would not place the young in the burrows at risk, thus it was considered that there was no formal requirement to undertake an assessment of significance.

After the full day assessment, ten other species of threatened animals were identified as having potential to occur, possessing key habitat elements in the Study Area, and not being able to flee on the face of mechanical disturbance:

- Jewelled Gecko (*Diplodactylus elderi)*;
- Crowned Gecko (*Diplodactylus stenodactylus*);
- Wedgesnout Ctenotus (*Ctenotus brooksi*) - a skink;
- Yellow-Tailed Slender Slider *(Lerista xanthura)* - a skink;
- Marble-Faced Delma (*Delma australis)* - a skink;
- Western Blue Tongue Lizard (*Tiliqua occipitalis);*
- Painted Burrowing Frog *(Neobatrachus pictus);*
- Southern Ningaui *(Ningaui yvonneae)* - a dasyurid;
- Kultarr *(Antechinomys laniger)* - a marsupial mouse; and
- Rainbow Bee-Eater *(Merops ornatus)* - a migratory species of bird.

Potential Painted Burrowing Frog habitat was identified in the field and recommendations for this and the other species noted above were formulated for their identification and management in the field. A double-sided laminated A4 page (with pictures of the animals and a brief description of where to find them and what to do if one was observed) was provided to all staff on the project. The site specific inductions included requirements that all staff must have this sheet in all vehicles at all times and individuals upon request should be able to procure a copy and show it to the Site Supervisor.

As no data was available to write meaningful seven part tests for these species, application of the precautionary principle resulted in assuming that none of the above mentioned species would be placed at risk of local extinction from the proposed works, given their scale and nature

within the broader analogous habitat surrounding the Study Area.

Recommendations included in the report noted an opportunity for the ecologist when undertaking unrelated training of the Aboriginal community to study microhabitat within Spinifex, to test the accuracy of the species list of animals and plants predicted to occur. Further, it was hoped that any information gleaned about these hard to detect species could be applied in the field to reduce impacts on them and provide information for other projects in similar landforms.
The information would then be used to write 'meaningful' seven-part tests as an addendum to the ecological assessment.

Comparative anatomy training and further fieldwork.
Part of the broader management of the environmental issues included the ecologist providing training to the Aboriginal community in comparative anatomy. The emphasis was on being able to identify common animal bones likely to be found alongside the highway (and within the dunes), with human bones. As noted previously, the potential for human burials remained a concern that could not be appropriately managed without appropriately trained Aboriginal monitors.

The Proponent was able to start scheduled works on time and engaged two members of the Aboriginal community to monitor soil disturbing works on dunes. The only dunes that were cut were those not removed from the project due to archaeological constraints. The laminated two sided A4 sheet with colour pictures and a short blurb was incorporated into the inductions and provided to all staff. The ecologist put together a comparative anatomy folder with as many different examples of kangaroo, emu, cattle bones and teeth as possible without causing information overload. A friend, "Harley" (yes his dad is a biker oddly enough), supplied the ecologist with a freshly boned sheep carcass as some of the literature reviewed stated that sheep bones are the ones most often confused with human bones to the untrained eye.

Training, establishing a monitoring programme and supervision of identification of bones recovered lasted five days. The four nights were spent camping out in the Study Area scouring dunes for nocturnal species listed above (mainly the geckos, but Elliot traps were also laid and more Anabat detection was undertaken to confirm the presence of the Beccari's Freetail Bat *(Mormopterus beccarii).* The Proponents senior environmental representative assisted the ecologist and oversaw the cultural heritage program being implemented. Over the period of a week, we also discussed the issues of how to manage those small animals which you simply cannot detect in the field without considerable effort in the far western landforms.

Results: Thanks to Dr Denny's report at the Ginko Mine and the subsequent prediction of this species to occur, the Aboriginal monitors were able to find and then call the ecologist over to confirm a Crowned/Sandplain Gecko (*Diplodactylus stenodactylus*) in the Study Area. The animal was dug up by an excavator (and remained alive and well). The animal was sheltering in a spider burrow at approximately 20cm deep in the corkscrew grass grasslands/forbland on sandplains vegetation community. Three Beaked Geckos (*Rhynchoedura ornata*) were also recorded (one slightly injured, one dead, the remainder unharmed) and four Royal Ctenotus (*Ctenotus regius*) were recorded with similar results in analogous habitat.

From observation (without any tangible empirical evidence), we believed that the scraper was less likely to injure small reptiles if a 10cm layer (5cm below and above), at 20cm below natural ground height on the lower dunes could be removed in one section.

Fortunately not being competitive in nature, I was not keen to outdo the monitors by finding human remains before they did. As always, the opportunity to discuss ethnobotany (bush tucker and medicine) with the Aboriginal community representatives was undertaken - this aspect of working for a heritage/ecological specialist company is intrinsically interesting.

As the monitors became proficient in identifying bones and the small reptiles previously noted, it allowed the ecologist time to consider minimising harm to small animals that may occur within Spinifex on the higher aeolian dunes adjacent to Popiltah Lake. One chief concern was impacts to Jewelled Geckos.

Photo 1: Sandplain or Crowned Gecko

On the first night of the programme, the ecologist and the Proponents senior environmental representative revised the scant habitat preferences documented for this species (and others on the list), then assessed what of those key habitat features were in the Study Area and followed up with targeted assessments. Assessment for the Jewelled Gecko ironically consisted of '*has been recorded in healthy dense Spinifex on sand dunes*' in the literature, translating in the field to "there's a bit that fits the description (walk 20 steps) – first clump of Spinifex...found one!" all within 30 minutes of starting on the first night in a mixture of *Black Oak/Western Rosewood open woodland on deep sandy loams* (Benson 58) on the sandplains in the south and the lake foreshore, and *sand hill wattle tall open shrubland on sand ridges in the arid zone* (Benson 124) on the sandplains in the south and the lake foreshore.

This species had not been previously recorded in the area. Initially, the assumption was that it was all too easy and that a locally abundant population was present, however, after four consecutive nights of scouring locally and more distant dunes, only the one population remained detected. The key habitat requirements for identification of animals in the field was subsequently updated to "*has been recorded in healthy dense Spinifex with signs of fresh growth on sand dunes which retain structural integrity (have not been trampled by goats), and possess a canopy shape similar to that of a mosque roof* ". Using this knowledge, we identified through direct observation that only one sand dune in the entire Impact Footprint possessed these key habitat features. Spotlighting of the three Spinifex clumps to be removed did not reveal any animals, however the location was approximately 100m from the only known population.

Spinifex is like handling razor wire. We observed that all of the eight Jewelled Geckos in the 70m^2 on two adjoining dunes instantly retreated into the safety of the entanglements upon our approach. About four seconds after being disturbed/observed, they would let go of their grassy footing and drop themselves to the safety of the bottom of the clump, out of sight. It was

thus worryingly obvious that the three Spinifex clumps in the Impact Footprint which were only 100m from the only recorded population had potential to possess extant individuals, assuming that others were likely to have taken evasive action prior to being observed.

On the last day of the training programme, the ecologist was permitted to 'borrow' an excavator and plant operator from the project and experiment in ways to remove Spinifex in order to minimise harm to any fauna which has potential to harbour in it. The project impacts started in an area with the least structural integrity, lowest levels of biodiversity, and on dunes that were furthest away from the lake and barely recognisable in the landscape, specifically so we could 'work out' how to manage particular heritage and ecology questions we were not able to resolve until works had begun and a routine was in place. The three Spinifex clumps identified in the environmentally sensitive areas which were considered potential habitat for Jewelled Gecko were selected.

The methods simply involved assuming that Jewelled Geckos also had the potential to use spider burrows in amongst the roots of the Spinifex to harbour in during the day, therefore making sure that any clump removed was done so by removing the Spinifex in one piece with at least 40 cm of roots and soil intact. One Spinifex was taken out and placed next to where it was excavated - roots to the ground, the second on its side, the third roots facing the sky. All three were methodically pulled apart by hand (with thick gloves) so as to find and record what happened to any small animals, particularly any extant Jewelled Geckos, during excavation and relocation of the clump.

In a nut shell, Spinifex are the coral reefs of the desert: the levels of biodiversity in what appeared to be a hostile clump of grass, were astounding. As I know little about insects, all that can be stated is that there was an amazing biomass of crickets, beetles and spiders. One Beaked Gecko was recovered, three Royal Ctenotus, a juvenile Painted Dragon (*Ctenophorus pictus*) and a sloughed snake skin. None of the reptiles were significantly injured.

Photos 3 and 4: The incredibly hard to photograph Jewelled Gecko heading for safety.

By the time the third Spinifex was dissected, the ecologist believed that there did not appear to be any difference in the injury rate to animals from the three orientations of the clumps. However, animals appeared to be much more willing to naturally disperse (after we had begun work on

pulling the clump apart by hand) from the clump that was placed with its roots to the sky. Animals within the clump that was placed roots down were recovered after almost the entire clump had been demolished (they retreated further into the root structure as we got closer to them).

Although not particularly scientific in nature (the small sample size is problematic from a statistical point of view and a methodical programme of identification of species and other aspects could not be undertaken due to serious time constraints), the activity did result in the creation of a work procedure for removal of Spinifex. Twenty-four hours before a dune was to be 'cut' for fill, a skilled operator would carefully remove Spinifex in one piece taking 40cm of soil beneath it and gently place it roots to the sky, thus allowing the animals within it to retain shelter during the day but to naturally disperse at night. It was again assumed that the unnatural orientation of the clump would not encourage the animals to remain.

The monitoring programme

The Aboriginal monitors became enthusiastic gecko and lizard spotters during the course of the week as it was a welcome relief to the monotony of following the scraper looking just for bones. The proponents representative supplied them a digital camera and purchased a field reptile guide book, and they became by default the ecologist's eyes and ears on the ground (theirs was a three month stint compared to my one week). By the end of the week, the ecologist had whittled down the list of what was likely to be impacted by the proposal to just some of the reptiles and the frog noted earlier. The ecologist then spent time with each of the plant operators and particularly the 'culvert crew' who were regarded as the most likely team to come across the illusive Painted Burrowing Frog.

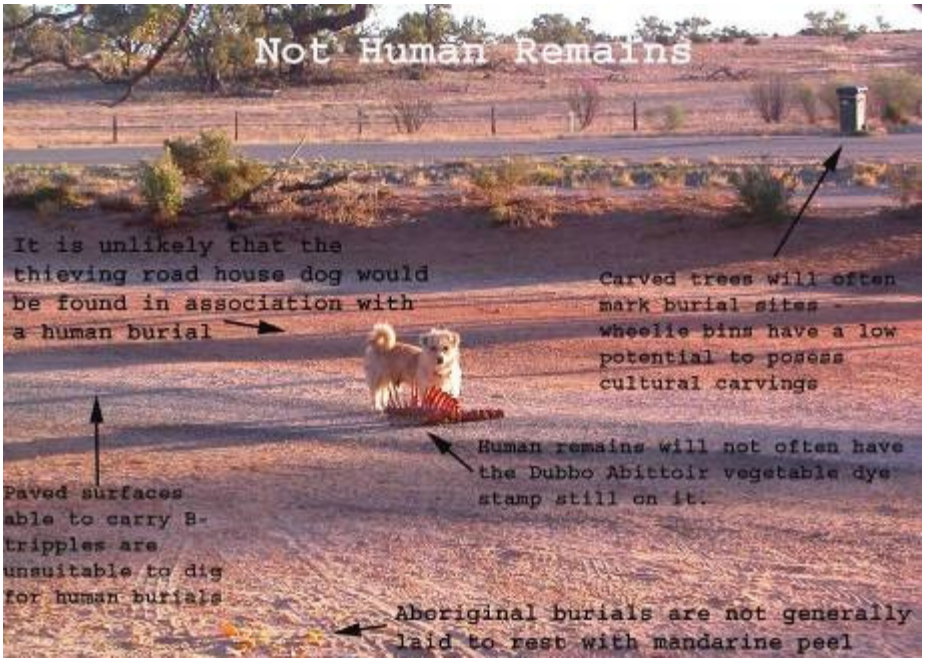
When the ecologist left the team, there was no sign of Painted Burrowing Frogs despite almost obsessive searching for it in 'likely habitat' in the Study Area. The occasional e-mail of a lizard photo would arrive from the site supervisor from the Aboriginal community, but nothing too exciting.

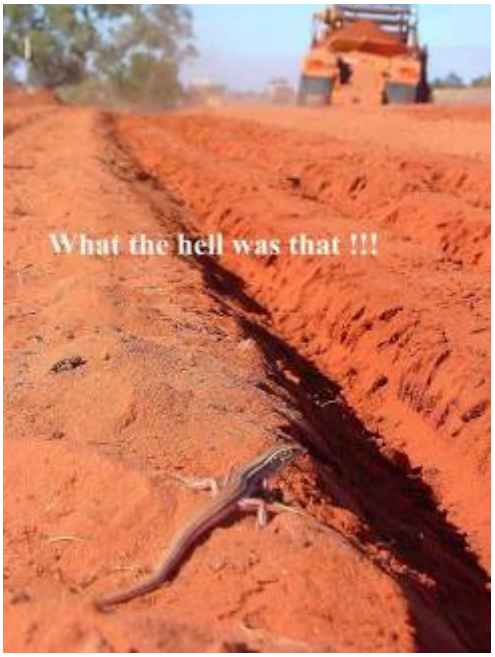
Approximately three weeks after the ecologist had left, it started to rain on site and the culvert crew, whilst packing away their gear saw the following:

Photo 4: Painted Burrowing Frog, doing its thing.

Photo 5: Painted Burrowing Frog (unfortunately bit out of focus)

Moral of the story: the guys on the tools by having a simple bit of laminated paper in their truck that included a picture of this frog were able to correctly identify it (or at least know where to go to get a second opinion). They subsequently could look at the rest of their impact footprints to see if any more were around, and avoid and mitigate where required. A great outcome for an otherwise extremely difficult species to detect in the field.





Entertaining endnote: What happened to 'Harley' the sheep carcass?

In the name of science, Harley still got used as a teaching aid after being cruelly kidnapped by the local roadhouse dog.

Contributions to the Newsletter, Volume 24

Contributions to the next newsletter should be forwarded to the editor, Jason Berrigan editor@ecansw.org.au or the administration assistant Amy Rowles admin@ecansw.org.au by the **1st of January 2010.**

- Articles may be emailed in WORD, with photos included or referenced in an attached file as a jpg.
- Please keep file size to a minimum, however there is no limit on article size (within reason)
- Ensure all photos are owned by you, or you have permission from the owner
- Ensure that any data presented is yours and you have permission from your client to refer to a specific site (if not please generalize the location).
- All articles will be reviewed by the editorial committee, and we reserve the right to request amendments to submitted articles or not to publish.
- Please avoid inflammatory comments about specific persons or entity

The following contributions are welcome and encouraged:

Relevant articles	Anecdotal ecological observations
Hints and information	Upcoming events
Recent literature	New publications (including reviews)
Member profiles	Photographs

ECA Photo Gallery

(Photo Competition Entries)

Top Left: Pink-tongued Skink (*Cyclodomorphus gerrardii*) hanging on to bill of wannabe predator, a Laughing Kookaburra (*Dacelo novaeguineae*), encountered in Bundjalung NP in northern NSW. Photo courtesy of Bob Moffat. ***Top Right:*** Sugar Glider (*Petaurus breviceps*) feeding on Red Bloodwood (*Corymbia gummifera*) sap in Duffy's Forest EEC at Terry Hills. Photo courtesy of Brett Morrisey. ***Middle Left:*** White-striped Freetail Bat (*Tadarida australis*), captured at Narrabri, NSW. Photo Courtesy of Narawan Williams. ***Middle Right:*** 'Destruction'. Photo Courtesy of Judie Rawling. ***Bottom Left:*** A Juvenile Grey-headed Flying-fox (*Pteropus poliocephalus*) in care. Photo courtesy of Amy Rowles. ***Bottom Middle:*** Grey-crowned Babblers (*Pomatostomus temporalis*). Photo courtesy of Jake Manners. ***Bottom Right:*** Tawny Rock Dragon (*Ctenophorus decresii*) listed as Endangered in NSW. A previously unknown population wasfound during field surveys for a recently approved Wind Farm near Broken Hill. Photo courtesy of Steven Sass.

Photo Competition

Email your favourite flora or fauna photo to admin@ecansw.org.au to enter a competition to have your photo on the cover of the next newsletter and win your choice of one year free membership or free entry into the next ECA annual conference. The winner will be selected by the ECA council. Runners up will be printed in the photo gallery.

ECA Photo Gallery

(Photo Competition Entries)

Left: **Runner up** - *Gompholobium huegeleii*, Lauriston Conservation Reserve, Victoria. Photo Courtesy of Colin Bower.

Below: The four-pored Earless Dragon (*Tympanocryptis tetraporophora*) is a small agamid around 16cm total length, that has a widespread distribution in the arid parts of north-western NSW. They have a tendency to occur on stony ground such as gibber plains and rocky hills. Photo courtesy of Steven Sass.

Bottom Left: *Eucalyptus racemosa* subsp *racemosa* and ***Bottom Right:*** *Grevillea parviflora* subsp *parviflora*, in the Appin area. Photos Courtesy of Colin Bower.